SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)

RAFFELS UNIVERSITY, NEEMRANA

B.Sc. (PCM) (3 Years Degree Program)

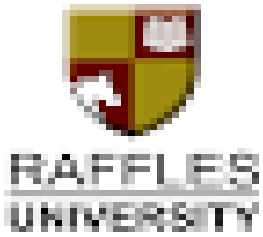
Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana



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Vision: To evolve as an Institution of Excellence, where scholars develop informed and inquiring minds and broaden the frontiers of pure and applied knowledge.

Mission: Mission: In graining the capacity to us usher in change by discovering nurturing and expanding individual skills talents and interests while standing forth as leader and path breaker in their future carrier.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 To providing subjective and practical knowledge as well as developing practical solutions and connections between theory.

PEO 2 Hearten individual growth among the students and enhance their confidence by providing them an opportunity to become a part of science-industry.

PEO 3 To make Science subjects interesting through technically, scientifically and experimentally.

PEO 4 To develop problem-solving skills through practical applications and research

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduateswillbe able to

PO 1	Provide students with fundamental knowledge and ability to expertise inComputer Science.
PO 2	Provide insight to problem solving to succeed in Technical Profession throughprecise education and to prepare students to excel in postgraduate programs.
PO 3	To inculcate in students professional, effective communication skills, team work, multidisciplinary approach and an ability to relate issues to broader socialcontext.
PO 4	Prepare students to be aware of excellence, leadership, written ethical codes and guidelines and lifelong learning needed for successful professional career by providing them with an excellent academic environment.
PO 5	Empower the students in academic, social, psychological and economic arenasby developing relevant competencies.
PO 6	Interpret and apply the implications of environment awareness initiatives incorporated in curriculum.
PO 7	Participation and contribution to community development activities throughNCC, NSS etc.
PO 8	Acquire sufficient knowledge base in the Domain Specific area leading to thepursuit of advanced level of study in the chosen Domain Specific area.
PO 9	Adaptability and capacity building to the everchanging needs of the industryand employment opportunities.
PO 10	Inculcate the human values through curricular, co-curricular and extracurricularactivities.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Department of Science, offers Three Year (comprising 6 semesters) Undergraduate Programin Mathematical Science with objective of empowering students to acquire all-inclusive understanding of Computer Knowledge both theoretical and practical as an academic discipline. Upon completion of B. Sc. Mathematical Science Degree Program study the students shall acquire the following skills and competencies.

PSO 1	Develop the ability to apply the knowledge acquired in the classroom and laboratories to specificproblems in theoretical and experimental Physics.
PSO 2	Gain the knowledge of Chemistry through theory and practical s.
PSO 3	Develop research-oriented skills.
PSO 4	Demonstrate basic manipulative skills in algebra, geometry, trigonometry and beginning calculus.
PSO 5	Investigate and apply mathematical problems and solutions in variety of context related to science,technology, business and industry. Illustrate solutions using numeric or graphical methods.
PSO 6	Develop programming skills and practical to further mathematical understanding and solvemathematical problem.
PSO 7	Perform job in various fields' like science, engineering, education, banking, business and public service, etc. Or be an entrepreneur with precision, analytical mind, innovative thinking, clarity of thought , expression, and systematic approach.

PSO-PO Mapping

		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PSO	**1**	√	√	√							
	2	√	√		√	√			√	√	
	3	√	√	√	√	√			√	√	
	4	√	√	√	√	√			√	√	√
	5			√	√	√	√	√	√		√
	6						√	√	√	√	√
	7			√	√		√	√	√	√	√

Course Objective and Course Outcomes

SCHOOL OF BASIC & APPLIED SCIENCES

(Syllabus & Scheme of Studies
B.Sc. (PCM)
I Year (I semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-101	Inorganic Chemistry	2	0	40	60	100	3	2
2		CH-103	Organic Chemistry	2	0	40	60	100	3	2
3		CH-105	Physical Chemistry	2	0	40	60	100	3	2
4		CH-107	Chemistry Lab-I	0	6	20	30	50	4	3
5	Physics	PHY-101	Mechanics – I	2	0	40	60	100	3	2
6		PHY-103	Thermodynamics – I	2	0	40	60	100	3	2
7		PHY-105	Electricity and Magnetism – I	2	0	40	60	100	3	2
8		PHY-107	Physics Laboratory	0	6	20	30	50	4	3
9	Mathematics	MA-101	Matrices and Statistics	2	0	40	60	100	3	2
10		MA-103	Calculus	2	0	40	60	100	3	2
11		MA-105	Three- Dimensional Geometry	2	0	40	60	100	3	2
12	Open Elective Paper	-	-	2	0	40	60	100	3	2
TOTAL				20	12			1100		26

1. Inorganic Chemistry (CH-101)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts of atomic structure.
2. Students will be able to understand the basic principle of classifications of elements and their periodic properties
3. Students will have through knowledge of different kinds bonding, hybridization in diatomic molecules.
4. Students can gain thorough knowledge about the structures of ionic solids, coordination no and lattice energy.

2. Organic Chemistry (CH-103)

Course Outcomes:

1. Have comprehensive knowledge of the basic organic chemistry like different electronic effects with suitable examples
2. Get information about the types of structural and stereoisomers, optical isomerism, and different nomenclature like D/L, R/S, cis/trans, E/Z etc. of various organic compounds.
3. Learn nomenclature of various types of alkanes and cycloalkanes, preparation and their chemical reactions.
4. Sound knowledge of alkenes, alkynes, dienes and their chemical reactions.

3.Physical Chemistry (CH-105)

Course Outcomes:

1. To understand the Maxwell distribution law and various parameters associated with collisions ideal gas molecules
2. To learn about Role of temperature and pressure to establish the state of gases and describe the Concept of critical temperature, pressure and volume of real gases
3. To study the Physical properties of liquids like surface tension, viscosity and their measurements
4. To have knowledge about various types of symmetries present in different solids and and Bragg's law of X-ray diffraction

4.Mechanics -I (PHY-101)

Course Outcomes:

CO 1: Student gains the knowledge on Fundamentals of Mechanics

CO 2: Student gets a thorough knowledge different types of forces that make lifesmoother.

CO 3: Student gets a thorough knowledge on fluid dynamics.

CO 4: Student gets a thorough knowledge on elastic properties of solids.

CO 5: Finds the evolution of theories for understanding the Universe and thedynamic nature of Universe.

5.Thermodynamics -I (PHY-103)

Course Outcomes:

CO 1: Student gains the knowledge on Fundamentals of Thermodynamics

CO 2: Student gets a thorough knowledge different types of reversible andirreversible engines

CO 3: Student gets a thorough knowledge on dynamics of Heat flow.

CO 4: Student gets a thorough knowledge on various degrees of freedom andmolecular movement.

CO 5: Finds the evolution of Quantum Mechanics, a new branch of Physics

1. Electricity and Magnetism-I (PHY-105)

Course Outcomes:

CO 1: understand concepts of electric and magnetic fields and electric potential;

CO 2: understand the topic of capacitance;

C) 3: be able to treat DC and AC circuits;

CO 4: understand the Lorentz force law and apply it to solve problems;

CO 5: be able to treat the motion of charged objects in two and three dimensions;

1.Matrices and Statistics (MA-101)

Course Outcomes:

CO 1: An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.

CO 2: An understanding of the analysis of distributed loads.

CO 3: A knowledge of internal forces and moments in members.

CO 4: An ability to calculate centroids and moments of inertia

2. Calculus (MA-103)

Course Outcomes:

1. understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.

2. locate the x and y intercepts, any undefined points, and any asymptotes.

3. apply the techniques from the previous section to graph a fourth degree polynomial or higher

4. determine if there is any symmetry to aid in the graphing process.

5. determine the point(s) of intersection of pairs of curves

3. Three-Dimensional Geometry (MA-105)

Course Outcomes:

CO 1: Understand how Real Analysis raw materials for growth

CO 2: Have comprehensive exposure to the subject of Real Analysis

CO 3: Develop the knowledge and confidence to pure Mathematics Understand the role of Real Analysis

CH-101	PO									
		1	2	3	4	5	6	7	8	9	10
CO	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-103	PO									
		1	2	3	4	5	6	7	8	9	10
CO	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-105	PO									
		1	2	3	4	5	6	7	8	9	10
CO	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-107	PO

		1	2	3	4	5	6	7	8	9	10
CO	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-101	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2
CO 4	2	2	1	2	2	1	1	2	1	1
CO 5	1	1	2	1	2	1	3	2	2	1

PHY-103	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2
CO 4	2	2	1	2	2	1	1	2	1	1
CO 5	1	1	2	1	2	1	3	2	2	1

PHY-105	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2
CO 4	2	2	1	2	2	1	1	2	1	1
CO 5	1	1	2	1	2	1	3	2	2	1

PHY-107	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2

	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-101	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-103	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-105	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

SCHOOL OF BASIC AND APPLIED SCIENCES
(Scheme of Studies & Examinations)
B. Sc. (PCM) I Year (II Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination Scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-102	Inorganic Chemistry	2	0	40	60	100	3	2
2		CH-104	Organic Chemistry	2	0	40	60	100	3	2
3		CH-106	Physical Chemistry	2	0	40	60	100	3	2

4		**CH-108**	**Chemistry Lab-II**	0	6	20	30	50	4	3
5	**Physics**	**PHY-102**	**Mechanics – 2**	2	0	40	60	100	2	2
6		**PHY-104**	**Thermodynamics – 2**	2	0	40	60	100	2	2
7		**PHY-106**	**Electricity and Magnetism – 2**	2	0	40	60	100	2	2
8		**PHY-108**	**Physics Laboratory**		6	20	30	50	4	3
9	**Mathematics**	**MA-102**	**Sequences and Series& Trigonometry**	2	0	40	60	100	3	2
10		**MA-104**	**Ordinary Differential Equations**	2	0	40	60	100	3	2
11		**MA-106**	**Vector Calculus and Geometry**	2	0	40	60	100	3	2
12	**Open Elective Paper**			2	0	40	60	100	3	2
TOTAL				**20**	**12**			**1100**		**36**

1.Inorganic Chemistry (CH-102)

Course Outcomes:

1. To know the conception of different types of hydrogen bonding and the effects of these. To learn about van der Waals forces on properties of substances.

2. To know about the diagonal relationship among s- block elements and about hydrides, oxides, hydroxides and halides of s-block elements.

3. Learn about chemistry of noble gases with emphasizing to xenon.

4. To know about the physical and chemical properties of p-block elements and have knowledge about the boron family elements their structure, preparation and properties of diborane and borazine.

5. Students can gain thorough knowledge about elements of carbon and nitrogen family and concept of catenation, carbides and fluorocarbons. They will know about the elements of oxygen family and have knowledge about the chemical properties of oxides of sulphur.

2. Organic Chemistry (CH-104)

1. To have sound knowledge in alkenes and their properties.

2. Learn the basics of aromaticity and Huckel's rule. To know preparation and chemical reactions of different aromatic hydrcarbons..

3. Sound knowledge of dienes and their chemical reactions.

4. Get knowledge about the mechanism of SN1 and SN2 reactions and other various chemical reactions of alkyl and aryl halides.

3.Physical Chemistry (CH-106)

1. Systematic and coherent understanding of the fundamental concepts in Chemical Kinetics.

2. Students will be able to understand the causes behind the different types of chemical reactions and the temperature dependence of reaction rate.

3. Students will be able to understand the basic principle of the electrical conduction in liquid state and how is it measured.

4. Students will learn the principles of equipment and instruments used in the chemistry laboratory. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state and its' application in different cases.

4.Mechanics-II (PHY-102)

Course Outcomes:

CO 1: Understand integration of vectors
CO 2: Student gets a thorough knowledge different types of forces that make lifesmoother.

CO 3: Derive Stoke's , Greens and Gauss theorems.

CO 4: Student gets a thorough knowledge on elastic properties of solids.

CO 5: Finds the evolution of theories for understanding the Universe and thedynamic nature of Universe.

5. Thermodynamics-II (PHY-104)

Course Outcomes:

CO 1: Student gains the knowledge on Fundamentals of Thermodynamics

CO 2: Student gets a thorough knowledge different types of reversible andirreversible engines

CO 3: Student gets a thorough knowledge on dynamics of Heat flow.

CO 4: Student gets a thorough knowledge on various degrees of freedom andmolecular movement.

CO 5: Finds the evolution of Quantum Mechanics, a new branch of Physics

6. Electricity and Magnetism-II (PHY-106)

Course Outcomes:

CO 1: understand the sources of magnetic field;

CO 2: know the law of EM induction; understand EM induction and inductance;

CO 3: understand Maxwell's equations and wave equation;

CO 4: perform basic experiments in electricity, magnetism, and optics, and work with other team

7. Sequence and Series Trigonometry (MA-102)

Course Outcomes:

CO1: Write programs/functions to compute number theoretic functions.

CO 2: Use mathematical induction and other types of proof writing techniques.

CO3: Evaluate trigonometric and inverse trigonometric functions.

CO4: Solve trigonometric equations and applications.

CO5: Apply and prove trigonometric identities.

8. Ordinary differential Equations (MA-104)

Course Outcomes:

CO 1: Student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.

CO 2: Student will be able to find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.

CO 3: Student will be introduced to the complete solution of a nonhomogeneous differential equation with constant coefficients by the method of undetermined coefficients.

CO 4: Student will be able to find the complete solution of a differential equation with constant coefficients by variation of parameters.

CO 5: Student will have a working knowledge of basic application problems described bysecond order linear differential equations with constant coefficients.

9. Vector Calculus and Geometry (MA-106)

Course Outcomes:

CO 1: Memorize definition of directional derivative and gradient and illustrate geometric meanings with the aid of sketches.

CO 2: Memorize theorem relating directional derivative to gradient and reproduce proof.

CO 3: Calculate directional derivatives and gradients.

CO 4: Apply gradient to solve problems involving normal vectors to level surfaces.

CO 5: Explain the concept of a vector integration a plane and in space.

CH-102	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-104	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-106	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-108	PO

		1	2	3	4	5	6	7	8	9	10
CO	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-102	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2
CO 4	2	2	1	2	2	1	1	2	1	1
CO 5	1	1	2	1	2	1	3	2	2	1

PHY-104	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2
CO 4	2	2	1	2	2	1	1	2	1	1
CO 5	1	1	2	1	2	1	3	2	2	1

PHY-106	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2
CO 4	2	2	1	2	2	1	1	2	1	1
CO 5	1	1	2	1	2	1	3	2	2	1

PHY-108	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2
CO 4	2	2	1	2	2	1	1	2	1	1
CO 5	1	1	2	1	2	1	3	2	2	1

MA-102	PO

CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-104	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-106	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

SCHOOL OF BASIC AND APPLIED SCIENCES
(Scheme of Studies & Examinations)
B. Sc. (PCM) II Year (III Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-201	Inorganic Chemistry	2	0	40	60	100	3	2
2		CH-203	Elective Paper	2	0	40	60	100	3	2
3		CH-205	Physical Chemistry	2	0	40	60	100	3	2
4		CH-207	Chemistry Lab-III	0	6	20	30	50	4	3
5	Physics	PHY-201	Optics – 1	2	0	40	60	100	3	2
6		PHY-203	Modern Physics – 1	2	0	40	60	100	3	2
7		PHY-205	Electronics – 1	2	0	40	60	100	3	2
8		PHY-207	Physics Lab-III	0	6	20	30	50	4	3
9	Mathematics	MA-201	Advance Calculus	2	0	40	60	100	3	2
10		MA-203	Partial Differential Equations	2	0	40	60	100	3	2
11		MA-205	Elective Paper	2	0	40	60	100	3	2

12	**Open Elective Paper**	**-**	**-**	2	2	40	60	100	3	2
				20	**14**			**1100**		**26**

1. Inorganic Chemistry (CH-201)

Course Outcomes:

CO 1: Have good knowledge about d-block elements particularly of transition elements.

CO 2: To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties of some compounds of transition elements.

CO 3: To know about the basic concepts of coordination chemistry like EAN, Werner theory of coordination, nomenclature and isomerism in coordination complexes.

CO 4: Students can gain knowledge about the properties and reactions in non-aqueous solvents like liquid NH_3 and liquid SO_2, and also the concept of Acids and Bases.

2.Organic Chemistry (CH-203)

Course Outcomes:

CO 1: Have comprehensive knowledge of the synthesis and properties of alcohols and epoxides

CO 2: Know about synthesis and properties of phenols and their chemical reactions.

CO 3: Have knowledge of Beer-Lambert law, molar absorptivity, different electronic transitions, analysis UV spectra and application of UV spectroscopy in structure elucidation.

CO 4: Knowledge about various methods for the preparation of carboxylic acid, carboxylic derivatives (ester, amide, acid chlorides, anhydrides) and their chemical reactions.

3.Physical Chemistry (CH-205)

Course Outcomes:

CO 1: To know about different process, functions and 1^{st} law of thermodynamics

CO 2: To have knowledge about w, q, dU & dH and Kirchoffs equation

CO 3: To understand the basic terms related to chemical equilibrium and derive the law thermodynamically, deduce relation between various equilibrium constants and determining partition coefficient of a solvent dissolved in two immiscible solvents

CO 4: To have good knowledge about distribution law and its applications

4. Optics-I (PHY-201)

Course Outcomes:

CO 1: Student gains the knowledge on Electromagnetic nature of light.

CO 2: Student gets a thorough knowledge optical properties of light.

CO 3: Applications of different techniques to correct the aberrations.

CO 4: Studies different eye pieces and various methods to produce collimatedparallel beams of light.

CO 5: Finds the applications of diffraction and its classification in day – to – day life.

5.Modern Physics – 1(PHY-203)

Course Outcomes:

CO 1: To understand the difference between Atomic and Molecular spectroscopies.

CO 2: Understand the intuitive ideas of the Quantum physics and Nuclear physics.

CO 3: Derive Schrodinger time dependent and time independent wave equations

CO 4: To understand dual nature of matter

CO 5: Gain knowledge on classification of various crystal systems

7. Electronics-I (PHY-205)

Course Outcomes:

1.Understand the diode and transistor characteristics.

2. Verify the rectifier circuits using diodes and implement them using hardware.

3. Design the biasing circuits like self biasing.

4. Design various amplifiers like CE, CC, common source amplifiers and implement them using hardware and also observe their frequency responses

5. Analyze the concepts of SCR and observe its characteristics.

8. Advance Calculus (MA-201)

Course Outcomes:

CO 1: Understand raw materials for growth calculus functions

CO 2: Have comprehensive exposure to the subject of Advanced Calculus

CO 3: Develop the knowledge and confidence to pursue advanced courses Understand the role of Advanced calculus

9. Partial differential equations (MA-203)

Course Outcomes:

CO1: Classify partial differential equations and transform into canonical form

CO 2: Solve linear partial differential equations of both first and second order

CO 3: Apply partial derivative equation techniques to predict the behaviour of certain Phenomena.

CO 4: Apply specific methodologies, techniques and resources to conduct research and Produce innovative results in the area of specialization.

CO 5: Extract information from partial derivative models in order to interpret reality.

CH-201	PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

CH-203	PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

CH-205		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

PHY-201		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

PHY-203		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

PHY-205		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

MA-201	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

MA-203	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

MA-205	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

SCHOOL OF BASIC AND APPLIED SCIENCES
(Scheme of Studies & Examinations)
B. Sc. (PCM) II Year (IVSemester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-202	Elective Paper	2	0	40	60	100	3	2
2		CH-204	Organic Chemistry	2	0	40	60	100	3	2
3		CH-206	Physical Chemistry	2	0	40	60	100	3	2
4		CH-208	Chemistry Lab-IV	0	6	40	60	100	4	3
5	Physics	PHY-202	Optics – 2	2	0	40	60	100	2	2
6		PHY-204	Modern Physics – 2	2	0	40	60	100	2	2
7		PHY-206	Electronics – 2	2	0	40	60	100	2	2
8		PHY-208	Physics Lab-IV		6	40	60	100	4	3
9	Mathematics	MA-202	Linear programming	2	0	40	60	100	3	2
10		MA-204	Special Functions and Integral Transforms	2	0	40	60	100	3	2
11		MA-206	Elective Paper	2	0	40	60	100	3	2
12	Open Elective Paper	-	-	2	0	40	60	100	3	2
TOTAL				40	12			1100		26

1. Inorganic Chemistry (CH-202)

Course Outcomes:

1. Have good knowledge about d-block elements particularly of transition elements.
2. To study the bonding of 3d elements. To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters. Students will be able to calculate the spectroscopic terms for various metal ions.
3. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.
4. To know about position of f block elements in periodic table and their general characteristics. To study the occurrence and separation of lanthanides and lanthanide compounds. Have knowledge of actinides their existence and general properties.
5. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

2.Organic Chemistry (CH-204)

Course Objective:

1. Able To describe absorptions of various functional groups and applications of IR spectroscopy. To know the application of IR spectroscopy in structure elucidation.
2. To synthesize and know reactions of amines.
3. To discuss synthetic application of diazonium salts and other nitro compounds.
4. Get knowledge about the preparation of aliphatic, aromatic aldehydes and ketones and various important name reactions of aldehydes and ketones.

3.Physical Chemistry (CH-206)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.

2. Students will be able to understand the fundamentals of thermodynamics and electrochemistry.

3. Students will be able to understand the solve problems using the properties and relationships of thermodynamic equations. Students will have understanding of thermodynamic fundamentals for application in applied thermodynamics.

4. Students will gain the knowledge of instrumentation in electrochemistry. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state.

3.Statistical Mechanics (PHY-202)

Course Objective:

1. To inculcate the fundamentals of Statistical Mechanics
2. To understand types of ensembles (Micro, Canonical and Grand Canonical)
3. To comprehend Partition function, Gibb's Paradox.
4. To understand classification of classical and Quantum statistics.
5. To understand the role of Quantum statistics in foundation of QuantumMechanics.

Course Outcomes:

CO 1: Student gains the knowledge on fundamentals of Statistical Mechanics

CO 2: Student gets a thorough knowledge on different systems and ensembles.

CO 3: The role of partition function in scientific problem solving.

CO 4: Applies the statistics accordingly to different classes of particles.

CO 5: Applies the statistics for various quantum possible applications.

4.Quantum Mechanics-I (PHY-204)

Course Objective:

1. To inculcate the fundamentals of Quantum Mechanics
2. To understand the nature of matter, de Broglie Hypothesis, Compton effect
3. To comprehend behaviour of matter at atomic level
4. To understand discrete energy levels, particle dynamics and variousoperations.
5. To understand the behaviour of particle in various circumstances viz potential

well, potential barrier.

Course Outcomes:

CO 1: Student gains the knowledge on fundamentals of Quantum Mechanics

CO 2: Student gets a thorough knowledge on dual nature of matter and itsverification.

CO 3: The dynamics of fundamental particles are studied using Schrodinger timedependent and time independent wave equations.

CO 4: Eigen states and eigen values gives the knowledge of allowed and forbiddenenergy regions.

CO 5: Applies the Quantum conditions for various quantum applications.

5.Optics-II (PHY-206)

Course Objective:

1. To inculcate the fundamentals properties of light
2. To understand the mechanism behind various polarizations of light.
3. To comprehend the diffraction phenomenon of light.
4. To understand the basic principles of 3 – D photography/ Holography.
5. To understand the 3level laser system.

Course Outcomes:

CO 1: Student gains the knowledge on basic principles of light and its applications.

CO 2: Student gets a thorough knowledge on types of polarization and its production andapplications.

CO 3: Student gains the demonstrated knowledge on diffraction phenomenon of light.

CO 4: Gains a comprehensive knowledge on construction of a hologram

CO 5: Gains a demonstrated knowledge on 3 level laser system and atomic interferencelasing without inversion.

6.Linear Programming (MA-202)

Course Objective:

1.To get familiarize with the mathematical formulation of a real-world problem.

2. To acquaint with the problem-solving techniques theoretically as well as graphically.

3. To tackle several parameters into account while dealing with the problem.

4. To make aware the students about the applications of various forms of Linear Programming.

Course Outcomes:

CO1: Understand a basic thoughtfulness for linear programming problem

CO2: Apply the techniques of LPP to solve real world problems

CO3: Judge Importance of solution obtained in terms of uniqueness, bound and optimality

CO4: Formulate mathematical model for management and technical problems using LPP concepts.

CO5: Create an interest to solve transportation and assignment problems with its physical significance.

7. Special Functions and Integral (MA-204)

Course Objective:

1. To analyze properties of special functions by their integral representations andsymmetries.
2. To determine properties of Fourier, transform which may be solved by application ofspecial functions.
3. To determine properties of Laplace, transform which may be solved by application ofspecial functions.
4. To determine properties of Legendre Polynomial which may be solved by application ofspecial functions.

Course Outcomes:

CO 1: understand integral calculus and special functions of various engineering problem and to know the application of some basic mathematical methods via all these special functions.

CO 2: explain the applications and the usefulness of these special functions.

CO 3: classify and explain the functions of different types of differential equations.

CO4: understand purpose and functions of the gamma and beta functions, Fourier series and Transformation.

CO 5: use the gamma function, beta function and special functions to: evaluate different typesof integral calculus problems and Fourier series to solve differential equations.

8. Special Functions andIntegral Transform (MA-204)

CO1: Explain the applications and the usefulness of these special functions.

CO2: Classify and explain the functions of different types of differential equations.

CO3: To determine types of PDEs which may be solved by application of special functions?

CO4: To analyse properties of special functions by their integral representations and symmetries.

CO5: Identified the application of some basic mathematical methods via all these special functions.

CO6: Apply these techniques to solve and analyse various mathematical problems.

PHY-202	PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1
PHY-204	PO									
		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1

CO	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1
PHY-206	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1
PHY-208	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

MA-202	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1
MA-204	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-206	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2

CO

B.Sc. (PCM) III Year (V)

Sr.No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-301	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-303	Organic Chemistry	2	0	20	30	50	3	2
3		CH-305	Elective Paper	2	0	20	30	50	3	2
4		CH-307	Chemistry Lab-V	0	6	20	30	50	4	3
5	Physics	PHY-301	Solid State Physics	2	0	20	30	50	3	2
6		PHY-303	Advance Electronic	2	0	20	30	50	3	2
7		PHY-305	Elective Paper	2	0	20	30	50	3	2
8		PHY-307	Physics Lab-V	0	6	20	30	50	4	3
9	Mathematics	MA-301	Real Analysis	2	0	20	30	50	3	2
10		MA-303	Modern algebra	2	0	20	30	50	3	2
11		MA-305	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			600		26

NOTE: - 1. **Abbreviations:** L=Lecture, T= Tutorials, P= Practical's, IA = Internal Assessment

2. **Marks distribution of Internal Assessment (IA)** for Theory Subjects should be 50% midterm Examination + 50% Assignments/Tutorials/Special activity viz: PPT, Quiz Test
3. **Elective paper:** MA-305A:-Dynamics OR MA-305B: Discrete Mathematics
   PHY-305A:- Quantum Mechanics - II OR PHY-305B: Classical MechanicsCH-305A:- Physical Chemistry OR CH-305B: Green Chemistry
4. **Open Elective Paper:** BE-301: Basic Electrical IL-301: Introductory Law, HV-301: Human Value

1. Inorganic Chemistry (CH-301)

Course Outcomes:

1. To summarize the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbitals in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters.

2. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

3. To study the magnetic properties of transition metal complexes and various types of magnetic materials and their magnetic susceptibility.

4. Have knowledge about orgal level diagrams for d1 and d9 electronic states and the electronic spectrum of $[Ti(H_2O)_6]^{+3}$complex ion.

2. Organic Chemistry (CH-303)

Course Outcomes:

1. Get knowledge about the principle of nuclear magnetic resonance.

2. To elucidate the structure of various molecules by using PMR spectra.

3. To have knowledge about classification, structures and important reactions of carbohydrates

4. Sound knowledge of organometallic compounds.

3.Physical Chemistry (CH-305)

Course Outcomes:

1. To know about dual characteristic of matter and extend this fact to obtain postulates of quantum mechanics and quantum-mechanical operators, apply Schrödinger equation to determine the physical observables for particle in a box.

2. To have knowledge about dipole moment, magnetic permeability and susceptibility

3. To have sound knowledge about the consequences of interaction of radiation with matter resulting into various types of spectra.

4. To be able to solve various numerical problems related to spectroscopy.

1. Student gains the knowledge on various nuclear models and properties ofnuclei
2. Student gets a thorough knowledge on alpha, beta, gamma decay
3. The Geiger Nuttel law, Range of alpha particles and their disintegrationlaws are thoroughly understood.
4. Types of nuclear accelerators and their basic principles of operation arethoroughly studied.
5. Student gains knowledge on how to control a nuclear chain reaction and how to attain the nuclear stability.

4. PHY-301 Solid State Physics

Course Outcomes:

1. Student gains the knowledge on fundamentals of Crystal structure
2. Student gets a thorough knowledge on different techniques for studying crystal structures
3. Applications of reciprocal lattice for crystal structure studies.
4. Studies the different types of magnetic materials
5. Studies the real time applications of superconducting materials and the corresponding science.

5. PHY-303 Advance Electronic

Course Outcomes:

1. Student gains the knowledge on functioning of FET and MOSFET for practical applications
2. Student gets a thorough knowledge functioning of OP AMPs
3. Student applies OP Amps for various mathematical operations like addition, subtraction, integration, differentiation, etc.
4. Studies the Amplitude and frequency modulations and its detection techniques.
5. Finds the applications of digital electronics in day – to – day life and could design them.

6. MA-303 Modern algebra

Course Outcomes:

After completing the course, the students will be able to learn :

1. The importance of group in algebra.
2. The importance of a ring as a fundamental object in algebra.
3. The importance of group in algebra.
4. The concept of a module as a generalization of a vector space and
5. an Abelian group.
6. Homomorphism and isomorphism, Cayley's theorem, Normal subgroups, Quotient group.
7. The concept of Sub ring Homomorphism and isomorphism, field, Field of quotients of an integral

domain

7. MA-301 Real Analysis

Course Outcomes:

1. Students will be able to demonstrate competence with elementary properties of sets by proving identities involving union and intersection and Cartesian Products of sets.
2. Students will be able to demonstrate competence with elementary properties of functions by proving results involving composite functions and inverse functions.
3. Students will be able to use mathematical induction to prove results involving natural numbers.
4. Students will be able to demonstrate competence with the algebraic and order properties of real numbers.
5. Students will be able to demonstrate competence with properties of real numbers by finding supremum and infimum of sets and using the completeness property of real numbers.

CH-301	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-303	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-305	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-301	PO

CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1
PHY-303	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1
PHY-305	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-301	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1
MA-303	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1
MA-305	PO										
		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1

CO	**3**	**2**	**1**	**2**	**1**	**2**	**2**	**1**	**3**	**1**	**2**
	4	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**2**	**1**	**1**
	5	**1**	**1**	**2**	**1**	**2**	**1**	**3**	**2**	**2**	**1**

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations of B.Sc. w. e. f. 2022-23 onwards)

B.Sc. (PCM) III Year (VI)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination Scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-302	Elective Paper	2	0	20	30	50	3	2
2		CH-304	Organic Chemistry	2	0	20	30	50	3	2
3		CH-306	Physical Chemistry	2	0	20	30	50	3	2
4		CH-308	Chemistry Lab-VI	0	6	20	30	50	4	3
5	Physics	PHY-302	Atomic, Molecular physics	2	0	20	30	50	3	2
6		PHY-304	Nuclear Physics	2	0	20	30	50	3	2
7		PHY-306	Elective Paper	2	0	20	30	50	3	2
8		PHY-308	Physics Lab-VI	0	6	20	30	50	4	3
9	Mathematics	MA-302	Complex Analysis	2	0	20	30	50	3	2
10		MA-304	Linear Algebra	2	0	20	30	50	3	2
11		MA-306	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			600		26

1. Inorganic Chemistry (CH-302)

Course Outcomes:

1. To get the detailed understanding of Bonding in homonuclear and heteronuclear molecules using the molecular orbital theory.
2. To study the nomenclature, classification, preparation and bonding in organometallic compounds and of metal carbonyls also.
3. To know about basic concepts of bioinorganic chemistry with reference to metal ions present in biological systems. To understand the biochemistry of oxygen carriers especially hemoglobin and myoglobin.
4. To know about various inorganic clusters compounds with special reference to silicones and phosphazenes.

2. Organic Chemistry (CH-304)

Course Outcomes:

1. To gain knowledge about aromatic behaviour and basicity of simple heterocyclic compounds (pyridine, piperidine and pyrrole).
2. To know about 5 and 6 membered heterocyclic rings , basicity of and the preparation and reactions of indole, quinoline and isoquinoline.
3. To get knowledge about the acidity of α-hydrogens of diethyl malonate, ethyl acetoacetate and the synthesis and Keto-enol tautomerism of ethyl acetoacetate.
4. To learn about the essential amino acids, peptides and proteins. To get the knowledge about their structure and properties.

3. Physical Chemistry (CH-306)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.
2. Students will be able to understand the basic principle of electronic spectroscopy and the energy related to every colour imparted by chemicals. They will also gain the clear physical interpretation of chemical bonding and molecular structure.
3. The course curriculum is expected to develop an inquisitive feature among the students through suitable questions and experimental investigation.
4. Students will be having clear knowledge of how light is important to chemical reactions and how the

amount of molecules in a solution affects the nature of a solution which is beneficial for the applied field.

5. Students will gain the knowledge of different phases of materials and their co-existence

4. Nuclear Physics (PHY-304)

Course Outcomes:

1. Student gains the knowledge on various nuclear models and properties of nuclei
2. Student gets a thorough knowledge on alpha, beta, gamma decay
3. The Geiger Nuttel law, Range of alpha particles and their disintegration laws are thoroughly understood.
4. Types of nuclear accelerators and their basic principles of operation are thoroughly studied.
5. Student gains knowledge on how to control a nuclear chain reaction and how to attain the nuclear stability.

5. Atomic Physics (PHY-302)

Course Outcomes:

1. Student gains the knowledge on basic principles of optical Fibre communication.
2. Student gets a thorough knowledge on basics of Laser functioning and different types of lasers and their applications.
3. Student gains the demonstrated knowledge on storing and retrieving information from Holograms and the principles behind it.
4. Gains a comprehensive knowledge on various blocks of optical Fibre communication systems including source, couplers, receivers, sensors.
5. Gains a demonstrated knowledge on digital communication system.

6. Complex analysis (MA-302)

Course Outcomes:

1. Represent complex numbers algebraically and geometrically
2. Analyze limit, continuity and differentiation of functions of complex variables.
3. Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.
4. Understand Cauchy theorem and Cauchy integral formulas and apply these to evaluate complex contour integrals.
5. Represent functions as Taylor and Laurent series; classify singularities and poles; find residues and evaluate complex integrals using the residue theorem.

7. Linear Algebra (MA-304)

Course Outcomes:

1. Understand the concepts of vector spaces, subspaces, bases, dimension and their properties.
2. Relate matrices and linear transformations, compute Eigen values and Eigen vectors of linear transformations.
3. Learn properties of inner product spaces and determine orthogonality in inner product spaces.

4. Obtain various variants of diagonalisation of linear transformations.
5. Realise importance of adjoint of a linear transformation and its canonical form.

CH-302	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-304	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-306	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	3	2	3	3	2	1	1
	5	1	3	2	1	2	1	3	2	2	1

PHY-302	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-304	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2

	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1
PHY-306	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-302	PO									
CO	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	0	0	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1
MA-304	PO									
CO	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	0	1	2	0	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1
MA-306	PO									
CO	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	0	1	2	2	0	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	0	2	1	2	1	3	2	0	1

B.Sc Chemistry Syllabus

(2022-2025)

RAFFLES
UNIVERSITY

Department of Chemistry School of Basic and Applied Sciences

RAFFLES UNIVERSITY
Japanese Zone, National Highway-48, Neemrana-301705,District: Alwar,
RAJASTHAN, INDIA www.rafflesuniversity.edu.in

RAFFLES UNIVERSITY

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Inorganic Chemistry **Paper Code : CH-101**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Atomic Structure: Idea of de-Broglie matter waves, Heisenberg's uncertainty principle, atomic orbital's, quantum numbers, Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configuration of the elements, radial and angular wave functions and probability distribution curves, shapes of s, p, and d orbitals.

UNIT-II

Periodic Table: General principles of periodic table, effective nuclear charge, Slater's rules, Atomic and ionic radii, ionization energy, electron affinity and electronegativity: definition, methods of determination or evaluation, trends in periodic table (s & p block elements).

UNIT-III

Covalent Bond: Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions (BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7 SO^{-2}, ClO^{-1})Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, ICI^- and H_2O_2. MO theory of heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

UNIT-IV

Ionic Solids: Ionic structures (NaCl, CsCl, ZnS, CaF_2) radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy (mathematical derivation excluded) and Born- Haber cycle, solvation energy and its relation with solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule.

Suggested books:

1. Fundamental concepts of Inorganic Chemistry, A.K. Das [Publisher: CBS]
2. Inorganic Chemistry, Malik, Tuli Madan, [Publisher: S.Chand]
3. Principles of Inorganic Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
4. Inorganic Chemistry, James E. Huheey, E.A. Keiter, R. L. Keiter, O. K. Medhi
5. Concise Inorganic Chemistry, J. D. Lee, [Publisher: Oxford]

RAFFLES UNIVERSITY

B.Sc. (PCM+CBZ) I Year (I Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Organic Chemistry **Paper Code : CH-103**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Structure and Bonding: Localized and delocalized chemical bond, van der Waals' interactions, resonance conditions, resonance effect and its applications, hyperconjugation, inductive effect,Electromeric effect & their comparison.

Stereochemistry of Organic Compounds-I: Concept of isomerism. Types of isomerism. Optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization.

UNIT-II

Stereochemistry of Organic Compounds-II: Relative and absolute configuration, sequence rules, R & Ssystem of nomenclature, Geometric isomerism, determination of configuration of geometrical isomers, E & Z system of nomenclature, Conformational isomerism conformational analysis of ethane and n-butane, conformations of cyclohexane, axial and equatorial bonds, Newman projection and Sawhorse formulae, Difference between configuration and conformation.

UNIT-III

Mechanism of Organic Reactions: Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Energy considerations.Reactive intermediates carbocations, carbanions, free radicals, carbenes , arynes and nitrenes (formation, structure & stability). Assigning formal charges on intermediates and other ionic species.

UNIT-IV

Alkanes and Cycloalkanes: IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties. Cycloalkanes: nomenclature, synthesis of cycloalkanes and their derivatives– photochemical (2+2) cycloaddition reactions, dehalogenation of dihalides, pyrolysis of calcium or barium salts of dicarboxylic acids, Baeyer's strain theory and its limitations, theory of strainless rings.

Suggested books:

1. Basic Stereochemistry of Organic molecules, Subrata Sengupta [Publisher: Oxford]
2. Organic Chemistry Vol-I, I. L. Finar [Publisher: Pearson]
3. Organic Chemistry Vol-I, Nemai Tewari, [Publisher: McGraw Hill]
4. Stereochemistry of Organic Compounds, D Nasipuri, [Publisher: New Age Central]

RAFFLES UNIVERSITY

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Physical Chemistry **Paper Code : CH-105**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Gaseous States: Maxwell's distribution of velocities and energies (derivation excluded) Calculation of rootmean square velocity, average velocity and most probable velocity. Collision diameter, collision number, collision frequency and mean free path. Deviation of Real gases from ideal behaviour. Derivation of Vander Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor) Explanation of behavior of real gases using Vander Waal's equation.

UNIT-II

Critical Phenomenon: Critical temperature, Critical pressure, critical volume and their determination. PV isotherms of real gases, continuity of states, the isotherms of Vander Waal's equation, relationship betweencritical constants and Vander Waal's constants. Critical compressibility factor. The Laws of corresponding states. Liquefaction of gases.

UNIT-III

Liquid States: Structure of liquids. Properties of liquids – surface tension, viscosity, vapour pressure and optical rotations and their determination.

UNIT-IV

Solid State: Classification of solids, Laws of crystallography – (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements of crystals, Definition of unit cell & space lattice. Bravais lattices, crystal system. X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl.

Liquid crystals: Difference between solids, liquids and liquid crystals, types of liquid crystals, Applications of liquid crystals.

Suggested books:

1. Physical Chemistry, P.C. Rakshit [Publisher: SBH]
2. A Textbook of Physical Chemistry Vol-2, K. L. Kapoor [Publisher: McGraw Hill]
3. Principles of Physical Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
4. Essentials of Physical Chemistry, Bahl, Bahl and Tuli [Publisher: S.Chand]
5. Physical Chemistry, P.W. Atkins [Oxford University Press]

RAFFLES UNIVERSITY

B.Sc. (PCM+CBZ) I Year (I Semester)

Schedule per week Practical: 6
Examination Time : 4 Hrs **Maximum Marks: 50 (20+30)**
Subject : Chemistry Lab-I **Paper Code : CH-107**

UNIT-I (Inorganic)

Volumetric Analysis

1. **Redo titrations**: Determination of Fe^{2+}, $C_2O_4^{2-}$ (using $KMnO_4$, $K_2Cr_2O_7$)
2. **Iodometic titrations:** Determination of Cu^{2+} (using standard hypo solution).
3. **Complexometric titrations:** Determination of Mg^{2+}, Zn^{2+} by EDTA.

UNIT-II (Physical)

1. To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
2. To prepare arsenious sulphide sol and compare the precipitating power of mono, bi and trivalent anions.

UNIT-III (Organic)

1. Preparation and purification through crystallization or distillation and ascertainingtheir purity through melting point or boiling point
   (i) Iodoform from ethanol (or acetone)
   (ii) *m*-Dinitrobenzene from nitrobenzene (use 1:2 conc. HNO_3 H_2SO_4 mixture if fuming HNO_3 is not available)
   (iii) *p*-Bromoacetanilide from acetanilide
   (iv) Dibenzalacetone from acetone and benzaldehyde
   (v) Aspirin from salicylic acid

Distribution of marks

1. UNIT-I	10 (6+4) marks
2. UNIT-II	10 (6+4) marks
3. UNIT-III	10 (6+4) marks
4. Viva-voce	10 (6+4) marks
5. Lab Record	10 (6+4) marks

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2023-26 onwards)B.Sc. (PCM+CBZ) I Year (II Semester)

Schedule per week Lectures : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Inorganic Chemistry**	**Paper Code**	**: CH-102**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Hydrogen Bonding & Vander Waals Forces: Hydrogen Bonding-Definition, Types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Vander Waals Forces**.** Metallic Bond and Semiconductors Metallic Bond- Brief introduction to metallic bond, band theory of metallic bond Semiconductors- types and applications.

UNIT-II

s-Block Elements: Comparative study of the elements including diagonal relationships, salient features of hydrides (methods of preparation excluded), solvation and complexation tendencies including their functionin biosystems.

Chemistry of Noble Gases: Chemical properties of the noble gases with emphasis on their low chemical reactivity, chemistry of xenon, structure and bonding of fluorides, oxides & oxyfluorides of xenon.

UNIT-III

p-Block Elements: Emphasis on comparative study of properties of p-block elements (including diagonal relationship and excluding methods of preparation).

Boron family (13th group): Diborane-properties and structure (as an example of electron-deficient compound and multicentre bonding), Borazine-chemical properties and structure Trihalides of Boron – Trends in acid character, structure of aluminium (III) chloride.

Carbon Family (14th group): Catenation, p–d bonding (an idea), carbides, fluorocarbons, silicates (structural aspects), silicons – general methods of preparations, properties and uses.

UNIT-IV

Nitrogen Family (15th group): Structures of oxides of N, P. oxyacids–structure and relative acid strengths of oxyacids of N and P. Structure of white, yellow and red phosphorus

Oxygen Family (16th group): Oxyacids of sulphur – structures and acidic strength, H_2O_2 structure,properties and uses.

Halogen Family (17th group): Basic properties of halogen, interhalogens, types, properties, hydroand oxyacids of chlorine – structure and comparison of acid strength

Suggested books:

1. Fundamental concepts of Inorganic Chemistry, A.K. Das [Publisher: CBS]
2. Inorganic Chemistry, Malik, Tuli Madan, [Publisher: S.Chand]
3. Principles of Inorganic Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
4. Inorganic Chemistry, R.P. Sarkar [Publisher: NCBA]
5. Concise Inorganic Chemistry, J. D. Lee, [Publisher: Oxford]

RAFFLES UNIVERSITY

B.Sc. (PCM+CBZ) I Year (II Semester)

Schedule per week Lectures : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Organic Chemistry**	**Paper Code**	**: CH-104**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Alkenes: Nomenclature of alkenes, mechanisms of dehydration of alcohols and dehydro- halogenation of alkyl halides, The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes.Chemical reactions of alkenes and mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration- oxidation, oxymercurationreduction, ozonolysis, hydration,hydroxylation and oxidation with $KMnO_4$,

UNIT-II

Arenes and Aromaticity: Nomenclature of benzene derivatives, Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aromatic ions, annulenes up to 10 carbon atoms, aromatic, antiaromatic and non-aromatic compounds. Aromatic electrophilic substitution general pattern of the mechanism, mechansim of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Energy profile diagrams; Activating , deactivating substituents and orientation.

UNIT-III

Dienes and Alkynes: Nomenclature and classification of dines isolated, conjugated and cumulated dienes. Structure of butadiene, Chemical reactions 1, 2 and 1, 4 additions (Electrophilic & free radical mechanism),Diels-Alder reaction, Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation of alkynes,

UNIT-IV

Alkyl and Aryl Halides: Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides, SN_2 and SN_1 reactions with energy profile diagrams. Methods of formation and reactions of aryl halides, The additionelimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

Suggested books:

1. Organic Chemistry, Subrata Sengupta [Publisher: Oxford]
2. Organic Chemistry Vol-I, I. L. Finar [Publisher: Pearson]
3. Organic Chemistry Vol-I, Nemai Tewari, [Publisher: McGraw Hill]
4. Organic Chemistry, Jerry March, [Publisher: Willey]
5. A guidebook to mechanism in organic chemistry, Peter Sykes, [Publisher: Pearson]

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2023-26 onwards)B.Sc. (PCM+CBZ) I Year (II Semester)

Schedule per week Lectures : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Physical Chemistry**	**Paper Code**	**: CH-106**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Kinetics-I: Rate of reaction, rate equation, factors influencing the rate of a reaction concentration,temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated rate expression for zero order,first order, second and third order reaction. Half-life period of a reaction. Methods of determination of orderof reaction,

UNIT-II

Kinetics-II: Effect of temperature on the rate of reaction-Arrhenius equation. Theories of reaction rate – Simple collision theory for unimolecular and bimolecular collision, Transition state theory of Bimolecular reactions.

UNIT-III

Electrochemistry-I: Electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance, equivalent conductance and relation among them, their variation with concentration. Arrhenius theory of ionization, Ostwald's Dilution Law, Debye- Huckel-Onsager's equation for strong electrolytes (elementary treatment only) Transport number, definition and determination by Hittorfs methods, (numerical included)

UNIT-IV

Electrochemistry-II: Kohlarausch's Law, calculation of molar ionic conductance and effect of viscosity temperature & pressure on it. Application of Kohlarausch's Law in calculation of conductance of weak electrolytes at infinite dilution. Applications of conductivity

Measurements: determination of degree of dissociation, determination of Ka of acids determination of solubility product of sparingly soluble salts, conductometric titrations. Definition of pH and pKa, Buffer solution, Buffer action, Henderson – Hazel equation, Buffer mechanism of buffer action.

Suggested books:

1. Physical Chemistry, Peter Atkins, De Paula [Publisher: Oxford]
2. Physical Chemistry, P.C. Rakshit [Publisher: SBH]
3. A Textbook of Physical Chemistry, K. L. Kapoor [Publisher: McGraw Hill]
4. Principles of Physical Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
5. Physical Chemistry, Ira Levine, [Publisher: Pearson]

RAFFLES UNIVERSITY

B.Sc. (PCM+CBZ) I Year (II Semester)

Schedule per week Practical: 6
Examination Time : 4 Hrs **Maximum Marks: 50 (20+30)**
Subject : Chemistry Lab-II **Paper Code : CH-108**

UNIT-I (Inorganic)

Volumetric Analysis

Complexometric titrations: Determination of Hardness of Water by EDTA

Paper Chromatography

Qualitative Analysis of the any one of the following Inorganic cations and anions by paper chromatography(Pb^{+2}, Cu^{+2}, Ca^{+2}, Ni^{+2}, Cl^{-}, Br^{-}, I^{-}, PO^{-3}_{4} and NO^{-}_{4}). 3

UNIT-II (Physical)

1. To determine the surface tension of a given liquid by drop number method.
2. To determine the viscosity of a given liquid.
3. To determine the specific refractivity of a given liquid

UNIT-III (Organic)

To study the process of sublimation of camphor and phthalic acid.

RAFFLES UNIVERSITY

Schedule per week Practical: 6

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Inorganic Chemistry **Paper Code : CH-201**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT–I

Chemistry of Elements of I transition series: Definition of transition elements, position in the periodic table, General characteristics & properties of I transition elements, Structures & properties of some compounds of transition elements-TiO_2, $VOCl_2$, $FeCl_3$, $CuCl_2$ and $Ni(CO)_4$

UNIT-II

Chemistry of Elements of IInd & IIIrd transition series: General characteristics and properties of the IInd and IIIrd transition elements Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry.

UNIT-III

Coordination Compounds: Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes

UNIT-IV

Non-aqueous Solvents: Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2

Acids and Bases, HSAB Concept: Arrhenius, Bronsted-Lowry, the Lux-Flood, Solvent system and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids &Bases. Symbiosis, electronegativity and hardness and softness.

Suggested books:

1. Fundamental concepts of Inorganic Chemistry, A.K. Das [Publisher: CBS]
2. Inorganic Chemistry, Malik, Tuli Madan, [Publisher: S.Chand]
3. Principles of Inorganic Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
4. Inorganic Chemistry, R.P. Sarkar [Publisher: NCBA]
5. Concise Inorganic Chemistry, J. D. Lee, [Publisher: Oxford]

RAFFLES UNIVERSITY

Schedule per week Practical: 6

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Organic Chemistry **Paper Code : CH-203**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT–I

Alcohols: Monohydric alcohols nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric alcohols — nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and pinacol-pinacolone rearrangement.

Epoxides: Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxidering opening, reactions of Grignard and organolithium reagents with epoxides

UNIT-II

Phenols: Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion.Reactions of phenols — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.

UNIT-III

Ultraviolet (UV) absorption spectroscopy: Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones, Woodward- Fieser rules, calculation of λmax of simple conjugateddienes and -unsaturated ketones. Applications of UV Spectroscopy in structure elucidation of simple organic compounds.

UNIT-IV

Carboxylic Acids & Acid Derivatives: Nomenclature of Carboxylic acids, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation. Structure, nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic)

Suggested books:

1. Organic Chemistry, Subrata Sengupta [Publisher: Oxford]
2. Organic Chemistry Vol-I, I. L. Finar [Publisher: Pearson]
3. Organic Chemistry Vol-I, Nemai Tewari, [Publisher: McGraw Hill]
4. Organic Chemistry, Jerry March, [Publisher: Willey]
5. A guidebook to mechanism in organic chemistry, Peter Sykes, [Publisher: Pearson]

OR

RAFFLES UNIVERSITY

Schedule per week Practical:

Examination Time	**: 3 Hrs**	**Maximum Marks:**	**50 (20+30)**
Subject	**: Polymer Chemistry (Elective)**	**Paper Code**	**: CH-203**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Introduction and history of polymeric materials: Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

Functionality and its importance: Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bifunctional systems, Poly-functional systems.

UNIT-II

Kinetics of Polymerization: Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques. **Crystallization and crystallinity:** Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.**Nature and structure of polymers-**Structure, Property relationships.

UNIT-III

Determination of molecular weight of polymers (Mn, Mw, etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersityindex. **Glass transition temperature** (Tg) and determination of Tg, Free volume theory, WLF equation, Factors affecting glass transition temperature (Tg).

UNIT-IV

Polymer Solution – Criteria for polymer solubility, Solubility parameter, Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions, Flory- Huggins theory, Lower and Upper critical solution temperatures.

Properties of Polymers (Physical, thermal, Flow & Mechanical Properties). Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes, Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)].

Suggested books:

Seymour's Polymer Chemistry, Marcel Dekker, Inc.

G. Odian: Principles of Polymerization, John Wiley.

3.F.W. Billmeyer: Text Book of Polymer Science, John Wiley.

4.P. Ghosh: Polymer Science& Technology, Tata Mcgraw-Hill.

5.R.W. Lenz: Organic Chemistry of Synthetic High Polymers.

RAFFLES UNIVERSITY

Schedule per week Practical: 6

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Physical Chemistry **Paper Code : CH-205**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1mark.*

UNIT-I

Thermodynamics-I: Definition of thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process.Concept of heat and work. Zeroth Law of thermodynamics, First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship.

UNIT-II

Thermodynamics-II: Joule's law, Joule Thomson coefficient for ideal gas and real gas: and inversion temperature. Calculation of w q dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Temperature dependence of enthalpy, Kirchoffs equation. Bond energiesand applications of bond energies.

UNIT-III

Chemical Equilibrium: Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm. Le-Chatetier's principle and Clausius-Clapeyron equation its applications.

UNIT-IV

Distribution Law: Nernst distribution law – its thermodynamic derivation, Modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distributionlaw: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride. (ii) Determination of equilibrium constant of potassium triiodide complex and process of extraction.

Suggested books:

1. Physical Chemistry, Peter Atkins, De Paula [Publisher: Oxford]
2. Physical Chemistry, P.C. Rakshit [Publisher: SBH]
3. A Textbook of Physical Chemistry Vol 2,3,5, K. L. Kapoor [Publisher: McGraw Hill]
4. Principles of Physical Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
5. Physical Chemistry, Ira Levine, [Publisher: Pearson]

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry

Schedule per week Practical: 6

Examination Time	**: 4 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Chemistry Lab-III**	**Paper Code**	**: CH-207**

UNIT-I (Inorganic)

1. Gravimetric Analysis

Quantitative estimations of, Cu^{2+} as copper thiocyanate and Ni^{2+} as Ni – dimethylglyoxime.

2. Colorimetry:

To verify Beer - Lambert law for $KMnO_4/K_2Cr_2O_7$ and determine the concentration of the given $KMnO_4/K_2Cr_2O_7$ solution.

UNIT-II (Physical)

1. To determine the CST of phenol – water system.
2. To determine the solubility of benzoic acid at various temperatures and to determine the H of the dissolution process.

UNIT-III (Organic)

Laboratory Techniques

(a) Steam distillation (non evaluative) Naphthalene from its suspension in water
Separation of *o*-and *p*-nitrophenols

(b) Column chromatography (non evaluative) Separation of fluorescein and methyleneblue
Separation of leaf pigments from spinach leaves

Distribution of marks

1. UNIT-I	10 (6+4) marks
2. UNIT-II	10 (6+4) marks
3. UNIT-III	10 (6+4) marks
4. Viva-voce	10 (6+4) marks
5. Lab Record	10 (6+4) marks

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry

Schedule per week Practical: 6
Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Inorganic Chemistry **Paper Code : CH-202**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Chemistry of f -block elements:
Lanthanides: Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

UNIT-II

Chemistry of f -block elements
Actinides: General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements.

UNIT-III

Theory of Qualitative and Quantitative Inorganic Analysis-I:
Chemistry of analysis of various acidic radicals, Chemistry of identification of acid radicals in typical combinations, Chemistry of interference of acid radicals including their removal in the analysis of basic radicals.

UNIT-IV

Theory of Qualitative and Quantitative Inorganic Analysis-II:
Chemistry of analysis of various groups of basic radicals, Theory of precipitation, co- precipitation, Post-precipitation, purification of precipitates.

Suggested books:

1. Fundamental concepts of Inorganic Chemistry, A.K. Das [Publisher: CBS]
2. Inorganic Chemistry, Malik, Tuli Madan, [Publisher: S.Chand]
3. Principles of Inorganic Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
4. Inorganic Chemistry, R.P. Sarkar [Publisher: NCBA]
5. Concise Inorganic Chemistry, J. D. Lee, [Publisher: Oxford]

OR

Schedule per week Lectures: 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Coordination Chemistry (Elective) **Paper Code : CH-202**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Werner's theory, valence bond theory (inner and outer orbital complexes), electroneutrality principle andback bonding. Crystal field theory, measurement of 10 Dq (Δo), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq (Δo, Δt). Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry. Qualitativeaspect of Ligand field and MO Theory.

IUPAC nomenclature of coordination compounds, isomerism in coordination compounds.Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes, Labile and inert complexes.

UNIT-II

Transition Elements: General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer diagrams) Different between the first, second and third transition series. Chemistry of Cr, Mn, Fe and Co in various oxidation states with special reference to the followingcompounds: peroxo compounds of chromium, potassium dichromate, potassium permanganate, potassiumferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.

UNIT-III

Lanthanoids and Actinoids: Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only).

UNIT-IV

Inorganic Reaction Mechanism : Introduction to inorganic reaction mechanisms. Substitution reactions insquare planar complexes, Trans- effect, theories of trans effect. Thermodynamic and Kinetic stability.

Suggested books:

1. Purcell, K.F & Kotz, J.C., Inorganic Chemistry W.B. Saunders Co, 1977.
2. Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993.
3. Cotton, F.A. & Wilkinson, G., Advanced Inorganic Chemistry Wiley-VCH, 1999
4. Basolo, F, and Pearson, R.C., Mechanisms of Inorganic Chemistry, John Wiley & Sons, NY, 1967.
5. Greenwood, N.N. & Earnshaw A., Chemistry of the Elements, ButterworthHeinemann, 1997.
6. Miessler, G. L. &. Tarr, Donald A. Inorganic Chemistry 3rd Ed.(adapted), Pearson, 2009

OR

Schedule per week Lectures: 2
Examination Time : 3 Hrs Maximum Marks: 50 (20+30)
Subject : Novel Inorganic Solids (Elective) Paper Code : CH-202

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Synthesis and modification of inorganic solids: Conventional heat and beat methods, Co-precipitationmethod, Sol-gel methods, Hydrothermal method, Ion-exchange and Intercalation methods.

Inorganic solids of technological importance: Solid electrolytes – Cationic, anionic, mixed Inorganicpigments – coloured solids, white and black pigments.

One-dimensional metals, molecular magnets, inorganic liquid crystals.

UNIT-II

Nanomaterials: Overview of nanostructures and nanomaterials: classification. Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture onedimensional control. Carbon nanotubes and inorganic nanowires. Bioinorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials, bionano composites. Introduction to engineering materials for mechanical construction: Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminum and their alloys like duralumin, brasses and bronzes cutting tool materials, super alloys thermoplastics, thermosets and composite materials.

UNIT-III

Composite materials:

Introduction, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites, environmental effects on composites, applications of composites.

UNIT-IV

Speciality polymers: Conducting polymers - Introduction, conduction mechanism, polyacetylene, polyparaphenylene and polypyrole, applications of conducting polymers, Ion-exchange resins and their applications. Ceramic & Refractory: Introduction, classification, properties, raw materials, manufacturing and applications.

Suggested books:

1. Atkins, Peter, Overton, Tina, Rourke, Jonathan, Weller, Mark and Armstrong, Fraser Shriver& Atkins' Inorganic Chemistry, 5 th Edition, Oxford University Press 2011- 2012
2. Adam, D.M. Inorganic Solids: An introduction to concepts in solid-state structural chemistry, John Wiley and Sons, London, New York, Sydney, Toronto, 1974
3. Poole Jr., Charles P., Owens, Frank J., Introduction to Nanotechnology John Wiley and Sons, 2003.

RAFFLES UNIVERSITY

Subject : Organic Chemistry **Paper Code : CH-204**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Infrared (IR) absorption spectroscopy: Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Applications of IR spectroscopy in structure elucidation of simple organic compounds.

UNIT-II

Amines: Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Preparation of alkyl and arylamines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabriel phthalimide reaction, Hofmann bromamide reaction. electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.

UNIT-III

Diazonium Salts: Mechanism of diazotization, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO2 and CN groups, reduction of diazonium salts to hyrazines, couplingreaction and its synthetic application.

Nitro Compounds: Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanismof electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium.

UNIT-IV

Aldehydes and Ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, advantage of oxidation of alcohols with chromium trioxide (Sarett reagent) pyridinium chlorochromate (PCC) and pyridinium dichromate, Physical properties. Comparison of reactivities of aldehydes and ketones. Mechanism ofnucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. Oxidationof aldehydes, Baeyer–Villiger oxidation of ketones, Cannizaro reaction. MPV, Clemmensen, Wolff- Kishner,$LiAlH_4$ and $NaBH_4$ reductions.

Suggested books:

1. Organic Chemistry, Subrata Sengupta [Publisher: Oxford]
2. Organic Chemistry Vol-I, I. L. Finar [Publisher: Pearson]
3. Organic Chemistry Vol-I, Nemai Tewari, [Publisher: McGraw Hill]
4. Organic Chemistry, Jerry March, [Publisher: Willey]
5. Organic Chemistry, Clayden, Greeves, Warren [Publisher: Oxford]

B.Sc. (PCM+CBZ) II Year (IV Semester)

Schedule per week Practical: 6
Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Physical Chemistry **Paper Code : CH-206**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Thermodynamics-III: Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycles and its efficiency, Carnot's theorem, Thermodynamics scale of temperature. Concept of entropy– entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropychange in physical change, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

UNIT-II

Thermodynamics-IV: Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function(G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.

UNIT-III

Electrochemistry-III: Electrolytic and Galvanic cells, reversible & Irreversible cells, conventional representation of electrochemical cells, EMF of cell and its measurement, Wes ton standard cell, activity and activity coefficients, Calculation of thermodynamic quantities of cell reaction (G, H& K).Types of reversible electrodes metal-metal ion gas electrode, metal–insoluble salt anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions, electrochemicalseries and its applications.

UNIT-IV

Electrochemistry-IV: Concentration cells with and without transference, liquid junction potential, application of EMF measurement i.e. valency of ions, solubility product activity coefficient, potentiometric titration (acid- base and redox). Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.

Suggested books:

1. Physical Chemistry, Peter Atkins, De Paula [Publisher: Oxford]
2. Physical Chemistry, P.C. Rakshit [Publisher: SBH]
3. A Textbook of Physical Chemistry Vol 1,2,3, K. L. Kapoor [Publisher: McGraw Hill]
4. Principles of Physical Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
5. Physical Chemistry, Ira Levine, [Publisher: Pearson]

B.Sc. (PCM+CBZ) II Year (IV Semester)

Schedule per week Practical: 6
Examination Time : 4 Hrs **Maximum Marks: 50 (20+30)**
Subject : Chemistry Lab-IV **Paper Code : CH-208**

UNIT-I (Inorganic)

Preparations: Preparation of Cuprous chloride, prussion blue from iron fillings, tetraammine cupric sulphate, chrome alum, potassium trioxalatochromate (III).

UNIT-II (Physical)

1. To determine the enthalpy of neutralisation of a weak acid/weak base vs. strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weakbase.
2. To determine the enthalpy of solution of solid calcium chloride
3. To study the distribution of iodine between water and CCl4.

UNIT-III (Organic)

Systematic identification (detection of extra elements, functional groups, determination of melting point orboiling point and preparation of at least one pure solid derivative) of the following simple mono and bifunctional organic compounds: Naphthalene, anthracene, acenaphthene, benzyl chloride, *p*- dichlorobenzene, *m*-dinitrobenzene, *p*-nitrotoluene, resorcinol , hydroquinone, α-naphthol, β-naphthol, benzophenone, ethyl methyl ketone, benzaldehyde, vanillin, oxalic acid, succinic acid, benzoic acid, salicyclic acid, aspirin, phthalic acid, cinnamic acid, benzamide, urea, acetanilide, benzanilide, aniline hydrochloride, p- toluidine, phenyl salicylate (salol), glucose, fructose, sucrose, *o*-, *m*-, *p* nitroanilines, thiourea.

Distribution of marks

1. UNIT-I 10 (6+4) marks
2. UNIT-II 10 (6+4) marks
3. UNIT-III 10 (6+4) marks
4. Viva-voce 10 (6+4) marks
5. Lab Record 10 (6+4) marks

RAFFLES UNIVERSITY

Schedule per week Lectures : 2 Hrs

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Inorganic Chemistry**	**Paper Code : CH-301**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Metal-ligand bonding in Transition Metal Complexes: Limitations of valence bond theory, an elementary idea of crystal-field theory, spectrochemical series, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

UNIT-II

Thermodynamic and Kinetic Aspects of Metal Complexes: Jahn-Teller effect of the transition metal complexes, A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes of Pt (II).

UNIT-III

Magnetic Properties of Transition Metal Complexes: Types of magnetic behavior, spin-only formula, orbital contribution to magnetic moments, L-S coupling, spectroscopic ground states, application of magnetic moment data for 3d metal complexes.

UNIT-IV

Electron Spectra of Transition Metal Complexes: Types of electronic transitions, selection rules for d-d transitions, appearance of colour in transition metal complexes, Orgel-energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{+3}$ complex ion.

Suggested books:

1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
2. Inorganic Chemistry, J.E. Huheey, HarperCollins.
3. Magnetochemistry, R.L. Carlin, Springer Verlog.
4. Magnetochemistry, A. Earnshaw.
5. Introduction to ligand fields, B.N. Figgis, Wiley Eastern-IIed.
6. Inorganic Chemistry, by Malik, Tuli Madan, S. Chand . & company.
7. Inorganic Chemistry B.Sc. -V, by Ramesh Kapoor and R S Chopra, R. Chand. & company.

RAFFLES
UNIVERSITY

B.Sc. (PCM+CBZ) III Year (V Semester)

Schedule per week Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Organic Chemistry **Paper Code : CH-303**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1mark.*

UNIT-I

NMR Spectroscopy-I: Principle of nuclear magnetic resonance, introduction to proton NMR, number of signals, peak areas and integration, equivalent and nonequivalent protons positions of signals and chemicalshift, shielding and de-shielding of protons, proton counting, splitting of signals and coupling constants.

UNIT-II

NMR Spectroscopy-II: Factors affecting chemical shift, Discuss ion of proton NMR spectra of the molecules: ethyl bromide, n-propylbromide, isopropyl bromide, 1,1-dibromoethane, 1,1,2-tribromoethane, ethanol, acetaldehyde, ethyl acetate, toluene, benzaldehyde and acetophenone. Brief introduction and chemical shift values of carbon NMR. Simple problems on NMR spectroscopy for structure determination of organic compounds.

UNIT-III

Carbohydrates-I: Classification and nomenclature. Monosaccharides, mechanism of osazone formation, inter-conversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of glucose and fructose. Open chain and cyclic structure of D (+)-glucose &D (-) fructose. Mechanism of mutarotation. Structures of ribose and deoxyribose.

UNIT-IV

Carbohydrates-II: An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Organometallic Compounds:

Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.

Suggested Books:

1. Principles of Biochemistry, A. L. Lehninger, Worth Publishers.
2. Biochemistry, L.Stryer, W.H.Freeman.
3. Biochemistry, J. David Rawn, Neil Patterson.
4. Biochemistry, Voet and Voet, John Wiley.
5. Organic chemistry For B. Sc. III Year By P Bhagchandani, Sahitayabhawan Publications.

RAFFLES UNIVERSITY

Schedule per week Lectures	**: 2 Hrs**		
Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Physical Chemistry**	**Paper Code**	**: CH-305**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Quantum Mechanic s-I: Black-body radiation, Plank's radiation law, photoelectric effect, heat capacity of solids, Compton effect, wave function and its significance of Postulates of quantum mechanics , quantum mechanical operator, commutation relations, Hamiltonian operator, Hermitian operator, average value of square of Hermitian as a positive quantity, Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box, Pictorial representation and its significance,

UNIT-II

Physical Properties and Molecular Structure: Optical activity, polarization-(clausius-Mossottiequation). Orientation of dipoles in an electric field, dipole moment, measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility, magnetic properties-paramagnetism, diamagnetism and ferromagnetics.

UNIT-III

Spectroscopy-I: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statementof Born-Oppenheimer approximation, Degrees of freedom.

Rotational Spectrum: Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules, spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotor, isotope effect.

UNIT–IV

Spectroscopy-II, Vibrational spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relationof force constant and bond energies, effects of an harmonic motion and isotopic effect on the spectra, ideaof vibrational frequencies of different functional groups.

Raman Spectrum: Concept of polarizibility, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra.

Text Books:

1. Physical Chemistry for B.Sc. Students by S C Khetarpal, R. Chand & Co, New Delhi
2. Principles of Physical Chemistry for B.Sc. Students by Puri, Sharma & Pathania
3. Introductory Quantum Chemistry, A.K. Chandra, Tata McGraw Hill.
4. Quantum Chemistry, I.M. Levine, Prentice Hall.
5. Basic Principles of Spectroscopy, G.M. Barrow, McGraw Hill.
6. Modern Spectroscopy, J.M. Hollas, John Wiley.
7. Quantum Chemistry, J. P. Lowe & K. Peterson, Academic Press (2005).

RAFFLES UNIVERSITY

Schedule per week Practical : 6 Hrs
Examination Time : 4 Hrs **Maximum Marks: 50 (30+20)**
Subject : Chemistry Lab-V **Paper Code : CH-307**

UNIT-I (Inorganic)

Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering,Combinations and excluding insolubles):

Pb^{2+}, Hg^{2+} , Hg_2^{2+}, Ag^{+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, As^{3+} , Sb^{3+}, Sn^{2+}, Fe^{3+} ,Cr^{3+}, Al^{3+} , Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+}, Mg^{2+},

UNIT-II (Physical)

1. To determine the strength of the given acid solution (mono and dibasic acid) conductometrically.
2. To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically

UNIT-III (Organic)

Chromatography Method

Determination of Rf values and identification of organic compounds

(a) Separation of green leaf pigments (spinach leaves may be used)by paper chromatographic method
(b) Separation of a mixture of colored organic compounds using common organic solvents by TLC.

Distribution of marks

1. UNIT-I	10 (6+4) Marks
2. UNIT-II	10 (6+4) Marks
3. UNIT-III	10 (6+4) Marks
4. Viva-voce	10 (6+4) Marks
5. Lab Record	10 (6+4) Marks

Suggested Books:

1. Experiments and Techniques in Organic Chemistry, D. Pasto, C. Johnson and M. Miller,Prentice Hall.
2. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C. Heath.
3. Systematic Qualitative Organic Analysis, H. Middleton, Adward Arnold.
4. Handbook of Organic Analysis-Qualitative and Quantitative, H. Clark, Adward Arnold.
5. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.
6. Advanced practical chemistry, Jagdamba, Yadav and shrivastava, PragatiPrakasan
7. Advanced organic practical chemistry, J.N.Gurtu and R. Kappor, S. Chand

RAFFLES UNIVERSITY

Schedule per week Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Inorganic Chemistry **Paper Code : CH-302**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT–I

Molecular Orbital Theory: Drawbacks of VBT and introduction of LCAO method, Simple MO diagrams of homonuclear molecules - C_2, N_2, O_2, Calculation of Bond order, MO diagrams of halogensand correlation of color of complexes. Non-crossing rule and MO of heteronuclear molecules – CO andHX.

UNIT-II

Organometallic Chemistry: Definition, nomenclature and classification of organometallic compounds. π-acidity of ligands and its effect on stretching frequencies, 18 electron rule, Preparation, properties, andbonding of alkyls of Li, Al, Hg, Brief account of metal-ethylenic complexes – Zeises salt, Organometalliccatalysis – Oxidative addition and Reductive elimination, Hydrogenation of olefins.

UNIT-III

Bioinorganic Chemistry: Essential and trace elements in biological processes, metalloporphyrins withspecial reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ionswith special reference to Ca^{+2}. Nitrogen fixation.

UNIT-IV

Silicones and Phosphazenes: Silicones and phosphazenes, their preparation, properties, structure and uses

Suggested Books:

1. Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.
2. The Organometallic Chemistry of the Transition Metals, R.H. Crabtree, John Wiley.
3. Organometallics, A. Salzer, Ch. Elschenbrioch.VCH Publications.
4. Inorganic Chemistry, by Malik, Tuli Madan, S. Chand . & company.
5. Inorganic Chemistry, by James E. Huheey, E.A. Keiter, R. L. Keiter, O. K. Medhi
6. Inorganic Chemistry B.Sc. -I, by Ramesh Kapoor and R S Chopra, R. Chand & company.

RAFFLES UNIVERSITY

Schedule per week Lectures : 2 Hrs
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Organic Chemistry **Paper Code : CH-304**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Heterocyclic Compounds-I: Introduction, Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole

UNIT-II

Heterocyclic Compounds-II: Introduction to condensed five and six- membered heterocycles. Prepration and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitutionreactions of, quinoline and isoquinoline**. Organosulphur Compounds:** Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine. Synthetic detergents alkyland aryl sulphonates.

UNIT-III

Organic Synthesis *via* Enolates: Acidity of hydrogens, alkylation of diethyl malonate and ethylacetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism ofethyl acetoacetate.
Synthetic Polymers: Addition or chain-growth polymerization. Free radical vinyl polymerization, ionicvinyl polymerization, and Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins. Natural and synthetic rubbers.

UNIT-IV

Amino Acids, Peptides& Proteins: Classification, of amino acids. Acid-base behavior, isoelectric pointand electrophoresis. Preparation of α-amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid–phase peptide synthesis. Structures of peptides and proteins: Primary & Secondary structure.

Suggested Books:

1. Sykes, P. A Guidebook to Mechanism in Organic Chemistry 6th Ed., Prentice-Hall (1996).
2. Finar, I. L. & Finar, A. L. Organic Chemistry Vol. 2, Addison-Wesley (1998).
3. Finar, I. L. Organic Chemistry Vol. 1, Longman (1998).
4. Natural Products, their chemistry and biological significance. J. Mann, R. S. Davidso

RAFFLES UNIVERSITY

Schedule per week Lectures	**: 2 Hrs**		
Examination Time	**: 3 Hrs**	**Maximum Marks: 50(20+30)**	
Subject	**: Physical Chemistry**	**Paper Code**	**: CH-306**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Spectroscopy-III: -Electronic Spectrum: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle. Qualitative description of sigma and pie and n molecular orbital (MO) their energy level and respectivetransitions.

UNIT-II

Photochemistry: Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grotthus-Drapper law, Stark-Einstein law (law of photochemical equivalence) Jablonski diagram depiciting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).

UNIT-III

Solutions: -Dilute Solutions and Colligative Properties: Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, Colligative properties, Raoult'slaw, relative lowering of vapour pressure, molelcular weight determination, Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmoticpressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree ofdissociation and association of solutes.

UNIT-IV

Phase Equillibrium: Statement and meaning of the terms- phase component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component System, water and Sulpher systems. Phase equilibria of two component systems, solid-liquid equilibria, simple eutectic, Pb- Ag system, desilverisation of lead

Suggested books:

1. Physical Chemistry, Peter Atkins, De Paula [Publisher: Oxford]
2. Physical Chemistry, P.C. Rakshit [Publisher: SBH]
3. A Textbook of Physical Chemistry Vol 1,2,3, K. L. Kapoor [Publisher: McGraw Hill]
4. Principles of Physical Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
5. Physical Chemistry, Ira Levine, [Publisher: Pearson]

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) I Year (I Semester)

Schedule per week Lectures	**: 6 Hrs**	
Examination Time	**: 4 Hrs**	**Maximum Marks: 50(30+20)**
Subject	**: Chemistry Lab-VI**	**Paper Code : CH-308**

UNIT-I (Inorganic Chemistry)

Semi micro qualitative analysis of mixture containing not more than four radicals (including interfering,Combinations and excluding insoluble's) NH_4^+, CO^{2-}, S^{2-}, SO_3^{2-}, SO_2^{2-}, NO_3^-, CH_3COO^-, Cl^-, Br^-, I^-, NO^-, SO_3^{2-}, $C_2O_4^{2-}$, PO_4^{3-}, BO_3^{3-}

UNIT-II (Physical Chemistry)

1. To determine the strength of given acid solution (mono and dibasic acid)/$KMnO_4$ – Mohrsalt potentiometrically.
2. To determine the molecular weight of a non-volatile solute by Rast method.
3. To standardize the given acid solution (mono and dibasic acid) pH metrically.

UNIT-III (Organic Chemistry) Synthesis of the following organic compounds:

(a) To prepare o-chlorobenzoic acid from anthranilic acid.
(b) To prepare p-bromoaniline from p-bromoacetanilide.
(c) To prepare m-nitroaniline from m-dinitrobenzene.
(d) To prepare S-Benzyl-iso-thiouronium chloride from thiourea

Distribution of marks

1. UNIT-I	10 (6+4) Marks
2. UNIT-II	10 (6+4) Marks
3. UNIT-III	10 (6+4) Marks
4. Viva-voce	10 (6+4) Marks
5. Lab Record	10 (6+4) Marks

Suggested Books:

1. Experiments and Techniques in Organic Chemistry, D. Pasto, C. Johnson and M. Miller, PrenticeHall.
2. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C. Heath.
3. Systematic Qualitative Organic Analysis, H. Middleton, Adward Arnold.
4. Handbook of Organic Analysis-Qualitative and Quantitative, H. Clark, Adward Arnold.
5. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) I Year (I Semester)

Schedule per week Lectures	**: 3 Hrs**		
Examination Time	**: 3 Hrs**	**Maximum Marks: 50(30+20)**	
Subject	**: M e c h a n i c s**	**Paper Code**	**: PHY-101**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Background of Vector calculus**:** Concepts of gradient**,** Divergence and curl**;** Line**,** Surface and Volume Integrals**,** Frame of Reference**,** Galilean transformation**,** Galilean Invariance**,** Inertial and Non-Inertial frames**,** Pseudo forces**,** Rotating reference frame**,** Centrifugal force**,** corilis force, motion under central force, Kepler's law, Conservative and Non-conservative force.

UNIT-II

Ideal fluids**,** Equation of continuity**,** Streamline flow**,** Rotational and irrotational flows**,** Euler's equation**,** Bernouli's Theorem**,** Viscous fluids**,** Poiseuille's equation**,** Viscosity by rotating cylindermethod. Elasticity Hook's law and elastic constant of isotropic solid.

UNIT-III

Strain and Stress in an isotropic homogeneous medium**,** Elastic moduli and relations between them**,**Torsion of cylinders**,** Bending of beams**,** Internal energy of a strained body, surface tension andsurface energy.

UNIT-IV

Inference of Michelson-Morley Experiment**,** Postulates of special relativity**,** Lorentz transformations**,**Length contraction**,** Time dilation**,** Simultaneity in relativity theory**,** Addition of velocities**,** Relativistic dynamics**,** Variation of mass with velocity**,** Mass-Energy relation**.**

Books Recommended:

1. Berkely Physics Course. Vol. 1. Mechanics by E.M.Purcell
2. Concepts of Modern Physics by Arthur Beiser
3. Properties of Matter by D.S. Mathur.

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) I Year (I Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Thermodynamics Paper code: PHY - 103

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

First Law of Thermodynamics and Internal Energy**,** Joule's Law**,** Applications of First Law**,** Carnot Cycle**,** Carnot Engine and Refrigerator**,** Reversible and Irreversible Process**,** Carnot Theorem**,** Thermodynamically Scale of Temperature

UNIT-II

Entropy**,** Calculation of Entropy in various processes**,** Entropy and unavailable energy**,** Physical Significance of Entropy**,** Second law of Thermodynamics**,** Thermodynamic Potentials and Maxwell's Equations**,** Application of Maxwell's equations, Phase diagram and triple point of a substance, Joule'sThomson effect.

UNIT-III

Maxwell-Boltzmann Law of Distribution of Molecular Velocities**,** Evaluation of r.m.s. velocity**,** Average and Most Probable Speeds**,** Mean Free Path**,** Transport Phenomenon .Degree of freedom,equi-partition of energy and its application for specific heat of gases.

UNIT-IV

Emissive and Absorptive Powers**,** Black Body Radiation**,** Kirchoff's Law **,** Intensity and Energy Density**,** Pressure and Energy density**,** Stefan-Boltzmann Law**,** Distribution of energy in the spectrum of black body radiation**,** Wein's Distribution Law**,** Wein's displacement law**,** Wein's formula**,** Rayleigh- Jean's law**,** Plank's law.

Books Recommended:

1. Thermodynamics By Enrico Fermi (Courier Dover Publications, 1956)
2. A Treatise on Heat : Including Kinetic Theory of Gases, Thermodynamics and Recent Advances in Statistical Thermodynamics By Meghnad Saha, B. N. Srivastava (Indian Press, 1958)
3. Heat and Thermodynamics: An Intermediate Textbook By Mark Waldo Zemansky, Richard Dittman (McGraw-Hill, 1981
4. Thermal Physics by Garg, Bansal and Ghosh (Tata McGra-Hill, 1993)

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) I Year (I Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Waves & Oscillations Paper code: PHY – 105

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Simple Harmonic Oscillations. Differential Equation of SHM and its Solution. Amplitude, Frequency, Time Period and Phase. Velocity and Acceleration. Kinetic, Potential and Total Energy and their TimeAverage Values. Reference Circle. Rotating Vector Representation of SHM.

UNIT –II

Free Oscillations of Systems with One Degree of Freedom :- (1) Mass-Spring system, (2)Simple Pendulum, (3) Torsional Pendulum, (4) Oscillations in a U-Tube, (5) Compound pendulum: Centres ofPercussion and Oscillation, and (6) Bar Pendulum.

UNIT –III

System with Two Degrees of Freedom : Coupled Oscillators. Normal Coordinates and Normal Modes.Energy Relation and Energy Transfer. Normal Modes of N Coupled Oscillators.

UNIT –IV

Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Water Waves : Ripple and Gravity Waves.

Books Recommended:

1 . Vibrations and Waves by A. P. French.(CBS Pub. & Dist., 1987)

2. The Physics of Waves and Oscillations by N.K. Bajaj (Tata McGraw-Hill, 1988)

3. Fundamentals of Waves & Oscillations By K. Uno Ingard (Cambridge University Press,1988)

4. An Introduction to Mechanics by Daniel Kleppner, Robert J. Kolenkow (McGraw-Hill,1973)

5. Waves: BERKELEY PHYSICS COURSE (SIE) by Franks Crawford (Tata McGrawHill, 2007).

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) I Year (II Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Nuclear and Particle Physics -I **Paper code: PHY – 102**

Note: Examiner will set nine questions and the students will be required to attempt five questions inall, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit – I General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density, matter density (experimental determination of each), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/Z plot, angular momentum, parity, magnetic moment, electric moments

Unit – II Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of its various terms, condition of nuclear stability, nucleon separation energies(up to two nucleons), Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure and the basic assumption of shell model

Unit – III Radioactivity decay: Decay rate and equilibrium (Secular and Transient) (a) Alpha decay: basics of α-decay processes, theory of α-emission, Gamow factor, Geiger Nuttall law, α-decay spectroscopy, decay Chains. (b) β-decay: energy kinematics for β-decay,β- spectrum, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay:
Gamma rays emission from the excited state of the nucleus& kinematics, internal conversion.

Unit – IV Nuclear Reactions: Types of Reactions, units of related physical quantities, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct Reaction, resonance reaction, Coulomb scattering (Rutherford scattering).

Reference Books:

- Basic Ideas and concepts in Nuclear Physics: An introductory Approach by K Heyde, Third edition, IOP Publication, 1999.
- Nuclear Physics by S. N. Ghoshal, First edition, S. Chand Publication, 2010.
- Concepts of Nuclear Physics by Bernard L Cohen, Tata McGraw Hill Publication, 1974.
- Introductory Nuclear Physics by Kenneth S, Krane, Wiley-India Publication, 2008
- Nuclear Physics : principles and applications by John Lilley, Wiley Publication, 2006.
- Physics and Engineering of Radiation Detection by Syed Naeem Ahmed, Academic Press Elsevier, 2007.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) I Year (II Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Semiconductor Physics Paper code: PHY – 104

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Energy bands in solids, Intrinsic and extrinsic semiconductors, p-n junction diode and their characteristics, Zener and Avalanche breakdown, Zener diode , Light emitting diodes (LED), Photodiode, Solar Cell, P-n junction, half wave and full wave rectifiers, Zener diode as a voltage regulator. Logic gates and its combination.

UNIT -II

Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (C-B, C-E, C-C modes), Constants of a transistor, Relation between alpha and beta, Common base, Commonemitter and common collector characteristics of transistor, Advantages and disadvantages of C-E configuration, Emitter follower.

UNIT -III

Transistor amplifier, Methods a of transistor biasing and stabilization, D.C. load line , Common baseand Common emitter biasing, Common base and common emitter amplifiers, Classification of amplifiers, Feedback in amplifiers, Positive and negatice feedback. Advantages of negative feedback,.

UNIT -IV

Oscillators, Principle of oscillation, classification of oscillators, Condition for self sustained oscillation:Barkhausen criterion for oscillation, Tuned collector common emitter oscillator, Hartley oscillator, RCoscillator, Phase shift and Wein-Bridge oscillator, Advantage of of RC oscillator over lC oscillator.

Books Recommended:

1. Integrated Electronics – J. Millman and C. C. Halkias (Mc Graw Hill).
2. Electronic Fundamentals and Applications – D. Chattopadhyay and P. C. Rakshit.
3. Digital Logic and Computer Design – M. Moris Mano, (PHI (Pvt.) Ltd.).
4. Microprocessor Architecture, Programming and Application – R. A. Gaonkar (Willey EasternLtd.).
5. Introduction to Microprocessor – Software, Hardware Programming – Laventhal (PHI Ltd.).
6. Electronics – R.K. Kar

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) I Year (II Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Laser and Fibre Optics Paper code: PHY – 106

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Laser: Principle of Laser action, Population Inversion, Einstein's A and B coefficients, feedback of energy in a resonator, Threshold condition of laser formation. 3 level and 4 level laser systems.

UNIT –II

Characteristics of laser radiation. He-Ne , Nd-YAG Laser, Ruby Laser, Semiconductor Lasers and Dye lasers. Application of Laser. Significance of non-linear polarization of lasers: Second harmonic generation using non-linear optical methods.

UNIT -III

Principle of holography (basic principle), isotope separation. Precision measurements (frequency and distance). Optical fiber, core and cladding, total internal reflection, optical fiber as waveguide, step index and graded index fiber.

UNIT -IV

communication through optical fibers, energy loss, band width and channel capacity for a typical system, attenuation and dispersion, splicing and couplers, Fiber optic sensors.

Books Recommended:

1. Laser Principles and Applications – A. K. Ghatak and K. Tyagrajan (Tata – Mc Graw Hill).
2. Optics and Atomic Physics – B. P. Khandelwal (Siblal Agarwala).
3. Optical Electronic – A. K. Ghatak and K. Tyagrajan.
4. Introduction to Fibre Optics - R. A. Shotwell (EEE, Prentice Hall).

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) II Year (III Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Nuclear and Particle Physics – II **Paper code: PHY – 201**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit I: Interaction of Nuclear Radiation with matter: Energy loss due to ionization (Bethe Blockformula), energy loss of electrons, Cerenkov radiation. Gamma ray interaction through matter(photoelectric effect, Compton scattering, pair production), neutron interaction with matter. **(9 Lectures)**

Unit II:Detector for Nuclear Radiations: Gas detectors: estimation of electric field, mobility ofparticle for ionization chamber and GM Counter. Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT).Semiconductor Detectors (Si and Ge) for charge particle and photon detection (concept of charge carrier and mobility), neutron detector. **(9 Lectures)**

Unit III: Particle Accelerators: Accelerator facility available in India: Van-de Graaff generator(Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons (Principal, construction, working, advantages and disadvantages). **(7 Lectures)**

Unit IV: Particle physics: Particle interactions (concept of different types of forces); basic features,types of particles and its families. Conservation Laws(energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness), concept of quark model, color quantum number and gluons. **(11 Lectures)**

Reference Books:

- Radiation detection and measurement, G.F. Knoll, John Wiley & Sons, 2010.
- Technique for Nuclear and Particle Physics experiments by William R Leo, Springer, 1994.
- Introduction to Modern Physics by Mani & Mehta, Affiliated East-West Press, 1990.
- Introduction to elementary particles by David J Griffiths, Wiley, 2008.
- Modern Physics by Serway, Moses and Moyer, CENGAGE LEARNING, 2012.
- Concepts of Modern Physics by Arthur Beiser, McGraw Hill Education, 2009.

For Numericals

- Schaum‟s Outline of Modern Physics, McGraw-Hill Education, 1999
- Modern Physics by R. Murugaeshan. S.ChandPublication, 2010.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) II Year (III Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Electrostatics **Paper code: PHY – 203**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit – I Electric Field and Electric Potential

Electric field: Electric field lines. Electric flux. Gauss‟ Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace‟s and Poisson equations.The Uniqueness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole.

Unit – II Capacitors : Electrostatic energy of system of charges. Electrostatic energy of a chargedsphere.Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere.

Unit – III Dielectric Properties of Matter: Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector **D**. Relations between **E**,**P** and **D**. Gauss‟ Law in dielectrics.

Unit – IV Solution of field problems in case of a point charge near a grounded conducting infinite plane. Boundary value problem : in uniform external field for (i) conducting spherical shell and (ii) dielectric sphere.

Books Recommended:

1. Introduction to Electrodynamics by A.Z.Capri & P.V.Panat.(New Delhi: NarosaPub.House, 2002).
2. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata Mc Graw Hill,2006).
3. Fundamentals of electromagnetics by M.A.W.Miah.(Tata Mc Graw Hill,1992)
4. Applied electromagnetism By Liang Chi Shen, Jin Au Kong (PWS Pub. Co., 1995)
5. David J. Griffiths, Introduction to Electrodynamics, 3rd edition, (Benjamin Cummings 1998).

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) II Year (III Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Magnetism **Paper code: PHY – 205(A)**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit I - Magnetic Field: Magnetic force between current elements and definition of Magnetic Field**B**. Biot-Savart‟s Law and its simple applications: straight wire and circular loop.Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole).Ampere‟s Circuital Law and its application to (1) Solenoid and (2) Toroid.

Properties of **B**: curl and divergence. Vector Potential. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements. Torque on a current loop in a uniform Magnetic Field.

Unit II - Magnetic Properties of Matter: Magnetization vector (**M).** Magnetic Intensity(**H).** Magnetic Susceptibility and permeability. Relation between **B, H, M**. Ferromagnetism.BH curve andhysteresis.

Unit III - Electromagnetic Induction: Faraday‟s Law. Lenz‟s Law. Self Inductance and Mutual Inductance. Energy stored in a Magnetic Field. Time varying Magnetic fields, Betatron, Self inductance of a long solenoid, coefficient of Mutual Inductance Introduction to Maxwell's Equations. Integral and Differential forms, Charge Conservation and Displacement current.

Unit – IV Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.

Reference Books:

- Fundamentals of Electricity and Magnetism, Arthur F. Kip, 2nd Edn.1981, McGrawHill.
- Electricity, Magnetism & Electromagnetic Theory, S.Mahajanand Choudhury, 2012, Tata McGraw Hill
- Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education
- Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
- Feynman Lectures Vol.2, R.P.Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education
- Electricity and Magnetism, J.H.Fewkes& J.Yarwood. Vol.I, 1991, Oxford Univ. Press.
- Network, Lines and Fields, John D. Ryder, 2nd Edn., 2015, Pearson.

- Schaum‟s Outline of Electric Circuits, J. Edminister& M. Nahvi, 3rd Edn., 1995,McGraw Hill.

OR

Paper Code : PHY205(B)

Material Sciences

UNIT-I

Atomic structure and bonding in materials. Crystal structure of materials, crystalsystems, unitcells and space lattices, determination of structures of simple crystals byx-ray diffraction, millerindices of planes and directions, packing geometry in metallic,ionic and covalent solids. Concept of amorphous, single and polycrystalline structuresand their effect on properties of materials. Crystal growth techniques. Imperfections incrystalline solids and their role in influencing variousproperties.

UNIT –II

Imperfections in crystalline solids and their role in influencing various properties. Smartmaterials, exhibiting ferroelectric, piezoelectric, optoelectric, semiconducting behavior, lasers and opticalfibers, photoconductivity and superconductivity,nanomaterials.

UNIT -III

Stress-strain diagrams of metallic, ceramic and polymeric materials, modulus of elasticity, yield strength, tensile strength, toughness, elongation, plastic deformation, viscoelasticity, hardness, impact strength, creep, fatigue, ductile and brittle fracture.

UNIT –IV

Reflection, refraction, absorption and transmission of electromagnetic radiation in solids. Originof magnetism in metallic and ceramic materials, paramagnetism, diamagnetism, antiferromagnetism, ferromagnetism, ferrimagnetism, magnetic hysterisis.

Books Recommended:

1. Material Science by V.Raghwan
2. Material science by Dierk Raabe
3. Material Science by kelester

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) II Year (IV Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: SOLID STATE PHYSICS **Paper code: PHY – 202**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit – I Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg's Law. Atomic and Geometrical Factor.

Unit -II Elementary band theory: Kronig Penny model. Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient.

Unit -III Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons.

Unit – IV Super Conductivity: Introduction to superconductors, Properties of superconductors, Dependence of SC on various factors BCS theory, Meissner effect, Penetration depth, types of super conductors, AC and DC Josephson effect, SQUIDS, Applications of SC.

Reference Books:

Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.

Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India

Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill

Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning

Solid-state Physics, H.Ibach and H Luth, 2009, Springer

Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India Solid State Physics, M.A. Wahab, 2011, Narosa Publications

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) II Year (IV Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Statistical Mechanics **Paper code: PHY – 204**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Statistical Mechanics: microstates and macrostates-classical description in terms of phase space and quantum description in terms of wave functions. Idea of ensemble. Hypothesis of equal a priori probability for microstates of an isolated system in equilibrium.

UNIT –II

Micro-canonical ensemble, Canonical and Grand canonical ensemble. Partition function of a system in thermal equilibrium with heat bath. Law of equipartition of energy, its limit of validity and application.

UNIT -III

Quantum Statistics: Gibbs' Paradox, Identical particle and symmetry requirement. Derivation of FD and BE statistics as the most probable distributions (micro- canonical ensemble). Classical limit of quantum statistics.

UNIT –IV

Bose Einstein (BE) distribution law: Derivation, Application of BE statistics to derive Planck's law. Rayleigh Jean's and Wien's law as limiting cases of Planck's law. Phonons andlattice, specific heat of solids: Einstein and Debye's theory, Bose- Einstein condensation.

Books Recommended:

1. Statistical Physics, F. Mandle (ELBS).
2. Fundamentals of Statistical and Thermal Physics, F. Reif, (Mc Graw Hill).
3. Statistical Mechanics by R. K. Patharia.(Oxford: Butterworth, 1996).
4. Statistical Mechanics by K. Huang (Wiley, 1987.)
5. Statistical Mechanics by eyring eyring eyring

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SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) II Year (IV Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Optics Paper code: PHY – 206(A)

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit – I Wave Optics: Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.
Interference: Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment.

Unit – II Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index. **Michelson's Interferometer:** (1) Idea of form of fringes (no theory needed), (2) Determination of wavelength,(3) Wavelength difference,(4) Refractive index, (5) Visibility of fringes.

Unit – III Diffraction: Fraunhofer diffraction: Single slit; Double Slit. Multiple slits & Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern, Resolving power of grating, Criterion for resolution, of a straight edge, a slit and a wire using half-period zone analysis.

Unit – IV Polarization: Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization. , Nicol Prism, Double Refraction, Optical Activity, Laurent's Half shade Polarimeter

Reference Books:

Fundamentals of Optics, F A Jenkins and H E White, 1976, McGraw-Hill

Principles of Optics, B.K. Mathur, 1995, Gopal Printing

Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication

University Physics. F W Sears, M W Zemansky and H D Young 13/e, 1986.AddisonWesley

OR

Paper Code : PHY-206(B)

Astrophysics & Cosmology

UNIT-I

Ancient astronomical systems and their utility. Celestial sphere. Calendrical phenomena. Major planets,
their orbits and their satellites. Asteroid belt, comets and other objects of the solar system.

UNIT –II

Variety of stellar objects; classification of stars; distance scales. Current survey of galaxies; clusters, voids, quasars Hubble expansion. Mass distribution in galaxies and clusters; Dark Matter. Type II a supernova and Dark Energy.

UNIT –III

Main sequence stars, H-R Diagram. White dwarfs, neutron stars, supernovae, quasars and gamma ray
bursters. Equivalence principle and a metric for the spacetime. Black Holes; FRW models; gravitational
lensing.

UNIT –IV

Primordial formation of neutral Hydrogen; CMBR. Chander shekher limit, Big Bang Nucleosynthesis;Baryon to entropy ratio; Neutrinos and other relics.

Books Recommended:

1. Bradly W. Carrol and Dale A. Ostlie, An introduction to Modern Astrophysics 2nd Ed., Pearson publication
2. P. J. E. Peebles, Principles of Physical Cosmology Princeton Univ. Press (1993)
3. T. Padmanabhan, Cosmology and Astrophysics through Problems Cambridge Univ. Press (1996)
4. T. Padmanabhan, Theoretical Astrophysics, vol I, II and III (Cambridge Univ. Press (1992 - 96)

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) III Year (V Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: ANALOG SYSTEMS AND APPLICATIONS - I **Paper code: PHY – 301**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit - I Semiconductor Diodes: P and N type semiconductors. Energy Level Diagram. Conductivity and Mobility, Concept of Drift velocity.PN Junction Fabrication (Simple Idea). Barrier Formation in PN Junction Diode. Derivation for Barrier Potential, Barrier Width and Current for abrupt Junction. Equation of continuity, Current Flow Mechanism in Forward and Reverse Biased Diode.

Unit – II Two-terminal Devices and their Applications: (1) Rectifier Diode: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, C-filter, (2) Zener Diode and Voltage Regulation. Principle,

Unit – III Types of Diodes structure and characteristics of (1) LED, (2) Photo diode and (3) Solar Cell, Qualitative idea of Schottky diode and Tunnel diode.

Unit – IV Bipolar Junction transistors: n-p-n and p-n-p Transistors. I-V characteristics of CB and CE Configurations. Active, Cut off and Saturation Regions. Current gains α and β. Relations between α and β. Load Line analysis of Transistors. DC Load line and Q-point. Physical Mechanism of Current Flow. Transistor Biasing and Stabilization Circuits. Fixed Bias. Transistor as 2-port Network. h-parameter Equivalent Circuit

Reference Books:

- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
- Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
- Solid State Electronic Devices, B.G.Streetman& S.K.Banerjee, 6th Edn.,2009, PHI Learning
- Electronic Devices & circuits, S.Salivahanan& N.S.Kumar, 3rd Ed., 2012, Tata McGraw Hill
- Semiconductor Devices: Physics and Technology, S.M. Sze, 2nd Ed., 2002, Wiley India
- Microelectronic Circuits, M.H. Rashid, 2nd Edition, Cengage Learning
- Microelectronic Devices & Circuits, David A.Bell, 5th Edn.,2015, Oxford University Press

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Department of Physics

(Syllabus and Scheme of Evaluation w. e. f. 2022-25 onwards)B.Sc. (PCM) III Year (V Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: DIGITAL SYSTEMS AND APPLICATIONS **Paper code: PHY – 303**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit -I Digital Circuits: Difference between Analog and Digital Circuits. Examples of linear and digital ICs, Binary Numbers. Decimal to Binary and Binary to Decimal Conversion. BCD, Octal and Hexadecimal numbers. AND, OR and NOT Gates (realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates and application as Parity Checkers.

Unit – II Boolean algebra: De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Idea of Min terms and Maxterms. Conversion of Truth table into Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.

Unit -III Arithmetic Circuits: Binary Addition. Binary Subtraction using 2's Complement. Half and Full Adders. Half & Full Subtractors, 4-bit binary Adder/Subtractor.

Unit -IV Sequential Circuits: SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Pre-set and Clear operations. Race-around conditions in JK Flip-Flop. M/S JK Flip flop.

Reference Books:

- Digital Principles and Applications, A.P.Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw
- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
- Digital Electronics G K Kharate ,2010, Oxford University Press
- Logic circuit design, Shimon P. Vingron, 2012, Springer.
- Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
- Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill

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SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) III Year (V Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Communication System **Paper code: PHY – 305**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

Unit – I Electronic communication: *Introduction to communication – means and modes. Needfor modulation. Block diagram of an electronic communication system. Electromagnetic communication spectrum, band designations and usage*

Unit – II Analog Modulation*: Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection. Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector),Qualitative idea of Super heterodyne receiver.*

Unit – III Analog Pulse Modulation*: Channel capacity, Sampling theorem, Basic Principles-PAM,PWM, PPM, modulation and detection technique for PAM only, Multiplexing.*

Unit – IV Digital Pulse Modulation*: Need for digital transmission, Pulse Code Modulation, DigitalCarrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase ShiftKeying(PSK), and Binary Phase Shift Keying (BPSK).*

Reference Books:

- *Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.*
- *Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.*
- *Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.*
- *Electronic Communication systems, G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.*
- *Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill*
- *Communication Systems, S. Haykin, 2006, Wiley India*
- *Electronic Communication system, Blake, Cengage, 5th edition.*
- *Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press*

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) III Year (VI Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Atomic Molecular and Laser Physics **Paper code: PHY – 302**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Brief review of early models of atomic structure. Hydrogen atom spectrum and the Bohr model. FranckHertz experiment. The reduced mass and the discovery of the hydrogen isotopes. Correspondence
principle, spectra of hydrogen-like atoms, magnetic moment due to orbital motion, normal Zeeman effect and limits of Bohr Sommerfield theory.

UNIT-II

Quantum mechanics applied to the hydrogen atom problem:Stern-Gerlach experiment and electron spin, spin orbit coupling, Fine structure of the hydrogen atom spectrum.

UNIT-III

Many-electron atoms: Hund's rule and the periodic table, spectral terms, doublet structure of alkali spectra. The effective quantum number and quantum defect, penetrating and non-penetrating orbits. Anomalous Zeeman effect, Paschen- Bach effect, Stark effect in hydrogen.

UNIT-IV

Rotational and Vibrational Spectroscopy: diatomic molecule as a rigid rotator, effect of isotopic substitution, non-rigid rotator. Vibrational energy of a molecule, diatomic molecule as a simple harmonic oscillator. The anharmonic rotator, Rotational- Vibrational Spectra, population of energy levels. Electronic spectra of molecules, dissociation, Frank-Condon principle. Raman effect: Lasers:
Brief
introduction to the principle of lasers. Energy level diagram of Laser (He-Ne). Relation of Einstein'scoefficient. Threshold condition of laser formation.

Reference Books:

1. Introduction of atomic spectra: white
2. Atomic molecular physics by Rajkumar.
3. Lasers – Theory and Applications" by K. Thyagrajan and A.K. Ghatak
4. Physics of Atoms and Molecules" by Bransden and Joachain

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Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) III Year (VI Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Mathematical Physics Paper code: PHY – 304

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each**.**

UNIT-I

Transformation properties of vectors; scalar and vector products; Differentiation and integration of vectors; Concept of tensors; Line integral, volume integral and surface integral involving vector fields; Gradient, divergence and curl of a vector field; Gauss's divergence theorem, Stokes' theorem, Green's theorem - application to simple problems.

UNIT-II

Orthogonal curvilinear coordinates; concept of a metric, spherical and cylindrical coordinates and their unit vectors. Hermitian, orthogonal and unitary matrices, inverse of a matrix, similarity transformations, Eigenvalue problems and diagonalization of matrices

UNIT-III

Infinite sequences and series - convergence and divergence, conditional and absolute convergence, ratio test for convergence. Complex-valued functions - analytic functions defined in terms of Taylor series expansion. Functions of several real variables - partial differentiation.

UNIT-IV

Solution of second order linear differential equation with constant coefficients and variable coefficients by Frobenius' method; Solution of Legendre and Hermite equations about x = 0; Legendre and Hermite polynomials - orthonormality properties.

Books Recommended:

1. Matrices and Tensors in Physics by A.W.Joshi.(New Age Int.Pub., 1995).

2. Linear Algebra Theory and Applications by Ward Cheney and David Kincaid (Jones &Bartlett)

3. Vector Spaces and Matrices in Physics by M. C. Jain (Alpha Science International Ltd,2007).

4. Partial Differential Equations for Scientists and Engineers By Stanley J. Farlow (DoverPublishers, 1993).

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Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) III Year (VI Semester)

Lectures : 3Hrs **Examination Time : 3 Hrs** **Maximum Marks : 50 (20 +30)**

Subject: Quantum Mechanics Paper code: PHY – 306

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Origin quantum physics (Experimental basis): Review of History of Origin of Quantum Mechanics-Plank's Quantum Hypothesis, black body radiation. Nature of Light, de Broglie Waves and Wave- Particle Duality, Heisenberg's Uncertainty Principle. Compton Effect. Phase velocity, group velocity and their relation.

UNIT-II

Operators: Linear Operators. Momentum operator, Energy operator, Hamiltonian operator, Eigen value problem. Eigen value of a Hermition and Unitary Operators. Property of Hermition operator. Expectation Values. Commutator bracket and Uncertainty relations.

UNIT III

Postulates of Quantum Mechanics: Derivation of 1-D, 2-D,3-D time-dependent Schrodinger wave equation (subject to force, free particle). Time-independent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Orthogonality and Normalization of function, Expectation values of dynamical quantities, probability current density.

UNIT-IV

Application of Schrodinger wave equation:

1. Free particle in 1-D, 2-D,3-D box (solution of Schrodinger wave equation, eigen functions, eigen values, quantization of energy and momentum, nodes and anti nodes, zero point energy).
2. One dimensional step potential E > VO (Reflection and Transmission coefficient)
3. One dimensional step potential E < VO (Penetration depth calculation).
4. One dimensional potential barrier, E > VO (Reflection and Transmission coefficient)

5. One-dimensional potential barrier, E < VO (penetration or tunneling coefficient).
6. Brief idea of energy and eigen function of Harmonic oscillator .

Reference Books:

1. Bransden B H and Joachain C J, Quantum Mechanics (2000), Pearson Education,New Delhi
2. Liboff R L, Introductory Quantum Mechanics
3. Eisberg R M and Resnick R, Quantum Physics of Atoms Molecules, Solids, Nuclei andParticles, Wiley Eastern Ltd, New Delhi
4. Verdeyen J T, Laser Electronics PHI, New Delhi
5. Thorenton S T and Rex A, Modern Physics, (2007) Cengage Learning, New Delhi
6. Taylor J R, Zafiratos C D and Dubson M A, Modern Physics, 2nd Ed (2004), PHI, NewDelhi.

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SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) I Year (I Semester)

Practical per Week : 4 **Maximum Marks : 50 (20 +**

Subject : Physics Lab - I Paper Code - PHY - 107

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.*

List of Experiments

Note: Students are required to perform minimum five experiments from given list.

1. To determine the height of terrestrial object using sextant.
2. Determination of Stefan's Constant.
3. To study the variation of semiconductor resistance with temperature and hence to Determine the Band Gap of semiconductor in the form of reverse biased P-N junction.
4. Moment of Inertia of a fly-wheel.
5. 'g' by Bar pendulum.
6. M.I. of an irregular body using a torsion pendulum.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Physics

(Syllabus and Scheme of Studies w. e. f. 2022-25 onwards)B.Sc. (PCM) I Year (II Semester)

Practical per Week : 4 **Maximum Marks : 50 (20 +**

Subject : Physics Lab - II Paper Code - PHY – 108

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.*

Note: Students are required to perform minimum five experiments from given list.

(1) To study and plot V-I characteristics of PN junction diode.

(2) To Study and plot V-I characteristics Zener Diode.

(3) To draw common emitter characteristics of a transistor and calculate transistor characteristics parameters.

(4) To draw common base characteristics of a transistor and calculate transistor characteristics parameters.

(5) To plot the waveform of the half wave rectifier and find the ripple factor for H.W.R.

(6) To plot the waveform of the full wave bridge rectifier and analyze its output.

(7) To study Cathode Ray Oscilloscope (CRO).

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Subject : Physics Lab - III Paper Code - PHY – 207

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*
I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.*

List of Experiments

Note: Students are required to perform minimum five experiments from given list.

1. To determine Earth's magnetic field using tangent Galvanometer.
2. Viscosity of water by its flow through a uniform capillary tube.
3. Verify the Faraday Law using magnetic induction.
4. Conversion of galvanometer into ammeter.
5. Conversion of galvanometer into voltmeter.
6. Calibration of a thermocouple by Potentiometer.
7. To determine specific resistance of a metallic wire using potentiometer

RAFFLES UNIVERSITY

Subject : Physics Lab - IV Paper Code - PHY – 208

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*
I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.*

Note: Students are required to perform minimum five experiments from given list.

1. Verification of Newton's Ring formula and determination of wavelength of sodium light.
2. Determination of Magnifying and Resolving power of a telescope.
3. Refractive Index and Dispersive Power of a Prism using spectrometer.
4. Determine wavelength of light using plane transmission diffraction grating.
5. Determine resolving power of a grating.
6. Specific Rotation of Sugar solution by Laurent's half-Shade Polarimeter.
7. To determine numerical aperture of the optical fiber
8. Wavelength of Sodium light by Fresnel's Biprism.

RAFFLES UNIVERSITY

Subject : Physics Lab - V Paper Code - PHY – 307

Special Note:- *Minimum six experiments from given list of experiment are required to complete. The students are required to calculate the error involved in a particular experiment.*

I. Each student has to perform a minimum number of experiments prescribed in the syllabus.

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.*

Note: Students are required to perform minimum six experiments from given list.

1. Moment of Inertia of a fly-wheel.
2. M.I. of an irregular body using a torsion pendulum.
3. Surface tension by Jeager's Method.
4. Young's Modulus of steel bar using tensile
5. Modulus of rigidity by torsion method
6. Elastic constant by Scarle's method.
7. Viscosity of water by its flow through a uniform capillary tube.
8. 'g' by Bar pendulum.
9. To verify the Bernoulies theorem.
10. To determine viscosity of a given fluid.
11. To calibrate the orificemeter.

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SCHOOL OF BASIC AND APPLIED SCIENCE
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Lecture : 2

Subject : Physics Lab - VI Paper Code - PHY – 308

II.	*After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and*

experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

III. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.

IV.	*The lab. Record register will be presented to external practical examiners for Lab. Record marks. These external examiners will verify the record randomly.*

Students need to perform minimum two experiments from each section and in total eight experiments.

Activities:

1. Demonstrations

(Any four demonstrations equivalent to two experiments)

(i) Electromagnetic induction by using two coils
(ii) Magnet –magnet interaction
(iii) Study of Collision by using balls
(iv) Study of Signal generator using CRO (Sine, square wave signal, measurement of AC voltage, frequency)
(v) Demonstration of action potential
(vi) Moment of inertia effect on rotation

2. Computer aided demonstrations (Using computer simulations or animations)

(Any two demonstrations equivalent to two experiments)

(i) Coulomb's law
(ii) Vectors: visualization of vectors
(iii) Bohr's model
(iv) Carnot engine, diesel engine
(v) Graphs and their slopes, and Kinematics graphs (using computer simulations)
(vi) Model of SC, BCC, FCC, and HCP crystals.

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Lecture : 2
Examination Time : 3 Hrs Maximum Marks: 50(20+30)
Paper Title : Matrices and Statistics **Paper Code : MA-101**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary Operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigen values, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and itsuse in finding the inverse of a matrix.

UNIT-II

Applications of matrices to a system of linear (both homogeneous and non–homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms.

UNIT-III

Meaning of correlation and regression. Coefficient of correlation, Rank correlation, lines of regression. Properties of regression coefficients.

UNIT-IV

Probability distribution of random variables, Binomial distribution, Poisson's distribution, Normal distribution, Mean, Variance and Fitting.

Books Recommended:

4. S. S Seth: A Text Books Mathematical Statistics
5. Shanti Narayan : A Text Books of Matrices.
6. Chandrika Prasad : Text Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.

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Lecture : 2
Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Paper Title : Calculus Paper Code : MA-103

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Definition of the limit of a function. Basic properties of limits, Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.

UNIT-II

Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Radius of curvature for pedal curves. Tangential polar equations. Centre of curvature. Chord of curvature..

UNIT-III

Tests for concavity and convexity. Points of inflexion. Multiple points. Cusps, nodes & conjugate points. Type of cusps Tracing of curves in Cartesian, parametric and polar co-ordinates. Intrinsic equations ofcurves.

UNIT-IV

Indeterminate forms, Partial differentiation, Homogenous function and Euler's theorem, Jacobians, Totaldifferentials Chain rule of partial differentiation.

Books Recommended:

1. Differential and Integral Calculus: Shanti Narayan.
2. Murray R. Spiegel: Theory and Problems of Advanced Calculus. Schaun's Outline series. SchaumPublishing Co., New York.
3. N. Piskunov: Differential and integral Calculus. Peace Publishers, Moscow.
4. Gorakh Prasad: Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.
5. Gorakh Prasad: Integral Calculus. Pothishala Pvt. Ltd., Allahabad.

Examination Time : 3 Hrs Maximum

Marks: 50(20+30) Paper Title : Three- Dimensional GeometryPaper Code : MA-105

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all,*

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Lecture : 2

Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT -I

General equation of second degree, System of conics, Confocal conics, Polar equation of a conic and its properties.

UNIT -II

Three dimensional systems of co-ordinates, Projection and direction cosines, plane and Straight line.

UNIT-III

Sphere: Plane section of a sphere. Sphere through a given circle. Cones: Right circular cone, envelopingcone and reciprocal cone. Cylinder: Right circular cylinder and enveloping cylinder

UNIT-IV

Central Conicoids, Reduction of general equation of second degree, Tangent plane and Normal to conicoid, Generating lines, Plane sections.

Books Recommended:

1. S. P. Nigam S. S. Gangwar, Coordinary Geometry of Three Dimensions
2. R.J.T. Bill, Elementary Treatise on Coordinary Geometry of Three Dimensions, MacMillan IndiaLtd. 1994.

P.K. Jain and Khalil Ahmad: A Textbook of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd.1999.

Examination Time : 3 Hrs Maximum Marks: 50(20+30)

Paper Title : Matrices and Statistics **Paper Code : MA-101**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary Operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigen values, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and

Lecture : 2

itsuse in finding the inverse of a matrix.

UNIT-II

Applications of matrices to a system of linear (both homogeneous and non–homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms.

UNIT-III

Meaning of correlation and regression. Coefficient of correlation, Rank correlation, lines of regression. Properties of regression coefficients.

UNIT-IV

Probability distribution of random variables, Binomial distribution, Poisson's distribution, Normal distribution, Mean, Variance and Fitting.

Books Recommended:

4. S. S Seth: A Text Books Mathematical Statistics
5. Shanti Narayan : A Text Books of Matrices.
6. Chandrika Prasad : Text Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.

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Lecture **: 2**

Examination Time **: 3 Hrs** **Maximum Marks: 50(20+30)**

Paper Title : Calculus Paper Code : MA-103

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT-I

Definition of the limit of a function. Basic properties of limits, Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibnitz theorem. Maclaurin and Taylor series expansions.

UNIT-II

Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Radius of curvature for pedal curves. Tangential polar equations. Centre of curvature. Chord of curvature..

UNIT-III

Tests for concavity and convexity. Points of inflexion. Multiple points. Cusps, nodes & conjugate points. Type of cusps Tracing of curves in Cartesian, parametric and polar co-ordinates. Intrinsic equations ofcurves.

UNIT-IV

Indeterminate forms, Partial differentiation, Homogenous function and Euler's theorem, Jacobians, Totaldifferentials Chain rule of partial differentiation.

Books Recommended:

1. Differential and Integral Calculus: Shanti Narayan.
2. Murray R. Spiegel: Theory and Problems of Advanced Calculus. Schaun's Outline series. SchaumPublishing Co., New York.
3. N. Piskunov: Differential and integral Calculus. Peace Publishers, Moscow.
4. Gorakh Prasad: Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.
5. Gorakh Prasad: Integral Calculus. Pothishala Pvt. Ltd., Allahabad.

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Lecture : 2

Examination Time : 3 Hrs Maximum **Marks: 50(20+30) Paper Title : Three- Dimensional Geometry Paper Code : MA-105**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT -I

General equation of second degree, System of conics, Confocal conics, Polar equation of a conic and its properties.

UNIT -II

Three dimensional systems of co-ordinates, Projection and direction cosines, plane and Straight line.

UNIT-III

Sphere: Plane section of a sphere. Sphere through a given circle. Cones: Right circular cone, envelopingcone and reciprocal cone. Cylinder: Right circular cylinder and enveloping cylinder

UNIT-IV

Central Conicoids, Reduction of general equation of second degree, Tangent plane and Normal to conicoid, Generating lines, Plane sections.

Books Recommended:

1. S. P. Nigam S. S. Gangwar, Coordinary Geometry of Three Dimensions
2. R.J.T. Bill, Elementary Treatise on Coordinary Geometry of Three Dimensions, MacMillan IndiaLtd. 1994.

P.K. Jain and Khalil Ahmad: A Textbook of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd.1999.

Paper Title : Sequences and Series and Trigonometry Paper Code : MA-102

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set, neighborhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set,

Lecture : 2

closure of a set in real numbers and their properties. Bolzano-Weiestrass theorem, Open covers, Compact sets and Heine-Borel Theorem.

UNIT -II

Sequence: Real Sequences and their convergence, Theorem on limits of sequence, Bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, Subsequences, Sub-sequential limits. Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series: Cauchy's general principle of Convergence of series, Convergence and divergence of geometric series, Hyper Harmonic series or p-series. D-Alembert's ratio test, Raabe's test, Logarithmic test, Cauchy's Nth root test.

UNIT -III

De Moivre's Theorem and its Applications. Expansion of trigonometrical functions. Direct circular and hyperbolic functions and their properties.

UNIT- IV

Inverse circular and hyperbolic functions and their properties. Logarithm of a complex quantity. Gregory's series. Summation of Trigonometry series.

Books Recommended:

1. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
2. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
3. Shanti Narayan : A Course in Mathematical Analysis, S.Chand and company, New Delhi
4. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York
5. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
6. Earl D. Rainville, Infinite Series, The Macmillan Co., New York
7. S.L. Loney : Plane Trigonometry Part – II, Macmillan and Company, London.
8. R.S. Verma and K.S. Sukla : Text Book on Trigonometry, Pothishala Pvt. Ltd. Allahabad.

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)B.Sc. (PCM) I Year (II Semester)

Lectures : 2 Hrs

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)Paper Title : Ordinary Differential Equations** **Paper Code : MA-104**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT- I

Geometrical meaning of a differential equation. Exact differential equations, integrating factors. First order higher degree equations solvable for x,y,p Lagrange's equations, Clairaut's equations. Equation reducible to Clairaut's form. Singular solutions.

UNIT-II

Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Equations reducible to homogeneous linear ordinary differential equations.

UNIT-III

Linear differential equations of second order: Reduction to normal form. Transformation of the equationby changing the dependent variable / the independent variable. Solution by operators of non-homogeneous linear differential equations. Reduction of order of a differential equation. Method of variations of parameters. Method of undetermined coefficients.

UNIT-IV

Ordinary simultaneous differential equations. Solution of simultaneous differential equations involving operators x (d/dx) or t (d/dt) etc. Simultaneous equation of the form dx/P = dy/Q = dz/R. Total differential equations. Condition for Pdx + Qdy + Rdz = 0 to be exact. General method of solving Pdx + Qdy + Rdz = 0 by taking one variable constant. Method of auxiliary equations.

Books Recommended :

1. D.A. Murray : Introductory Course in Differential Equations. Orient Longaman(India) . 1967
2. A.R.Forsyth : A Treatise on Differential Equations, Machmillan and Co. Ltd. London
3. E.A. Codington : Introduction to Differential Equations.
4. S.L.Ross: Differential Equations, John Wiley & Sons
5. B.Rai & D.P. Chaudhary : Ordinary Differential Equations; Narosa, Publishing House Pvt. Ltd

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Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)B.Sc. (PCM) II Year (IV Semester)

Paper Title : Vector Calculus and Geometry Paper Code : MA-106

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Vector differentiation. Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives.

UNIT-II

Gradient of a scalar point function, geometrical interpretation of grad $\emptyset$, character of gradient as a point function. Divergence and curl of vector point function, characters of Div$\vec{f}$ and Curl $\vec{f}$ as point function, examples. Gradient, divergence and curl of sums and product and their related vector identities.Laplacian operator.

UNIT-III

Vector integration; Line integral, Surface integral, Volume integral. Theorems of Gauss, Green & Stokesand problems based on these theorems.

UNIT-IV

General equation of second degree, Tracing of conics Parabola, Ellipse and Hyperbola. Polar Equation ofconic.

Books Recommended:

1. Murrary R. Spiegel: Vector Analysis, Schaum Publisghing Company, New York.
2. N. Saran and S.N. NIgam. Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.
3. Shanti Narayna : A Text Book of Vector Calculus. S. Chand & Co., New Delhi.
4. S.L.Loney, The Elements of Coordinate Geometry, Macmillan and company, London
5. P. K. Jain and Khalil Ahamad, A text book of Analytic Geometry of Two Dimensions MacmillanIndia Ltd. 1994.

Sharma and Sharma A Text Book of Vector Calculus Krishna Prakashan Media

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Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)B.Sc. (PCM) II Year (IV Semester)

Paper Title : Advanced Calculus *Paper Code : MA-201*

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives.

UNIT-II

Limit and continuity of real valued functions of two variables. Taylor's theorem for functions of two variables. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers and Envelopes.

UNIT-III

Reduction formula, Beta and Gamma function.

UNIT-IV

Qudrature, Rectification, Volume and surface of solids of revolution, Pappus theorem, double and tripleintegrals, Change the order of integration, Dirichlet's integral.

Books Recommended:

1. C.E. Weather burn: Differential Geometry of three dimensions, Radhe Publishing House, Calcutta
2. Gabriel Klaumber : Mathematical analysis, Mrcel Dekkar, Inc., New York, 1975
3. R.R. Goldberg : Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
4. Gorakh Prasad : Differential Calculus, Pothishala Pvt. Ltd., Allahabad
5. S.C. Malik : Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
6. Shanti Narayan : A Course in Mathemtical Analysis, S.Chand and company, New Delhi
7. Murray, R. Spiegel : Theory and Problems of Advanced Calculus, Schaum Publishing co., New York
8. A. R. Vasishtha, J.N. Sharma, A. K. Vasishtha Advanced Calculus Krishna Prakashan Media

SCHOOL OF BASIC AND APPLIED SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)B.Sc. (PCM) II Year (IV Semester)

Paper Title : Partial Differential Equations *Paper Code : MA-203*

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.

UNIT-II

Linear partial differential equations of second and higher orders, Linear and non-linear homogeneous and non-homogeneous equations with constant co-efficient, Partial differential equation with variable co-efficient reducible to equations with constant coefficients, their complimentary functions and particular Integrals, Equations reducible to linear equations with constant co-efficients.

UNIT-III

Classification of linear partial differential equations of second order, Hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order.

UNIT-IV

Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.

Books Recommended:

1. D.A.Murray: Introductory Course on Differential Equations, Orient Longman, (India),1967
2. Erwin Kreyszing : Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
3. A.R. Forsyth : A Treatise on Differential Equations, Macmillan and Co. Ltd.
4. Ian N.Sneddon : Elements of Partial Differential Equations, McGraw Hill BookCompany, 1988
5. Frank Ayres : Theory and Problems of Differential Equations, McGraw Hill BookCompany, 1972
6. J.N. Sharma & Kehar Singh : Partial Differential Equations

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(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)B.Sc. (PCM) II Year (IV Semester)

Paper Title : Elective paper **Paper Code : MA-205(A)**

Statics

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Forces acting at a point, Parallel forces. Moments and Couples.

UNIT-II

Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Gravity.

UNIT-III

Virtual work. Forces in three dimensions. Poinsots central axis.

UNIT-IV

Wrenches. Null lines and planes. Stable and unstable equilibrium.

Books Recommended:

1. S.L. Loney : Statics, Macmillan Company, London
2. R.S. Verma : A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad

OR

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(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)B.Sc. (PCM) II Year (IV Semester)

Paper Title : Elective paper **Paper Code : MA-205(B)**

Number Theory and Cryptography

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT- I

Divisibility:- GCD, LCM , Prime number, fundamental theorem of arithmetic, perfect numbers, floor and ceiling functions, Congruence: properties, complete and reduced residue system, Fermat's theorem, Euler functions, Chinese remainder theorem.

UNIT-II

Primality testing and factorization algorithms, Pseudo primes, Fermate's pseudo-primes, Pollard's rho method for factorization.

UNIT-III

Introduction to cryptography: Attack services and mechanisms, Security services, Conventional encryption. Classical techniques: Model stegnanography, Clasical encryption technique, Modern techniques: DES, cryptanalysis, block cipher principles and design, key distribution problem, Random number generation.

UNIT-IV

Hash function public key cryptography, Diffie-Hellmann key exchange, Discrete logarithm-based crypto- systems, RSA crypto system signature schemes, Digital signature standard (DSA), RSA signature schemes,knapsack problem.

Books Recommended:

1. **Koblitz**, Neal A Course in Number Theory and Cryptography Publisher Springer
2. J. H. Loxton Number Theory and Cryptography Publisher: Cambridge University Press

Dr.Hari Kishan, Dr. Manoj Km. Baliyan Number Theory and Cryptography publisher Krishna Pvt. Ltd.

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(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)B.Sc. (PCM) II Year (IV Semester)

Lectures *: 2 Hrs*

Examination Time **: 3 Hrs** **Maximum Marks: 50(20+30)**

Paper Title *: Linear Programming* *Paper Code* *: MA-202*

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Linear programming problems, Statement and formation of general linear programming problems, Graphical method, slack and surplus variables, standard and matrix forms of linear programming problem, Basic feasible solution.

UNIT-II

Transportation problems, Assignment problems.

UNIT-III

Fundamental theorem of linear programming, simplex method Artificial variables, Big-M method, Convex sets.

UNIT-IV

Duality in linear programming problems, Dual simplex method, Primal-dual method.

Books Recommended:

1. J.K Sharma Operations Research: Theory and Applications 5th Edition (English) 5th Edition LaxmiPublications New- Delhi
2. V. K Kapoor Operations Research: Sultan Chand and Sons
3. S.D Sharma Operations Research Publisher Kedar Nath Ram Nath
4. R. K Gupta linear programming Krishna Prakashan Media

SCHOOL OF BASIC AND APPLIED SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)B.Sc. (PCM) II Year (IV Semester)

Lectures : 2 Hrs

Examination Time : 3 Hrs Maximum Marks: 50(20+30)Paper Title : Special Functions and Integral Transforms Paper Code : MA-204

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT – I

Series solution of differential equations -Power series method, Definitions of Beta and Gamma functions. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions.

UNIT – II

Legendre and Hermite differentials equations and their solutions: Legendre and Hermite functions and their properties-Recurrence Relations and generating functions. Orhogonality of Legendre and Hermite polynomials. Rodrigues' Formula for Legendre & Hermite Polynomials, Laplace Integral Representation of Legendre polynomial.

UNIT-III

Laplace Transforms – Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem.

UNIT-IV

Inverse Laplace transforms, convolution theorem, Inverse Laplace transforms of derivatives and integrals, change the scale property and Shifting theorems for inverse Laplace, solution of ordinary differential equations using Laplace transform. Finite Fourier transforms, Infinite Fourier transforms, Fourier integral, Application of Fourier transform to boundary value problems,

Books Recommended:

1. I.N. Sneddon: the use of integral transform, McGraw Hill, 1972
2. Murray R. Spiegel: Laplace transforms, Schaum's Series.
3. S. S Seth Integral Transforms **:** Students' Friends & Company
4. I.N. Sneddon: Special Functions on mathematics, Physics & Chemistry.
5. W.W. Bell: Special Functions for Scientists & Engineers.

SCHOOL OF BASIC AND APPLIED SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)B.Sc. (PCM) II Year (IV Semester)

Lectures : 2 Hrs

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Paper Title : Elective paper **Paper Code : MA-206(A)**

Programming in C and Numerical Method

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Programmer's model of a computer, Algorithms, Flow charts, Data types, Operators and expressions, Input / outputs functions

UNIT-II

Decisions control structure: Decision statements, Logical and conditional statements, Implementation of Loops, Switch Statement & Case control structures. Functions, Preprocessors and Arrays.

UNIT-III

Strings: Character Data Type, Standard String handling Functions, Arithmetic Operations on Characters. Structures: Definition, using Structures, use of Structures in Arrays and Arrays in Structures. Pointers: Pointers Data type, Pointers and Arrays, Pointers and Functions. Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method. Newton's iterative method for finding pth root of a number, Order of convergence of above methods.

UNIT-IV

Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Crout's method, Cholesky Decomposition method. Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.

Books Recommended:

1. B.W. Kernighan and D.M. Ritchie : The C Programming Language, 2nd Edition
2. V. Rajaraman : Programming in C, Prentice Hall of India, 1994
3. Byron S. Gottfried : Theory and Problems of Programming with C, Tata McGraw -Hill Publishing Co. Ltd., 1998
4. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
5. M.K. Jain, S.R.K. Lyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
6. Computer Oriented Numerical Methods, Prentice Hall of India Pvt. Ltd.
7. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill Publishing Co. Ltd.
8. Gupta and Malik, Numerical Analysis Krishna Prakashan Media
9. Babu Ram: Numerical Methods, Pearson Publication.
10. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.

OR

SCHOOL OF BASIC AND APPLIED SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)

B.Sc. (PCM) II Year (IV Semester)

Lectures : 2 Hrs

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)Paper**

Title : Elective paper **Paper Code : MA-206(B)**

Differential Geomeetry and Tenssor Analysis

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and thestudents will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Local theory of curves space curves, examples, Plane curves, tangent and normal and binormal osculating normal plane and rectifying plane, Helices serret- Frenet apparatus, contact between curve and surfaces, tangent surfaces, involutes and evolutes of curves.

UNIT –II

Intrinsic equations, fundamental existence theorem for space curves, Local theory of surfaces Parametric patches on surface curve of a surface, surface of revolution, Helicoids, Metric first fundamental form and arc length.

UNIT –III

Local theory of surface (contd.) Direction coefficients, families of curves, intrinsic properties, geodesics, canonical geodesic equations normal properties of geodesics, geodesics curvature, geodesics polars, Gass-Bonnet theorem, Gaueeian curvature, normal curvature.

UNIT –IV

Contravariant and covariant vectors and tensors, Mixed tensors, Symmetric and skew –symmetric tensors, Algebra of tensors, Contraction and inner product, Quotient theorem, Reciprocal tensors.

Books Recommended:

1. Vasistha and Other Differential Geometry and Tenssor Analysis publisher Krishna Pvt. Ltd.
2. K.K. Dube Differential Geometry and Tensors I. K International Publishing house Pvt. Ltd.

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)

B. Sc. III Year (V Semester)

Schedule per week Lectures : 2Hrs

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Real Analysis Paper Code : MA-301

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and thestudents will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Riemann integral, Integrabililty of continuous and monotonic functions, The Fundamental Theorem of integral calculus. Mean value theorems of integral calculus.

UNIT-II

Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests,μ- test, Integral as a function of a parameter. Continuity Differentiability and integrability of an integral of a function of a parameter.

UNIT-III

Definition and examples of metric spaces, neighborhoods, limit points, interior points, open and Closed sets, closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness, Cantor's intersection theorem, Baire's category theorem, contraction Principle.

UNIT-IV

Continuous functions, uniform continuity, compactness for metric spaces, sequential compactness, Bolzano-Weierstrass property, total boundedness, finite intersection property, continuity in relation with compactness, connectedness, components, continuity in relation with connectedness.

Book s Recommended:

1. P.K. Jain and Khalil Ahmad: Metric Spaces, 2nd Ed., Narosa, 2004
2. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
3. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
4. D. Somasundaram and B. Choudhary : A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997
5. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi

6. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
7. G.F. Simmons : Introduction to Topology and Modern Analysis, McGraw Hill, 1963.

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RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)

B. Sc. III Year (V Semester)

Schedule per week Lectures : 2Hrs

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Modern algebra Paper Code : MA-303

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and thestudents will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Nature of the roots of an equation Descarte's rule of signs. Definition of a group with examples and simple properties, permutation groups, subgroup, centre and normalizer, cyclic groups, Left and right cosets, Coset decomposition, Lagrange's theorem and its consequences.

UNIT-II

Homomorphism and isomorphism, Cayley's theorem, Normal subgroups, Quotient group, Fundamental theorem of homomorphism, conjugancy relation, class equation.

UNIT-III

Introduction to rings, subrings, integral domains and fields, Characteristics of a ring. Ring homomorphisms, ideals (principle, prime and Maximal) and Quotient rings, Field of quotients of an integral domain.

UNIT-IV

Euclidean rings, Polynomial rings, Polynomials over the rational field, The Eisenstein's criterion, Polynomial rings over commutative rings, Unique factorization domain, R unique factorization domain implies so is R*X1 , X2……Xn+.

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2^{nd} edition).
3. VivekSahai and VikasBist : Algebra, NKarosa Publishing House.
4. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Norsa Publishing House.
5. J.B. Gallian: Abstract Algebra, Narosa Publishing House.

RAFFLES UNIVERSITY

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)

B. Sc. III Year (V Semester)

Schedule per week Lectures : 2Hrs

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Dynamics Paper Code : MA-305

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and thestudents will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration. Simple harmonic motion. Elastic strings.

UNIT-II

Motion of resisting medium, Constrained Motion (Circular and Cycloid only).

UNIT-III

Motion on smooth and rough plane curves. Projectile motion of a particle in a plane. Vector angular velocity.

UNIT-IV

General motion of a rigid body.Central Orbits, Kepler laws of motion. Motion of a particle in threedimensions.

Books Recommended:

1. S.L.Loney : An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, CambridgeUniversity Press, 1956
2. F. Chorlton : Dynamics, CBS Publishers, New Delhi
3. A.S. Ramsey: Dynamics Part-1&2, CBS Publisher & Distributors.
4. M. Ray and G.C Sharma Dynamics S. Chand Publisher & Distributors

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)

B. Sc. III Year (VI Semester)

Schedule per week Lectures : 2Hrs

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Complex Analysis Paper Code : MA-302

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and thestudents will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Function of a complex variable, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions, orthogonal system.

UNIT-II

Mappings by elementary functions: Translation, rotation, Conformal Mappings, Mobiustransformations, Fixed pints, Cross ratio, Inverse Points and critical mappings, Conformal transforms.

UNIT-III

Complex integration, Line integral, Cauchy's fundamental theorem, Cauchy's integral formula, Morera'stheorem, Liouville theorem, Maximum Modulus Theorem, Taylor and Laurent series.

UNIT-IV

Singularities and zeros of an analytic function, Rouche's theorem, Fundamental theorem of algebra,Analytic continuation.

References:

1. A. R. Vasishtha, J.N. Sharma, A. K. VasishthaComplex AnalysisKrishna Prakashan Media
2. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
3. R.V. Churchill & J.W. Brown: Complex Variables and Applications, 5th Edition, McGraw-Hill, New York, 1990
4. Shanti Narayan : Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.

RAFFLES UNIVERSITY

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)

B. Sc. III Year (VI Semester)

Schedule per week Lectures : 2Hrs

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Linear Algebra Paper Code : MA-304

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vactor space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.

UNIT-II

Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Vector space of all the linear transformations Dual Spaces, Bidual spaces, annihilator of subspaces of finite dimensionalvector spaces, Null Space, Range space of a linear transformation, Rank and Nullity Theorem,

UNIT-III

Algebra of Liner Transformation, Minimal Polynomial of a linear transformation, Singular andnon-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.

UNIT-IV

Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements,Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram - Schmidt, Orthogonalization process.

Books Recommended:

1. I.N. Herstein : Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal : Basic Abstract Algebra (2nd edition).
3. VivekSahai and VikasBist : Algebra, Narosa Publishing House.
4. I.S. Luther and I.B.S. Passi : Algebra, Vol.-II, Narosa Publishing House.
5. A. R. Vasishtha, J.N. Sharma, A. K. VasishthaLinearAlgebra,Krishna Prakashan Media

RAFFLES UNIVERSITY

RAFFLES UNIVERSITY, NEEMRANA, ALWAR

SCHOOL OF SCIENCE

Department of Mathematics

(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)

B. Sc. III Year (VI Semester)

Schedule per week Lectures : 2Hrs

Examination Time	**: 3 Hrs**	**Maximum Marks:**
50(20+30)Subject	**: Numerical Analysis**	**Paper Code : MA-306**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and thestudents will be required to attempt one question from each unit which will be of 6 marks each*

UNIT-I

Finite Differences operators and their relations. Finding the missing terms and effect of error ina difference tabular values, Interpolation with equal intervals: Newton's forward and Newton's backward interpolation formulae. Interpolation with unequal intervals: Newton's divided difference, Lagrange's Interpolation formulae, Hermite Formula.

UNIT-II

Central Differences: Gauss forward and Gauss's backward interpolation formulae, Sterling, Bessel Formula.

UNIT-III

Numerical Differentiation: Derivative of a function using interpolation formulae as studied in Sections –I & II. Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one-third and three-eighth rule, Weddle's rule, Chebychev formula, Gauss Quadrature formula.

UNIT-IV

Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Modified Euler's method, Milne-Simpson's method.

Books Recommended:

1. Babu Ram: Numerical Methods, Pearson Publication.
2. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.
3. M.K. Jain, S.R.K.Iyengar, R.K. Jain : Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996
4. M.K. Jain, S.R.K. Iyengar, R.K. Jain : Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
5. C.E. Froberg : Introduction to Numerical Analysis (2nd Edition).

6. Melvin J. Maaron : Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., NewYork.
7. R.Y. Rubnistein : Simulation and the Monte Carlo Methods, John Wiley, 1981.
8. Radhey S. Gupta: Elements of Numerical Analysis, Macmillan

Publishing Co.Gupta and Malik, Numerical AnalysisKrishna Prakashan
Media

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)

RAFFELS UNIVERSITY, NEEMRANA

B.Sc. (CBZ) (3 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
UNIVERSITY

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Vision: To evolve as an Institution of Excellence, where scholars develop informed and inquiring minds and broaden the frontiers of pure and applied knowledge.

Mission: In graining the capacity to us usher in change by discovering nurturing and expanding individual skills talents and interests while standing forth as leader and path breaker in their future carrier.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 To providing subjective and practical knowledge as well as developing practical solutions and connections between theory.

PEO 2 Hearten individual growth among the students and enhance their confidence by providing them an opportunity to become a part of science-industry.

PEO 3 To make Science subjects interesting through technically, scientifically and experimentally.

PEO 4 To develop problem-solving skills through practical applications and research

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduateswillbe able to

PO 1	Provide students with fundamental knowledge and ability to expertise inComputer Science.
PO 2	Provide insight to problem solving to succeed in Technical Profession throughprecise education and to prepare students to excel in postgraduate programs.
PO 3	To inculcate in students professional, effective communication skills, team work, multidisciplinary approach and an ability to relate issues to broader socialcontext.
PO 4	Prepare students to be aware of excellence, leadership, written ethical codes and guidelines and lifelong learning needed for successful professional career by providing them with an excellent academic environment.
PO 5	Empower the students in academic, social, psychological and economic arenasby developing relevant competencies.
PO 6	Interpret and apply the implications of environment awareness initiatives incorporated in curriculum.

PO 7	Participation and contribution to community development activities throughNCC, NSS etc.
PO 8	Acquire sufficient knowledge base in the Domain Specific area leading to thepursuit of advanced level of study in the chosen Domain Specific area.
PO 9	Adaptability and capacity building to the everchanging needs of the industryand employment opportunities.
PO 10	Inculcate the human values through curricular, co-curricular and extracurricularactivities.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Department of Science, offers Three Year (comprising 6 semesters) Undergraduate Programin Science with objective of empowering students to acquire all-inclusive understanding of Computer Knowledge both theoretical and practical as an academic discipline. Upon completion of B. Sc.Computer Science Degree Programsuccessfully, the students shall acquire the following skills and competencies.

PSO 1	Gain the knowledge of Chemistry through theory and practical s.
PSO 2	Develop research-oriented skills.
PSO 3	The students will graduate with proficiency in Botany.
PSO 4	The students will be able to start ventures related to plants viz. horticulture units, agro-units (mushroomcultivation, plant-tissue culture, Hi-Tech Nursery etc.), plant exploration, and conservation NGO. The students equipped with the basics of plant science will be able to apply the knowledge in practicingagriculture with a scientific outlook thereby increasing the production and profits.
PSO 5	Understand the basics of Zoology, Botany
PSO 6	Develop the ability to apply the knowledge acquired in the classroom and laboratories to specificproblems in theoretical and experimental Zoology.

PSO 7	Perform job in various fields like science, environment, education, banking, business and public service, etc. or be an entrepreneur with precision, analytical mind, innovative thinking, clarity of thought,expression, and systematic approach.

Course Objective and Course Outcomes

SCHOOL OF BASIC AND APPLIED SCIENCES

(CBCS Scheme of Studies & Examinations w. e. f. 2023-26 onwards)

B.Sc. (CBZ) I Year (I Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-101	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-103	Organic Chemistry	2	0	20	30	50	3	2
3		CH-105	Physical Chemistry	2	0	20	30	50	3	2
4		CH- 107	Chemistry Lab-I	0	3/6	20	30	50	4	3
5	Botany	BOT-101	Diversity of microbes and plant pathology	3	0	20	30	50	3	3
6		BOT-103	Plant Ecology	3	0	20	30	50	3	3
7		BOT-105	Botany Lab-I	0	2/4	20	30	50	4	2
8	Zoology	ZOO-101	Life and Diversityfrom Protozoa to Helminthes	3	0	20	30	50	3	3
9		ZOO-103	Cell Biology	3	0	20	30	50	3	3
10		ZOO-105	Zoology Lab-I	0	2/4	20	30	50	3	2
11	Open Elective/Skill Enhancement Course (SEC)*	-	-	2	0	20	30	50	3	2
TOTAL				20	14			550		27

SCHOOL OF BASIC & APPLIED SCIENCES
(Syllabus & Scheme of Studies w.e.f. 2021-22)
B.Sc. (CBZ)
I Year (I semester)

1. Inorganic Chemistry (CH-101)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts of atomic structure.
2. Students will be able to understand the basic principle of classifications of elements and their periodic properties
3. Students will have through knowledge of different kinds bonding, hybridization in diatomic molecules.
4. Students can gain thorough knowledge about the structures of ionic solids, coordination no and lattice energy.

2. Organic Chemistry (CH-103)

Course Outcomes:

1. Have comprehensive knowledge of the basic organic chemistry like different electronic effects with suitable examples
2. Get information about the types of structural and stereoisomers, optical isomerism, and different nomenclature like D/L, R/S, cis/trans, E/Z etc. of various organic compounds.
3. Learn nomenclature of various types of alkanes and cycloalkanes, preparation and their chemical reactions.
4. Sound knowledge of alkenes, alkynes, dienes and their chemical reactions.

3.Physical Chemistry (CH-105)

Course Outcomes:

1. To understand the Maxwell distribution law and various parameters associated with collisions ideal gas molecules
2. To learn about Role of temperature and pressure to establish the state of gases and describe the Concept of critical temperature, pressure and volume of real gases
3. To study the Physical properties of liquids like surface tension, viscosity and their measurements

4. To have knowledge about various types of symmetries present in different solids and and Bragg's law of X-ray diffraction

3. Diversity of microbes and Plant Pathology (BOT-101)

Course Outcomes:

1. Evaluate the trend of evolution from unicellular to multicellular organisms.
2. Describe the all-introductory terms concerned with cryptogams.
3. Determine significance of thallus organization and alternation of generation among different groups studied.
4. Utilize different studied groups for various environmental issues and assessments
5. Evaluate different studied groups for several bio- prospection studies
6. Develop various methodologies to recognize pathogenic and non-pathogenic associations among organisms.

4.Plant Ecology (BOT-103)

Course Outcomes:

1. Explain various Ecosystems & relationships between Organisms and environment.
2. State plant population and community ecology
3. Describe energy flow and biomass transfer in different ecosystems
4. Describe the correlations between balanced ecosystem and cycling of minerals and nutrients
5. Identify Phyto geographical Regions of India, Plant Biodiversity and its importance using additional OE resources available in the internet using modern ICT tools.
6. Analysis the effect of pollution on environment, their causes and measures

5.Life and Diversity from Protozoa to Helminthes (ZOO-101)

Course Outcomes:

1. Students will be able to describe unique characters, Life history, mode of infection and pathogenicity of parasitic protozoans of Phylum Protozoa.
2. Students will be able to identify the diversity and ecological role, Canal system and spicules in sponges of Phylum Arthropoda especially of Porifera.

3. Students will be able to describe the general characteristics and classification biodiversity, economic importance, Corals and coral reefs, polymorphism belonging to Phylum Coelenterate.
4. Students will be able to understand the unique characteristics, economic importance, Brief account of life history, mode of infection and pathogenicity of helminth parasites, parasitic adaptations belonging to Phylum Platyhelminthes.
5. Students will be able to describe the general characteristics and classification, Brief account of life history, mode of infection and pathogenicity of helminth parasites, parasitic adaptations of Phylum Aschelminths.

6.Cell Biology (Z00-103)

Course Outcomes:

1. Students will understand the basic structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelle.
2. Students will understand how these cellular components are used to generate and utilize energy in cells
3. Students will understand the cellular components underlying mitotic cell division.
4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.
5. Students will understand the basics of cancer, different microscopic and centrifugal techniques.

CO-PO MAPPING

CH-101	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-103	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	3	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	3	2	2	1

CH-105	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	1	2	2	1

BOT-101	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1
	CO6	2	2	1	2	1	2	1	2	1	2

BOT-103	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	√	2	2	1
	CO6	2	1	2	1	3	2	2	2	1	2

BOT-105	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ZOO-101	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ZOO-103	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ZOO-105	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

PSO-PO Mapping

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment Level*	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

SCHOOL OF BASIC & APPLIED SCIENCES
(Syllabus & Scheme of Studies w.e.f. 2021-22)
B.Sc. (CBZ)
I Year (II semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination Scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-102	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-104	Organic Chemistry	2	0	20	30	50	3	2
3		CH-106	Physical Chemistry	2	0	20	30	50	3	2
4		CH-108	Chemistry Lab-II	0	3/6	20	30	50	4	3
5	Botany	BOT-102	Biodiversity (Archegoniate)	3	0	20	30	50	3	3
6		BOT-104	Plant Taxonomy	3	0	20	30	50	3	3
7		BOT-106	Botany Lab-II	0	2/4	20	30	50	4	2
8	Zoology	ZOO-102	Life and Diversity fromAnnelida to Hemichordate	3	0	20	30	50	3	3
9		ZOO-104	Developmental Biology	3	0	20	30	50	3	3
10		ZOO-106	Zoology Lab-II	0	2/4	20	30	50	3	2
11	Open Elective/Skill Enhancement Course (SEC)*	-	-	2	0	20	30	50	3	2
TOTAL				20	14			550		27

1.Inorganic Chemistry (CH-102)

Course Outcomes:

1. To know the conception of different types of hydrogen bonding and the effects of these. To learn about van der Waals forces on properties of substances.

2. To know about the diagonal relationship among s- block elements and about hydrides, oxides, hydroxides and halides of s-block elements.

3. Learn about chemistry of noble gases with emphasizing to xenon.

4. To know about the physical and chemical properties of p-block elements and have knowledge about the boron family elements their structure, preparation and properties of diborane and borazine.

5. Students can gain thorough knowledge about elements of carbon and nitrogen family and concept of catenation, carbides and fluorocarbons. They will know about the elements of oxygen family and have knowledge about the chemical properties of oxides of sulphur.

2. Organic Chemistry (CH-104)

Course Outcomes:

1. To have sound knowledge in alkenes and their properties.

2. Learn the basics of aromaticity and Huckel's rule. To know preparation and chemical reactions of different aromatic hydrocarbons.

3. Sound knowledge of dienes and their chemical reactions.

4. Get knowledge about the mechanism of SN1 and SN2 reactions and other various chemical reactions of alkyl and aryl halides.

5.understand cyclo alkanes.

3.Physical Chemistry (CH-106)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts in Chemical Kinetics.

2. Students will be able to understand the causes behind the different types of chemical reactions and the temperature dependence of reaction rate.

3. Students will be able to understand the basic principle of the electrical conduction in liquid state and how is it measured.

4. Students will learn the principles of equipment and instruments used in the chemistry laboratory. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state and its' application in different cases.

4.Biodiversity (Archegoniates) (BOT-102)

Course Outcomes:

1. Recognize, and describe the morphological characteristics of bryophytes and pteridophytes.
2. Draw and describe the gametophytic and sporophytic life cycle of bryophytes and pteridophytes.
3. Identify the given specimens in laboratory and field-based study.
4. Understand the origin and evolution of Land plants.
5. Understand the affinities of thallophytes with higher plants.
6. Evaluate the importance of Archegoniate.

5.Plant Taxonomy (BOT-104)

Course Outcomes:

1.Employ various taxonomic resources for plant identification and herbarium collections.
2.Outline and describe the different parameters of classification
3.Identify, and describe the morphological characteristics of Dicotyledons and Monocotyledonous families.
4.Draw and describe floral formulas and diagrams of Angiosperms.
5.Recognize the economic importance (Medicinal as well as Industrial uses) of important members of Angiosperms.
6.Design, carry out, and present a laboratory-based study in flowering plants.

6.Life and Diversity of Annelida to Hemichordate (ZOO-102)

Course Outcomes:

1. Students will be able to describe unique characters, metamerism mechanism and recognize life functions of Phylum Annelida.
2. Students will be able to identify the diversity and ecological role of Phylum Arthropoda especially of cockroach.
3. Students will be able to describe the general characteristics and classification biodiversity, economic importance, torsion and detorsion mechanism and evolutionary relationship belonging to Phylum Mollusca.
4. Students will be able to understand the unique characteristics, economic importance, concept of Echinoderm larvae and Aristotle's latern belonging to Phylum Echinodermata.
5. Students will be able to describe the general characteristics and classification of Phylum Hemichordata.

7.Developmental Biology(Z00-104)

Course Outcomes:

1. Students will be able to understand different classical and experimental developmental theories
2. Students will be able to describe the events that lead up to fertilization, its stages and cellular mechanisms for gastrulation, and embryonic development.
3. Students will be able to understand the concept of extra-embryonic membranes, implantation of embryo.
4. Students will be able to describe the process of blastulation and gastrulation of frog and chick.
5. Students will be able to understand the phenomenon of regeneration, competence, determination and cell differentiation, neural induction and its genetic basis.

CO-PO MAPPING

CH-102	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-104	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-106	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

BOT-102	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

BOT-104	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ZOO-102	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ZOO-104	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SCHOOL OF BASIC & APPLIED SCIENCES
(Syllabus & Scheme of Studies w.e.f. 2021-22)
B.Sc. (CBZ)
II Year (III semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Durationof exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-201	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-203	Organic Chemistry	2	0	20	30	50	3	2
3		CH-205	Physical Chemistry	2	0	20	30	50	3	2
		CH-207	Chemistry Lab-III	0	6	20	30	50	4	3
5	Botany	BOT-201	Plant Anatomy	3	0	20	30	50	3	3
6		BOT-203	Plant Embryology	3	0	20	30	50	3	3
		BOT-205	Botany Lab-III	0	2/4	20	30	50	4	2
8	Zoology	ZOO-201	Life and Diversity of Chordates	3	0	20	30	50	3	3
9		ZOO-203	Mammalian Physiology -I	3	0	20	30	50	3	3
10		ZOO-205	Zoology Lab-III		2/4	20	30	50	3	2
11	Open Elective/Skill Enhancement Course (SEC)*	-	-	2	0	20	30	50	3	2
TOTAL				20	14			550		27

1. Inorganic Chemistry (CH-201)

Course Outcomes:

1. Have good knowledge about d-block elements particularly of transition elements.

2. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties of some compounds of transition elements.

3. To know about the basic concepts of coordination chemistry like EAN, Werner theory of coordination, nomenclature and isomerism in coordination complexes.

4. Students can gain knowledge about the properties and reactions in non-aqueous solvents like liquid NH_3 and liquid SO_2, and also the concept of Acids and Bases.

2.Organic Chemistry (CH-203)

Course Outcomes:

1. Have comprehensive knowledge of the synthesis and properties of alcohols and epoxides

2. Know about synthesis and properties of phenols and their chemical reactions.

3. Have knowledge of Beer-Lambert law, molar absorptivity, different electronic transitions, analysis UV spectra and application of UV spectroscopy in structure elucidation.

4. Knowledge about various methods for the preparation of carboxylic acid, carboxylic derivatives (ester, amide, acid chlorides, anhydrides) and their chemical reactions.

3. Physical Chemistry (CH-205)

Course Outcomes:

1. To know about different process, functions and 1^{st} law of thermodynamics

2. To have knowledge about w, q, dU & dH and Kirchoffs equation

3. To understand the basic terms related to chemical equilibrium and derive the law thermodynamically, deduce relation between various equilibrium constants and determining partition coefficient of a solvent dissolved in two immiscible solvents

4. To have good knowledge about distribution law and its applications

4.Biology and Diversity of Seed Plants-I (BOT-201)

Course Outcomes:

1. Understand the concept of evolution and distinguish primitive and advanced characters in plants. Draw life-cycle and economic importance of: *Cycas* and *Pinus*
2. Recognize origin of seed plants and correlate their affinity with other plant groups
3. Describe the process involved in fossilization, types of fossils and importance of fossils
4. Evaluate Economic importance of Gymnosperms
5. Analyse the advancement in reproductive structures and modes of fertilization in Gymnosperms.
6. Evaluate affinities between Gymnosperms and Angiosperms.

5. Plant Anatomy (BOT-203)

Course Outcomes:

1. Identify the function and importance of various tissue systems.
2. Describe the modifications of plant parts in accordance with environmental conditions
3. Understand Apical meristem of root & shoot, types of tissues, vascular bundles, xylem, phloem, cambium, and periderm.
4. Differentiate monocots and dicots morphologically and anatomically.
5. Understand the physiological processing in plants through various apertures and appendages.
6. Understand the processing of secondary growth and its importance in plants.

6.Life and Diversity of Chordates (Z00-201)

Course Outcomes:

1. Students will be able to describe unique characters, Retrogressive metamorphosis belonging to subphylum urochordata, cepahalochordata and Phylum cyclostomata especially of petromyzon.
2. Students will be able to describe the general characteristics and classification biodiversity, economic importance, Osmoregulation, migration, Parental care belonging to class Pisces & Amphibia and paedomorphosis belonging to Phylum Amphibia.
3. Students will be able to describe unique characters, Poisonous and non- poisonous snakes in India, Biting mechanism in snakes of Phylum Reptilia and Origin of birds, Flight adaptations, Migration belonging to class Aves.

4. Students will be able to understand the unique characteristics, economic importance, classification, Origin of mammals, dentition belonging to class Mammalia.

7. Mammalian Physiology-I (Z00-203)

1. It will make the students understand the physiology of digestive system, mechanism of buccal, gastric, intestinal, pancreatic digestion and absorption.
2. Students will be able to understand the concept of osmoregulation, physiology of excretion, structure of excretory system and mechanism of urine formation.
3. Students will be able to explain the mechanism of structure of respiratory system, different respiratory pigments, mechanism of external and internal respiration and transport of gases.
4. It will make the students understand the concept of circulatory system, origin and conduction of heart beat, Cardiac cycle, working of mammalian heart, Blood composition and function, Mechanism of blood clotting.

CO and PO Mapping

CH-201	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-203	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-207	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

BOT-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

BOT-203	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

BOT-205	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	3	2	1	1	1	2	2	2	1

ZOO-203	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	3	2	1	1	1	2	2	2	1

ZOO-205	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	3	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SCHOOL OF BASIC & APPLIED SCIENCES
(Syllabus & Scheme of Studies w.e.f. 2021-22)
B.Sc. (CBZ)
II Year (IV semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-202	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-204	Organic Chemistry	2	0	20	30	50	3	2
3		CH-206	Physical Chemistry	2	0	20	30	50	3	2
		CH-208	Chemistry Lab-IV	0	6	20	30	50	4	3
5	Botany	BOT-202	Plant Physiology	3	0	20	30	50	3	3
6		BOT-204	Plant Metabolism	3	0	20	30	50	3	3
		BOT-206	Botany Lab-IV	0	2/4	20	30	50	4	2
8	Zoology	ZOO-202	Genetics and Immunology	3	0	20	30	50	3	3
9		ZOO-204	Mammalian Physiology-II	3	0	20	30	50	3	3
10		ZOO-206	Zoology Lab-IV	0	2/4	20	30	50	3	2
11	Open Elective/Skill Enhancement Course (SEC)*	-	-	0	2	30	20	50		2
TOTAL				18	16			500		27

1. Inorganic Chemistry (CH-202)

Course Outcomes:

1. Have good knowledge about d-block elements particularly of transition elements.
2. To study the bonding of 3d elements. To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters. Students will be able to calculate the spectroscopic terms for various metal ions.
3. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.
4. To know about position of f block elements in periodic table and their general characteristics. To study the occurrence and separation of lanthanides and lanthanide compounds. Have knowledge of actinides their existence and general properties.
5. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

2.Organic Chemistry (CH-204)

Course Objective:

1. Able To describe absorptions of various functional groups and applications of IR spectroscopy. To know the application of IR spectroscopy in structure elucidation.
2. To synthesize and know reactions of amines.
3. To discuss synthetic application of diazonium salts and other nitro compounds.
4. Get knowledge about the preparation of aliphatic, aromatic aldehydes and ketones and various important name reactions of aldehydes and ketones.

3.Physical Chemistry (CH-206)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.

2. Students will be able to understand the fundamentals of thermodynamics and electrochemistry.

3. Students will be able to understand the solve problems using the properties and relationships of thermodynamic equations. Students will have understanding of thermodynamic fundamentals for application in applied thermodynamics.

4. Students will gain the knowledge of instrumentation in electrochemistry. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state.

5. Biology and Diversity of Seed Plants-II (BOT-202)

Course Outcomes:

1. Employ various taxonomic resources for plant identification and herbarium collections.
2. Identify, and describe the morphological characteristics of Dicotyledons and Monocotyledonous families.
3. Draw and describe floral formulas and diagrams of Angiosperms.
4. Recognize the economic importance (Medicinal as well as Industrial uses) of important members of Angiosperms
5. Outline and describe the different parameters of classification.
6. Design, carry out, and present a laboratory-based study in flowering plants.

6.Plant Embryolog (BOT-204)

Course Outcomes:

1. Explain structure and functions of reproductive organs of flowering plants.
2. Identify, and describe morphological adaptations of flowers linked with variety of pollinators.
3. Draw, identify, and describe different structural patters of ovules.
4. Outline and describe the developmental process of male and female gametophyte.
5. Outline and describe the fertilization process and understanding of the embryogenesis.
6. Design, carry out, and present a laboratory-based study in plant embryology.

7. Genetics and Immunology (Z00-202)

1. Students will be able to understand the concept of genetics, its basic principles & theories and genetic interactions.
2. Students will have acquaintance with respect to variations, mutations and sex linked inheritance.
3. Students will be able to get knowledge about several chromosomal abnormalities involving autosomes and sex chromosomes along with some implications of applied genetics.
4. Students will be able to understand the concept of immune system, blood transfusion, autoimmune disorders and transplanting of tissues and organs

8.Mammalian Physiology-I (Z00-204)

Course Outcomes:

1. It will make the students understand the appropriate functioning of various body systems in animals and mechanism of working.
2. Students will be able to understand the structure of various muscle fibres and mechanism of muscle contraction.
3. Students will be able to explain the mechanism of nerve conduction and related neurotransmitters involved in its physiological processes.
4. It will make the students understand the structure and function of various endocrine glands as well as their secretion.
5. Students will be able to understand the control of hormones on reproductive physiology mechanism that is essential for the continuance of the human species.

CO-PO MAPPING

CH-202	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-204	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-206	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

BOT-202	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

BOT-204	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ZOO-202	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ZOO-204	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

Z00-206	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SCHOOL OF BASIC & APPLIED SCIENCES
(Syllabus & Scheme of Studies w.e.f. 2021-22)
B.Sc. (CBZ)
III Year (V semester)

Sr.No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-301	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-303	Organic Chemistry	2	0	20	30	50	3	2
3		CH-305	Physical Chemistry	2	0	20	30	50	3	2
		CH-307	Chemistry Lab-V	0	6	20	30	50	4	3
5	Botany	BOT-301	Economic Botany	3	0	20	30	50	3	3
6		BOT-303	Plant Biotechnology	3	0	20	30	50	3	3
		BOT-305	Botany Lab-V	0	2/4			50	4	2
8	Zoology	ZOO-301	Biochemistry	3	0	20	30	50	3	3
9		ZOO-303	Ecology & Evolution	3	0	20	30	50	3	3
10		ZOO-305	Zoology Lab-V	0	2/4	20	30	50	3	2
11	ECA	ECA-301	Seminar/ Project/ Internship	2	0	-	-	50	-	2
TOTAL				20	14			500		27

1. Inorganic Chemistry (CH-301)

Course Outcomes:

1. To summarize the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbitals in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters.

2. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

3. To study the magnetic properties of transition metal complexes and various types of magnetic materials and their magnetic susceptibility.

4. Have knowledge about orgal level diagrams for d1 and d9 electronic states and the electronic spectrum of $[Ti(H_2O)_6]^{+3}$complex ion.

2. Organic Chemistry (CH-303)

Course Outcomes:

1. Get knowledge about the principle of nuclear magnetic resonance.

2. To elucidate the structure of various molecules by using PMR spectra.

3. To have knowledge about classification, structures and important reactions of carbohydrates

4. Sound knowledge of organometallic compounds.

3.Physical Chemistry (CH-305)

Course Outcomes:

1. To know about dual characteristic of matter and extend this fact to obtain postulates of quantum mechanics and quantum-mechanical operators, apply Schrödinger equation to determine the physical observables for particle in a box.

2. To have knowledge about dipole moment, magnetic permeability and susceptibility

3. To have sound knowledge about the consequences of interaction of radiation with matter resulting into various types of spectra.

4. To be able to solve various numerical problems related to spectroscopy.

4.Plant Physiology (BOT-301)

Course Outcomes:

1. Describe the all-introductory terms concerned with plant physiology and plant Biochemistry like osmosis, transpiration, diffusion and Imbibitions etc.
2. Understand the basic information about principles of physiology and biochemistry of plants, their application in daily life and industry.
3. Describe the various types of plant hormones and plant growth regulators and their origin, distribution, physiological description, brief idea of their action and economic uses of PGRs.
4. Analyse the behaviour of chemical processes of behind the plant movement and their significance for the crops belongs to various taxonomic families.
5. Evaluate the significance of the physiological processes involved in the manufacturing of the dyes, tannins, beverages, timber and rubbers in the body of plants.
6. Create the comparative knowledge of commercial application of the physiological and biochemical processes.

5.Ecology (BOT-303)

Course Outcomes:

1. Understand major biological ecological concepts; develop contemporary scientific outlook in the field of Ecology.
2. Interpret close interrelationship between various components of an ecosystem to exchange nutrients and elements.
3. Understand adaptations in an organism to sustain in their niche.
4. Evaluate population and community quantitatively and qualilatively
5. Analyse various global environments problem their probable solutions.
6. Demonstrate effective communication skills in writing and in oral presentations.

6.Biochemistry (Z00-301)

Course Outcomes:

1. It will make the students understand the structure, function and significance of carbohydrates.
2. Students will be able to understand the Students Oxidation of glucose through glycolysis, Kreb's cycle and oxidative phosphorylation.

3. Students will be able to explain the mechanism of inter conversion of glycogen and glucose in liver and Role of insulin and glucagon.
4. It will make the students understand the structure, function and significance of lipids, Beta-oxidative pathway of fatty acids, Essential and non essential fatty acids, Biosynthesis of different lipids.
5. Students will be able to understand the structure, function and significance of proteins and enzymes, Essential and non-essential amino acids, ornithine cycle
6. Students will be able to understand the concept of vitamins, minerals and nucleic acid.

7. Ecology & Evolution(Z00-303)

Course Outcomes:

1. It will make the students understand the knowledge of interaction between organisms and environment and exchange of nutrients within the ecosystem.
2. Students will be able to understand the concept of population ecology, population growth curves, mechanism of regulation of population growth.
3. Students will be able to explain the various biological interactions and relation between abiotic and biotic factors.
4. It will make the students understand the concept of Succession, stages of primary succession, climax community, Energy flow and chemical cycling through an ecosystem.
5. Students will be able to understand the evolution, the theory of natural selection, Variations, isolation, adaptations and Palaeontology.

CO-PO MAPPING

CH-301	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-303		PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-305		PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-307		PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

BOT-301		PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

BOT-303	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

zoo-301	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

zoo-303	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

zoo-305	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SCHOOL OF BASIC & APPLIED SCIENCES
(Syllabus & Scheme of Studies w.e.f. 2021-22)
B.Sc. (CBZ)
III Year (VI semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination Scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-302	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-304	Organic Chemistry	2	0	20	30	50	3	2
3		CH-306	Physical Chemistry	2	0	20	30	50	3	2
4		CH-308	Chemistry Lab-VI	0	6	20	30	50	4	3
5	Botany	BOT-302	Cell Biology & Genetics	3	0	20	30	50	3	3
6		BOT-304	Plant Breeding	3	0	20	30	50	3	3
		BOT-306	Botany Lab-VI	0	2/4	20	30	50	4	2
8	Zoology	ZOO-302	Environmental Biology & Ethology	3	0	20	30	50	3	3
9		ZOO-304	Applied Biology & Biostatistics	3	0	20	30	50	3	3
10		ZOO-306	Zoology Lab-VI	0	2/4	20	30	50	3	2
11	ECA	ECA-302	Seminar/ Project/ Internship	-	-	-	-	50	-	2
TOTAL				18	12			500		26

1. Inorganic Chemistry (CH-302)

Course Outcomes:

1. To get the detailed understanding of Bonding in homonuclear and heteronuclear molecules using the molecular orbital theory.
2. To study the nomenclature, classification, preparation and bonding in organometallic compounds and of metal carbonyls also.
3. To know about basic concepts of bioinorganic chemistry with reference to metal ions present in biological systems. To understand the biochemistry of oxygen carriers especially hemoglobin and myoglobin.
4. To know about various inorganic clusters compounds with special reference to silicones and phosphazenes.

2. Organic Chemistry (CH-304)

Course Outcomes:

1. To gain knowledge about aromatic behaviour and basicity of simple heterocyclic compounds (pyridine, piperidine and pyrrole).
2. To know about 5 and 6 membered heterocyclic rings , basicity of and the preparation and reactions of indole, quinoline and isoquinoline.
3. To get knowledge about the acidity of α-hydrogens of diethyl malonate, ethyl acetoacetate and the synthesis and Keto-enol tautomerism of ethyl acetoacetate.
4. To learn about the essential amino acids, peptides and proteins. To get the knowledge about their structure and properties.

3.physical Chemistry (CH-306)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.
2. Students will be able to understand the basic principle of electronic spectroscopy and the energy related to every colour imparted by chemicals. They will also gain the clear physical interpretation of chemical bonding and molecular structure.

3. The course curriculum is expected to develop an inquisitive feature among the students through suitable questions and experimental investigation.
4. Students will be having clear knowledge of how light is important to chemical reactions and how the amount of molecules in a solution affects the nature of a solution which is beneficial for the applied field.
5. Students will gain the knowledge of different phases of materials and their co-existence

4.Biochemistry and Plant Biotechnology (BOT-302)

Course Outcomes:

1. Describe the mechanism of enzyme and their role in industries.
2. Explain the molecular structure and role of carbohydrates, proteins and lipids.
3. Explain the theory and practice of recombinant DNA technology.
4. Select and apply experimental procedures to the spectrum of fields making use of biotechnology.
5. Handle, store and analyse different culture and sub-cultures how these can be used for in vitro studies and secondary metabolite production.
6. Grow, maintain, and propagate different plant cell types in aseptic conditions.

6. Economic Botany (BOT-304)

Course Outcomes:

1. Identify the criteria of geological distribution of crops.
2. Determine the trend of migration of crops globally.
3. Identify different methodologies for crop cultivation and their values.
4. Identify the types of major traditional crops in India and their utility in mankind.
5. Identify the economic importance of medicinally plants.
6. Determine the significance of energy plantation.

7.Environmental biology & Ethology (Z00-302)

Course Outcomes:

1. It will give students an insight about the benefits of environment and can be used in the management of natural resources for sustainable development in ways that leave the environment healthy.
2. It will boost students for betterment of diversified resources and life forms for better conservational measures with keen understanding and new approaches.
3. The awareness about pollution and toxic agents, their different sources and their effects on humans and their livestock will be appraised.

4. The students will have the knowledge about solution for ozone depletion, green house, biomagnification and bioaccumulation.
5. Students will have an understanding of ill-health of growing population and continuously rising urbanization.
6. It will give detailed understanding of different interesting patterns of animal behaviour.

8.Applied Zoology & Biostatistics (Z00-304)

Course Outcomes:

1. Students will be able to awareness about use of certain animals and their products for human welfare.
2. Students will be able to explain the basic concepts of sericulture, apiculture, lac culture and other animal industries
3. Students will gain the information regarding different pests along with economics of pest management techniques.
4. Students will able to generate a hypothesis from a set of observation and then design experiment to test the hypothesis.
5. Student will be able to acquire, analyse and understand the significance of data.

CO-PO MAPPING

CH-302	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-304	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

CH-306	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	2	2	2	1

BOT-302	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	2	2	2	1

BOT-304	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	2	2	2	1

BOT-306	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	2	2	2	1

zoo-302	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	2	2	2	1

zoo-304	PO									
	1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

zoo-306	PO									
	1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

B.Sc Chemistry Syllabus

(2022-2025)

RAFFLES
UNIVERSITY

Department of Chemistry School of Basic and Applied Sciences

RAFFLES UNIVERSITY
Japanese Zone, National Highway-48, Neemrana-301705,
District: Alwar, RAJASTHAN, INDIA www.rafflesuniversity.edu.in

RAFFLES UNIVERSITY

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Inorganic Chemistry **Paper Code : CH-101**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Atomic Structure: Idea of de-Broglie matter waves, Heisenberg's uncertainty principle, atomic orbital's, quantum numbers, Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configuration of the elements, radial and angular wave functions and probability distribution curves, shapes of s, p, and d orbitals.

UNIT-II

Periodic Table: General principles of periodic table, effective nuclear charge, Slater's rules, Atomic and ionic radii, ionization energy, electron affinity and electronegativity: definition, methods of determination or evaluation, trends in periodic table (s & p block elements).

UNIT-III

Covalent Bond: Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions (BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7 SO^{-2}, ClO^{-1})Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, ICI^- and H_2O_2. MO theory of heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

UNIT-IV

Ionic Solids: Ionic structures (NaCl, CsCl, ZnS, CaF_2) radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy (mathematical derivation excluded) and Born- Haber cycle, solvation energy and its relation with solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule.

Suggested books:

1. Fundamental concepts of Inorganic Chemistry, A.K. Das [Publisher: CBS]
2. Inorganic Chemistry, Malik, Tuli Madan, [Publisher: S.Chand]
3. Principles of Inorganic Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
4. Inorganic Chemistry, James E. Huheey, E.A. Keiter, R. L. Keiter, O. K. Medhi
5. Concise Inorganic Chemistry, J. D. Lee, [Publisher: Oxford]

RAFFLES UNIVERSITY

B.Sc. (PCM+CBZ) I Year (I Semester)

Schedule per week Lectures: 2
Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Organic Chemistry **Paper Code : CH-103**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Structure and Bonding: Localized and delocalized chemical bond, van der Waals' interactions, resonance conditions, resonance effect and its applications, hyperconjugation, inductive effect,Electromeric effect & their comparison.

Stereochemistry of Organic Compounds-I: Concept of isomerism. Types of isomerism. Optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization.

UNIT-II

Stereochemistry of Organic Compounds-II: Relative and absolute configuration, sequence rules, R & Ssystem of nomenclature, Geometric isomerism, determination of configuration of geometrical isomers, E & Z system of nomenclature, Conformational isomerism conformational analysis of ethane and n-butane, conformations of cyclohexane, axial and equatorial bonds, Newman projection and Sawhorse formulae, Difference between configuration and conformation.

UNIT-III

Mechanism of Organic Reactions: Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Energy considerations.Reactive intermediates carbocations, carbanions, free radicals, carbenes , arynes and nitrenes (formation, structure & stability). Assigning formal charges on intermediates and other ionic species.

UNIT-IV

Alkanes and Cycloalkanes: IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties. Cycloalkanes: nomenclature, synthesis of cycloalkanes and their derivatives– photochemical (2+2) cycloaddition reactions, dehalogenation of dihalides, pyrolysis of calcium or barium salts of dicarboxylic acids, Baeyer's strain theory and its limitations, theory of strainless rings.

Suggested books:

1. Basic Stereochemistry of Organic molecules, Subrata Sengupta [Publisher: Oxford]
2. Organic Chemistry Vol-I, I. L. Finar [Publisher: Pearson]
3. Organic Chemistry Vol-I, Nemai Tewari, [Publisher: McGraw Hill]
4. Stereochemistry of Organic Compounds, D Nasipuri, [Publisher: New Age Central]

RAFFLES UNIVERSITY

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Physical Chemistry **Paper Code : CH-105**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Gaseous States: Maxwell's distribution of velocities and energies (derivation excluded) Calculation of rootmean square velocity, average velocity and most probable velocity. Collision diameter, collision number, collision frequency and mean free path. Deviation of Real gases from ideal behaviour. Derivation of Vander Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor) Explanation of behavior of real gases using Vander Waal's equation.

UNIT-II

Critical Phenomenon: Critical temperature, Critical pressure, critical volume and their determination. PV isotherms of real gases, continuity of states, the isotherms of Vander Waal's equation, relationship betweencritical constants and Vander Waal's constants. Critical compressibility factor. The Laws of corresponding states. Liquefaction of gases.

UNIT-III

Liquid States: Structure of liquids. Properties of liquids – surface tension, viscosity, vapour pressure and optical rotations and their determination.

UNIT-IV

Solid State: Classification of solids, Laws of crystallography – (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements of crystals, Definition of unit cell & space lattice. Bravais lattices, crystal system. X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl.

Liquid crystals: Difference between solids, liquids and liquid crystals, types of liquid crystals, Applications of liquid crystals.

Suggested books:

1. Physical Chemistry, P.C. Rakshit [Publisher: SBH]
2. A Textbook of Physical Chemistry Vol-2, K. L. Kapoor [Publisher: McGraw Hill]
3. Principles of Physical Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
4. Essentials of Physical Chemistry, Bahl, Bahl and Tuli [Publisher: S.Chand]
5. Physical Chemistry, P.W. Atkins [Oxford University Press]

RAFFLES UNIVERSITY

B.Sc. (PCM+CBZ) I Year (I Semester)

Schedule per week Practical: 6
Examination Time : 4 Hrs **Maximum Marks: 50 (20+30)**
Subject : Chemistry Lab-I **Paper Code : CH-107**

UNIT-I (Inorganic)

Volumetric Analysis

1. **Redo titrations**: Determination of Fe^{2+}, $C_2O_4^{2-}$ (using $KMnO_4$, $K_2Cr_2O_7$)
2. **Iodometic titrations:** Determination of Cu^{2+} (using standard hypo solution).
3. **Complexometric titrations:** Determination of Mg^{2+}, Zn^{2+} by EDTA.

UNIT-II (Physical)

1. To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
2. To prepare arsenious sulphide sol and compare the precipitating power of mono, bi and trivalent anions.

UNIT-III (Organic)

1. Preparation and purification through crystallization or distillation and ascertainingtheir purity through melting point or boiling point
   (i) Iodoform from ethanol (or acetone)
   (ii) *m*-Dinitrobenzene from nitrobenzene (use 1:2 conc. HNO_3 H_2SO_4 mixture if fuming HNO_3 is not available)
   (iii) *p*-Bromoacetanilide from acetanilide
   (iv) Dibenzalacetone from acetone and benzaldehyde
   (v) Aspirin from salicylic acid

Distribution of marks

1. UNIT-I	10 (6+4) marks
2. UNIT-II	10 (6+4) marks
3. UNIT-III	10 (6+4) marks
4. Viva-voce	10 (6+4) marks
5. Lab Record	10 (6+4) marks

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2023-26 onwards)B.Sc. (PCM+CBZ) I Year (II Semester)

Schedule per week Lectures : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Inorganic Chemistry**	**Paper Code**	**: CH-102**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Hydrogen Bonding & Vander Waals Forces: Hydrogen Bonding-Definition, Types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Vander Waals Forces**.** Metallic Bond and Semiconductors Metallic Bond- Brief introduction to metallic bond, band theory of metallic bond Semiconductors- types and applications.

UNIT-II

s-Block Elements: Comparative study of the elements including diagonal relationships, salient features of hydrides (methods of preparation excluded), solvation and complexation tendencies including their functionin biosystems.

Chemistry of Noble Gases: Chemical properties of the noble gases with emphasis on their low chemical reactivity, chemistry of xenon, structure and bonding of fluorides, oxides & oxyfluorides of xenon.

UNIT-III

p-Block Elements: Emphasis on comparative study of properties of p-block elements (including diagonal relationship and excluding methods of preparation).

Boron family (13th group): Diborane-properties and structure (as an example of electron-deficient compound and multicentre bonding), Borazine-chemical properties and structure Trihalides of Boron – Trends in acid character, structure of aluminium (III) chloride.

Carbon Family (14th group): Catenation, p–d bonding (an idea), carbides, fluorocarbons, silicates (structural aspects), silicons – general methods of preparations, properties and uses.

UNIT-IV

Nitrogen Family (15th group): Structures of oxides of N, P. oxyacids–structure and relative acid strengths of oxyacids of N and P. Structure of white, yellow and red phosphorus

Oxygen Family (16th group): Oxyacids of sulphur – structures and acidic strength, H_2O_2 structure,properties and uses.

Halogen Family (17th group): Basic properties of halogen, interhalogens, types, properties, hydroand oxyacids of chlorine – structure and comparison of acid strength

Suggested books:

1. Fundamental concepts of Inorganic Chemistry, A.K. Das [Publisher: CBS]
2. Inorganic Chemistry, Malik, Tuli Madan, [Publisher: S.Chand]
3. Principles of Inorganic Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
4. Inorganic Chemistry, R.P. Sarkar [Publisher: NCBA]
5. Concise Inorganic Chemistry, J. D. Lee, [Publisher: Oxford]

RAFFLES UNIVERSITY

B.Sc. (PCM+CBZ) I Year (II Semester)

Schedule per week Lectures : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Organic Chemistry**	**Paper Code**	**: CH-104**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Alkenes: Nomenclature of alkenes, mechanisms of dehydration of alcohols and dehydro- halogenation of alkyl halides, The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes.Chemical reactions of alkenes and mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration- oxidation, oxymercurationreduction, ozonolysis, hydration,hydroxylation and oxidation with $KMnO_4$,

UNIT-II

Arenes and Aromaticity: Nomenclature of benzene derivatives, Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aromatic ions, annulenes up to 10 carbon atoms, aromatic, antiaromatic and non-aromatic compounds. Aromatic electrophilic substitution general pattern of the mechanism, mechansim of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Energy profile diagrams; Activating , deactivating substituents and orientation.

UNIT-III

Dienes and Alkynes: Nomenclature and classification of dines isolated, conjugated and cumulated dienes. Structure of butadiene, Chemical reactions 1, 2 and 1, 4 additions (Electrophilic & free radical mechanism),Diels-Alder reaction, Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation of alkynes,

UNIT-IV

Alkyl and Aryl Halides: Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides, SN_2 and SN_1 reactions with energy profile diagrams. Methods of formation and reactions of aryl halides, The additionelimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

Suggested books:

1. Organic Chemistry, Subrata Sengupta [Publisher: Oxford]
2. Organic Chemistry Vol-I, I. L. Finar [Publisher: Pearson]
3. Organic Chemistry Vol-I, Nemai Tewari, [Publisher: McGraw Hill]
4. Organic Chemistry, Jerry March, [Publisher: Willey]
5. A guidebook to mechanism in organic chemistry, Peter Sykes, [Publisher: Pearson]

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry
(Syllabus and Scheme of Studies w. e. f. 2023-26 onwards)B.Sc. (PCM+CBZ) I Year (II Semester)

Schedule per week Lectures : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Physical Chemistry**	**Paper Code**	**: CH-106**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Kinetics-I: Rate of reaction, rate equation, factors influencing the rate of a reaction concentration,temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated rate expression for zero order,first order, second and third order reaction. Half-life period of a reaction. Methods of determination of orderof reaction,

UNIT-II

Kinetics-II: Effect of temperature on the rate of reaction-Arrhenius equation. Theories of reaction rate – Simple collision theory for unimolecular and bimolecular collision, Transition state theory of Bimolecular reactions.

UNIT-III

Electrochemistry-I: Electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance, equivalent conductance and relation among them, their variation with concentration. Arrhenius theory of ionization, Ostwald's Dilution Law, Debye- Huckel-Onsager's equation for strong electrolytes (elementary treatment only) Transport number, definition and determination by Hittorfs methods, (numerical included)

UNIT-IV

Electrochemistry-II: Kohlarausch's Law, calculation of molar ionic conductance and effect of viscosity temperature & pressure on it. Application of Kohlarausch's Law in calculation of conductance of weak electrolytes at infinite dilution. Applications of conductivity

Measurements: determination of degree of dissociation, determination of Ka of acids determination of solubility product of sparingly soluble salts, conductometric titrations. Definition of pH and pKa, Buffer solution, Buffer action, Henderson – Hazel equation, Buffer mechanism of buffer action.

Suggested books:

1. Physical Chemistry, Peter Atkins, De Paula [Publisher: Oxford]
2. Physical Chemistry, P.C. Rakshit [Publisher: SBH]
3. A Textbook of Physical Chemistry, K. L. Kapoor [Publisher: McGraw Hill]
4. Principles of Physical Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
5. Physical Chemistry, Ira Levine, [Publisher: Pearson]

RAFFLES UNIVERSITY

B.Sc. (PCM+CBZ) I Year (II Semester)

Schedule per week Practical: 6
Examination Time : 4 Hrs **Maximum Marks: 50 (20+30)**
Subject : Chemistry Lab-II **Paper Code : CH-108**

UNIT-I (Inorganic)

Volumetric Analysis

Complexometric titrations: Determination of Hardness of Water by EDTA

Paper Chromatography

Qualitative Analysis of the any one of the following Inorganic cations and anions by paper chromatography(Pb^{+2}, Cu^{+2}, Ca^{+2}, Ni^{+2}, Cl^{-}, Br^{-}, I^{-}, PO^{-3}_{4} and NO^{-}_{3}).

UNIT-II (Physical)

1. To determine the surface tension of a given liquid by drop number method.
2. To determine the viscosity of a given liquid.
3. To determine the specific refractivity of a given liquid

UNIT-III (Organic)

To study the process of sublimation of camphor and phthalic acid.

RAFFLES UNIVERSITY

Schedule per week Practical: 6

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Inorganic Chemistry**	**Paper Code**	**: CH-201**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT–I

Chemistry of Elements of I transition series: Definition of transition elements, position in the periodic table, General characteristics & properties of I transition elements, Structures & properties of some compounds of transition elements-TiO_2, $VOCl_2$, $FeCl_3$, $CuCl_2$ and $Ni(CO)_4$

UNIT-II

Chemistry of Elements of IInd & IIIrd transition series: General characteristics and properties of the IInd and IIIrd transition elements Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry.

UNIT-III

Coordination Compounds: Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes

UNIT-IV

Non-aqueous Solvents: Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2

Acids and Bases, HSAB Concept: Arrhenius, Bronsted-Lowry, the Lux-Flood, Solvent system and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids &Bases. Symbiosis, electronegativity and hardness and softness.

Suggested books:

1. Fundamental concepts of Inorganic Chemistry, A.K. Das [Publisher: CBS]
2. Inorganic Chemistry, Malik, Tuli Madan, [Publisher: S.Chand]
3. Principles of Inorganic Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
4. Inorganic Chemistry, R.P. Sarkar [Publisher: NCBA]
5. Concise Inorganic Chemistry, J. D. Lee, [Publisher: Oxford]

RAFFLES UNIVERSITY

Schedule per week Practical: 6

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Organic Chemistry **Paper Code : CH-203**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT–I

Alcohols: Monohydric alcohols nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric alcohols — nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and pinacol-pinacolone rearrangement.

Epoxides: Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxidering opening, reactions of Grignard and organolithium reagents with epoxides

UNIT-II

Phenols: Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion.Reactions of phenols — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.

UNIT-III

Ultraviolet (UV) absorption spectroscopy: Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones, Woodward- Fieser rules, calculation of λmax of simple conjugateddienes and -unsaturated ketones. Applications of UV Spectroscopy in structure elucidation of simple organic compounds.

UNIT-IV

Carboxylic Acids & Acid Derivatives: Nomenclature of Carboxylic acids, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation. Structure, nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic)

Suggested books:

1. Organic Chemistry, Subrata Sengupta [Publisher: Oxford]
2. Organic Chemistry Vol-I, I. L. Finar [Publisher: Pearson]
3. Organic Chemistry Vol-I, Nemai Tewari, [Publisher: McGraw Hill]
4. Organic Chemistry, Jerry March, [Publisher: Willey]
5. A guidebook to mechanism in organic chemistry, Peter Sykes, [Publisher: Pearson]

OR

RAFFLES UNIVERSITY

Schedule per week Practical:

Examination Time	**: 3 Hrs**	**Maximum Marks:**	**50 (20+30)**
Subject	**: Polymer Chemistry (Elective)**	**Paper Code**	**: CH-203**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Introduction and history of polymeric materials: Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

Functionality and its importance: Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bifunctional systems, Poly-functional systems.

UNIT-II

Kinetics of Polymerization: Mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques. **Crystallization and crystallinity:** Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting point.**Nature and structure of polymers-**Structure, Property relationships.

UNIT-III

Determination of molecular weight of polymers (Mn, Mw, etc) by end group analysis, viscometry, light scattering and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersityindex. **Glass transition temperature** (Tg) and determination of Tg, Free volume theory, WLF equation, Factors affecting glass transition temperature (Tg).

UNIT-IV

Polymer Solution – Criteria for polymer solubility, Solubility parameter, Thermodynamics of polymer solutions, entropy, enthalpy, and free energy change of mixing of polymers solutions, Flory- Huggins theory, Lower and Upper critical solution temperatures.

Properties of Polymers (Physical, thermal, Flow & Mechanical Properties). Brief introduction to preparation, structure, properties and application of the following polymers: polyolefins, polystyrene and styrene copolymers, poly(vinyl chloride) and related polymers, poly(vinyl acetate) and related polymers, acrylic polymers, fluoro polymers, polyamides and related polymers. Phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, silicone polymers, polydienes, Polycarbonates, Conducting Polymers, [polyacetylene, polyaniline, poly(p-phenylene sulphide polypyrrole, polythiophene)].

Suggested books:

Seymour's Polymer Chemistry, Marcel Dekker, Inc.

G. Odian: Principles of Polymerization, John Wiley.

3.F.W. Billmeyer: Text Book of Polymer Science, John Wiley.

4.P. Ghosh: Polymer Science& Technology, Tata Mcgraw-Hill.

5.R.W. Lenz: Organic Chemistry of Synthetic High Polymers.

RAFFLES UNIVERSITY

Schedule per week Practical: 6

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Physical Chemistry **Paper Code : CH-205**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1mark.*

UNIT-I

Thermodynamics-I: Definition of thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process.Concept of heat and work. Zeroth Law of thermodynamics, First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship.

UNIT-II

Thermodynamics-II: Joule's law, Joule Thomson coefficient for ideal gas and real gas: and inversion temperature. Calculation of w q dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Temperature dependence of enthalpy, Kirchoffs equation. Bond energiesand applications of bond energies.

UNIT-III

Chemical Equilibrium: Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van't Hoff reaction isochore, Van't Hoff reaction isotherm. Le-Chatetier's principle and Clausius-Clapeyron equation its applications.

UNIT-IV

Distribution Law: Nernst distribution law – its thermodynamic derivation, Modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distributionlaw: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride. (ii) Determination of equilibrium constant of potassium triiodide complex and process of extraction.

Suggested books:

1. Physical Chemistry, Peter Atkins, De Paula [Publisher: Oxford]
2. Physical Chemistry, P.C. Rakshit [Publisher: SBH]
3. A Textbook of Physical Chemistry Vol 2,3,5, K. L. Kapoor [Publisher: McGraw Hill]
4. Principles of Physical Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
5. Physical Chemistry, Ira Levine, [Publisher: Pearson]

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry

Schedule per week Practical: 6

Examination Time	**: 4 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Chemistry Lab-III**	**Paper Code**	**: CH-207**

UNIT-I (Inorganic)

1. Gravimetric Analysis

Quantitative estimations of, Cu^{2+} as copper thiocyanate and Ni^{2+} as Ni – dimethylglyoxime.

2. Colorimetry:

To verify Beer - Lambert law for $KMnO_4/K_2Cr_2O_7$ and determine the concentration of the given $KMnO_4/K_2Cr_2O_7$ solution.

UNIT-II (Physical)

1. To determine the CST of phenol – water system.
2. To determine the solubility of benzoic acid at various temperatures and to determine the H of the dissolution process.

UNIT-III (Organic)

Laboratory Techniques

(a) Steam distillation (non evaluative) Naphthalene from its suspension in water
Separation of *o*-and *p*-nitrophenols

(b) Column chromatography (non evaluative) Separation of fluorescein and methyleneblue
Separation of leaf pigments from spinach leaves

Distribution of marks

1. UNIT-I	10 (6+4) marks
2. UNIT-II	10 (6+4) marks
3. UNIT-III	10 (6+4) marks
4. Viva-voce	10 (6+4) marks
5. Lab Record	10 (6+4) marks

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Chemistry

Schedule per week Practical: 6
Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Inorganic Chemistry **Paper Code : CH-202**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Chemistry of f -block elements:
Lanthanides: Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

UNIT-II

Chemistry of f -block elements
Actinides: General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements.

UNIT-III

Theory of Qualitative and Quantitative Inorganic Analysis-I:
Chemistry of analysis of various acidic radicals, Chemistry of identification of acid radicals in typical combinations, Chemistry of interference of acid radicals including their removal in the analysis of basic radicals.

UNIT-IV

Theory of Qualitative and Quantitative Inorganic Analysis-II:
Chemistry of analysis of various groups of basic radicals, Theory of precipitation, co- precipitation, Post-precipitation, purification of precipitates.

Suggested books:

1. Fundamental concepts of Inorganic Chemistry, A.K. Das [Publisher: CBS]
2. Inorganic Chemistry, Malik, Tuli Madan, [Publisher: S.Chand]
3. Principles of Inorganic Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
4. Inorganic Chemistry, R.P. Sarkar [Publisher: NCBA]
5. Concise Inorganic Chemistry, J. D. Lee, [Publisher: Oxford]

OR

Schedule per week Lectures: 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Coordination Chemistry (Elective)**	**Paper Code**	**: CH-202**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Werner's theory, valence bond theory (inner and outer orbital complexes), electroneutrality principle andback bonding. Crystal field theory, measurement of 10 Dq (Δo), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq (Δo, Δt). Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry. Qualitativeaspect of Ligand field and MO Theory.

IUPAC nomenclature of coordination compounds, isomerism in coordination compounds.Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, polynuclear complexes, Labile and inert complexes.

UNIT-II

Transition Elements: General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer diagrams) Different between the first, second and third transition series. Chemistry of Cr, Mn, Fe and Co in various oxidation states with special reference to the followingcompounds: peroxo compounds of chromium, potassium dichromate, potassium permanganate, potassiumferrocyanide, potassium ferricyanide, sodium nitroprusside and sodium cobaltinitrite.

UNIT-III

Lanthanoids and Actinoids: Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only).

UNIT-IV

Inorganic Reaction Mechanism : Introduction to inorganic reaction mechanisms. Substitution reactions insquare planar complexes, Trans- effect, theories of trans effect. Thermodynamic and Kinetic stability.

Suggested books:

1. Purcell, K.F & Kotz, J.C., Inorganic Chemistry W.B. Saunders Co, 1977.
2. Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993.
3. Cotton, F.A. & Wilkinson, G., Advanced Inorganic Chemistry Wiley-VCH, 1999
4. Basolo, F, and Pearson, R.C., Mechanisms of Inorganic Chemistry, John Wiley & Sons, NY, 1967.
5. Greenwood, N.N. & Earnshaw A., Chemistry of the Elements, ButterworthHeinemann, 1997.
6. Miessler, G. L. &. Tarr, Donald A. Inorganic Chemistry 3rd Ed.(adapted), Pearson, 2009

OR

Schedule per week Lectures: 2
Examination Time : 3 Hrs Maximum Marks: 50 (20+30)
Subject : Novel Inorganic Solids (Elective) Paper Code : CH-202

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Synthesis and modification of inorganic solids: Conventional heat and beat methods, Co-precipitationmethod, Sol-gel methods, Hydrothermal method, Ion-exchange and Intercalation methods.

Inorganic solids of technological importance: Solid electrolytes – Cationic, anionic, mixed Inorganicpigments – coloured solids, white and black pigments.

One-dimensional metals, molecular magnets, inorganic liquid crystals.

UNIT-II

Nanomaterials: Overview of nanostructures and nanomaterials: classification. Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture onedimensional control. Carbon nanotubes and inorganic nanowires. Bioinorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials, bionano composites. Introduction to engineering materials for mechanical construction: Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminum and their alloys like duralumin, brasses and bronzes cutting tool materials, super alloys thermoplastics, thermosets and composite materials.

UNIT-III

Composite materials:

Introduction, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites, environmental effects on composites, applications of composites.

UNIT-IV

Speciality polymers: Conducting polymers - Introduction, conduction mechanism, polyacetylene, polyparaphenylene and polypyrole, applications of conducting polymers, Ion-exchange resins and their applications. Ceramic & Refractory: Introduction, classification, properties, raw materials, manufacturing and applications.

Suggested books:

1. Atkins, Peter, Overton, Tina, Rourke, Jonathan, Weller, Mark and Armstrong, Fraser Shriver& Atkins' Inorganic Chemistry, 5 th Edition, Oxford University Press 2011- 2012
2. Adam, D.M. Inorganic Solids: An introduction to concepts in solid-state structural chemistry, John Wiley and Sons, London, New York, Sydney, Toronto, 1974
3. Poole Jr., Charles P., Owens, Frank J., Introduction to Nanotechnology John Wiley and Sons, 2003.

RAFFLES UNIVERSITY

Subject : Organic Chemistry **Paper Code : CH-204**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Infrared (IR) absorption spectroscopy: Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Applications of IR spectroscopy in structure elucidation of simple organic compounds.

UNIT-II

Amines: Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Preparation of alkyl and arylamines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabriel phthalimide reaction, Hofmann bromamide reaction. electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.

UNIT-III

Diazonium Salts: Mechanism of diazotization, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO2 and CN groups, reduction of diazonium salts to hyrazines, couplingreaction and its synthetic application.

Nitro Compounds: Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanismof electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium.

UNIT-IV

Aldehydes and Ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, advantage of oxidation of alcohols with chromium trioxide (Sarett reagent) pyridinium chlorochromate (PCC) and pyridinium dichromate, Physical properties. Comparison of reactivities of aldehydes and ketones. Mechanism ofnucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. Oxidationof aldehydes, Baeyer–Villiger oxidation of ketones, Cannizaro reaction. MPV, Clemmensen, Wolff- Kishner,$LiAlH_4$ and $NaBH_4$ reductions.

Suggested books:

1. Organic Chemistry, Subrata Sengupta [Publisher: Oxford]
2. Organic Chemistry Vol-I, I. L. Finar [Publisher: Pearson]
3. Organic Chemistry Vol-I, Nemai Tewari, [Publisher: McGraw Hill]
4. Organic Chemistry, Jerry March, [Publisher: Willey]
5. Organic Chemistry, Clayden, Greeves, Warren [Publisher: Oxford]

B.Sc. (PCM+CBZ) II Year (IV Semester)

Schedule per week Practical: 6
Examination Time : 3 Hrs Maximum Marks: 50 (20+30)
Subject : Physical Chemistry Paper Code : CH-206

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Thermodynamics-III: Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycles and its efficiency, Carnot's theorem, Thermodynamics scale of temperature. Concept of entropy– entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropychange in physical change, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

UNIT-II

Thermodynamics-IV: Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function(G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.

UNIT-III

Electrochemistry-III: Electrolytic and Galvanic cells, reversible & Irreversible cells, conventional representation of electrochemical cells, EMF of cell and its measurement, Wes ton standard cell, activity and activity coefficients, Calculation of thermodynamic quantities of cell reaction (G, H& K).Types of reversible electrodes metal-metal ion gas electrode, metal–insoluble salt anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions, electrochemicalseries and its applications.

UNIT-IV

Electrochemistry-IV: Concentration cells with and without transference, liquid junction potential, application of EMF measurement i.e. valency of ions, solubility product activity coefficient, potentiometric titration (acid- base and redox). Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.

Suggested books:

1. Physical Chemistry, Peter Atkins, De Paula [Publisher: Oxford]
2. Physical Chemistry, P.C. Rakshit [Publisher: SBH]
3. A Textbook of Physical Chemistry Vol 1,2,3, K. L. Kapoor [Publisher: McGraw Hill]
4. Principles of Physical Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
5. Physical Chemistry, Ira Levine, [Publisher: Pearson]

B.Sc. (PCM+CBZ) II Year (IV Semester)

Schedule per week Practical: 6
Examination Time : 4 Hrs Maximum Marks: 50 (20+30)
Subject : Chemistry Lab-IV Paper Code : CH-208

UNIT-I (Inorganic)

Preparations: Preparation of Cuprous chloride, prussion blue from iron fillings, tetraammine cupric sulphate, chrome alum, potassium trioxalatochromate (III).

UNIT-II (Physical)

1. To determine the enthalpy of neutralisation of a weak acid/weak base vs. strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weakbase.
2. To determine the enthalpy of solution of solid calcium chloride
3. To study the distribution of iodine between water and CCl4.

UNIT-III (Organic)

Systematic identification (detection of extra elements, functional groups, determination of melting point orboiling point and preparation of at least one pure solid derivative) of the following simple mono and bifunctional organic compounds: Naphthalene, anthracene, acenaphthene, benzyl chloride, *p*- dichlorobenzene, *m*-dinitrobenzene, *p*-nitrotoluene, resorcinol , hydroquinone, α-naphthol, β-naphthol, benzophenone, ethyl methyl ketone, benzaldehyde, vanillin, oxalic acid, succinic acid, benzoic acid, salicyclic acid, aspirin, phthalic acid, cinnamic acid, benzamide, urea, acetanilide, benzanilide, aniline hydrochloride, p- toluidine, phenyl salicylate (salol), glucose, fructose, sucrose, *o*-, *m*-, *p* nitroanilines, thiourea.

Distribution of marks

1. UNIT-I 10 (6+4) marks
2. UNIT-II 10 (6+4) marks
3. UNIT-III 10 (6+4) marks
4. Viva-voce 10 (6+4) marks
5. Lab Record 10 (6+4) marks

RAFFLES UNIVERSITY

Schedule per week Lectures : 2 Hrs

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Inorganic Chemistry**	**Paper Code : CH-301**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Metal-ligand bonding in Transition Metal Complexes: Limitations of valence bond theory, an elementary idea of crystal-field theory, spectrochemical series, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

UNIT-II

Thermodynamic and Kinetic Aspects of Metal Complexes: Jahn-Teller effect of the transition metal complexes, A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes of Pt (II).

UNIT-III

Magnetic Properties of Transition Metal Complexes: Types of magnetic behavior, spin-only formula, orbital contribution to magnetic moments, L-S coupling, spectroscopic ground states, application of magnetic moment data for 3d metal complexes.

UNIT-IV

Electron Spectra of Transition Metal Complexes: Types of electronic transitions, selection rules for d-d transitions, appearance of colour in transition metal complexes, Orgel-energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{+3}$ complex ion.

Suggested books:

1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
2. Inorganic Chemistry, J.E. Huheey, HarperCollins.
3. Magnetochemistry, R.L. Carlin, Springer Verlog.
4. Magnetochemistry, A. Earnshaw.
5. Introduction to ligand fields, B.N. Figgis, Wiley Eastern-IIed.
6. Inorganic Chemistry, by Malik, Tuli Madan, S. Chand . & company.
7. Inorganic Chemistry B.Sc. -V, by Ramesh Kapoor and R S Chopra, R. Chand. & company.

B.Sc. (PCM+CBZ) III Year (V Semester)

Schedule per week Lectures : 2 Hrs

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Organic Chemistry**	**Paper Code : CH-303**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1mark.*

UNIT-I

NMR Spectroscopy-I: Principle of nuclear magnetic resonance, introduction to proton NMR, number of signals, peak areas and integration, equivalent and nonequivalent protons positions of signals and chemicalshift, shielding and de-shielding of protons, proton counting, splitting of signals and coupling constants.

UNIT-II

NMR Spectroscopy-II: Factors affecting chemical shift, Discuss ion of proton NMR spectra of the molecules: ethyl bromide, n-propylbromide, isopropyl bromide, 1,1-dibromoethane, 1,1,2-tribromoethane, ethanol, acetaldehyde, ethyl acetate, toluene, benzaldehyde and acetophenone. Brief introduction and chemical shift values of carbon NMR. Simple problems on NMR spectroscopy for structure determination of organic compounds.

UNIT-III

Carbohydrates-I: Classification and nomenclature. Monosaccharides, mechanism of osazone formation, inter-conversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of glucose and fructose. Open chain and cyclic structure of D (+)-glucose &D (-) fructose. Mechanism of mutarotation. Structures of ribose and deoxyribose.

UNIT-IV

Carbohydrates-II: An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Organometallic Compounds:

Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.

Suggested Books:

1. Principles of Biochemistry, A. L. Lehninger, Worth Publishers.
2. Biochemistry, L.Stryer, W.H.Freeman.
3. Biochemistry, J. David Rawn, Neil Patterson.
4. Biochemistry, Voet and Voet, John Wiley.
5. Organic chemistry For B. Sc. III Year By P Bhagchandani, Sahitayabhawan Publications.

RAFFLES UNIVERSITY

Schedule per week Lectures	**: 2 Hrs**		
Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Physical Chemistry**	**Paper Code**	**: CH-305**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Quantum Mechanic s-I: Black-body radiation, Plank's radiation law, photoelectric effect, heat capacity of solids, Compton effect, wave function and its significance of Postulates of quantum mechanics , quantum mechanical operator, commutation relations, Hamiltonian operator, Hermitian operator, average value of square of Hermitian as a positive quantity, Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box, Pictorial representation and its significance,

UNIT-II

Physical Properties and Molecular Structure: Optical activity, polarization-(clausius-Mossottiequation). Orientation of dipoles in an electric field, dipole moment, measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility, magnetic properties-paramagnetism, diamagnetism and ferromagnetics.

UNIT-III

Spectroscopy-I: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statementof Born-Oppenheimer approximation, Degrees of freedom.

Rotational Spectrum: Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules, spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotor, isotope effect.

UNIT–IV

Spectroscopy-II, Vibrational spectrum: Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relationof force constant and bond energies, effects of an harmonic motion and isotopic effect on the spectra, ideaof vibrational frequencies of different functional groups.

Raman Spectrum: Concept of polarizibility, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra.

Text Books:

1. Physical Chemistry for B.Sc. Students by S C Khetarpal, R. Chand & Co, New Delhi
2. Principles of Physical Chemistry for B.Sc. Students by Puri, Sharma & Pathania
3. Introductory Quantum Chemistry, A.K. Chandra, Tata McGraw Hill.
4. Quantum Chemistry, I.M. Levine, Prentice Hall.
5. Basic Principles of Spectroscopy, G.M. Barrow, McGraw Hill.
6. Modern Spectroscopy, J.M. Hollas, John Wiley.
7. Quantum Chemistry, J. P. Lowe & K. Peterson, Academic Press (2005).

RAFFLES UNIVERSITY

Schedule per week Practical : 6 Hrs
Examination Time : 4 Hrs **Maximum Marks: 50 (30+20)**
Subject : Chemistry Lab-V **Paper Code : CH-307**

UNIT-I (Inorganic)

Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering,Combinations and excluding insolubles):

Pb^{2+}, Hg^{2+} , Hg_2^{2+}, Ag^{+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, As^{3+} , Sb^{3+}, Sn^{2+}, Fe^{3+} ,Cr^{3+}, Al^{3+} , Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+}, Mg^{2+},

UNIT-II (Physical)

1. To determine the strength of the given acid solution (mono and dibasic acid) conductometrically.
2. To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically

UNIT-III (Organic)

Chromatography Method

Determination of Rf values and identification of organic compounds

(a) Separation of green leaf pigments (spinach leaves may be used)by paper chromatographic method
(b) Separation of a mixture of colored organic compounds using common organic solvents by TLC.

Distribution of marks

1. UNIT-I	10 (6+4) Marks
2. UNIT-II	10 (6+4) Marks
3. UNIT-III	10 (6+4) Marks
4. Viva-voce	10 (6+4) Marks
5. Lab Record	10 (6+4) Marks

Suggested Books:

1. Experiments and Techniques in Organic Chemistry, D. Pasto, C. Johnson and M. Miller,Prentice Hall.
2. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C. Heath.
3. Systematic Qualitative Organic Analysis, H. Middleton, Adward Arnold.
4. Handbook of Organic Analysis-Qualitative and Quantitative, H. Clark, Adward Arnold.
5. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.
6. Advanced practical chemistry, Jagdamba, Yadav and shrivastava, PragatiPrakasan
7. Advanced organic practical chemistry, J.N.Gurtu and R. Kappor, S. Chand

Schedule per week Lectures	**: 2 Hrs**		
Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**	
Subject	**: Inorganic Chemistry**	**Paper Code**	**: CH-302**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT–I

Molecular Orbital Theory: Drawbacks of VBT and introduction of LCAO method, Simple MO diagrams of homonuclear molecules - C_2, N_2, O_2, Calculation of Bond order, MO diagrams of halogensand correlation of color of complexes. Non-crossing rule and MO of heteronuclear molecules – CO andHX.

UNIT-II

Organometallic Chemistry: Definition, nomenclature and classification of organometallic compounds. π-acidity of ligands and its effect on stretching frequencies, 18 electron rule, Preparation, properties, andbonding of alkyls of Li, Al, Hg, Brief account of metal-ethylenic complexes – Zeises salt, Organometalliccatalysis – Oxidative addition and Reductive elimination, Hydrogenation of olefins.

UNIT-III

Bioinorganic Chemistry: Essential and trace elements in biological processes, metalloporphyrins withspecial reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ionswith special reference to Ca^{+2}. Nitrogen fixation.

UNIT-IV

Silicones and Phosphazenes: Silicones and phosphazenes, their preparation, properties, structure and uses

Suggested Books:

1. Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg, University Science Books.
2. The Organometallic Chemistry of the Transition Metals, R.H. Crabtree, John Wiley.
3. Organometallics, A. Salzer, Ch. Elschenbrioch.VCH Publications.
4. Inorganic Chemistry, by Malik, Tuli Madan, S. Chand . & company.
5. Inorganic Chemistry, by James E. Huheey, E.A. Keiter, R. L. Keiter, O. K. Medhi
6. Inorganic Chemistry B.Sc. -I, by Ramesh Kapoor and R S Chopra, R. Chand & company.

RAFFLES UNIVERSITY

Schedule per week Lectures	**: 2 Hrs**		
Examination Time	**: 3 Hrs**	**Maximum Marks: 50(20+30)**	
Subject	**: Organic Chemistry**	**Paper Code**	**: CH-304**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Heterocyclic Compounds-I: Introduction, Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole

UNIT-II

Heterocyclic Compounds-II: Introduction to condensed five and six- membered heterocycles. Prepration and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitutionreactions of, quinoline and isoquinoline**. Organosulphur Compounds:** Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine. Synthetic detergents alkyland aryl sulphonates.

UNIT-III

Organic Synthesis *via* Enolates: Acidity of hydrogens, alkylation of diethyl malonate and ethylacetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism ofethyl acetoacetate.
Synthetic Polymers: Addition or chain-growth polymerization. Free radical vinyl polymerization, ionicvinyl polymerization, and Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins. Natural and synthetic rubbers.

UNIT-IV

Amino Acids, Peptides& Proteins: Classification, of amino acids. Acid-base behavior, isoelectric pointand electrophoresis. Preparation of α-amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid–phase peptide synthesis. Structures of peptides and proteins: Primary & Secondary structure.

Suggested Books:

1. Sykes, P. A Guidebook to Mechanism in Organic Chemistry 6th Ed., Prentice-Hall (1996).
2. Finar, I. L. & Finar, A. L. Organic Chemistry Vol. 2, Addison-Wesley (1998).
3. Finar, I. L. Organic Chemistry Vol. 1, Longman (1998).
4. Natural Products, their chemistry and biological significance. J. Mann, R. S. Davidso

Schedule per week Lectures	**: 2 Hrs**		
Examination Time	**: 3 Hrs**	**Maximum Marks: 50(20+30)**	
Subject	**: Physical Chemistry**	**Paper Code**	**: CH-306**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six short answer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Spectroscopy-III: -Electronic Spectrum: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle. Qualitative description of sigma and pie and n molecular orbital (MO) their energy level and respectivetransitions.

UNIT-II

Photochemistry: Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grotthus-Drapper law, Stark-Einstein law (law of photochemical equivalence) Jablonski diagram depiciting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).

UNIT-III

Solutions: -Dilute Solutions and Colligative Properties: Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, Colligative properties, Raoult'slaw, relative lowering of vapour pressure, molelcular weight determination, Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmoticpressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree ofdissociation and association of solutes.

UNIT-IV

Phase Equillibrium: Statement and meaning of the terms- phase component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component System, water and Sulpher systems. Phase equilibria of two component systems, solid-liquid equilibria, simple eutectic, Pb- Ag system, desilverisation of lead

Suggested books:

1. Physical Chemistry, Peter Atkins, De Paula [Publisher: Oxford]
2. Physical Chemistry, P.C. Rakshit [Publisher: SBH]
3. A Textbook of Physical Chemistry Vol 1,2,3, K. L. Kapoor [Publisher: McGraw Hill]
4. Principles of Physical Chemistry, Puri, Sharma, Pathania [Publisher: VPC]
5. Physical Chemistry, Ira Levine, [Publisher: Pearson]

Schedule per week Lectures : 6 Hrs
Examination Time : 4 Hrs **Maximum Marks: 50(30+20)**
Subject : Chemistry Lab-VI **Paper Code : CH-308**

UNIT-I (Inorganic Chemistry)
Semi micro qualitative analysis of mixture containing not more than four radicals (including interfering,Combinations and excluding insoluble's) NH_4^+, CO^{2-}, S^{2-}, SO_3^{2-}, SO_2^{2-}, NO_3^-, CH_3COO^-, Cl^-, Br^-, I^-, NO^-, SO^{2-}, $C_2O_4^{2-}$, PO^{3-}, BO_3^{3-}

UNIT-II (Physical Chemistry)

1. To determine the strength of given acid solution (mono and dibasic acid)/$KMnO_4$ – Mohrsalt potentiometrically.
2. To determine the molecular weight of a non-volatile solute by Rast method.
3. To standardize the given acid solution (mono and dibasic acid) pH metrically.

UNIT-III (Organic Chemistry) Synthesis of the following organic compounds:

(a) To prepare o-chlorobenzoic acid from anthranilic acid.
(b) To prepare p-bromoaniline from p-bromoacetanilide.
(c) To prepare m-nitroaniline from m-dinitrobenzene.
(d) To prepare S-Benzyl-iso-thiouronium chloride from thiourea

Distribution of marks

1. UNIT-I 10 (6+4) Marks
2. UNIT-II 10 (6+4) Marks
3. UNIT-III 10 (6+4) Marks
4. Viva-voce 10 (6+4) Marks
5. Lab Record 10 (6+4) Marks

Suggested Books:

1. Experiments and Techniques in Organic Chemistry, D. Pasto, C. Johnson and M. Miller, PrenticeHall.
2. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C. Heath.
3. Systematic Qualitative Organic Analysis, H. Middleton, Adward Arnold.
4. Handbook of Organic Analysis-Qualitative and Quantitative, H. Clark, Adward Arnold.
5. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.

Scheme of Examination and Syllabus

For B.Sc. (CBZ)

Subject: BOTANY

Semester I to VI (2022-2025)

RAFFLES
UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES (SOBAS)

RAFFLES UNIVERSITY

Japanese Zone, National Highway-48, Neemrana-301705,District: Alwar,

RAJASTHAN, INDIA www.rafflesuniversity.edu.in

SCHOOL OF BASIC AND APPLIED SCINCES
Department of Botany
(Syllabus and Scheme of Studies w. e. f. 2022-23)

Course Specific Outcomes for Department of Botany (B.Sc. Medical)

On completion of the course the students will:

1. acquire the basic knowledge of plant sciences through theory and practical.
2. get immense knowledge of different specializations and biological processes of Botany such as plant taxonomy, developmental biology, biochemistry, physiology, morphology, anatomy, reproduction, genetics, plant breeding, biotechnology, evolution, ecology and molecular biology of different forms of life.
3. able to understand, identify, classify and compare the different groups of plants (from algae to angiosperms).
4. help students to understand the degree of genetic diversity and phylogeny of plants.
5. understand the economic importance of Algae, Fungi and other microbes in the field of Industry, Medicine and Agriculture that will help them to do advanced studies and serve the institutions, industry, and society efficiently.
6. be able to understand the contribution of plant sciences in the production of medicines and other natural plant-based products.
7. be able to understand the advanced techniques of applied sciences that will help students in finding career opportunities in higher education in the field of plant sciences.
8. be able to describe and perform certain fundamental and applied experiments in various fields of plant sciences.
9. possess minimum standards of communication skills expected from a Botany graduate in the country.

SCHOOL OF BASIC AND APPLIED SCINCES
Department of Botany
(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Sc. I Year (I Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Diversity of microbes and plant pathology
Paper Code: BOT-101 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeach unit which will be of 6 marks each.

UNIT-I

Bacteria: Structure, nutrition, reproduction and economic importance; General account of cyanobacteria (with reference to *Nostoc*).

UNIT-II

Algae: General characters, classification upto classes (Lee 1980) and economic importance; Important features and life-history (excluding development) of *Volvox*, (Chlorophyceae),*Chara* (Charophyceae) *Vaucheria* (Xanthophyceae), *Ectocarpus* (Phaeophyceae) and *Polysiphonia* (Rhodophyceae).

UNIT-III

Viruses: General account of Viruses including structure of TMV and Bacteriophages.
General account of Lichens.

UNIT-IV

Fungi: General characters, classification upto classes (Ainsworth 1971) and economic importance; important features and life-history of *Phytophthora* (Mastigomycotina), *Mucor* (Zygomycotina), *Penicillium* (Ascomycotina), *Puccinia* (Basidiomycotina), *Colletotrichum* (Deuteromycotina).

SUGGESTED READINGS

1. Ahluwalia, A.S. (Ed.). Phycology: Principles, Processes and Applications. Daya Publishing House, New Delhi. 2003.

2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.

3. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA.8th edition.

4. Dube, H.C. 1990. An Introduction to Fungi, Vikas Publishing House Pvt. Ltd., Delhi.

5. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.

6. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge.4th edition.

7. Mehrotra, R.S.& Aneja, K.R. 1990: An introduction of Mycology, New Age International Press, N. Delhi

8. Mehrotra, R.S. and Aggarwal, Ashok (2013) Fundamentals of Plant Pathology, Tata McGraw-Hill Publishing company Ltd, New Delhi

9. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

10. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.

11. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.

12. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.

13. Sharma, O.P. 1992. Text Book of Thallophytes, McGraw Hill Publishing Co.

14. Sharma, P.D. 1991. The Fungi. Rastogi & Co., Meerut.

15. Smith, G.M. 1971. Cryptogamic Botany. Vol. I. Algae & Fungi. Tata McGraw Hill Publishing Co., New Delhi.

16. Thakur, A.K. and Bassi, S.K. (2008). Diversity of Microbes and Cryptogams. S. Chand & Co., Delhi.

17. Wiley J. M., Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International.

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B. Sc. I Year (I Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Plant Ecology
Paper Code: BOT-103 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeach unit which will be of 6 marks each.

UNIT-I

Introduction to Ecology: Definition; scope and importance; levels of organization. **Environment:** Introduction; environmental factors- climatic (water, humidity, wind, light, temperature), edaphic factors (soil profile, physico-chemical properties), topographic and biotic factors (species interaction). Adaptations of plants to water stress and salinity (morphological and anatomical features of hydrophytes, xerophytes and halophytes).

UNIT-II

Population Ecology: Basic concept; characteristics; biotic potential, growth curves; ecotypes and ecads. **Community Ecology:** Concepts; characteristics (qualitative and quantitative-analytical and synthetic); methods of analysis; ecological succession.

UNIT-III

Ecosystem: Structure (components) and functions (trophic levels, food chains, food webs, ecological pyramids and energy flow)

Biogeochemical Cycles: Carbon and Nitrogen; Hydrological (water) cycle.

UNIT-IV

Phyto-geography: Phyto-geographical regions of India; vegetation types of India (forests).

Environmental Pollution: Sources, types and control of air and water pollution.

Global Change: Greenhouse effect and greenhouse gases; impacts of global warming; carbon trading.

Suggested Readings

1. Botkin, D.B. and E.A. Keller, 2004. Environment Science: Earth as a Living Planet, John Wiley & Sons Inc., New York.
2. Kormondy, E.J. 1996: Concepts of Ecology, Prantice-Hall of India Pvt. Ltd., New Delhi.
3. Mackenzie, A. et al. 1999: Instant Notes in Ecology, Viva Books Pvt. Ltd., New Delhi.
4. Odum, E.P. 1983. Basic Ecology, Saunders, Philadelphia.
5. Sharma, P.D., 2010 Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
6. Singh, J.S., Singh, S.P. and Gupta, S.R. 2006. Ecology, Environment and Resource Conservation, Anamaya Publishers, New Delhi.
7. Smith, R.L. 1996, Ecology and Field Biology, Harper Collins, New York.

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B. Sc. I Year (I Semester)

Examination Time: 4 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Botany Lab-I
Paper Code: BOT-105 **Schedule per week Lectures: 3**

1. Ecological experiment A & B (as per the list) 08

2. Write Ecological notes on the specimens C and D 05

3. Identify, classify and write short morphological notes giving well labelled relevant diagrams on the given specimens/slide A & B (one each from Algae & Fungi). 06

4. Write short note on given chart/Photograph/Specimen 6 & 7 (one from Viruses/Bacteria & one from Cyanobacteria/ Lichen). 03

5. Note-book 04

6. Viva-voce. 04

List of practical

1. **Viruses**: EMs/Models of viruses: T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycles.

2. **Bacteria**: Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.

3. **Cyanobacteria &Algae**: Study of vegetative and reproductive structures of *Nostoc*, *Volvox*, *Chara*, *Vaucheria*, *Ectocarpus* and *Polysiphonia* through temporary preparations and permanent slides.

4. **Fungi**: Study of vegetative & reproductive structures of *Phytophthora*, *Mucor*, *Puccinia*, *Penicillium* & *Colletotrichum*: Asexual and sexual stages through temporary preparations and permanent slides.

5. **Lichens**: Study of growth forms of lichens (crustose, foliose and fruticose).

6. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.

7. Determination of pH, and analysis of two soil samples for carbonates, chlorides and sulphates by rapid field test.

8. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.

9. (a) Study of morphological adaptations of hydrophytes and xerophytes (four each).

10. (b) Study of biotic interactions of the following: Stem parasite (*Cuscuta*), Root parasite (*Orobanche*), Epiphytes (Orchid) and Predation (Insectivorous plants) using museum specimens/ live plants.

11. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus or nearby fields by species area curve method (species to be listed).

12. Quantitative analysis of herbaceous vegetation in the college campus or nearby fields for frequency and comparison with Raunkiaer's frequency distribution law.

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B. Sc. I Year (II Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Biodiversity (Archegoniate)
Paper Code: BOT-102 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Bryophyta: General characters, classification upto classes (Smith, 1935), alternation of generations, structure and reproduction (excluding development) of *Marchantia* (Hepaticopsida), *Anthoceros* (Anthocerotopsida), *Funaria* (Bryopsida).

UNIT-II

Pteridophyta: General characters, classification upto classes (Proskauer1957), Alternation of generations.

Gymnosperms-General characteristics, classification up to family (Smith 1955).

UNIT-III

Pteridophyta: Structure and Reproduction (excluding development) of *Rhynia* (Psilopsida), *Selaginella* (Lycopsida), *Equisetum* (Sphenopsida) and *Pteris* (Pteropsida).

UNIT-IV

Gymnosperms- Morphology, anatomy and reproduction of *Cycas, Pinus and Ephedra* (developmental details not to be included); Ecological and economic importance.

SUGGESTED READINGS

1. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.

2. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA.8th edition.

3. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

4. Puri, P., 1980, Bryophyta, Atma Ram & Sons, Delhi.

5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. 2005.Biology. Tata McGraw Hill, Delhi.

6. Sharma, O.P. 1990. Text Book of Pteridophyta, McMillan India Ltd.

7. Sharma, O.P. 1992. Text Book of Thallophytes, McGraw Hill Publishing Co.

8. Smith, G.M. 1971. Cryptogamic Botany, Vol. II, Bryophytes & Pteridophytes. Tata McGraw Hill Publishing Co., New Delhi.

9. Thakur, A.K. and Bassi, S.K. (2008). Diversity of Microbes and Cryptogams. S. Chand & Co., Delhi.

10. Vanderpoorten, A. & Goffinet, B. (2009) Introduction to Bryophytes. Cambridge University Press.

11. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.

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B. Sc. I Year (II Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Plant Taxonomy
Paper Code: BOT-104 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-I

Taxonomy and systematics, fundamental components of taxonomy (identification, classification, description, nomenclature and phylogeny). Role of chemotaxonomy and cytotaxonomy in relation to taxonomy.

Botanical nomenclature, principles and rules, principle of priority. Type concept, author citation, taxonomic ranks. Keys to identification of plants.

UNIT-II

Herbarium: General introduction and importance of herbaria. Botanical gardens and their importance.

Documentation of Floristic Diversity: Brief idea about floras, monograph and journals. Flower and types of inflorescences.

UNIT-III

Types of classification: Artificial, natural and phylogenetic.

Bentham and Hooker system of classification (upto series), Angiosperm Phylogeny Group (APG)- general introduction.

UNIT-IV

Diversity of Flowering Plants: Diagnostic features and economic importance of the following families: Ranunculaceae, Brassicaceae, Malvaceae, Euphorbiaceae, Rutaceae, Leguminosae, Apocynaceae, Solanaceae, Asteraceae, Liliaceae and Poaceae.

Suggested Readings

1. B.P. Pandey. 2001. A Textbook of Botany: Angiosperms - Taxonomy, Anatomy, Embryology and Economic Botany. S Chand and Co Delhi.

2. Chopra, GL. 1984. Angiosperms: Systematic & Life-Cycle. Pradeep Publications.

3. Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperm Taxonomy, Oliver and Boyd, London.

4. Gifford, E.M. and Foster, A.S. 1988. Morphology and Evolution of Vascular Plants, W.H. Freeman & Company, New York.

5. Heywood, V.H. and Moore, D.M. (Eds.) 1984.Current Concepts in Plant Taxonomy. Academic Press, London.

6. Jeifrey, C. 1982. An introduction to Plant Taxonomy. Cambridge University Press, Cambridge, London.

7. Jones, S.B., Jr. Luchsinger, A.E. 1986. Plant Systematics (2nd edition). McGraw Hill Book Co.

8. Radford, A.E. 1986. Fundamentals of Plant Systematics. Harper and Row, New York.

9. Simpson, M.G. (2006). *Plant Systematics.* Elsevier Academic Press, San Diego, CA, U.S.A.

10. Singh and Jain, 2015. Taxonomy of Angiosperms 10 Edition. Rastogi Publication Meerut.

11. Singh, G. 2017. Plant Systematics Theory And Practice 3rd Edition, Oxford & IBH Publishing

12. Stace, C.A. 1989. Plant Taxonomy and Biosystematics (2nd edition). Edward Arnold, London.

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B. Sc. I Year (II Semester)

Examination Time: 4 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Botany Lab-II
Paper Code: BOT-106 **Schedule per week Lectures: 3**

1. Identify, classify and write short morphological notes giving well labelled relevant diagrams on the given specimens A, B & C (one each from Bryophytes, Pteridophytes & Gymnosperms). 06

2. Identify, giving two important characters of identification, the spots 1, 2 & 3 (one slide or material each from Bryophytes, Pteridophytes & Gymnosperms). 06

3. Describe/compare the given flowers A and B in semi-technical language giving V.S. of flowers, T.S. of ovaries, Floral Diagrams and Floral Formulae. Identify and assign them to their respective families giving reasons. 06

5. Note-book 04

6. Collection and Collection Report. 04

7. Viva-voce. 04

List of Practicals

1. ***Marchantia***- Morphology of thallus, W.M. rhizoids and scales, V.S. thallus with gemma cup, W.M. gemmae, V.S. antheridiophore, archegoniophore, L.S. sporophyte (temporary/permanent slides).
2. ***Anthoceros***- Morphology of thallus, W.M. rhizoids, V.S. thallus, VS Antheridia and Archegonia, L.S. sporophyte (temporary/permanent slides).
3. ***Funaria***- Morphology, W.M. leaf, rhizoids, operculum, peristome, annulus, spores, slides showing antheridial and archegonial heads, L.S. capsule (temporary /permanent slides).
4. ***Selaginella***- Morphology, W.M. leaf with ligule, T.S. stem, W.M. strobilus, W.M. microsporophyll and megasporophyll, L.S. strobilus (temporary/ permanent slide).

5. ***Equisetum***- Morphology, T.S. internode, L.S. strobilus, T.S. strobilus, W.M. sporangiophore.
6. ***Pteris***- Morphology, T.S. rachis, V.S. sporophyll, W.M. sporangium, W.M. spores, T.S. rhizome.
7. ***Cycas***- Morphology (coralloid roots, bulbil, leaf, megasporophyll), T.S. normal & coralloid root, T.S. rachis, T.S. leaflet and microsporophyll.
8. ***Pinus***- Morphology (long and dwarf shoots, W.M. dwarf shoot, male cones and female cones), T.S. Pinus needle, T.S. Stem and male cone.
9. ***Ephedra***- Morphology, T.S. internode, L.S./T.S. male and female strobili, W.M. spores (wet and dry), T.S. rhizome (temporary/permanent slide), T.S. stem (young & mature).
10. **Excursion Report**: Report on excursion tours with photographs, collection, preservation and preparation of herbarium sheets and specimens related to Archegoniates and Angiosperms. Mounting of a collected, properly dried and pressed specimen of minimum 20 wild plants with herbarium label.
11. Study of vegetative and floral characters of the one or two member of each family/sub-family mentioned in theory syllabus (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification).

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B. Sc. II Year (III Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Plant Anatomy
Paper Code: BOT-201 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeach unit which will be of 6 marks each.

UNIT-I

Diversity in plant forms: Annuals, biennials and perennials.

Tissues: Meristematic and permanent (simple and complex).

Epidermis: Uniseriate and multiseriate, epidermal appendages and their morphological types.

UNIT-II

Leaf: Types of leaves (simple and compound); phyllotaxy. Anatomy of typical monocot and dicot leaf and cell inclusions in leaves; Leaf abscission.

Stomatal apparatus and their morphological types.

UNIT-III

Shoot system: Shoot apical meristem and its histological organizations (monocot and dicot stem); **Cambium:** Structure and functions; secondary growth in dicot stem; characteristics of growth rings; sap wood and heart wood, periderm.

Anomalous secondary growth (*Achyranthes* & *Boerhaavia*)

UNIT-IV

Root system: Root apical meristem; histological organization of monocot and dicot roots. Secondary growth in dicot root.

Structural modifications in roots: Storage (*Beta*), respiratory (*Rhizophora*), epiphytic (*Vanda*).

Anatomical aspects of adaptations in xerophytes, hydrophytes, halophytes.

Suggested Readings

1. Bryan G. Bowes 1999. A Colour Atlas of Plant Structure. Manson Publishing

2. Cutter, E.G. 1969. Plant Anatomy Part-I, Cells and Tissues, Edward Arnold, London.

3. Cutter, E.G. 1971. Plant Anatomy: Experiment and Interpretation. Part-II Organs, Edward Arnold London.

4. Esau, K. 1977. Anatomy of Seed Plants, 2nd Edition. John Wiley & Sons, New York.

5. Fahn, A. 1974. Plant Anatomy, 2nd Edition. Pergamon Press, Oxford.

6. Hartmann, H.T. and Kestler, D.E. 1976. Plant Propagation; Principles and Practices. 3rdEdition.Prentice Hall of India Pvt. Ltd. New Delhi.

7. King. J. 1997. Reaching for the Sun: How Plants Work. Cambridge University Press, Cambridge, U.K.

8. Mauseth, J.D. 1988. Plant Anatomy. The Benjamin/Cummings Publishing Company Inc., Menlo Park, California, USA.

9. Pandey, B.P 2012. Plant Anatomy. S. Chand & Co. Publisher

10. Raven, P.H. Evert, R.F. and Eichhorn, S.E. 1999. Biology of Plants.5th edition. W.R. Freeman and Co., Worth Publishers, New York.

11. Sharma MK. Plant Structure (An Introduction To Plant Anatomy) JBC Press

12. William C. Dickison 2015. Integrative Plant Anatomy. Academic Press

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B. Sc. II Year (III Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Plant Embryology
Paper Code: BOT-203 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeach unit which will be of 6 marks each.

UNIT-I

Flower-a modified shoot; functions of various floral parts.

Pollination (types and agencies); pollen germination (micro gametogenesis). Pollen-pistil interaction; self-incompatibility.

UNIT-II

Male gametophyte. Microsporangium, its wall and dehiscence mechanism. Microsporogenesis, pollen grains and its structure (pollen wall).

Structure of megasporangium (ovule) & its curvatures. Megasporogenesis and mega gametogenesis.

UNIT-III

Female gametophyte (monosporic, bisporic and tetrasporic)- organization and ultrastructure of mature embryo sac.

Double fertilization.

Endosperm types and their biological importance.

UNIT-IV

Embryogenesis in dicot and monocot; Polyembryony and apomixis.

Structure of dicot and monocot seed.

Fruit types; dispersal mechanisms in fruits and seeds.

Suggested Readings

1. B.M. Johri Editor (1984) Embryology of Angiosperms Springer Verlag

2. Bhojwani, S.S. & Bhatnagar, S.P. (2011). Embryology of Angiosperms. Vikas Publication House Pvt. Ltd. New Delhi. 5th edition.

3. Fageri, K. and Van der Pijl1979.The Principles of Pollination Ecology. Pergamon Press, Oxford.

4. Hartmann, H.T. and Kestler, D.E. 1976. Plant Propagation; Principles and Practices. 3rdEdition.Prentice Hall of India Pvt. Ltd. New Delhi.

5. King. J. 1997. Reaching for the Sun: How Plants Work. Cambridge University Press, Cambridge, U.K.

6. P. Maheshwari (1950) An Introduction to the Embryology of Angiosperms McGraw Hill

7. Proctor, M. and Yeo, P. 1973. The Pollination of Flowers. William Collins Sons, London.

8. Raven, P.H. Evert, R.F. and Eichhorn, S.E. 1999. Biology of Plants.5th edition. W. R. Freeman and Co., Worth Publishers, New York.

9. Thomas, P. 2000. Trees: Their Natural History. Cambridge University Press, Cambridge.

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B. Sc. II Year (III Semester)

Examination Time: 4 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Botany Lab-III
Paper Code: BOT-205 **Schedule per week Lectures: 3**

1. Cut Transverse Section and prepare a double-stained permanent mount of the given material A and B (from angiosperms). Identify giving reasons and show it to the examiner. 10

2. Identify, giving the important characters of identification, the spots 1, 2, 3 and 4 (one material/photograph/ slide from embryology of angiosperms). 08

3. Dissect out the globular/heart-shaped embryo from the given material. 04

7. Note-book 04

8. Viva-voce 04

List of Practicals

1. Study of meristems through permanent slides and photographs.
2. Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylary elements, Phloem (Permanent slides, photographs)
3. Stem: Monocot: *Zea mays*; Dicot: *Helianthus*; Secondary: *Helianthus* (Permanent slides preparation).
4. Root: Monocot: *Zea mays*; Dicot: *Helianthus*; Secondary: *Helianthus* (Permanent slides preparation).
5. Leaf: Dicot and Monocot leaf (Permanent slides).
6. Adaptive anatomy: Xerophyte (*Nerium* leaf); Hydrophyte (*Hydrilla* stem).
7. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).
8. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/campylotropous (Permanent Slides).

9. Female gametophyte: *Polygonum* (monosporic) type of Embryo sac Development (Permanent slides/photographs).

10. Ultrastructure of mature egg apparatus cells through electron micrographs.

11. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).

12. Dissection of embryo/endosperm from developing seeds.

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B. Sc. II Year (IV Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Plant Physiology
Paper Code: BOT-202 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeach unit which will be of 6 marks each.

UNIT-I

Plant-water Relations: Importance of water to plant life; physical properties of water; Imbibition, Diffusion, Osmosis and Plasmolysis; absorption and transport of water; transpiration-types, physiology of stomata, factors affecting transpiration, importance of transpiration.

UNIT-II

Mineral Nutrition: Essential macro and micro elements; criteria of essentiality of elements; Role of essential elements; mineral uptake; deficiency symptoms.

Transport of Organic Substances: Mechanism of phloem transport; source-sink relationship; factors affecting translocation

UNIT-III

Seed dormancy; Plant movements; Concept of photoperiodism; Physiology of flowering; Florigen concept; Physiology of senescence; Fruit ripening.

Growth and Development: Definitions; phases of growth and development.

UNIT-IV

Plant Hormones: Auxins, Gibberellins, Cytokinins, Abscisic acid and Ethylene, history of their discovery, mechanism of action.

Photo-morphogenesis: phytochromes and their discovery, physiological role and mechanism of action.

Suggested Readings

1. Dennis, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell (eds.). 1997: Plant Metabolism (2nd Edition), Longman, Essex, England.

2. Galston, A.W. 1989: Life Processes in Plants, Scientific American Library, Springer-Verlag, New York, USA.

3. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. New York.

4. Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology.John Wiley and Sons.U.S.A.4th edition.

5. Hopkins, W.G., 1995: Introduction to Plant Physiology, John Wiley & Sons, Inc., New York, USA.

6. Mohr, H. and Schopfer, P. 1995: Plant Physiology. Springer-Verlag, Berlin Germany.

7. Pandey, S.N &Sinha BK. 2018. Plant Physiology 4/Ed .Vikas Publishing House Pvt Ltd

8. Salisbury, F.B. and Ross, C.W. 1986: Plant Physiology. CBS Publishers and Distributors, New Delhi.

9. Taiz, L. and Zeiger, E. 2003: Plant Physiology. Panima Publishing Corporation, New Delhi.

10. Taiz, L., Zeiger, E., Moller, I.M. and Murphy, A. (2015). Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition.

11. Verma, V. 2015. Plant Physiology 2nd Ed. Athena Academic

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B. Sc. II Year (IV Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Plant Metabolism
Paper Code: BOT-204 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeach unit which will be of 6 marks each.

UNIT-I

Photosynthesis: Significance; historical aspects; photosynthetic pigments; action spectra and enhancement effects; concept of two photosystems; Z-scheme; photo-phosphorylation; Calvin cycle; C4 pathway; CAM plants; photorespiration.

UNIT-II

Respiration: ATP–the biological energy currency; aerobic and anaerobic respiration; Krebs cycle; electron transport mechanism (chemi-osmotic theory); redox -potential; oxidative phosphorylation; pentose phosphate pathway.

UNIT-III

Nitrogen metabolism: Biology of nitrogen fixation; importance of nitrate reductase and its regulation; ammonium assimilation.

Lipid metabolism: Structure and functions of lipids; fatty acid biosynthesis; B-oxidation; saturated and unsaturated fatty acids; storage and mobilization of fatty acids.

UNIT-IV

Basics of Enzymology: Discovery, nomenclature & characteristics of enzymes; concept of holoenzyme, apoenzyme, coenzyme & co-factors; regulation of enzyme activity.

Suggested Readings:

1. Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology. John Wiley and Sons.U.S.A.4th edition.

2. Taiz, L., Zeiger, E., Moller, I.M. and Murphy, A. (2015). Plant Physiology and Development. Sinauer Associates Inc. USA.6th edition.

3. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. New York.

4. Dennis, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell (eds.). 1997: Plant Metabolism (2nd Edition), Longman, Essex, England.

5. Galston, A.W. 1989: Life Processes in Plants, Scientific American Library, Springer-Verlag, New York, USA.

6. Hopkins, W.G., 1995: Introduction to Plant Physiology, John Wiley & Sons, Inc., New York, USA.

7. Mohr, H. and Schopfer, P. 1995: Plant Physiology. Springer-Verlag, Berlin Germany.

8. Salisbury, F.B. and Ross, C.W. 1986: Plant Physiology. CBS Publishers and Distributors, New Delhi.

9. Taiz, L. and Zeiger, E. 2003: Plant Physiology. Panima Publishing Corporation, New Delhi.

SCHOOL OF BASIC AND APPLIED SCINCES
Department of Botany
(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Sc. II Year (IV Semester)

Examination Time: 4 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Botany Lab-IV
Paper Code: BOT-206 **Schedule per week Lectures: 3**

1. Devise experiments A and B to demonstrate the physiological process (as per the list). Perform it and show it to the examiners. 08

2. Comment on the physiological experiment C and D (Specimen/ set-up / Model / Chart). 04

3. Test for carbohydrates / Proteins / Fats. 06

4. Note Book and Report 08

5. Viva-voce. 04

List of Practicals

1. Demonstration of imbibition by plaster of Paris method.

2. Demonstration of Osmosis by potato osmoscope method.

3. To study the Osmotic pressure of onion scale/ Rhoeo leaf peel by plasmolytic method.

4. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.

5. Demonstration of transpiration by Ganong's/ Farmer's potometer.

6. To separate of photosynthetic pigments by thin layer/paper chromatography.

7. Demonstration of Ascent of sap/Transpiration pull

8. To study the rate of photosynthesis under varying CO2 concentration using Wilmott's bubbler.

9. To study the effect of light intensity on oxygen evolution during photosynthesis Using Wilmott's bubbler.

10. Demonstration of aerobic & anaerobic respiration.

11. To study the evolution of heat during respiration

12. Demonstration of manometric determination of R. Q.

13. Demonstration of phototropism, geotropism and hydrotropism.

14. Simple tests for the detection of carbohydrates (monosaccharides, disaccharides and starch); Proteins and Fats.

15. Preparation of report on use of plant hormones in vegetative reproduction, seed germination etc.

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B. Sc. III Year (V Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Economic Botany
Paper Code: BOT-301 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeach unit which will be of 6 marks each.

UNIT-I

Origin, distribution, botanical description, brief idea of cultivation and uses of the following:

Food plants: Cereals (Rice, Wheat and Maize).

Pulses: Gram, Arhar and Pea. **Vegetables:** Potato, Tomato and Onion.

UNIT-II

Morphology of plant part used, brief idea of cultivation and uses of the following:

Spices: Coriander, Ginger, Turmeric and Cloves.

Fibers: Cotton, Jute and Flax.

Oils: Groundnut, Mustard and Coconut.

UNIT-III

Morphology of plant part used, brief idea of cultivation and uses of the following:

Medicinal Plants: *Cinchona*, *Rauwolfia*, *Atropa*, Opium, *Cannabis*, Neem, *Withania* and other industrially important medicinal plants.

Energy plantations and bio-fuels.

UNIT-IV

Botanical description and processing of:

Beverages: Tea and Coffee; **Rubber:** *Hevea*; **Sugar:** Sugarcane.

General account and sources of timber.

Suggested Readings:

1. Kocchar, S.L. 1998: Economic Botany in Tropics, 2nd edition, MacMillan India Ltd., New Delhi.
2. Kocchar, S.L. 2016. Economic Botany: A Comprehensive Study, 5 Ed, Cambridge India.
3. Sambammurthy, A.V.S.S. And Subramanyam, N.S. 1989: A Textbook of Economic Botany, Wiley Eastern Ltd., New Delhi.
4. Sharma, O.P. 1996: Hills Economic Botany (Late Dr. A.F. Hill adapted by O.P. Sharma), Tata McGraw Hill Co. Ltd., New Delhi.
5. Simpson, B.B. and Conner-Ogorzaly, M. 1986: Economic Botany- Plants in our World, McGraw Hill, New York.

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B. Sc. III Year (V Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Plant Biotechnology
Paper Code: BOT-303 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeach unit which will be of 6 marks each.

UNIT I

Historical perspective of plant tissue culture; Composition of media; Nutrient and hormone requirements; Totipotency; Organogenesis; Embryogenesis; Protoplast culture; Plant tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production; Cryopreservation. Restriction Endonucleases- types and role.

UNIT II

Brief idea about cloning vectors- Ti plasmid, BAC, Lambda phage, M13phagemid, cosmid, shuttle vector; eukaryotic vectors (YAC).

Recombinant DNA, bacterial transformation and selection of recombinant clones, PCR mediated gene cloning; Genomic and cDNA libraries.

UNIT III

Methods of gene transfer- Agrobacterium mediated, electroporation, microinjection, microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).

Industrial enzymes (aspergillase, protease, lipase); Biosafety concerns.

UNIT IV

Applications of biotechnology-pest resistant (Bt-cotton); herbicide resistant plants (Round-Upready soybean); Transgenic crops with improved quality traits (FlavrSavr tomato, golden rice); Improved horticultural varieties (Moondust carnations).

Suggested Readings

1. BD Singh. Biotechnology. Kalyani Publications

2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.

3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.

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B. Sc. III Year (V Semester)

Examination Time: 4 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Botany Lab-V
Paper Code: BOT-305 **Schedule per week Lectures: 3**

1. Identify and Classify spots 1, 2, 3, and 4 from the point of view of economic importance and morphology of the plant part used. 08

2. Perform the Applied Botany experiment (as per the list). 04

3. Comment on the specimen A and B (Chart/ Model /Photograph from Biotechnology) 06

4. Note Book, Collection and field report. 08

5. Viva-voce. 04

List of Practicals

1. Study of economically important plants: Wheat, Rice, Gram, Pea, Arhar, Soybean, Black pepper, Ginger, Clove, Turmeric, Tea, Coffee, Cocoa, Cotton, Jute, Coir,Groundnut, Coconut and Mustard

2. Collection and preparation of report on various crops and economically important plants being cultivated/wildly available in your area.

3. Brief introduction to the components and working of the instruments- oven, autoclave, incubator, centrifuge and laminar air flow). Familiarization with basic equipment in tissue culture and Preparation of MS medium.

4. To prepare the slants and petri plates for plant tissue culture.

5. Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc.

6. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs.

7. Study of methods of gene transfer through photographs: Agrobacterium-mediated,

direct gene transfer by electroporation, microinjection, microprojectile bombardment.

8. Study of steps of genetic engineering for production of Bt cotton, Golden rice, FlavrSavr tomato through photographs.

9. Isolation and quantification of genomic DNA from bacteria (*E. coli*) or Plants

10. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.

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B. Sc. III Year (VI Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Cell Biology & Genetics
Paper Code: BOT-302 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeach unit which will be of 6 marks each.

Unit I

Heredity: Brief life history of Mendel; Terminologies; Laws of Inheritance.

Modified Mandelian Ratios: Lethal Genes; Co-dominance, incomplete dominance; Gene interaction (9:7; 9:4:3; 13:3; 12:3:1, 15:1).

Linkage: Concept & history, complete & incomplete linkage.

Unit II

Cell organelles: Golgi Apparatus, Endoplasmic Reticulum, Lysosomes, Peroxisomes and Vacuoles. **Ultra-structure and function:** Chloroplast, Mitochondria, Nucleus and Nucleolus. **Cell Cycle:** General account and its Phases, Molecular basis of cell cycle control and checkpoints. **Cell Division:** Mitosis and Meiosis - Stages and Significance.

Unit III Cytoplasmic Inheritance: leaf variegation in *Mirabilis*
jalapa,
Chromosome theory of Inheritance. Sex-determination and Sex-linked Inheritance.
Crossing over: concept and significance, cytological proof of crossing over.
Mutations & Chromosomal Aberrations; Types of mutations, effects of different mutagens.
Numerical chromosomal changes: Euploidy, Polyploidy and Aneuploidy.
Structural chromosomal changes: Deletions, Duplications, Inversions & Translocations

Unit IV

Genetic Material: DNA - the genetic material, DNA structure and replication, DNA-Protein interaction, The Nucleosome Model, Genetic Code, Satellite and Repetitive DNA.

Gene Expression: Modern concept of gene; RNA; Ribosomes; Transfer of genetic information - transcription and translation.

Suggested Readings

1. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley India.
2. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.
3. Klug WS, Cummings MR, Spencer, C, Palladino, M (2011). Concepts of Genetics, 10th Ed., Benjamin Cummings
4. Pierce BA (2011) Genetics: A Conceptual Approach, 4th Ed., Macmillan Higher Education Learning
5. Singh, BD. Genetics. Kalyani Publishers Delhi

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B. Sc. III Year (VI Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)**
Paper Title: Plant Breeding
Paper Code: BOT-304 **Schedule per week Lectures: 3**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeach unit which will be of 6 marks each.

Unit- I

Introduction and objectives of Plant Breeding: Breeding systems; modes of reproduction in crop plants; Important achievements and undesirable consequences of plant breeding.

Methods of crop improvement: Introduction; Centres of origin and domestication of crop plants; plant genetic resources; Acclimatization.

Unit II

Selection methods: For self-pollinated, cross pollinated and vegetatively propagated plants.

Hybridization: For self, cross and vegetatively propagated plants–Procedure, advantages and limitations.

Unit III

Quantitative inheritance: Concept, mechanism, examples. Monogenic vs. polygenic Inheritance. **Inbreeding depression and heterosis**: History, genetic basis of inbreeding depression and heterosis.

Unit IV

Crop improvement and breeding Applications.

Role of mutations, polyploidy, distant hybridization and role of biotechnology in crop improvement.

Suggested Readings

1. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. Blackwell Publishing.
2. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding. Oxford – IBH. 2nd edition.
3. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition.
4. Poehlman JM and Sleper DA (1995) Breeding Field Crops, AVI. Publ., U.S.A.
5. Singh, B.D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7th edition.

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B. Sc. III Year (VI Semester)

Examination Time: 3 Hrs **Maximum Marks: 50 (20+30)Paper Title: Botany Lab-VI**
Paper Code: BOT-306 **Schedule per week Lectures: 3**

1. Numerical regarding Genetics (Mendelian Inheritance or Gene Interaction) as per syllabus. 04
2. Identify and comment on the specimen A, B, C and D (Chart/ Model /Photograph) 08
3. Identify giving two important characters of identification of the given spots 1 and 2 (One each from mitosis and meiosis) 06
4. Note Book and Chart/Model/Report on any Genetics/Plant Breeding Phenomenon. 08
5. Viva-voce. 04

List of Practicals

1. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.
2. Chromosome mapping using point test cross data.
3. Pedigree analysis for dominant and recessive autosomal and sex-linked traits.
4. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3,15:1,12:3:1, 9:3:4).
5. Cell Divisions: Mitosis Stages, Meiosis – Stages.
6. Photographs/Permanent Slides showing Translocation Ring, Laggards and InversionBridge.
7. Hybridization techniques - Emasculation, Bagging & Cross Pollination (For demonstrationonly).
8. Induction of polyploidy conditions in plants (For demonstration only).

Scheme of Examination and Syllabus

For B.Sc. (CBZ)

Subject: ZOOLOGY

Semester I to VI (2022-2025)

RAFFLES
UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES (SOBAS)

RAFFLES UNIVERSITY

Japanese Zone, National Highway-48, Neemrana-301705,District: Alwar,

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Schedule per week Lectures: 3
Examination Time: 3 Hrs **Maximum Marks: 50(20+30)**
Subject: Life and Diversity from Protozoa to Helminthes **Paper Code: ZOO-101**

Note: *Examiner will set nine questions and the students will be required to attempt fivequestions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words).* Answer to each part should not exceed 20 words. *Further examiner will set two questions from each unit and the students will be required to attemptone question from each unit which will be of 6 marks each.*

UNIT 1 - Phylum- Protozoa

(1) General characters and classification upto order level
(2) Biodiversity and economic importance of Protozoa
(3) Parasitic Protozoans: Life history, mode of infection and pathogenicity of *Entamoeba,Plasmodium, Trypanosoma, Leishmania* and *Giardia*

UNIT 2 - Phylum- Porifera

(1) General characters and classification up to order level
(2) Biodiversity and economic importance of Porifera
(3) Type study - *Sycon*
(4) Canal system in sponges
(5) Spicules in sponges

UNIT 3 - Phylum - Coelenterata

(1) General characters and classification up to order level
(2) Biodiversity, economic importance
(3) Type Study - *Obelia*
(4) Corals and coral reefs
(5) Polymorphism in Siphonophores

UNIT 4 - Helminths

(1) General characters and classification of Platyhelminthes
(2) General characters and classification of Aschelminthes
(3) Type study - *Fasciola hepatica* and *Ascaris*
(4) Helminths parasites: Brief account of life history, mode of infection and pathogenicity of *Schistosoma, Taenia, Ancylostoma, Trichinella, Wuchereria* and *Oxyuris*
(5) Parasitic adaptations

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Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Cell biology **Paper Code: ZOO-103**

Note: *Examiner will set nine questions and the students will be required to attempt fivequestions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words).* Answer to each part should not exceed 20 words. *Further examiner will set two questions from each unit and the students will be required to attemptone question from each unit which will be of 6 marks each.*

UNIT 1

1. Ultrastructure of different cell organelles of animal cell
2. Plasma Membrane: Fluid mosaic model, various modes of transport across the membrane, mechanism of active and passive transport, endocytosis and exocytosis.
3. Goigi complex: Structure, Associated enzymes and role of golgi-complex in animal cell

UNIT 2

1. Endoplasmic reticulum (ER): types, role of ER in protein synthesis and transportation in animal cell
2. Ribosomes: Types, biogenesis and role in protein synthesis.
3. Lysosomes: Structure, enzyme and their role; polymorphism

UNIT 3

1. Mitochondria: Mitochondrial DNA; as semiautonomous body, biogenesis, mitochondrial enzymes (only names), role of mitochondria
2. Cytoskeleton: Microtubules, microfilaments, centriole and basal body. Cilia and Flagella
3. Nucleus: Nuclear· membrane, nuclear lamina, nucleolus, fine structure of chromosomes, nucleosome concept and role of histones, euchromatin and heterochromatin, lampbrush and polytene chromosomes

UNIT 4

1. Mitosis and Meiosis (Cell reproduction).
2. Brief account of causes of cancer.
3. Microscopy: General principles of light, florescent and electron microscope.
4. Centrifugation techniques.

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Examination Time :3 Hrs **Maximum Marks: 50(20+30)**
Subject :Zoology Lab-I **Paper Code : ZOO-105**

(A) Classification up to orders with ecological note and economic importance ofthe following animal:

Protozoa : Lamination of cultures of *Amoeba, Euglena* and *Paramecium;* Permanent prepared slides: *Amoeba, Euglena, Trypanosoma,Noctiluca, Eimeria, Paramecium* (binary fission and conjugation), *Opalina, Verticella, Balantidium, Nyctotherus,* radiolarian andformaniferan ooze. Parazoa (Porifera): Specimens: Sycon. *Grantia, Euplectella, Hyalonema, Spongilla,Euspongia* Coelenterata : Specimens: *Porpita, Valella, Physalia, Aurelia, Rhyzostoma,Metridium, Millipora, Alcyonium, Tubipora, Zoanthus, Madrepora, Favia, Fungia,* and *Astrea,*Permanent prepared slides: *Hydra* (W.M.), *Hydra* with buds, *Obelia* (colony and medusa), *Sertularia, Plumularia, Tubularia, and Bougainvillea, Aurelia* (sense organs and stages of lifehistory) Platyhelminthes : Specimens: *Dugesia, Fasciola, Taenia, Echinococus,* Permannt prepared slides: *Miracidium, sporocyst, redia, cercaria,scolex* and *proglotttids; Taenia* (mature and gravid)Aschelminthes : Specimens: *Ascaris* (male & female), *Trichinella, Ancylostoma, Meloidogyne.*

(B) Study of the following permanent stained preparations: L.S. and TS.*Sycon;*gemmules, spicules and sponging fibres of*Sycon,*canalsystem of sponges, TS. *Hydra* (testis and ovary region). T.S. *Fasciola* (different regions). T.S. *Ascaris* (male and female).Temporary preparation of *Volvox, Paramecium,* Gemmules and spicules of *Sycon*, Preparation of permanent stained whole mounts of *Hydra, Obelia, Sertularia,Plumularia* and *Bougainvillea*, Pathogenic protozoans: Plasmodium, Giardia or as available, Pathogenic Helminthes:
Ancylostma; Wuchereria or as available

(C) Cell biology and Genetics:
Cell division: Prepared slides of stages of mitosis and meiosis,Temporary squash preparations of onion root tip / grasshopper testis for the study of mitosis using acetocarmine stain, Salivary gland and polytene chromosomes of *Drosophila*/*Chironomus*, Exercise based on mendel's law

(E) Project:

1. Parasitic adaptations (Protozoa to helminthes)
2. DNA: types, structure and its model preparation
3. Survey: Diversity of particular family/taxa in your surrounding area
4. Microscopy: principles and its significance
5. Staining techniques and their significance

Suggested readings

1. Barnes, RD. Invertebrate zoology. WG Saunders, Philadelphia.
2. P S Verma, E L Jordan. Invertebrate Zoology 25th Edition, 2001. S. Chand Publications, New Delhi.
3. Stephen A. Miller, John B. Harley, Zoology, 6th Edition 2005The McGraw-Hill Companies.
4. D. T. Anderson .Invertebrate Zoology. Second Edition, 1999 Oxford University Press

5. E. D. De Robertis,1987. Cell and Molecular Biology 8th Edition. Lippincott Williams & Wilkins
6. Benjamin A. Pierce. Genetics: A Conceptual Approach, 2014. W.H.Freeman & Co Ltd;
7. Janet Moore. An Introduction to the Invertebrates.2006. Cambridge University Press
8. Ahluwalia KB. Genetics. Wiley Eastern Ltd., New Delhi.
9. Jonathan, Slack. Genes. Oxford University Press, New Delhi.

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Schedule per week Lectures: 3

Examination Time: 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Life and Diversity of Annelida to Hemichordata **Paper Code : ZOO-102**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words).* Answer to each part should not exceed 20 words. *Further examiner will set two questions from each unit and the students will be required toattempt one question from each unit which will be of 6 marks each.*

UNIT 1- Phylum – Annelida

1. General characters and classification up to order level
2. Biodiversity and economic importance of Annelida
3. Type study - *Pheretima* (Earthworm)
4. Metamerism in Annelida
5. Trochophore larva:. Affinities, evolutionary significance

UNIT 2 - Phylum - Arthropoda

1. General characters and classification up to order level
2. Biodiversity and economic importance of insects
3. Type study – *Periplaneta*

UNIT 3- Phylum – Mollusca

1. General characters and classification up to order level
2. Biodiversity and economic importance
3. Type study - *Pila*
4. Torsion and detorsion in gastropoda
5. Respiration and foot

UNIT 4- Phylum - Echinodermata

1. General characters and classification up to order level
2. Biodiversity and economic importance
3. Type Study -*Asteries* (Sea Star)
4. Echinoderm larvae
5. Aristotle's Lantern

Phylum – Hemichordata

1. General characters and classification, Type study: *Balanoglossus*

RAFFLES UNIVERSITY

Schedule per week Lectures: 3

Examination Time : 3 Hrs Maximum Marks: 50(20+30)

Subject : Developmental Biology Paper Code : ZOO-104

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark. Further examiner will be set two questions from each unit and the students will be required to attempt one question fromeachunit which will be of 6 marks each.*

UNIT 1

1. History and basic concepts : Historical review
2. Experimental Developmental Biology: Epigenesis, preformation, mosaic and regulativedevelopment
3. Branches and Significance of Developmental Biology

UNIT 2

1. Generalized structure of mammalian ovum & sperm, spermatogenesis and Oogenesis, different types of eggs, egg membranes.
2. Fertilization, parthenogenesis, changes in gametes, monospermy and polyspermy, planes and and patterns of cleavage.
3. Late Embryonic development: fate of germ layers, extra-embryonic membranes, implantation of embryo in humans, placenta structure, types and functions of placenta.

UNIT 3

1. Process of blastulation and fate-map construction in frog and chick.
2. Gastrulation in frog and chick upto the formation of three germinal layers.
3. Embryonic Induction (Primary organizers): Experimental evidences and characteristics, Neural Induction, role of grey crescent in neural induction, Regional specificity of primary inductor (organisers), Embryonic induction in different chordates
4. Chemical and genetic basis of neural induction

UNIT 4

1. Concepts of competence, determination and differentiation.
2. Repair and Regeneration: Concept, Degree of regenerative ability in non-chordates and chordates, categories and mechanism of regeneration, control of regeneration, factors affecting regeneration, physiological processes involved in regeneration.

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Subject : Zoology Lab-II **Paper Code : ZOO-106**

(A) Classification up to orders with ecological note and economic importance of the following group of animals:

1. Annelida Specimens: Pheretima, Heteronereis, Aphrodite, Chaetopterus, Arenicola, Tubifex and Pontobdella.
2. Arthropoda Specimens: Peripatus, Palaemon (Prawn), Lobster, Cancer (crab), Sacculina, Eupagurus (hermit crab), Lepas, Balanus, Cyclops, Daphnia, Lepisma, Periplaneta (cockroach), Schistocerca (locust), Poecilocerus (ak-hopper), Gryllus (cricket), Mantis (praying mantis),Cicada, Forticula (earwig), Dragon fly, termite queen, bug, moth, beetle, Polistes (wasp), Apis (honeybee), Bombyx (silk moth), Cimex (begbug), Pediculus (body louse). Millipedes, Scolopendra (centipedes), Palamnaeus (scorpion), Aranea (spider), Limulus (king crab).
3. Mollusca Specimens: Mytilus, Ostrea, Cardium, Pholas, Solen (razor fish), Pecten, Holiotis, Patella, Aplysia, Doris, Limax, Loligo, Sepia, Octopus, Nautilus (complete and T.S.), Chiton and Dentalium.
4. Echinodermata Specimens: Asterias, Echinus, Cucumara, Ophiothrix, Antedon and Asterophyton.
5. Hemichordata: Balanoglossus

(B) Study of the following permanent stained preparations:

1. T.S. Pheretima (pharyngeal and typhlosolar regions), Setae, septal nephridia and spermathecae of Pheretima.
2. Trachea and mouthpmts of cockroach.
3. Statocyst of Palaemon.
4. Glochidium larva of Anodonta; radula and osphradium of Pila.
5. T.S. Star fish (arm)
6. T.S. Balanoglossus (through various regions)

(C) Demonstration by C. D.:

1. Mouth parts and trachea of Periplanata (cockroach), radula of Pila; pedicillarae of Asterias.
2. Setae of earthworm, and mouth parts of Honey bee, House fly and cockroach.

(D) Preparation of models of the different systems of the following animals:

1. Earthworm: Digestive, reproductive and nervous systems.
2. Grasshopper/ cockroach: Digestive, reproductive and nervous systems.
3. Pila: Pallial complex, digestive and nervous systems

(E) Embryology:

1. Histological slides of frog: cleavage, blastula, gastrula, neurula and tailbud stage
2. Chick developmental study (slides): 18 hrs, 21 hrs, 33 hrs, 72 hrs and 96 hrs of incubation, primitive streak stage in embryo and study of various foetal membranes in a 10-12 day old chick embryo.

Suggested readings:

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1. Barrington, EJW. Invertebrate structure and function. East West Press Pvt. Ltd. New Delhi.
2. Parker and Haswell. Text book of zoology: invertebrates. Vol. 1. Lowpriced textbook. The Macmillan press Ltd.
3. R. L. Kotpal Modern Text Book of Zoology: Invertebrates, 2009. Rastogi Publications
4. P S Verma, E L Jordan . Chordate Zoology, 2009. S. Chand Publications, New Delhi.
5. Scott F. Gilbert, Susan R. Singer.Developmental Biology, 2010. Sinauer Associates.
6. Balinsky, BI. An introduction to Embryology. Saunders, Philadelphia.
7. Lewis, Wolpert. Development Biology. Oxford University Press, Delhi.

RAFFLES
UNIVERSITY

Schedule per week Lectures: 3

Examination Time : 3 Hrs Maximum Marks: 50(20+30) Subject : Developmental Biology Paper Code : ZOO-104

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to eachquestion should not exceed 20 words). Answer to each part should not exceed 20 words. Further examiner will set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT-1

Chordates: General characteristics and classification, affinities and origin, Protochordates, Retrogressive metamorphosis, Agnatha: General features of living Agnatha and classification upto classes. Type study of Pteromyzon: Structure and life history

UNIT-2

Pisces: General features & Classification, Osmoregulation, migration and Parental care, Type study: Scoliodon

Amphibia: General features & Classification upto orders, Origin and evolution of terrestrial ectotherms/tetrapods, Parental care & paedomorphosis. Type study: Rana.

UNIT-3

Reptiles: General features & Classification upto orders, Origin of reptiles skulltypes, Poisonous and non-poisonous snakes in India, Biting mechanism in snakes

Aves: General features & Classification upto orders. Origin of birds, Flight adaptations, Migration.

UNIT-4

Mammals: General features & Classification upto orders. Origin of mammals, dentition, Type study: Rat.

Schedule per week Lectures: 3
Examination Time : 3 Hrs Maximum Marks: 50(20+30) Subject : Mammalian Physiology Paper Code : ZOO-203

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to eachquestion should not exceed 20 words). Answer to each part should not exceed 20 words. Further examiner will set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT 1

Digestion - Brief introduction to digestive system, Buccal digestion; salivary secretion and digestion, Gastric digestion; gastric secretion and digestion, Intestinal digestion; pancreatic secretion, bile juices and digestion and small intestine and digestion and absorption in large intestine

UNIT 2

Osmoregulation and excretion - Osmoregulation , Mammalian excretory system; excretory organs and major associated blood vessels, kidney structure, nephron structure, Urine formation; ultra filtration, selective re-absorption and tubular secretion, Counter current multiplier system

UNIT 3

Respiration - Respiratory organs, Breathing mechanism, Respiratory pigments;properties and functions, External and internal respiration, Transport of gases.

UNIT 4

Circulation – Origina and conduction of heart beat, cardiac cycle, electrocardiogram, Blood pressure, Working of mammalian heart, Blood composition and function, Mechanism of blood clotting

Examination Time: 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Zoology Lab-III **Paper Code : ZOO-205**

1. Classification upto orders, habit, habitats, external characters and economic importance (if any) of the following animals:-

Protochordata; Molqula, Hetryllus, Pyrosoma, Doliolum, Olikopleura, andAmphioxus.

Cyclostomata; Myxine, Petromyzon and Ammocoetus larva.

Chondrichthyes;Zygaena, Pristis, Narcine (electric ray), Trygon, Rhinobatus, Raja andChimaera.

Osteichthyes; Acipenser, Lepidosteus, Muraena, Mystus, Catla, Hippocampus,Syngnathus, Exocoetus, Anabas, Diodon, Ostraczion, Tetradon, Echinus,Lophius, Solea and Polypterus. Any of the Lung Fish

2. Preparation of models of the different systems of the following animals: Herdmania: General anatomy

Labeo (locally available fish): Digestive and reproductive systems: cranial nerves

3. Study of the skeleton of : Scoliodon, Labeo

4. Study of the prepared slides: Tornaria larva, T.S.Amphioxus(through differentregionds). Oikopleura, different types of scales

5. Make permanent stained preparations of the following:Salpa,Spicules, and Cycloid scales

6. Physiology practical; Estimation of abnormal constituents of urine (Albumin, sugar, ketone bodies), Use of respirometer, Haematein crystal preparation, Estimation of Hb, DLC of Man, RBC count, WBC count.

7. Project Report: Migration in fishes, faunal survey

8. Disaster Management Project Work: (Field Work, Case Studies.for details see the UGC Website

Examination Time: 3 Hrs **Maximum Marks: 50(20+30)**
Subject: Genetics and Immunology **Paper Code: ZOO-202**

Note: *Examiner will set nine questions and the students will be required toattempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words).* Answer to each part should not exceed 20 words. *Further examiner will set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

Unit 1:

1. Basic principles of Heredity, basic idea on extensions and modifications of basic principles
2. Chromosomal theory of Inheritance.
3. Linkage and recombination : coupling and repulsion hypothesis, crossing over and chiasma formation
4. Multiple alleles, gene interactions (allelic and non-allelic)

UNIT II:

1. Variation; types, sources of variation.
2. Mutation; chromosome and gene mutations, implications of mutation
3. Sex linked Inheritance: Chromosomal system of sex determination, Haemophilia and Colour blindness in man, Eye colour in *Drosophila*, Non-disjunction of sex chromosomes in *Drosophila*

UNIT-III:

1. Human genetics: Human Karyotype, genetic counselling and testing, Chromosomal abnormalities involving autosomes and sex chromosomes, monozygotic and dizygotic twins, Inborn errors of metabolism (Alcaptonuria, Phenylketonuria, Albinism, Sickle-cell anaemia), DNA fingerprinting, genetic compatibility
2. Applied genetics; genetic engineering, implications, transgenic animals, eugenics, euthenics and euphenics.

UNIT IV:

Immunology - Innate and Acquired immunity, Antigen, Antibody, Humoral and cell- mediated immunity, Active and passive immunization, Blood groups and transfusions, tissue and organ transplants, Allergies, autoimmune diseases, immunodeficiency diseases.

Schedule per week Lectures: 3
Examination Time: 3 Hrs **Maximum Marks: 50(20+30)**
Subject: Mammalian Physiology-II **Paper Code: ZOO-204**

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words).* Answer to each part should not exceed 20 words. *Further examiner will set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.*

UNIT 1- Muscle physiology

1. Ultra structure of smooth, striated and cardiac muscles
2. Muscle contraction
3. Simple twitch and fatigue

UNIT 2- Nerve physiology

1. Structure of neuron
2. Conduction of nerve impulse through axon
3. Neurotransmitters
4. Synapses; ultrastructure and function

UNIT 3 - Endocrinology

1. Endocrine system; definition of endocrine, paracrine and autocrine system, significance of endocrine and neuro-endocrine system
2. Pituitary gland; structure, hormones and their functions
3. Thyroid gland; structure, hormones and their functions
4. Adrenal gland; structure, hormones and their functions
5. Pancreas; islets of langerhans, structure, hormones and their functions

UNIT 4 -Physiology of reproduction

1. Hormonal control of male and female reproduction
2. Implantation
3. Parturition and lactation in mammals
4. Reproductive cycle; oestrous and menstrual cycles
5. Menopause in human

Schedule per week Lectures: 3
Examination Time: 4 Hrs **Maximum Marks: 50(20+30)**
Subject: Zoology Lab-IV **Paper Code: ZOO-206**

1. Classification up to orders, habit, habitats, external characters and economic importance (if any) of the following animals:-

Amphibia: *Necturus, Proteus, Amphiuma, Salamandra, Amblystoma, Axolotle larva, Alytes,Bufo, Rana*
Reptilia: *Hemidactylus, Calotes, Draco, Varanus, Phrynosoma, Chamaeleon, Typhops,Python, Eryx, Ptyas, Bungarus, Naja, Hydrus, Viper, Crocodilus, Gavialis, Chelone* (Turtle) and *Testudo* (Tortoise)
Aves: *Casuarius, Arden, Anas, Milvus, Pavo, Eudynamis, Tyto* and *Alcedo,Halcyon* Mammalia: *Ornithorphynchus, Echidna, Didelphis, Macropus, Loris, Macaque,Hystrix,Funambulus, Telix, Panthera, Canis, Herpestes, Capra, Pteropus*

2. Preparation of models of the different systems of the following animals: *Hemidactylus;* Digestive, arterial, venous and urinogenital systemsRat : Digestive, arterial, venous and urinogenital systems
3. Study of the skeleton of*Rana*(Frog),*Varanus*,Pigeon or Gallus and*Orcyctolagus/*rat
4. Study of the following prepared slides: Histology of rat (compound tissues)
5. Study and collection of different types of feathers; Quill, Contour, Filoplume and Down feathers
6. Physiology practical; study of estrus cycle, ultrasound image of foetus, study of histological structure of major endocrine glands of mammals
7. Project Report: Survey of diversity, Parental care , Dentition in mammals, Migrationin birds

Suggested readings

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1. Bell JN and Davidson GH, Textbook of physiology and Biochemistry, ELBS.
2. Sastry, KV. Animal physiology & biochemistry. Rastogi publications, Meerut.
3. Taylor, DJ, Green, NPO, and Stout, GW. Biological Science. Cambridge lowprice edition. Cambridge University Press.
4. Schmidt-Nielsen. Animal physiology. Cambridge University Press.
5. David S. Goodsell The Machinery of Life, 2009. Springer-Verlag New York Inc.
6. Young J Z. The life of vertebrates, Osford University Press, London
7. Peter Holland. The Animal Kinggom. Oxford University Press, New Delhi.

RAFFLES UNIVERSITY

B. Sc. III Year (V Semester)

Schedule per week Lectures: 3

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**

Subject : Biochemistry **Paper Code : ZOO-301**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words). Answer to each part should not exceed 20 words. Further examiner will set two questions from each unit and the students will be required to attempt onequestion from each unit which will be of 6 marks each.

UNIT 1

1. Carbohydrates: structure, function and significance
2. Oxidation of glucose through glycolysis, Kreb's cycle and oxidative phosphorylation,
3. Elementary knowledge of inter conversion of glycogen and glucose in liver
4. Role of insulin and glucagon

UNIT 2

1. Lipids: structure, function and significance
2. Beta-oxidative pathway of fatty acids
3. Essential and non essential fatty acids
4. Brief account of biosynthesis of triglycerides,
5. Phospholipids and steroids

UNIT 3

1. Proteins: structure, function and significance
2. Essential and non essential amino acids
3. Transformation of amino acids; deamination, transamination, decarboxylation
4. Synthesis of protein and urea
5. Fate of ammonia (ornithine cycle)
6. Fate of carbon skeleton
7. Enzymes; types and mechanism of action

UNIT 4

1. Vitamins; sources and deficiency
2. Minerals; sources and deficiency
3. Nucleic acid; nucleotides, Catabolism and biosynthesis of nucleotides

RAFFLES UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Zoology

(Syllabus and Scheme of Studies w. e. f. 2022-23onwards)

B. Sc. III Year (V Semester)

Schedule per week Lectures: 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50(20+30)**
Subject	**: Ecology and Evolution**	**Paper Code : ZOO-303**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words). Answer to each part should not exceed 20 words. Further examiner will set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT 1 - Introduction to Ecology

1. Relevance of studying ecology, its history, autecology, synecology
2. Species; Sympatric, parapatric and Allopatric
3. Abiotic Factors; Laws of limiting factors; Liebig's law of minimum and Shelford's law of tolerance, brief account of light and temperature as limiting factors, soil types and soil erosion

UNIT 2 - Population ecology

1. Unitary and modular populations
2. Population density, dispersion and demography
3. Exponential and logistic growth model
4. Population Growth regulation: Intrinsic mechanism and extrinsic mechanism
5. Age structure pyramids for the human population

UNIT 3 - Community and Ecosystem

1. Community structure, diversity index, ecotone/edge effect, island equilibriummodel
2. Succession, stages of primary succession, climax community
3. Community's interactions; types with examples, Niche concept, Gause's principle of competitive exclusion with laboratory and field examples, Lotka Volterra Equation forprey predator interaction
4. Energy flow and chemical cycling through an ecosystem

UNIT 4 - Evolution

1. History of evolutionary thoughts
2. Natural selection, speciation
3. Variations, isolation and adaptations
4. Palaeontology; fossils, geological divisions of the earth's crust, imperfection of the geological record
5. Study of extinct forms; Dinosaurus, Archaeopteryx

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Zoology

B. Sc. III Year (V Semester)

Schedule per week Lectures: 6

Examination Time : 4 Hrs **Maximum Marks: 50(20+30)**

Subject : Zoology Lab-V **Paper Code : ZOO-305**

1. Study of an ecosystem; pond/lake/reservoir
2. Calculating Shannon index of biodiversity for fauna/flora of the campus
3. Evolutionary evidences and/or its demonstration through models/video/CD etc
4. Adaptive modifications in feet and beaks of birds
5. Evolutionary evidences of man and horse
6. Visit to a fossil park/Birbal Sahani Paleontological Institute in Lucknow
7. Qualitative tests for identification of simple sugars, disaccharides and polysaccharides.
8. Detection of proteins, carbohydrates and lipids in animal tissue food sample.
9. Demonstration of the principle of paper chromatography
10. Study of human salivary amylase activity: Effect of temperature, pH, Concentration
11. Project Report : radio carbon dating, fossil collection, population study of any fauna in the university campus and elsewhere

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Environmental Biology & Ethology **Paper Code : ZOO-302**

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words). Further examiner will be set two questions from each unit andthe students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT 1

1. Environment and its concepts, global environment, hydrosphere, lithosphere and atmosphere
2. Natural resources; present status and future needs, conservation and management of natural resources; renewable (forest, wildlife, water) and non renewable (soil, minerals and energy)
3. Wildlife conservation; vanishing and threatened animals and plants in Rajasthan, wildlife management efforts by Government and Non government organizations (including wildlife Acts)

UNIT 2

1. Environmental pollution; general outline and various types of pollution (water, air, and soil), Sources and remedies for noise, radiation, industrial chemicals, agrochemicals, insecticides, pesticides and household pollutants
2. Green house effect, ozone layer depletion, El-Nino and La-Nino effects, fallout effects of radiation, nuclear accidents
3. Basic concepts of bioaccumulation, biomagnification, biodegradation of pollutants

UNIT 3

1. Impact of urbanization; development and distribution of urban centres, factors, problems and solutions of urbanization, brief idea of human population of India and Rajasthan
2. Space ecology; space ecosystem, space problems and their solutions, colonization

UNIT 4

1. Introduction and history of Ethology
2. Concepts of Ethology; fixed action pattern, sign stimulus, innate learning mechanism, motivation, imprinting and learning
3. Pheromones and their role in alarm spreading
4. Societies; characteristics and advantage with special reference to honey bee, and monkey
5. Biological rhythms and biological clocks
6. Methods of studying animal behaviour

Examination Time : 3 Hrs Maximum Marks: 50(20+30)Subject : Applied Zoology & Biostatistics Paper Code : ZOO-304

Note: Examiner will set nine questions and the students will be required to attempt five questions in all, Question number one is compulsory containing six short answer types' questions covering the entire syllabus and will be of 1 mark each (Answer to each question should not exceed 20 words). Further examiner will set two questions from each unit and the students will be required to attempt one question from each unit which will be of 6 marks each.

UNIT 1

Principles and practices of Vermiculture, Sericulture (including Ericulture), Lac culture, Apiculture, Prawn culture, Pisciculture, Pearlculture and Poultry keeping

UNIT 2

Pest; definition, types of pests, control (insecticides and plant protection appliances (like hand compression spray, hand rotating duster, bucket pump etc. and natural control),
Study of major crop pest; Jowar (stem borer, midge flies), cotton (red cotton bug, pink ballworm) etc.

UNIT 3

Introduction, scope and application of biostatistics
Scientific method, writing up an experiment, Hypothesis (null and alternative)
Basic concepts of statistics; presenting data (tabulations, graphical representation, frequencydistributions, samples and populations

UNIT 4

Elementary statistical methods in biology; measures of central tendency (mean, mode, median), measures of dispersion (standard deviation, standard error, variance), correlation and regression

SCHOOL OF BASIC AND APPLIED SCIENCES
Department of Zoology
(Syllabus and Scheme of Studies w. e. f. 2022-23 onwards)

B. Sc. III Year (VI Semester)
Schedule per week Lectures: 3

Examination Time : 3 Hrs **Maximum Marks: 50(20+30)**
Subject : Zoology Lab-VI **Paper Code : ZOO-306**

Environmental biology &Ethology

1. Chemical analysis of pond water for pH, alkalinity, acidity, dissolved oxygen,
2. Estimating water salinity in a given water sample/ TDS
3. Visiting nearby factory to study their control measures taken up for controlling varioustypes of pollution
4. Qualitative estimation of zooplankton in given sample of water
5. A visit to zoo/museum of natural history and wildlife sanctuary (where present0
6. Behavioural study in mammals/birds
7. Construction of frequency table, histograms, polygons and piecharts
8. Exercises on mean, mode and median, standard deviation, correlation and bar diagram.
9. Study of stored pests/agricultural pests
10. Project report:

a. Apiculture/Sericulture
b. Pollution control measures taken up by any industry
c. Hazardous waste treatment in your city

Suggested readings

1. Townsend C, Harper J and Michael Begon. Essentials of Ecology, Blackwell Science.
2. David, L, Nelson and Michael M Cox. Lehninger's principles of Biochemistry.
3. Bell JN and Davidson GH, Textbook of physiology and Biochemistry, ELBS.
4. Sastry, KV. Animal physiology & biochemistry. Rastogi publications, Meerut.
5. Taylor, DJ, Green, NPO, and Stout, GW. Biological Science. Cambridge low price edition.Cambridge University Press.
6. Gupta, PK. Environmental biology. Rastogi publications, Meertu.
7. Miller TG, Jr. environmental Science. Wordsworth publishing company.
8. Odum, EP. Fundamentals of ecology, WB Sanunders.
9. Chapman and Reiss. Ecology. Cambridge University Press.
10. Manning and Dawkins. An introduction to animal behavior. Cambridge University Press.
11. Mathur, R. Animal behavior. Rastogi publications, Meerut.
12. Frank and Althoen. Statistics. Cambridge University Press.
13. Wilson and Walker. Principles and techniques of practical biochemistry. Cambridge

University Press.

14. Harrison and de Mora. Introductory chemistry for the environmental science.Cambridge University Press.
15. Bailey. Statistical methods in biology. Cambridge University Press.
16. Brian & Deborah Charlesworth. Evolution. Oxford University Press.

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)

RAFFELS UNIVERSITY, NEEMRAN

B.Sc. (Computer Science (3 Years Degree Program)

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduateswill be able to

PO 1	Provide students with fundamental knowledge and ability to expertise inComputer Science.
PO 2	Provide insight to problem solving to succeed in Technical Profession throughprecise education and to prepare students to excel in postgraduate programs.
PO 3	To inculcate in students professional, effective communication skills, team work, multidisciplinary approach and an ability to relate issues to broader socialcontext.
PO 4	Prepare students to be aware of excellence, leadership, written ethical codes and guidelines and lifelong learning needed for successful professional career by providing them with an excellent academic environment.
PO 5	Empower the students in academic, social, psychological and economic arenasby developing relevant competencies.
PO 6	Interpret and apply the implications of environment awareness initiatives incorporated in curriculum.
PO 7	Participation and contribution to community development activities throughNCC, NSS etc.
PO 8	Acquire sufficient knowledge base in the Domain Specific area leading to thepursuit of advanced level of study in the chosen Domain Specific area.
PO 9	Adaptability and capacity building to the everchanging needs of the industryand employment opportunities.
PO 10	Inculcate the human values through curricular, co-curricular and extracurricularactivities.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Department of Computer Science, offers Three Year (comprising 6 semesters) Undergraduate Programin Computer Science with objective of empowering students to acquire all-inclusive understanding of Computer Knowledge both theoretical and practical as an academic discipline. Upon completion of B. Sc. Computer Science Degree Program successfully, the students shall acquire the following skills and competencies.

PSO 1	Ability to apply foundations of Mathematics, Principles of Physics/Statisticsand Theory of Computer Science in solving the real-world problems.
PSO 2	Identify, formulate, review research literature, and analyzes complex problems reaching substantiated conclusions using first principles of mathematics and Computer science.
PSO 3	Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PSO 4	Create, select, and apply appropriate techniques, resources, and modern IT tools including prediction and modelling to complex activities with an understanding of the limitations.
PSO 5	Understand the impact of the professional solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PSO 6	Function effectively as an individual, and as a member or leader in diverseteams, and in multidisciplinary settings.
PSO 7	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PSO-PO Mapping

		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PSO	**1**	√	√	√							
	2	√	√		√	√			√	√	
	3	√	√	√	√	√			√	√	
	4	√	√	√	√	√			√	√	√
	5			√	√	√	√	√	√		√
	6						√	√	√	√	√
	7			√	√		√	√	√	√	√

Course Objective and Course Outcomes

SCHOOL OF BASIC & APPLIED SCIENCES
(Syllabus & Scheme of Studies w.e.f. 2021-22)
B.Sc. (Computer Science)
I Year (I semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Computer Science	COM-101	Computer Fundamentals and Programming in C - I	2	0	20	30	50	3	2
2		COM-103	Computer Architecture & Networking - I	2	0	20	30	50	3	2
3		COM-105	Practical & Viva-voce (Based on Paper COM-101	2	0	20	30	50	3	2
5	Physics	PHY-101	Mechanics	2	0	20	30	50	3	2
6		PHY-103	Thermodynamics	2	0	20	30	50	3	2
7		PHY-105	Wave and Oscillations	2	0	20	30	50	3	2
8		PHY-107	Physics Lab-I	0	6	20	30	50	4	3
9	Mathematics	MA-101	Matrices and Statistics	2	0	20	30	50	3	2
10		MA-103	Calculus	2	0	20	30	50	3	2
11		MA-105	Three-Dimensional Geometry	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			550		23

1. Computer Fundamentals and Programming in C – I (COM-101)

Course Objectives:

1. Broad and balance knowledge in computer hardware in addition to understanding of key concepts, principles and theories.
2. To formulate opinion about the impact of computers on society
3. To provide knowledge and skill to the students' thus enabling them to undertake further studies in computer in related areas or multidisciplinary areas that can be helpful for self-employment/entrepreneurship.
4. Know and use of different number system, operating systems, primary and secondary memories and different types of software.

Course Outcomes:

CO 1: Understand the basics of computer.

CO 2: Understanding the concept of input and output devices of computer.

CO 3: Learn the functional units and classify types of computers, how they process information.

CO 4: Understanding the working of an operating system.

CO 5: Study to use internet safely, legally and responsibly.

2. Computer Architecture & Networking – I (COM-103)

Course Objectives:

1. Broad and balance knowledge of logic gates in addition to understanding of key concepts, principles and theories.
2. To formulate opinion about combinational and sequential circuits.
3. To provide knowledge and skill to the students about information transfer between registers thus enabling them to understand the basic computer organization and design.

Course Outcomes:

CO 1: To know about the basics of circuit design using gates.

CO 2: Understanding the concept of combinational and sequential circuits.

CO 3: Learn the functional units of computers, how they process information.

CO 4: Understanding the working of different instruction cycles.

CO 5: Understanding the memory reference and input-output instructions

3.Mechanics (PHY-101)

Course Objective:

1. To inculcate the fundamentals of Mechanics
2. To understand the importance of various forces in day-to-day life.
3. To comprehend the dynamics of fluids.
4. To understand elastic properties of solids.
5. To understand the role of relative dynamics in observing the celestial objectsand universe

Course Outcomes:

CO 1: Student gains the knowledge on Fundamentals of Mechanics

CO 2: Student gets a thorough knowledge different types of forces that make life smoother.

CO 3: Student gets a thorough knowledge on fluid dynamics.

CO 4: Student gets a thorough knowledge on elastic properties of solids.

CO 5: Finds the evolution of theories for understanding the Universe and thedynamic nature of Universe.

4. Thermodynamics (PHY-103)

Course Objective:

1. To understand the importance of various irreversible engines.
2. To comprehend the dynamics of Heat.
3. To understand various degrees of freedom and molecular movement.
5. To understand the role of Planck's law in origin of Quantum Mechanics

Course Outcomes:

CO 1: Student gains the knowledge on Fundamentals of Thermodynamics

CO 2: Student gets a thorough knowledge different types of reversible and irreversible engines

CO 3: Student gets a thorough knowledge on dynamics of Heat flow.

CO 4: Student gets a thorough knowledge on various degrees of freedom and molecular movement.

CO 5: Finds the evolution of Quantum Mechanics, a new branch of Physics

5. Wave and Oscillations (PHY-105)

Course Objective:

1. To inculcate the fundamentals of Mechanics
2. To understand the importance of various forces in day-to-day life.
3. To comprehend the dynamics of fluids.
4. To understand elastic properties of solids.
5. To understand the role of relative dynamics in observing the celestial objectsand universe

Course Outcomes:

CO 1: Student gains the knowledge on Fundamentals of Mechanics

CO 2: Student gets a thorough knowledge different types of forces that make life smoother.

CO 3: Student gets a thorough knowledge on fluid dynamics.

CO 4: Student gets a thorough knowledge on elastic properties of solids.

CO 5: Finds the evolution of theories for understanding the Universe and thedynamic nature of Universe.

6. Matrices and Statistics (MA-101)

Course Objective:

1. Develop an understanding of the principles of statics
2. Develop an ability to analyze problems in a systematic and logical manner, including the ability to draw free-body diagrams.
3. Ability to analyze the statics of trusses, frames and machine.
4. Ability to apply laws of statics.
5. To know the knowledge of equilibrium conditions of a static bod

Course Outcomes:

CO 1: An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.

CO 2: An understanding of the analysis of distributed loads.

CO 3: A knowledge of internal forces and moments in members.

CO 4: An ability to calculate centroids and moments of inertia

7.Calculus (MA-103)

Course Objective:

1. Use the fact that the derivative is the slope of the tangent line to the curve at a given point to help determine the derivatives of simple linear functions.
2. Determine whether the equation of a function given is differentiable or continuous at a particular value of x.
3. Determine the information from a graph that when the second derivative is positive the graph is concave upward, when the second derivative is negative the graph is concave downward, and when there is a switch in sign there is an inflection point.
4. Understand the various forms of a line including: standard form, point slope form, and slope intercept form.
5. Calculate definite integrals that may involve logarithms, exponentials, polynomials, and powers by using the Fundamental Theorem of Calculus

Course Outcomes:

1. understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
2. locate the x and y intercepts, any undefined points, and any asymptotes.
3. apply the techniques from the previous section to graph a fourth degree polynomial or higher
4. determine if there is any symmetry to aid in the graphing process.
5. determine the point(s) of intersection of pairs of curves

8. Three-Dimensional Geometry (MA-105)

Course Objective:

1. The course is intended to provide the students up-to-date knowledge about fundamental Real Analysis.

2. To increase student's awareness and appreciation for Real Analysis functions
3. To refresh the basic knowledge of about Real Analysis is just a fancy way of describing topics in Real Analysis that require a bit more thought and work
4. To update knowledge on just applications of principles from basic Real Analysis, such as pure mathematics.

Course Outcomes:

CO 1: Understand how Real Analysis raw materials for growth

CO 2: Have comprehensive exposure to the subject of Real Analysis

CO 3: Develop the knowledge and confidence to pure Mathematics Understand the role of Real Analysis

SCHOOL OF BASIC AND APPLIED SCIENCES
(Scheme of Studies & Examinations w. e. f. 2022-25 onwards)
B. Sc. (Computer Science) I Year (II Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination Scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Computer Science	COM-102	Computer Fundamentals and Programming in C - II	2	0	20	30	50	3	2
2		COM-104	Computer Architecture & Networking - II	2	0	20	30	50	3	2
3		COM-106	Practical & Viva-voce (Based on Paper- COM-102	2	0	20	30	50	3	2
5	Physics	PHY-102	Mathematical Physics	2	0	20	30	50	2	2
6		PHY-104	Semiconductor Devices	2	0	20	30	50	2	2
7		PHY-106	Laser and fiber optics	2	0	20	30	50	2	2
8		PHY-108	Physics Lab-II		6	20	30	50	4	3
9	Mathematics	MA-102	Sequences and Series& Trigonometry	2	0	20	30	50	3	2
10		MA-104	Ordinary Differential Equations	2	0	20	30	50	3	2
11		MA-106	Vector Calculus and Geometry	2	0	20	30	50	3	2
12	Open Elective Paper			2	0	20	30	50	3	2
TOTAL				20	12			550		23

1. Computer Fundamentals and Programming in C – II (COM-102)

Course Objective:

1. Develop C program
2. To Learn data types in C
3. To provide knowledge and skill to the students about mathematical and logical operations.
4. To understand the control statements
5. To understand and implement function, array, strings, structure and pointer

Course Outcomes:

CO 1: To know about the basics concept of Algorithms and flow chart of a problem in computer
CO 2: Understand I/O operations in your C program.
CO 3: Control the sequence of the program and give logical outputs
CO 4: Apply code reusability with functions and pointers
CO 5: Implement structure and strings in your C program

2. Computer Architecture & Networking – II (COM-104)

Course Objectives:

1. Basic concept and structure of CPU and explain different types of addressing modes
2. Understand the basic concept of computer network
3. To provide the knowledge reference models OSI and TCP/IP.

Course Outcomes:

CO 1: Know about the basics of CPU and different addressing mode.
CO 2: Understand the basic of direct memory access (DMA)
CO3: Explain the basics of computer network and different type of network topology.
CO 4: Understand the differentiate between various type of computer network
CO 5: Understand the basic knowledge of reference model OSI, TCP/IP.

3. Mathematical Physics (PHY-102)

Course Objective:

1. To inculcate the fundamentals of Mathematics
2. To understand Line, surface and volume Integrals.
3. To comprehend Matrices and different matrices.
4. To understand Convergence, divergence, Taylor series and different complexfunctions
5. To understand Legndre and Hermite polynomials, orthonormality properties.

Course Outcomes:

CO 1: Student gains the knowledge on fundamentals of Mathematics

CO 2: Student gets a thorough knowledge on Line, surface and volume Integrals.

CO 3: Applications of Matrices for scientific problem solving.

CO 4: Applies the Various principles of Mathematics for reducing the error measurements in scientific problems.

CO 5: Applies the Complex function in complex system analysis

4. Semiconductor Devices (PHY-104)

Course Objective:

1. To inculcate the fundamentals of Semiconductors
2. To understand Working of Transistor operations.
3. To comprehend the construction Amplifiers and biasing an Amplifier.
4. To achieve the State of Oscillation in Feedback Amplifiers.
5. To Construct and verify different types of Oscillators.

Course Outcomes:

CO 1: Student gains the knowledge on basic principles of Semiconductor Technology.

CO 2: Student gets a thorough knowledge on basics of Transistors (NPN, PNP,CE, CB, CC)

CO 3: Student gains the demonstrated knowledge on different applications of Amplifiersin real time.

CO 4: Gains a comprehensive knowledge on Positive and Negative Feedback Amplifiersand its applications

CO 5: Gains a demonstrated knowledge on different types of Oscillators.

5.Laser and fiber optics (PHY-106)

Course Objective:

1. To inculcate the fundamentals of Optical Fibre communication
2. To understand Principles of Lasers functioning.
3. To comprehend the construction of a Hologram.

4. To understand the optical Fibre communication system.
5. To augment scientific temperament in modern digital communication

Course Outcomes:

CO 1: Student gains the knowledge on basic principles of optical Fibre communication.

CO 2: Student gets a thorough knowledge on basics of Laser functioning and different types of lasers and their applications.

CO 3: Student gains the demonstrated knowledge on storing and retrieving information from Holograms and the principles behind it.

CO 4: Gains a comprehensive knowledge on various blocks of optical Fibre communication systems including source, couplers, receivers, sensors.

CO 5: Gains a demonstrated knowledge on digital communication system.

6.Sequence and Series Trigonometry (MA-102)

Course Objective:

1. Formulate and prove conjectures about numeric patterns.
2. Produce rigorous arguments (proofs) centered on the material of number theory, most notably in the use of Mathematical Induction and/or the Well Ordering Principal in the proof of theorems.
3. Evaluate trigonometric and inverse trigonometric functions.
4. Solve trigonometric equations and applications.
5. Apply and prove trigonometric identities.

Course Outcomes:

CO1: Write programs/functions to compute number theoretic functions.

CO 2: Use mathematical induction and other types of proof writing techniques.

CO3: Evaluate trigonometric and inverse trigonometric functions.

CO4: Solve trigonometric equations and applications.

CO5: Apply and prove trigonometric identities.

7.Ordinary Differential Equations (MA-104)

Course Objective:

1. Evaluate first order differential equations including separable, homogeneous, exact, and linear
2. Solve second order and higher order linear differential equations.
3. Create and analyze mathematical models using higher order differential equations tosolve application problems such as harmonic oscillator and circuits.
4. Solve differential equations using variation of parameters
5. Solve linear systems of ordinary differential equations

Course Outcomes:

CO 1: Student will be able to solve first order differential equations utilizing the standardtechniques for separable, exact, linear, homogeneous, or Bernoulli cases.

CO 2: Student will be able to find the complete solution of a nonhomogeneous differentialequation as a linear combination of the complementary function and a particular solution.

CO 3: Student will be introduced to the complete solution of a nonhomogeneous differentialequation with constant coefficients by the method of undetermined coefficients.

CO 4: Student will be able to find the complete solution of a differential equation with constantcoefficients by variation of parameters.

CO 5: Student will have a working knowledge of basic application problems described bysecond order linear differential equations with constant coefficients.

8.Vector Calculus and Geometry (MA-106)

Course Objective:

1. Define vector fields.
2. Use the fundamental theorem of line integrals.
3. Use Green's theorem to evaluate line integrals along simple closed contours on theplane.
4. Compute the curl and the divergence of vector fields.
5. Apply Stokes' theorem to compute line integrals along the boundary of a surface.

Course Outcomes:

CO 1: Memorize definition of directional derivative and gradient and illustrate geometricmeanings with the aid of sketches.

CO 2: Memorize theorem relating directional derivative to gradient and reproduce proof.

CO 3: Calculate directional derivatives and gradients.

CO 4: Apply gradient to solve problems involving normal vectors to level surfaces.

CO 5: Explain the concept of a vector integration a plane and in space.

SCHOOL OF BASIC AND APPLIED SCIENCES
(Scheme of Studies & Examinations w. e. f. 2022-25 onwards)
B. Sc. (Computer Science) II Year (III Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Computer Science	COM-201	Data and File Structures - I	2	0	20	30	50	3	2
2		COM-203	Object-oriented Design and C++ - I	2	0	20	30	50	3	2
3		COM-205	Practical & Viva-voce (Based on Paper COM-201 & 203)	2	0	20	30	50	3	2
5	Physics	PHY-201	Electrostatics	2	0	20	30	50	3	2
6		PHY-203	Magnetism	2	0	20	30	50	3	2
7		PHY-205	Elective Paper	2	0	20	30	50	3	2
8		PHY-207	Physics Lab-III	0	6	20	30	50	4	3
9	Mathematics	MA-201	Advance Calculus	2	0	20	30	50	3	2
10		MA-203	Partial Differential Equations	2	0	20	30	50	3	2
11		MA-205	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	2	20	30	50	3	2
				20	**14**			**550**		**23**

1. Data and File Structures – I (COM-201)

Course Objective:

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of writing efficient programs.
3. Apply algorithms to solve the problems

Course Outcomes

CO 1: Understand the concept of Dynamic memory management, data types, algorithms.

CO 2: Understand basic data structures such as arrays, linked lists, stacks and queues.

CO 3: Describe the hash function and concepts of collision and its resolution methods

CO 4: Solve problem involving graphs, trees and heaps

CO 5: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

2. Object-oriented Design and C++ - I (COM-203)

Course Objective:

1. The basic programming and OOPs concepts and Creating C++ programs
2. Arranging same data systematically with arrays
3. Classes and objects in C++

Course Outcomes:

CO 1: Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects.

CO 2: Understand dynamic memory management techniques using pointers, constructors, destructors, etc

CO 3: Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.

CO 4: Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.

CO 5: Demonstrate the use of various OOPs concepts with the help of programs.

3.Electrostatics (PHY-201)

Course Objective:

1. To inculcate the fundamentals of Electrostatics
2. To understand the importance of Gauss and Poisson and Laplace Equations.
3. To comprehend effects of electric fields and their boundaries.
4. To understand Capacitance, types of capacitors.
5. To understand the role of dielectrics in capacitance

Course Outcomes:

CO 1: Student gains the knowledge on Fundamentals of static electricity

CO 2: Student gets a thorough knowledge Gauss and Laplace applications.

CO 3: Various advantages and Applications of Capacitors

CO 4: Studies the boundary conditions for far field electricity.

CO 5: Finds the applications of static electricity in day-to-day life

4. Magnetism (PHY-203)

Course Objective:

1. To inculcate the fundamentals of Magnetism
2. To understand principles of Electromagnetism.
3. To comprehend effects of electric and magnetic fields and their inter relation.
4. To understand classification of magnetic materials.
5. To understand energy losses in magnetizing and demagnetizing a magneticmaterial.

Course Outcomes:

CO 1: Student gains the knowledge on fundamentals of Magnetism

CO 2: Student gets a thorough knowledge on principles of Electromagnetism.

CO 3: Applications of electric fields and magnetic fields to various materials

CO 4: Studies the dia, para, ferro, anti ferro and ferri magnetic materials

CO 5: Hysteresis loss in ferro magnetic materials.

5.Optics (PHY-205)

Course Objective:

1. To inculcate the fundamentals of Electromagnetic nature of light.
2. To understand optical properties of light.
3. To comprehend types of aberrations and their corrections.
4. To understand different eye pieces and various methods to producecollimated parallel beams of light.
5. To understand diffraction and its classification.

Course Outcomes:

CO 1: Student gains the knowledge on Electromagnetic nature of light.

CO 2: Student gets a thorough knowledge optical properties of light.

CO 3: Applications of different techniques to correct the aberrations.

CO 4: Studies different eye pieces and various methods to produce collimatedparallel beams of light.

CO 5: Finds the applications of diffraction and its classification in day – to – day life.

6.Advance Calculus (MA-201)

Course Objective:

1. The course is intended to provide the students up-to-date knowledge about fundamental Calculus.
2. To increase student's awareness and appreciation for calculus functions.
3. To refresh the basic knowledge of about Advanced calculus is just a fancy way of describing topics in calculus that require a bit more thought and work
4. To update knowledge on just applications of principles from basic calculus, such as derivatives, differentiation

Course Outcomes:

CO 1: Understand raw materials for growth calculus functions

CO 2: Have comprehensive exposure to the subject of Advanced Calculus

CO 3: Develop the knowledge and confidence to pursue advanced courses Understand the role of Advanced calculus

7.Partial Differential Equation (MA-203)

Course Objective:

1. Introduce students to partial differential equations.
2. Introduce students to how to solve linear Partial Differential with different methods.
3. To derive heat and wave equations in 2D and 3D.
4. Find the solutions of PDEs are determined by conditions at the boundary of the spatial domain and initial conditions at time zero.
5. Technique of separation of variables to solve PDEs and analyze the behaviour of solutions in terms of eigen function

Course Outcomes:

CO1: Classify partial differential equations and transform into canonical form

CO 2: Solve linear partial differential equations of both first and second order

CO 3: Apply partial derivative equation techniques to predict the behaviour of certain Phenomena.

CO 4: Apply specific methodologies, techniques and resources to conduct research and Produce innovative results in the area of specialization.

CO 5: Extract information from partial derivative models in order to interpret reality.

SCHOOL OF BASIC AND APPLIED SCIENCES
(Scheme of Studies & Examinations w .e. f. 2022-25 onwards)
B. Sc. (Computer Science) II Year (IV Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Computer Science	COM-202	Data and File Structures - II	2	0	20	30	50	3	2
2		COM-204	Object-oriented Design and C++ - II	2	0	20	30	50	3	2
3		COM-206	Practical & Viva-voce (Based on Paper COM-202 and COM-204)	2	0	20	30	50	3	2
5	Physics	PHY-202	Statistical Mechanics	2	0	20	30	50	2	2
6		PHY-204	Quantum Mechanics-I	2	0	20	30	50	2	2
7		PHY-206	Elective Paper	2	0	20	30	50	2	2
8		PHY-208	Physics Lab-IV		6	20	30	50	4	3
9	Mathematics	MA-202	Linear programming	2	0	20	30	50	3	2
10		MA-204	Special Functions and Integral Transforms	2	0	20	30	50	3	2
11		MA-206	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				**20**	**12**			**550**		**23**

1.Data and File Structures – II (COM-202)

Course Objective

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of writing efficient programs.
3. Apply algorithms to solve the problems

Course Outcomes:

CO 1: Understand the concept of Dynamic memory management, data types, algorithms.

CO 2: Understand basic data structures such as arrays, linked lists, stacks and queues.

CO 3: Describe the hash function and concepts of collision and its resolution methods

CO 4: Solve problem involving graphs, trees and heaps

CO 5: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

2. Object-oriented Design and C++ - II (COM-204)

Course Objective:

1. The basic programming and OOPs concepts and Creating C++ programs
2. Arranging same data systematically with arrays
3. Classes and objects in C++

Course Outcomes:

CO 1: Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects.

CO 2: Understand dynamic memory management techniques using pointers, constructors, destructors, etc

CO 3: Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.

CO 4: Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.

CO 5: Demonstrate the use of various OOPs concepts with the help of programs.

3.Statistical Mechanics (PHY-202)

Course Objective:

1. To inculcate the fundamentals of Statistical Mechanics
2. To understand types of ensembles (Micro, Canonical and Grand Canonical)
3. To comprehend Partition function, Gibb's Paradox.
4. To understand classification of classical and Quantum statistics.
5. To understand the role of Quantum statistics in foundation of QuantumMechanics.

Course Outcomes:

CO 1: Student gains the knowledge on fundamentals of Statistical Mechanics

CO 2: Student gets a thorough knowledge on different systems and ensembles.

CO 3: The role of partition function in scientific problem solving.

CO 4: Applies the statistics accordingly to different classes of particles.

CO 5: Applies the statistics for various quantum possible applications.

4.Quantum Mechanics-I (PHY-204)

Course Objective:

1. To inculcate the fundamentals of Quantum Mechanics
2. To understand the nature of matter, de Broglie Hypothesis, Compton effect
3. To comprehend behaviour of matter at atomic level
4. To understand discrete energy levels, particle dynamics and variousoperations.
5. To understand the behaviour of particle in various circumstances viz potential

well, potential barrier.

Course Outcomes:

CO 1: Student gains the knowledge on fundamentals of Quantum Mechanics

CO 2: Student gets a thorough knowledge on dual nature of matter and its verification.

CO 3: The dynamics of fundamental particles are studied using Schrodinger time dependent and time independent wave equations.

CO 4: Eigen states and eigen values gives the knowledge of allowed and forbiddenenergy regions.

CO 5: Applies the Quantum conditions for various quantum applications.

5.Optics-II (PHY-206)

Course Objective:

1. To inculcate the fundamentals properties of light
2. To understand the mechanism behind various polarizations of light.
3. To comprehend the diffraction phenomenon of light.
4. To understand the basic principles of 3 – D photography/ Holography.
5. To understand the 3level laser system.

Course Outcomes:

CO 1: Student gains the knowledge on basic principles of light and its applications.

CO 2: Student gets a thorough knowledge on types of polarization and its production and applications.

CO 3: Student gains the demonstrated knowledge on diffraction phenomenon of light.

CO 4: Gains a comprehensive knowledge on construction of a hologram

CO 5: Gains a demonstrated knowledge on 3 level laser system and atomic interference lasing without inversion.

6.Linear Programming (MA-202)

Course Objective:

1.To get familiarize with the mathematical formulation of a real world problem.

2. To acquaint with the problem-solving techniques theoretically as well as graphically.

3. To tackle several parameters into account while dealing with the problem.

4. To make aware the students about the applications of various forms of Linear Programming.

Course Outcomes:

CO1: Understand a basic thoughtfulness for linear programming problem

CO2: Apply the techniques of LPP to solve real world problems

CO3: Judge Importance of solution obtained in terms of uniqueness, bound and optimality

CO4: Formulate mathematical model for management and technical problems using LPP concepts.

CO5: Create an interest to solve transportation and assignment problems with its physical significance.

7. Special Functions and Integral (MA-204)

Course Objective:

1. To analyze properties of special functions by their integral representations and symmetries.
2. To determine properties of Fourier, transform which may be solved by application ofspecial functions.
3. To determine properties of Laplace, transform which may be solved by application ofspecial functions.
4. To determine properties of Legendre Polynomial which may be solved by application ofspecial functions.

Course Outcomes:

CO 1: understand integral calculus and special functions of various engineering problem and to know the application of some basic mathematical methods via all these special functions.

CO 2: explain the applications and the usefulness of these special functions.

CO 3: classify and explain the functions of different types of differential equations.

CO4: understand purpose and functions of the gamma and beta functions, Fourier series and Transformation.

CO 5: use the gamma function, beta function and special functions to: evaluate different typesof integral calculus problems and Fourier series to solve differential equations.

SCHOOL OF BASIC AND APPLIED SCIENCES
(Scheme of Studies & Examinations w. e. f. 2022-25 onwards)
B. Sc. (Computer Science) III Year (V Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Computer Science	COM-301	Database Management System, Oracle and Visual Basic - I	2	0	20	30	50	3	2
2		COM-303	Software Engineering - I	2	0	20	30	50	3	2
3		COM-305	Practical & Viva-voce (Based on Paper COM-301)	2	0	20	30	50	3	2
5	Physics	PHY-301	Solid State Physics	2	0	20	30	50	3	2
6		PHY-303	Advance Electronic	2	0	20	30	50	3	2
7		PHY-305	Elective Paper	2	0	20	30	50	3	2
8		PHY-307	Physics Lab-V	0	6	20	30	50	4	3
9	Mathematics	MA-301	Real Analysis	2	0	20	30	50	3	2
10		MA-303	Modern algebra	2	0	20	30	50	3	2
11		MA-305	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			550		23

1. Database Management System, Oracle and Visual Basic -I(COM-301)

Course Objective:

1. Discuss Database management systems, databases and its applications
2. Familiarize the students with a good formal foundation on the relational model.
3. Outline the various systematic database design approaches
4. Describe the concepts of transactions and transaction processing and the issues, techniques related to concurrency and recovery manager.
5. Explore the File organizations, indexing and hashing mechanisms.

Course Outcomes:

CO1: Model Entity-Relationship diagrams for enterprise level databases

CO 2: Formulate Queries using SQL and Relational Formal Query Languages

CO 3: Apply different normal forms to design the Database

CO 4: Summarize concurrency control protocols and recovery algorithms

CO 5: Identify suitable Indices and Hashing mechanisms for effective storage and retrieval of Data

2.Software Engineering-I (COM-303)

Course Objective

1. To provide the idea of decomposing the given problem into Analysis, Desing, Implementation, Testing and Maintenance phases
2. To provide an idea of using various process models in the software industry according to given circumstances.
3. To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.

Course Outcomes:

CO 1: Students will be able to decompose the given project in various phases of a lifecycle.

CO 2: Students will be able to choose appropriate process model depending on the user requirements.

CO 3: Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.

CO 4: Students will be able to know various processes used in all the phases of the product.

CO 5: Students can apply the knowledge, techniques, and skills in the development of a software product

3.Solid State Physics (PHY-301)

Course Objective:

1. To inculcate the fundamentals of Crystal structure
2. To understand different techniques for studying crystal structures.
3. To comprehend reciprocal lattice and Bravais lattice.
4. To understand different types of magnetic materials
5. To understand Superconductivity.

Course Outcomes:

CO 1: Student gains the knowledge on fundamentals of Crystal structure

CO 2: Student gets a thorough knowledge on different techniques for studyingcrystal structures

CO 3: Applications of reciprocal lattice for crystal structure studies.

CO 4: Studies the different types of magnetic materials

CO 5: Studies the real time applications of superconducting materials and thecorresponding science.

4.Advance Electronics (PHY-303)

Course Objective:

1. To inculcate the fundamentals of Uni Junction Transistors like JFET,MOSFET
2. To understand basic circuit components used in electronic circuits and itsvarious applications.
3. To comprehend design of Op amps for mathematical operations.
4. To understand fundamentals of Signal modulation
5. To understand fundamentals of digital electronics

Course Outcomes:

CO 1: Student gains the knowledge on functioning of FET and MOSFET forpractical applications

CO 2: Student gets a thorough knowledge functioning of OP AMPs

CO 3: Student applies OP Amps for various mathematical operations likeaddition, subtraction, integration, differentiation, etc.

CO 4: Studies the Amplitude and frequency modulations and its detection techniques.

CO 5: Finds the applications of digital electronics in day – to – day life and could design them.

5.Quantum Mechanics (PHY-305)

Course Objective:

1. To inculcate the fundamentals of Quantum Mechanics.
2. To understand the application of various operators on wave function.
3. To comprehend motion of quantum particles in quantum states.
4. To understand behaviour of quantum particle in different quantum states.
5. To understand motion of particle in potential barriers and potential wells.

Course Outcomes:

CO 1: Student gains the knowledge on fundamentals of Quantum Mechanics.

CO 2: Student gets a thorough knowledge on various operators on wave function.

CO 3: Application of Schrodinger mechanics to study the motion of quantumparticle.

CO 4: Studies the behaviour of quantum particle in different quantum states

CO 5: Studies the motion of particle in potential barriers and potential wells.

6.Real Analysis (MA-301)

Course Objective:

1. Define the real numbers, least upper bounds, and the triangle inequality.
2. Define functions between sets; equivalent sets; finite, countable and uncountable sets.Recognize convergent, divergent, bounded, Cauchy and monotone sequences.
3. Calculate the limit superior, limit inferior, and the limit of a sequence.

4. Recognize alternating, convergent, conditionally and absolutely convergent series.
5. Determine if subsets of a metric space are open, closed, connected, bounded, totallybounded and/or compact.
6. Determine if a function on a metric space is discontinuous, continuous, or uniformlycontinuous.

Course Outcomes:

CO 1: describe fundamental properties of the real numbers that lead to the formal developmentof real analysis.

CO 2: comprehend rigorous arguments developing the theory underpinning real analysis.

CO 2: demonstrate an understanding of limits and how they are used in sequences, series,differentiation and integration.

CO 3: construct rigorous mathematical proofs of basic results in real analysis.

CO 4: appreciate how abstract ideas and rigorous methods in mathematical analysis can beapplied to important practical problems.

7.Modern Algebra (MA-303)

Course Objective:

1. Explain the fundamental concepts of advanced algebra such as groups and rings and their role in modern mathematics and applied contexts
2. Accurate and efficient use of advanced algebraic techniques
3. Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from advanced algebra
4. Apply problem-solving using advanced algebraic techniques applied to diverse situations in physics, engineering and other mathematical contexts

Course Outcomes:

CO 1: The importance of a ring as a fundamental object in algebra.

CO 2: The importance of group in algebra.

CO 3: The concept of a module as a generalization of a vector space and an Abelian group.

CO 4: Homomorphism and isomorphism, Cayley's theorem, Normal subgroups, Quotient group.

CO 5: The concept of Sub ring Homomorphism and isomorphism, field, Field of quotients of an integral domain

SCHOOL OF BASIC AND APPLIED SCIENCES
(Scheme of Studies & Examinations w. e. f. 2022-25 onwards)
B. Sc. (Computer Science) III Year (VI Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination Scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Computer Science	COM-302	Database Management System, Oracle and Visual Basic - II	2	0	20	30	50	3	2
2		COM-304	Software Engineering - II	2	0	20	30	50	3	2
3		COM-306	Practical & Viva-voce (Based on Paper COM-302)	2	0	20	30	50	3	2
5	Physics	PHY-302	Atomic, Molecular physics	2	0	20	30	50	3	2
6		PHY-304	Nuclear Physics	2	0	20	30	50	3	2
7		PHY-306	Elective Paper	2	0	20	30	50	3	2
8		PHY-308	Physics Lab-VI	0	6	20	30	50	4	3
9	Mathematics	MA-302	Complex Analysis	2	0	20	30	50	3	2
10		MA-304	Linear Algebra	2	0	20	30	50	3	2
11		MA-306	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			550		23

1.Database Management System, Oracle and Visual Basic-II (COM-302)

Course Objective

1. Discuss Database management systems, databases and its applications
2. Familiarize the students with a good formal foundation on the relational model.
3. Outline the various systematic database design approaches
4. Describe the concepts of transactions and transaction processing and the issues, techniques related to concurrency and recovery manager.
5. Explore the File organizations, indexing and hashing mechanisms.

Course Outcomes:

CO1: Model Entity-Relationship diagrams for enterprise level databases

CO 2: Formulate Queries using SQL and Relational Formal Query Languages

CO 3: Apply different normal forms to design the Database

CO 4: Summarize concurrency control protocols and recovery algorithms

CO 5: Identify suitable Indices and Hashing mechanisms for effective storage and retrieval of Data

2.Software Engineering-II (COM-304)

Course Objective:

1. To provide the idea of decomposing the given problem into Analysis, Desing, Implementation, Testing and Maintenance phases
2. To provide an idea of using various process models in the software industry according to given circumstances.
3. To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.

Course Outcomes:

CO 1: Students will be able to decompose the given project in various phases of a lifecycle.

CO 2: Students will be able to choose appropriate process model depending on the user requirements.

CO 3: Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.

CO 4: Students will be able to know various processes used in all the phases of the product.

CO 5: Students can apply the knowledge, techniques, and skills in the development of a software product

3. **Atomic, Molecular physics (PHY-302)**

Course Objective:

1. To inculcate the fundamentals of atomic structure
2. To understand fine structure of hydrogen atom spectrum.
3. To comprehend effects of electric and magnetic fields on spectral lines.
4. To understand rotational, vibrational spectra of a molecule
5. To understand Raman Effect.

Course Outcomes:

CO 1: Student gains the knowledge on various models of atomic structure

CO 2: Student gets a thorough knowledge on singly ionized atoms like hydrogenatomic spectra.

CO 3: Applications of electric fields and magnetic fields to alter the energy bandspectra of atoms.

CO 4: Studies the rotational, vibrational spectra of various molecules for understanding the properties of molecules

CO 5: Finds the applications of Raman effect in real time applications.

4. **Nuclear physics (PHY-304)**

Course Objective:

1. To inculcate the fundamentals of atomic Nuclei
2. To understand nuclear radiation decay process.
3. To understand various laws which govern nuclear decay processes.
4. To understand the role of nuclear accelerators
5. To comprehend various laws that govern nuclear reactions.

Course Outcomes:

CO 1: Student gains the knowledge on various nuclear models and properties ofnuclei

CO 2: Student gets a thorough knowledge on alpha, beta, gamma decay

CO 3: The Geiger Nuttel law, Range of alpha particles and their disintegrationlaws are thoroughly understood.

CO 4: Types of nuclear accelerators and their basic principles of operation arethoroughly studied.

CO 5: Student gains knowledge on how to control a nuclear chain reaction and how to attain the nuclear stability.

5.Complex Analysis (MA-302)

Course Objective

1. Understand how complex numbers provide a satisfying extension of the real numbers;
2. Learn techniques of complex analysis that make practical problems easy (e.g. graphicalrotation and scaling as an example of complex multiplication);
3. Appreciate how mathematics is used in design (e.g. conformal mapping);
4. Unlearn (if ever learned) the notion that mathematics is all about getting "the right answer";
5. To understand signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.

Course Outcomes:

CO 1: Students will be able to understand the concept of limit for real functions and be able to calculate limits of standard functions and construct simple proofs involving this concept;

CO 2: Student will be introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions;

CO 3: Student will understand the concept of the differentiability of a real valued function and be familiar with the statements and proofs of the standard results about differentiable real functions.

CO 4: Student will have a working knowledge of differentiability for complex functions and be familiar with the Cauchy-Riemann equations;

CO 5: Student will evaluate integrals along a path in the complex plane and understand the statement of Cauchy's Theorem.

6.Linear Algebra (MA-304)

Course Objective

1. Solve systems of linear equations,
2. Recognize the concepts of the terms span, linear independence, basis, and dimension, andapply these concepts to various vector spaces and subspaces,
3. Use matrix algebra and the related matrices to linear transformations,
4. Compute and use determinants,
5. Compute and use eigenvectors and eigenvalues

Course Outcomes:

CO 1: Identify and construct linear transformations of a matrix.

CO 2: Characterize linear transformations as onto, one-to-one.

CO 3: Solve linear systems represented as linear transforms.

CO 4: Express linear transforms in other forms, such as as matrix equations, and vector equations.

CO 5: Characterize a set of vectors and linear systems using the concept of linear independence.

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)
RAFFELS UNIVERSITY, NEEMRANA
MSc (Chemistry)
(2 Years Degree Program)

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)
RAFFELS UNIVERSITY, NEEMRANA
M.Sc. (Chemistry) (2 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

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Program objectives

- To impart an advance level theoretical and practical knowledge in the major fields of inorganic, organic, physical, analytical, material and computational chemistry.
- To engaged in research projects for gaining wide spectrum of subject knowledge and research experience.
- To focused on skill enhancement in the core chemistry with practical expert hands which will make students employable in academia and industries.
- To make responsible citizen to serve the nation

Program outcomes

After completing M.Sc. Chemistry program, students will be able to

1. understand, analyze and interpret various chemical phenomena and process
2. develop skill in planning and conducting advanced chemical experiments as well as accurately record and analyze the results of such experiments
3. develop new molecules or innovative techniques with industrial and societal applications
4. develop a research culture and implementation of the policies to tackle the burning global issues.
5. engage in independent learning in the broadest context of scientific advancement
6. generate new scientific insights or to the innovation of new applications of chemical research
7. communicate the principles and practice of chemical sciences in a clear and concise manner to both science community and society
8. address issues of environment, health and development from a chemical perspective

9. to act with integrity and good ethics in their profession and their obligation to society.

Course Code: CH -401

Title of the Course: INORGANIC CHEMISTRY-I

Course Objectives: To understand molecular symmetry, chemical bonding, structure of coordination compounds, cluster, ring and chain compounds of main group elements, inorganic reaction mechanism, environmental and bioinorganic chemistry.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	get basic ideas of theories of Bonding in coordination complex
UNIT-II	Understand about lanthanides and Actinides
UNIT – III	learn about cluster, ring and chain compounds of main group elements
UNIT-IV	Address chemistry of non-transition elements chemical perspective and able to explain the function of various elements in biological systems.
UNIT – V	obtain theoretical understanding of chemistry of non transion elements ii and non aques solvent

Course Code: CH -403

Title of the Course: ORGANIC CHEMISTRY – I

Course Objectives: To understand the structure, stereochemistry and reaction pathways of organic molecules.

After completion of this course successfully, the students will be able ……	
UNIT – I	get a basic idea about the nature of bonding in organic molecules and the role of structures in interpreting organic reactions.
UNIT-II	an exposure about the stereochemistry of molecules and different techniques of asymmetric synthesis.
UNIT – III	get an idea about the mechanistic pathway of various substitution reactions.
UNIT-IV	study the Chromatographic techniques
UNIT – V	learn the mechanistic pathways of organic chemistry under the terms of addition and elimination reactions.

Course Code: CH-405

Title of the Course: PHYSICAL CHEMISTRY-I

Course Objectives: To understand the thermodynamics and electrochemistry processes

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	get basic idea about fundamental laws of thermodynamics
UNIT-II	learn applications of thermodynamics II
UNIT – III	be introduced about the ELECTROCHEMISTRY
UNIT-IV	Impart knowledge on the fundamentals of Electrochemistry II chemical
UNIT – V	study the kinetics of different types of reactions and methodologies

Course Code: CH-407

Title of the Course: Mathematics for Chemist

Course Objectives: To know
Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	get the fundamentals vectors and matric and determinates
UNIT-II	study the differential and integral calculus
UNIT – III	learn the **Graphical Representation of Equations:**
UNIT-IV	impart knowledge on **Partial Differentiation:**
UNIT – V	study the **Elements of Algebraic and Trigonometric Functions**

Course Code: CH -409

Title of the Course: Biology for CHEMIST

Course Objectives: To analyze biological aspect of chemical reaction complexes.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT-I	analyze **Cell Structure and Functions**
UNIT-II	estimate **Lipids**
UNIT-III	gather information about lipids and proteins
UNIT-IV	analyze nucleic and Genetic Code
UNIT-V	Understand proteins and chemistry

Course Code: CH -411

Title of the Course: INORGANIC CHEMISTRY-lab-1
Course Objectives: Quantitative Analysis Preparation Inorganic Chemistry Lab-1 is for students to develop the skills and knowledge necessary to perform accurate and precise quantitative analysis of inorganic compounds.

By the end of the course, students should be able to:

Co:1Understand the basic principles of quantitative analysis, including gravimetry, titrimetric, and spectrophotometry.
CO:2 Design and execute quantitative analysis experiments for a variety of inorganic compounds.
CO:3Use a variety of analytical equipment, such as analytical balances, volumetric glassware, and UV-Vis spectrometers.
CO:4Calculate and report the results of quantitative analysis experiments accurately and precisely.

Course Code: CH -413

Title of the Course: ORGANIC CHEMISTRY-lab-1

Course Objective:
The MSC course outcome for Organic Chemistry Lab-: Qualitative Analysis and Organic Synthesis is for students to develop the skills and knowledge necessary to perform qualitative analysis and synthesis of organic compounds.

By the end of the course, students should be able to:
Course outcomes:

CO1: Identify the functional groups present in organic compounds using a variety of chemical tests.
CO2: Design and execute organic synthesis experiments to produce desired products.
CO3: Use a variety of laboratory techniques, such as crystallization, distillation, and chromatography, to purify and isolate organic compounds.
CO4: Calculate and report the yields of organic synthesis experiments.
CO5: Apply their knowledge of qualitative analysis and organic synthesis to solve problems in a variety of fields, such as medicinal chemistry, materials science, and environmental chemistry.

Course Code: CH -415

Title of the Course: Physical lab CHEMISTRY-lab-1

Course Objective: The MSC course outcome for Conductometry, Potentiometry, and pH Meter is for students to develop the skills and knowledge necessary to use these electrochemical techniques to solve problems in chemistry and related fields.

By the end of the course, students should be able to:

CO1:Understand the basic principles of conductometry, potentiometry, and pH measurement. Design and execute experiments using these techniques to measure the conductivity, potential, or pH of solutions.
CO2:Use a variety of electrochemical instruments, such as conductometers, potentiometers, and pH meters.
CO3:Analyze and interpret the results of electrochemical experiments accurately and precisely.
CO4:Apply their knowledge of electrochemical techniques to solve problems in a variety of fields, such as environmental chemistry, materials science, and analytical chemistry.
CO5:In addition to the general course outcomes listed above, MSC students may also be required to complete a capstone project or research thesis in electrochemical techniques. This will give them the opportunity to apply their knowledge and skills to solve a real-world problem in the field.

Course Learning Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	understand the magnetic properties of coordination compounds
UNIT-II	understand the electronic properties of coordination compounds
UNIT – III	know the chemical properties and applications of lanthanides and actinides
UNIT-IV	understand the structure, bonding, and reactivity of π-acid complexes
UNIT – V	design and develop new bio-inorganic model systems

Course Code: CHM -404

Title of the Course: ORGANIC CHEMISTRY-II

Course Objectives: To have an exposure in the understanding structure and mechanisms of organicions, reductions in organic reaction chemistry.

Course Learning Outcomes (COs)

After completion of this course successfully, the students will be able ……	
UNIT – I	get the fundamentals of reduction reaction of organic molecules by reducing agent. **Aliphatic Electrophilic Substitution**
UNIT-II	study the different approaches of **Aliphatic and Aromatic Nucleophilic Substitution**
UNIT – III	learn how organic reaction intermediates can be generated and reacted. **Free Radical Reaction**
UNIT-IV	gain an understanding of photochemical processes in organic synthesis.
UNIT – V	study the fundamentals of Pericyclic Reactions. **Addition to Carbon-Hetero Multiple Bonds**

Course Code: CH -406

Title of the Course:) Structure & Mechanism in Organic Chemistry-

Course Objectives: To learn basic concepts on symmetry and bonding, stereochemistry and spectroscopy of molecules. Also, to impart knowledge on front-line topics such as green chemistry, environmental chemistry and nanomaterials.

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able ……	
UNIT – I	learn fundamentals of symmetry and nature of bonding and structure of molecules.
UNIT-II	study basic concept on stereochemistry of various organic and inorganic molecules.
UNIT – III	gain knowledge on cutting-edge topics of green chemistry and environmental chemistry.
UNIT-IV	study basic concept of spectroscopic methods and their application for compound analysis.
UNIT – V	study basic concept and applications of chemistry of nanomaterials.

Course Code: CH -408

Title of the Course: QUANTUM CHEMISTRY AND MOLECULAR SPECTROSCOPY (Open Course-II)

Course Objectives: To learn the fundamentals of quantum mechanics and its applications to study the molecular spectroscopy

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……	
UNIT – I	understand operator algebra and application of Schrödinger wave equation
UNIT-II	realize theories of chemical bonding and their applications
UNIT – III	be introduced with electronic and microwave spectroscopy
UNIT-IV	know the fundamentals of infrared and Raman spectroscopy
UNIT – V	learn the fundamentals and applications of NMR spectroscopy

Course Code: CH-410

Title of the Course: Physical Chemistry –II

(Kinetics, Quantum Mechanics and Spectroscopy)

Course Objectives: To conduct fundamental (Kinetics, Quantum Mechanics and Spectroscopy

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT-I	**Able to understand Quantum Mechanics**.
UNIT-II	**Understand Chemical kinetics**
UNIT-III	**Apply the knowledge of Chemical Dynamics I**
UNIT-IV	**Analyses the Spectroscopical data**
UNIT-V	**Elucidate the data intepation of different spectroscopical data.**

After completion of this course successfully, the students will be able to……	
UNIT-I	**:** separate the mixture of organic compounds by TLC and Columnchromatography.
UNIT-II	separate and analyse the component of mixtures.
UNIT-III	synthesis some important organic molecules applying methodologies of some well-known name reactions.
UNIT-IV	isolate some bio-active natural products from the crude bio-organic materials.
UNIT-V	attain basic knowledge about computational chemistry.

Course Code: CHM -501

Title of the Course: INORGANIC CHEMISTRY-III

Course Objectives: Impart knowledge on organometallic compounds and their catalytic applications, Group Theory and its application in spectroscopy, nuclear radiation and measurement and supramolecular chemistry.

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……	
UNIT – I	understand the synthesis, structure, bonding, reactivity of various organometallic compounds
UNIT-II	understand homogeneous catalysis relevant to chemical and polymer industries.
UNIT – III	learn the basics of group theory and its application in chemistry. This knowledge may help them to learn other topics in chemistry like spectroscopy and coordination chemistry etc.
UNIT-IV	learn various nuclear radiations and their detection and measurement techniques
UNIT – V	provide insight into the various supramolecular interactions, molecular recognition, transport, translocation, self-assembly and molecular devices

Course Code: CHM -503

Title of the Course: ORGANIC CHEMISTRY – III

Course Objectives: To understand the properties, isolation, chemical synthesis of some bio-active natural product, lipids, proteins, enzymes, and heterocyclic compound. Also, to build a concept on the role of different reagents and green approach in organic synthesis.

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able……	
UNIT – I	acquire knowledge on how different reagents can be applicable in organic transformations.
UNIT-II	get an idea about the chemical synthesis and reactions of some important heterocyclic compounds.
UNIT – III	be aware of the essence and learn the concept of green chemistry and its applications in organic synthesis.
UNIT-IV	learn the isolation process, properties and chemical synthesis of some bio-active

	natural products.
UNIT – V	get basic idea about biogenesis process.

Course Code: CHM -503

Title of the Course: PHYSICAL CHEMISTRY-III

Course Objectives: An in-depth study of the statistical mechanics, chemistry of macromolecules and adsorption processes on solid surfaces

Course Learning Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	be introduced about the fundamentals of statistical thermodynamics
UNIT-II	learn the application of the concept of partition function
UNIT – III	understand the distribution functions and their applications
UNIT-IV	study the physical chemistry of macromolecules
UNIT – V	provide physical insight into adsorption processes on solid surfaces

Course Code: CHM -505

Title of the Course: APPLICATIONS OF SPECTROSCOPIC METHODS

Course Objectives: Structural evaluation of inorganic compounds by spectroscopic study like, IR, NMR, ESR, Mass and Mossbauer spectroscopy.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
Part A : Inorganic Chemistry	
UNIT – I	analyze spectroscopic information to find structural information of molecules
UNIT-II	assess structureof inorganic compounds using magnetic resonance spectroscopy (ESR, NMR)
UNIT – III	learn principle of mass spectroscopy and Mossbauer spectroscopy and structure elucidation of inorganic compounds
Part B: Organic Chemistry	
UNIT – I	To get basic idea and application of mass spectroscopy and UV-Visible spectroscopy
UNIT-II	To learn applications of IR spectroscopy in organic molecules.

UNIT – III	To be introduced about Continuous wave (CW) and Fourier-Transform (FT) NMR spectroscopy.
UNIT-IV	To get basic idea of 13C NMR spectroscopy and 2D NMR spectroscopy.

Course Code: CHMCC -509

Title of the Course: LABORATORY COURSE IN PHYSICAL CHEMISTRY

Course Objectives: Fundamental physical chemistry experiments to enable to work in academia and industry

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT-I	study the theories of common physical chemistry experiments
UNIT-II	prepare the solutions for the experiment
UNIT-III	perform the experiment and record the data in tabular form
UNIT-IV	analyze the results and plot of graphs
UNIT-V	present the principles, methodologies, observations and calculation in the laboratory notebook in a scientific manner

Course Code: CH -511

Title of the Course: ANALYTICAL AND COMPUTATIONAL CHEMISTRY

Course Objectives: Introduction to analytical techniques such as purification and separation, electrochemical analysis, thermal analysis and nuclear analysis and concept in computational chemistry

Course Learning Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	concept on various purification and separation techniques and their applications in compound analysis
UNIT-II	understanding different electrochemical methods and their application for various chemical analysis
UNIT – III	principle, instrumentation and applications of various thermal analysis and neutron activation analysis (NAA) and X-ray fluorescence spectroscopy (XRF)
UNIT-IV	basic structure and functioning of a computer and computer coding involving simple formula in chemistry
UNIT – V	concepts in computational chemistry consisting of various approximation and theory

Course Code: CH -513

Title of the Course: Organic Spectroscopy SPECIAL

Course Objectives: To bridge the fundamental ideas of chemistry to modern research and industry-related topics

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……	
UNIT – I	be introduced to UV
UNIT-II	understand the IR
UNIT – III	study NMR
UNIT-IV	learn MASS Spectroscopy
UNIT – V	know ORD and CD

Course Code: CH -515

Title of the Course: INORGANIC CHEMISTRY-IV
Course Objectives: To study organometallic compounds with multiple M-C bond and C-C bonded ligands, photochemical reactions of coordination compounds, application of radiochemical methods, bio-inorganic enzyme chemistry, crystal engineering and applications.

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……	
UNIT – I	understand the structure, bonding and reactivity of π-Coordination of C-C multiple bonds
UNIT-II	understand the basics of photochemistry and applications of photochemical reactions of coordination compounds
UNIT – III	get information of different radiochemical method of analysis
UNIT-IV	design new catalysts, new reactions and properties based on the fundamental insights received about different enzymes
UNIT – V	understand the molecular crystal design, formation and explore their

	applicability

Course Code: CH -517 ORGANIC CHEMISTRY –(Heterocyclic chemistry)

Title of the Course: ORGANIC CHEMISTRY – IV

Course Objectives: To get idea about the various applications of organic chemistry in the light of strategies and control.

After completion of this course successfully, the students will be able ……	
UNIT – I	gain exposure to the applications of heterocyclic chemistry
UNIT-II	get an idea about six membered heterocyclic with 2 heteroatoms
UNIT – III	acquire knowledge of the mechanistic yields.
UNIT-IV	develop the concept of protecting group chemistry
UNIT – V	gain an understanding of nucleoside and nucleotides .

Course Code: CH-519 C

Title of the Course: organic lab-IV

Course Objectives: An advanced knowledge about the organic techniques properties and processes

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	understand the different multistep synthesis
UNIT-II	Isolation of different chemicals
UNIT – III	viva

UNIT-IV	learn different approaches to derive the equation of state of the liquids
UNIT – V	study the chemical reactions and the relevant .

Course Code: CH -521

Title of the Course:, ORGANIC chemistry lab iv

Course Objectives: Impart basic knowledge on research problems and literature survey, designing new experiment, their analysis and interpretation of results.

Course Learning Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	understand titrimetric
UNIT-II	uv
UNIT – III	Amino acid
UNIT-IV	Protein
UNIT – V	carbhohydrates

Course Code: CH -523

Title of the Course: ORGANIC CHEMISTRY-II(Seminar)

Course Objectives: To understand molecular symmetry, chemical bonding, structure of coordination compounds, cluster, ring and chain compounds of main group elements, inorganic reaction mechanism, environmental and bioinorganic chemistry.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	get basic ideas **Electronic Spectra of Transition Metal Complexes**
UNIT-II	Understand **Magnetic Properties of transition metal complexes**
UNIT – III	learn about **Reaction Mechanism of Transition Metal Complexes – I**
UNIT-IV	**Reaction Mechanism of Transition Metal Complexes - II**
UNIT – V	Obtain theoretical **Metal-Ligand Equilibria in Solution**

Course Code: CH -525

Title of the Course: physical chemistry special-I (Seminar)

Course Objectives: To understand molecular symmetry, chemical bonding, structure of coordination compounds, cluster, ring and chain compounds of main group elements, inorganic reaction mechanism, environmental and bioinorganic chemistry.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	get basic ideas **Electrified interfied**
UNIT-II	Understand **Magnetic Properties of tr**
UNIT – III	learn about **Reaction Mechanism of Transition Metal Complexes – I**
UNIT-IV	**Reaction Mechanism of Transition Metal Complexes - II**
UNIT – V	Obtain theoretical **Metal-Ligand Equilibria in Solution**

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)
RAFFELS UNIVERSITY, NEEMRANA

MSc (Physics)

(2 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
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Program objectives

- To impart an advance level theoretical and practical knowledge in the major fields of Physics.
- To engaged in research projects for gaining wide spectrum of subject knowledge and research experience.
- To focused on skill enhancement in the basic and applied physics with practical expert hands which will make students employable in academia and industries.
- To make responsible citizen to serve the nation.

Program outcomes

After completing M.Sc. Physics program, students will be able to

1. Understand, analyze and interpret various phenomena and processes related to Physics and nature.
2. develop skill in planning and conducting advanced experiments as well as accurately record and analyze the results of such experiments
3. develop new methods or innovative techniques with industrial and societal applications
4. develop a research culture and implementation of the policies to tackle the burning global issues.
5. engage in independent learning in the broadest context of scientific advancement
6. generate new scientific insights or to the innovation of new applications of research
7. communicate the principles and practice of the sciences in a clear and concise manner to both science community and society
8. address issues of environment, health and development from a perspective
9. to act with integrity and good ethics in their profession and their obligation to society.

Course Code: **PHY-401**

Title of the Course: **Mathematical Physics**

Course Objectives: To impart knowledge about various mathematical tools employed to study physics problems.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	Calculate the eigenvalues and the eigenvectors of a square matrix and to find the spectral representation of a Hermitian matrix
UNIT-II	Learn about solution of second order linear ordinary differential equations, Generating function and recurrence relations
UNIT – III	Getting understanding of complex variable, limit, continuity and differentiability of function of complex variables
UNIT-IV	To learn about Fourier series, Fourier integral and Fourier transformations.

Course Code: **PHY-403**

Title of the Course: Classical Mechanics

Course Objectives: The course aims to develop an understanding of Lagrangian and Hamiltonian formulation which allow for simplified treatments of many complex problems in classical mechanics and provides the foundation for the modern understanding of dynamics.

After completion of this course successfully, the students will be able ……	
UNIT – I	Revise the knowledge of the Newtonian, student know to modern dynamics Lagrangian and Learn to define generalised coordinates, generalised velocities, generalised force and write Lagrangian for mechanical system in terms of generalised coordinates. Student also able to be learn D'Alembert's principle and Lagrange's equations,
UNIT-II	Student has developed the knowledge of modern mechanics like Hamiltonian formulations of classical mechanics and their applications in appropriate physical problems. The students also will be able to apply Legendre transformations and the Hamilton's equations of motion, cyclic coordinates and Conservation Theorems, Hamilton's equations from Hamilton's principle, the principle of least action.
UNIT – III	Student able to be learn Canonical transformations with examples of harmonic oscillator, Poisson's brackets, Equations of motion and conservation theorems in the Poisson Bracket formulation. Hamilton-Jacobi (HJ) theory:
UNIT-IV	Learn to the Central force: Two-body central force problem and its reduction to the equivalent one-body problem, The equations of motion and first integrals, The equivalent one-dimensional problem and classification of orbits, The differential equation of the orbit, Closure and stability of orbits, The Kepler problem, Scattering in a central force field: Rutherford scattering.

Course Code: **PHY-405**

Title of the Course: Computational Physics

Course Objectives: To understand intricacies of relationship and interplay between Physics and Computational Sciences.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	Learn Basic Computer organization: Handling input and output files.
UNIT-II	Studying different types of Errors, Solution of algebraic equation, Curve Fitting: Least-square curve fitting, straight line and polynomial fits.
UNIT – III	learn about numerical differentiation, Integration: Numerical double integration.
UNIT-IV	Learn about Numerical solution of ordinary differential equation, Second order differential equation, Numerical solution of radial Schrödinger equation

Course Code: **PHY-407**

Title of the Course: Fundamental of Electronics

Course Objectives: To Apply the knowledge of theorems/laws to analyze the simple circuits and use the principles of electromagnetic induction in electrical applications.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	Study the p-n junction, various types of diodes and liquid crystal display.
UNIT-II	Study Differential Amplifier, Electronic analog computation comparator.
UNIT – III	Lear about Boolean algebra, Data processing, Sequential Circuits: Design and applications.
UNIT-IV	study Semiconductor Memories, D/A and A/D Converters

Course Code: PHY-409

Title of the Course: Physics Lab-1

Course Objectives: To understand various experimental principles, instruments/setup, and procedure.

Course Outcomes (COs)

CO1: understand different components and equipment in physics practical.
CO2: work effectively and safely in the laboratory environment independently and as well as in teams.

Course Code: PHY-411

Title of the Course: Computational Physics & Programming Lab

Course Objectives: Developing numerical, computational and logical skills relevant for solution of theoretical and experimental physics problems.

Course outcomes:
By the end of the course, students should be able to:

1. perform Matrix summation, subtraction and multiplication.
2. find the root of algebraic equation using bisection method.
3. find the root of algebraic equation Newton Raphson method.
4 find the root of algebraic equation using Muller method
5 fit a straight line through given data using Least square method.
6 fit the given data using polynomial fitting.
7. Interpolation and extrapolation using Lagrange method.
8. perform Numerical differentiation using Newton's method.

Course Code: PHY-402

Title of the Course: Elements of Solid State Physics

Course Objective:
The course gives an introduction to solid state physics, and will enable the student to employ classical and quantum mechanical theories needed to understand the physical properties of solids. Emphasis is put on building models able to explain several different phenomena in the solid state.

Course outcomes:
By the end of the course, students should be able to:

CO1: Explain crystal systems, Diffraction and Reciprocal space, Crystal systems, Crystal planes and directions, Miller indices, Diffraction of waves by crystals and Bragg's law, Knows Reciprocal

space, Reciprocal lattice, Construction of reciprocal lattice, Reciprocal lattice vectors and Diffraction condition, Explains Reciprocal space and Laue equations and Brillouin zone.

CO2: explain bonding types in crystals, Defines Bonds in crystals, Inert gas crystals, Van der Waals-London interaction, Repulsive interaction and Binding energy, Knows Ionic crystal, Madelung energy and constant, Defines Covalent, Metallic and Hydrogen bonds.

CO3: explain Phonons and Thermal properties of phonons, Explains Phono-crystal interactions, Monoatomic and diatomic linear chain and w-k relationship, Explains Optic and Acoustic phonon modes, Defines Thermal properties of phonons, heat capacity of phonons, Density of states and Density of states models of Debye and Einstein.

CO4: explain Free electron gas model and band models, Explains Fermi free electron gas, Fermi-Dirac distribution and temperature, Defines Energy bands, Bloch theory and Kronig-Penney model, Defines semiconductor crystals, Defines Direct and indirect band gap semiconductors, Knows Effective mass and E-k relationship.

Course Code: PHY-404

Title of the Course: Atomic and Molecular Physics

Course Objective: It covers electronic transitions, atomic spectra, excited states, hydrogenic and multi-electron atoms. The second half of the course deals with the binding of atoms into molecules, molecular degrees of freedom (electronic, vibrational, and rotational), elementary group theory considerations and molecular spectroscopy.

After completion of this course successfully, the students will be able to……	
UNIT – I	Understand Spectrum of He-atom, Hyperfine structure of spectral line: Determination of nuclear spin using hyperfine structure
UNIT-II	Know about rotational and vibrational spectra, Raman spectroscopy
UNIT – III	Know the features of electronic band spectra, Intensity of electronic bands: Franck Condon principle.
UNIT-IV	Learn basic laser action, florescence spectroscopy.

Course Code: PHY-406

Title of the Course: Quantum Mechanics-I

Course Objectives: It covers the experimental basis of quantum physics, introduces wave mechanics, Schrödinger's equation in a single dimension, and Schrödinger's equation in three dimensions.

Course Learning Outcomes (COs)

After completion of this course successfully, the students will be able ……	
UNIT – I	Study the Schroedinger equations, the uncertainty principle, eigenvalues and Eigen functions, Application of Schrodinger equation.
UNIT-II	Learn about operators in quantum mechanics, coherent states, Time development of states and operators, Heisenberg, Schroedinger and interactive pictures.
UNIT – III	Learn angular momentum operators and their representation, solution of Schrodinger equation, Hydrogen atom. Representation of general angular momentum operator,
UNIT-IV	Study and learn the Time independent perturbation theory: Stark effect in hydrogen, Hydrogen and Helium atoms

Course Code: PHY -408

Title of the Course: Elements of Nuclear Physics

Course Objectives: To impart knowledge about basic nuclear physics properties and nuclear models for understanding of related reaction dynamics.

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to ……	
UNIT – I	explain the ground state properties of the nucleus for study of the nuclear structure behavior.
UNIT-II	explain the deuteron behavior at ground and excited states
UNIT – III	apply deuteron physics and the Nucleon-Nucleon scattering for explaining the nuclear forces
UNIT-IV	demonstration of the shell model and collective model descriptions
UNIT – V	apply various aspects of nuclear reactions in view of compound nuclear dynamics.

Course Code: CH -410

Title of the Course: Physics Lab – II

Course Objectives: To learn the fundamentals of quantum mechanics and its applications to study the molecular spectroscopy

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……

Learn about several experimental related to the analog and digital electronics.

Course Code: PHY-412

Title of the Course: Computational Physics & Simulation Lab

Course Objectives: The aim of the Programme is for students to develop a high level of proficiency in comprehending the complexities of the relationship and interaction between Physics and Computational Sciences.

Course Outcomes (COs)

Students will acquire knowledge of Ordinary Differential Equations (ODEs) and Partial Differential Equations (PDEs), as well as their practical applications. Additionally, they will explore Boundary Value Problems (BVPs) and their relevance to quantum mechanical problems.

Course Code: PHY -501

Title of the Course: Electrodynamics

Course Objectives: The objective of this study is to address issues pertaining to the computation of fields, the movement of charged particles, and the generation of electromagnetic waves.

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……	
UNIT – I	use Maxwell's equations in analyzing the electromagnetic field due to time varying charge and current distribution.
UNIT-II	describe the nature of electromagnetic wave and its propagation through different media and interfaces.
UNIT – III	explain charged particle dynamics and radiation from localized time varying electromagnetic sources.
UNIT-IV	to learn Plasma physics, Debye shielding phenomenon and criteria for plasma, motion of charged particles in electromagnetic field.

Course Code: PHY -503

Title of the Course: Quantum Mechanics - II

Course Objectives: To advance the understanding of quantum mechanics, particularly in the realm of relativistic quantum mechanics, it is imperative to explore various approximation methods that aid in problem-solving.

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able……	
UNIT – I	Develop the knowledge of approximation method of quantum mechanics. Variational method, expectation value of energy, application to excited states, ground state of He-atom, Zero point energy of one dimensional harmonic oscillator, the W.K.B. approximation,
UNIT-II	Develop a knowledge of theory of scattering: differential and total scattering cross section, wave mechanical picture of scattering & the scattering amplitude, Green's functions and formal expression for scattering amplitude, The Born approximation and its validity,
UNIT – III	Learn the time-dependent perturbation theory, first order perturbation, Harmonic perturbation, Fermi`s Golden rule, Ionization of a H-atom, absorption and induced emission, Selection rules. Identical particles, symmetric and anti-symmetric wave functions.
UNIT-IV	to learn relativistic quantum mechanics, formulation of relativistic quantum theory, the Klein-Gordon equation; plane wave solutions, charge and current densities, The Dirac equation for a free particle, matrices alpha and beta, Lorentz covariance of the Dirac equation, free particle solutions and the energy spectrum, charge and current densities.

Course Code: PHY -505A

Title of the Course: Analog Communication

Course Objectives: Provide an overview of the fundamental principles underlying analog modulation schemes. Additionally, elucidate the diverse categories of noise and anticipate their impact on different analog communication systems.

Course Learning Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	Analyze analog communications in time domain and frequency domain.
UNIT-II	Distinguish between different analog modulation techniques
UNIT – III	Understand the importance of noise considerations in communication systems.
UNIT-IV	Familiarize with fundamentals of RADAR. Analyze the performance of simple Tracking RADAR.

Course Code: PHY -505B

Title of the Course: Digital Communication

Course Objectives: In order to comprehend and examine the signal flow within a digital communication system, as well as to assess the error performance of said system in the presence of noise and other interferences.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	Gain a comprehensive understanding of waveform coding techniques and conduct a thorough analysis of their performance.
UNIT-II	Evaluate the performance of a baseband and passband digital communication system by examining their error rate and spectral efficiency.
UNIT – III	Apply the knowledge of digital electronics and describe the error control codes like block code, cyclic code.
UNIT – IV	Describe and analyze the digital communication system with spread spectrum modulation.

Course Code: PHY -507A

Title of the Course: Nuclear Reactions

Course Objectives: To compare and contrast nuclear reactions and chemical reactions. explain the role of subatomic particles in a nuclear reaction. describe different types of nuclear reactions.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT-I	Describe basic properties of nuclei, nuclear interactions, nuclear structure and reactions.
UNIT-II	Identify the strengths and limitations of various nuclear models
UNIT-III	Apply the knowledge of basic laws of conservation and momentum in the determination of particle properties and properties of processes in the subatomic world.
UNIT-IV	Work on elementary problem solving in nuclear and particle physics, and relating theoretical predictions and measurement results.

Course Code: CH -507B

Title of the Course: Nuclear detectors

Course Objectives: Upon successful completion of this module, individuals will possess the capability to articulate the physical mechanisms employed in the detection of gamma and neutron radiation. Furthermore, they will be equipped to recognize and elucidate the fundamental functioning principles underlying gas-filled, scintillation, and semiconductor detectors.

Course Learning Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	To classify various detectors
UNIT-II	To explain the physical principles of operation of various detectors
UNIT – III	To describe use of the detectors
UNIT-IV	To review limits of detection for each detector

Program Outcomes for M.Sc(Mathematics)

PO1	Disciplinary knowlegde	Capability of demonstrating comprehensive knowledge of mathematics gained during course of study.
PO2	Communications skills	Ability to communicate various concepts of Mathematics effectively using examples and their geometrical visualizations, and also demonstrate the importance of Mathematics in other subjects.
PO3	Critical thinking and analytical reasoning	Ability to employ critical thinking in understanding the concepts in every area of mathematics and analytical reasoning to apply them in various problems appearing in different branches of mathematics
PO4	Problem Solving	Ability to solve real life problems and provide new solutions using the acquired domain knowledge of mathematics.
PO5	Research-related skills	Capability for inquiring about appropriate questions relating to the concepts in various fields of mathematics, and developing passion for the related research.
PO6	Information/digital literacy	Capability to learn and apply the programming skills and softwares for mathematical investigations and problem solving.
PO7	Self-directed learning	Ability to work independently and do in-depth study of various notions of mathematics
PO8	Moral and ethical awareness/reasoning	Ability to identify unethical behaviour such as fabrication, falsification or misrepresentation of data and adopting objective, unbiased and truthful actions in all aspects.
PO9	Life-long Learning	Ability to think, acquire knowledge and skills through logical reasoning and to inculcate a habit of self-learning
PO10	Applications	Ability to demonstrate fundamental systematic knowledge of mathematics and its applications in engineering, science, technology and mathematical sciences

Programme Specific Outcomes (PSOs)

On successful completion of the M.Sc. Programme, a student will

PSO1	Have a strong foundation in core areas of Mathematics, both pure and applied
PSO2	Be able to apply mathematical skills and logical reasoning for problem solving
PSO3	Communicate mathematical ideas effectively, in writing as well as orally
PSO4	Have sound knowledge of mathematical modeling, programming and computational techniques as required for employment in industry

M.Sc. (Mathematics) Semester I

Contact hours 32 **Credits: = 24** **Marks: 700**

Paper Code	Course Name	Course type	Contact Hours per week	Credits	Examination Scheme					
					Inter. Assessment	Theory	Practical	Seminar/ viva voce	Assignment	Total
MS- 101	Advanced Abstract Algebra	core	4+2	4	40	60				**100**
MS- 102	Real Analysis	core	4+2	4	40	60				**100**
MS-103	Mechanics	core	4+2	4	40	60				**100**
MS- 104	Differential Equations and Dynamical System	core	4+2	4	40	60				**100**
MS- 105	Discrete Mathematical Structures	core	4+2	4	40	60				**100**
MS-106	Seminar /Assignment	Core	2	2				**50**	50	**100**
	Sub-total		32	22	200	300		**50**	**50**	**600**
MS -107	Comprehensive viva-voce			2				**100**		**100**
	Total		**32**	**24**	**200**	**300**		**150**	**50**	**700**

M.Sc. (Mathematics) Semester II

Contact hours 32 **Credits: = 24** **Marks: 700**

Paper Code	Course Name	Course type	Contact Hours per week	Credits	Examination Scheme					
					Inter. Assessment	Theory	Practical	Seminar/ viva voce	Assignment	Total
MS-201	Topology	core	4+2	4	40	60				**100**
MS- 202	Complex Analysis	core	4+2	4	40	60				**100**
MS- 203	Partial Differential Equation	core	4+2	4	40	60				**100**
MS- 204	Numerical Analysis	core	4+2	4	40	60				100
MS 205	Number Theory	core	4+2	4	40	60				**100**
MS-206	Seminar /Assignment	Core	2	2				**50**	50	**100**
	Sub-total		32	22	200	300		**50**	**50**	**600**
MS -207	Comprehensive viva-voce			2				**100**		**100**
	Total		**32**	**24**	**200**	**300**		**150**	**50**	**700**

M.Sc. (Mathematics) Semester III

Contact hours 32 **Credits: = 24** **Marks: 700**

Paper Code	Course Name	Course type	Contact Hours per week	Credits	Examination Scheme					
					Inter. Assessment	Theory	Practical	Seminar/ viva voce	Assignment	Total
MS- 301	Functional Analysis	core	4+2	4	40	60				**100**
MS- 302	Measure Theory	core	4+2	4	40	60				**100**
MS-303	Bio Mechanics	core	4+2	4	40	60				**100**
	Elective	core	4+2	4	40	60				**100**
	Choice Bases	core	4+2	4	40	60				**100**
MS-308	Seminar /Assignment	Core	2	2				**50**	50	**100**
	Sub-total		32	22	200	300		**50**	**50**	**600**
MS -309	Comprehensive viva-voce			2				**100**		**100**
	Total		**32**	**24**	**200**	**300**		**150**	**50**	**700**

Elective papers (Choice Any Two)

1. MS-304 Operation Research
2. MS-305 Fluid Dynamics

Choice Base paper for MS-305 (Any one)

1. MS-306 Object Oriented Programming using C++
2. MS-307 Data Stature

M.Sc. (Mathematics) Semester IV

Contact hours 32 **Credits: = 24** **Marks: 700**

Paper Code	Course Name	Course type	Contact Hours per week	Credits	Examination Scheme					
					Inter. Assessment	Theory	Practical	Seminar/ viva voce	Assignment	Total
MS-401	Special Functions	core	4+2	4	40	60				**100**
MS- 402	Integral Equations and Calculus of Variation	core	4+2	4	40	60				**100**
MS-403	Tensor and Differential Geometry	core	4+2	4	40	60				**100**
	Elective	core	4+2	4	40	60				**100**
	Choice Base	core	4+2	4	40	60				**100**
MS-409	Seminar /Assignment	Core	2	2				**50**	50	**100**
	Sub-total		32	22	200	300		**50**	**50**	**600**
MS -410	Comprehensive viva-voce			2				**100**		**100**
	Total		**32**	**24**	**200**	**300**		**150**	**50**	**700**

Elective paper (Choice Any Two)

1. **MS-404 Fluid Mechanics**
2. **MS-405 Fuzzy set and Their Application**
3. **MS-406 Wavelets**

Choice Base paper (Any one)

1. **MS-407 Mat Lab**
2. **MS-408 Neural Network**

CO-PSO matrix for the Course MS-101: Advanced Abstract Algebra

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3
CO2	3	2	2	3
CO3	3	3	3	3
CO4	3	3	3	3

CO-PO matrix for the Course MS-101: Advanced Abstract Algebra

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	2	3	3	2	3	2	2	2
CO2	3	3	3	2	3	3	2	3	2	3
CO3	3	3	3	2	3	2	2	2	3	3
CO4	3	3	2	3	3	3	3	2	2	2

Paper Title **ADVANCED ABSTRACT ALGEBRA**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-101**

Unit-I

Sylows First, Second and Third theorems, p-sylow Subgroups, Double cosets conjugate groups, Normal and Subnormal series, Composition series, Jordan Holder theorem, Solvable groups, and commutator subgroups.

Unit-II

Modules, Cyclic modules, Simple modules, finitely generated modules, Fundamental structure theorem for finitely generated modules,

Unit-III

Field theory, Extension fields, Algebraic Extensions, Roots of polynomials, Simple extension, Splitting fields.

Unit-IV

Elements of Galois Theory, Fixed Fields, Normal extensions, Group of automorphisms, Galois group, Fundamental theorem of Galois theory.

Text Books :

1. Topics in Algebra by I.N. Herstein, Wiley Eastern Ltd., New Delhi, 1975.
2. Basic Abstract Algebra (2^{nd} Edition), Cambridge University Press, Indian Edition, 1997.
3. Algebra by M. Artin, Prentice-Hall of India1991.

Reference Books:

1. Algebra by P.M. Cohn, Vols. I, II & III, John Wiley & Sons, 1982,1989,1991.
2. Basic Algebra, Vols. I & II by N. Jacobson, W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
3. Galois theory by J.P. Escofier, GTM, Vol. 204, Springer, 2001.
4. Lectures on Modules and Rings by T.Y. Lam, GTM Vol. 189, Springer-Verlag, 1999.

CO-PSO matrix for the Course MS-102: Real Analysis

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	M

CO-PO matrix for the Course MS 102: Real Analysis

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	M	S	M	S	M
CO2	S	S	S	S	M	M	S	M	S	M
CO3	S	S	S	S	S	S	M	M	S	S
CO4	S	M	S	S	S	S	M	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **REAL ANALYSIS**

Lectures : (4+2)Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-102**

Unit-I

Metric spaces: compact sets, perfect sets, connected sets, compactness and completeness, limit and continuity of function defined on metric spaces, limits of functions, continuous functions. Continuity and Compactness, continuity and connectedness, monotonic functions.

Unit-II

Definition and existence of Riemann – Stieltjes integral, properties of the integral, integration and differentiation, the fundamental theorem of calculus, integration of vector-valued functions. Sequence & Series of function point wise & uniform Convergence, Cauchy Criterion for uniform Convergence, Weierstrass M-Test for uniform Convergence of Series, Uniform Convergence & Continuity

Unit–III

Uniform Convergence & R-S integral Uniform Convergence & differentiation, Weierstrass approximation Theorem. Lebesgue outer measure, Measurable sets & its properties, Borel set & their measurability, Non-measurable set, measurable functions, characteristic function & simple function, Littlewood's three Principles.

Unit-IV

Lebesgue integral of bounded function over a set of finite measure, Integration of Non-negative function,The general Lebesgue integral, Monotonic Convergence Theorem, Lebesgue convergence Theorem, Fatou's Lemma.

Text Books:

1. Principles of Mathematical Analysis by Walter Rudin.
2. Real Analysis (UNIT IV & V) by H. L. Roydon.

Reference Books:

1. Mathematical Analysis by Mullick & Arora, New Age International Publisher.
2. Lebsegue Measure & Integration by Jain & Gupta, New Age International Publisher

CO-PSO matrix for the Course MS-103: Mechanics

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	S

CO-PO matrix for the Course MS-103: Mechanics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	M	S	M	M	S
CO2	S	M	S	S	S	S	S	S	S	S
CO3	S	S	S	S	M	S	S	M	M	S
CO4	S	M	S	S	M	M	S	M	M	S

S=Strong, M=Medium, W=Weak

Paper Title **MECHANICS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-103**

Unit-I

Hamilton's variables, Donkin's theorem, Hamilton canonical equations, Generalized coordinates, Holonomic and Non–holonomic systems, Scleronomic and Rheonomic systems, Generalized potential. Lagrange's equations of first kind. Lagrange's equations of second Kind, Uniqueness of solution, Energy, equation for conservative fields.

Unit-II

Fundamental lemma of calculus of variation, Euler's equation for one dependent function, Generalization of Euler's equations to (i) 'n' dependent functions, (ii) higher order derivatives.

Cyclic coordinates, Routh's equations, Poisson's Bracket, Poisson's identity, Jacobi-Poisson Theorem, Motivating Problems of calculus of variations, Shortest distance, Minimum surface of revolution, Brachistochorone Problems, Isoperimetric problems, Geodesic.

Unit-III

Conditional extremum under geometric constraints and under integral constraints, Hamilton's Principle, Principle of least action. Poincare Cartan integral invariant, Whittaker's equations, Jacobi''s equations, Statement of Lee Hwa chung's theorem.

Unit-IV

Method of separation of Variables, Hamilton-Jacobi equation, Jacobi theorem, , Lagrange Brackets, Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets, Invariance of Lagrange brackets and Poisson brackets under canonical transformations.

Text Books:

1. Calculus of Variation by I.M. Gelfand and S.V. Fomin, Prentice Hall.
2. Analytical Mechanics by Louis N. Hand and Janet D. Finch, Cambridge University, Press, 1998.

CO-PSO matrix for the Course MS-104: Differential Equations and Dynamical System

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S
CO2	S	S	M	S
CO3	S	S	S	S
CO4	M	S	S	S

CO-PO matrix for the Course MS-104: Differential Equations and Dynamical System

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	S	M	S	S
CO2	S	M	S	M	S	M	S	S	M	S
CO3	M	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	M	S	S	S	S

S=Strong, M=Medium, W=Weak

Paper Title **DIFFERENTIAL EQUATIONS AND DYNAMICAL SYSTEM**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-104**

Unit-I

Differential Inequalities and integral inequalities –Gronwall's inequality, Maximal and Minimal solutions, differential inequalities, Lower and upper function. Preliminaries-Initial value problem and the equivalent integral equation, System of first order ordinary differential equations, concepts of local existence, Existence and uniqueness of solutions of scalar differential Equations, Peano's existence theorem and corollary for scalar case, system of differential Equations

Unit- II

Ascoli-Arzela theorem (Statement only) , Picard-Lindelof theorem, Peano's existence theorem and corollary for vector case. Linear systems of differential equation, characteristic polynomials eigen values, eigen vectors, linear homogenous systems and their properties, wronskian, fundamental matrix, Abel-Liouville formula, periodic linear system and Floquet's theorem, Inhomogeous linear systems and variation of constants formula

Unit- III

Poincare- Bendixson Theory –Autonomous systems, Poincare-Bendixson theorem (statement only), Stability of periodic solutions, foci, nodes and saddle points. Automomous system of ordinary differential equations, Phase Plane, critical points, Stability, Critical Points and Stability of linear systems, Stability by
Liapunov's direct method, Lyapunov functions.

Unit- IV

The Pitchfork Bifurcation,A Pure Imaginary Pair of eigenvalues.The Poincare- Andronov –Hopf Bifurcation, Bifurcation of Fixed Points of Ordinary differential Equation, A Zero Eigenvalue; Examples, What is a "Bifurcation of a Fixed Point",The saddle –Node Bifurcation, The Transcritical Bifurcation.

Text Books:

1. Ordinary Differential Equations by M.Rama Mohan Rao, East-West Press.
2. Introduction to Applied Nonlinear Dynamical Systems and chaos by Stephen Wiggins, Springer, New York.

Reference Books:

1. Ordinary Differential Equations by P. Hartman, John wiley.
2. Theory of Ordinary Differential Equations by E.A.Coddington and DSN, Levinson, McGraw Hill, NY.
3. Differential Equations with Applications and Historical note by G.F.Simmons, Tata McGraw Hill.
4. Ordinary Differentions by W.T. Reid, John Wiley & Sons, NY.
5. Differential Equations and Dynamical Systems, by Lawrence Perko, Springer, Newyork.

CO-PSO matrix for the Course MS-105: Discrete Mathematical Structures

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	S

CO-PO matrix for the Course MS-105: Discrete Mathematical Structures

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	S	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	M	S	M	S	S
CO4	S	S	S	S	S	M	S	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **DISCRETE MATHEMATICAL STRUCTURES**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-105**

Unit-I

Relation, Equivalence relation, Partitioning, Fundamental theorem on equivalence relation, ordered sets, First and last elements, maximal and minimal elements, upper and lower bounds, similar sets, Totally ordered sets, well ordered sets, Axioms of choice, Zorn's lemma, Well ordering theorem (Statements only), Inclusion exclusion principle & Pigeon Hole principle.

Unit-II

Mathematical logic: Propositions and logical operators, Contradictions and Tautologies, Equivalence & Implication, Duality NAND and NOR connections, Functionally complete sets, Two-state devices and statement logic, Normal forms, Predicate calculus, Free and bound variables.

Unit-III

Lattice-Definition & examples, Distributive lattice, modular lattice. Bounded lattice, complemented lattice, Boolean lattice, Sublattice, Boolean algebra- Definition & examples, Basic Boolean algebra laws Principle of duality, Applications of Boolean algebra, Boolean functions, Disjunctive & Conjunctive normal forms.

Unit-IV

Mathematical Induction, Recursion, Recursion and iteration, closed form expression, sequence of integers, Recurrence relation, linear recurrence relation, Homogeneous recurrence, Recurrence relations obtained from solutions, Solving linear homogeneous recurrence relation, solving linear non-homogeneous recurrence relations, Generating functions, solution of recurrence relation using generating functions.

Text Books:

1. Discrete Mathematics by N Ch. S N Iyengar, V M Chandra Sekharan, K A Venkatesh, P.S. Arunachalam- Vikas Publishing House Pvt. Ltd.
2. Set Theory-Schaum outline series.

Reference Books:

1. Discrete Mathematics and its applications by Kenneth H. Rosen Tata McGraw Hill Pub. Ltd.
2. Discrete Mathematics for Computer Scientists by J K Truss, Pearson Education Asia Ltd.
3. Discrete Mathematical Structures with Applications by J P Tremblay, R. Manohar Data McGraw Hill Pub. Company Ltd.

CO-PSO matrix for the Course MS-201: Topology

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S
CO2	S	S	S	M
CO3	S	M	S	S
CO4	S	S	S	S

CO-PO matrix for the Course MS-201: Topology

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	M	S	M	S
CO2	S	S	S	S	M	S	S	M	S	S
CO3	S	M	S	M	S	S	S	S	M	S
CO4	S	S	S	S	S	S	M	M	S	M

S=Strong, M=Medium, W=Weak

Paper Title **TOPOLOGY**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-201**

Unit-I

Topological Spaces: Definition and examples, Open Sets, Closed Sets, Closure neighborhoods, Interior, exterior and boundary, Limit points and derived sets, Basis and Sub basis, Alternate method of defining a topology in terms of Kuratowski Closure operator and Neighbourhood systems.

Unit-II

First and Second countable Spaces, Lindelof theorem, Separable Spaces, Second countability and Separability, The product and box topology, Continuous functions and homeomorphism, Countability.

Unit-III

Compact Spaces, Lebesgue number lemma, Uniform continuity theorem, Limit point compactness, Local compactness and sequential compactness, One point compactification.

Connected Spaces, Connected Sets in the real line, Components, Path components, local connectedness, Path connectedness, Local Path connectedness.

Unit-IV

Separation axioms, Hausdroff, Regular and Normal Spaces, The Urysohn lemma, Tietze extension theorem, The Uryshon metrization theorem, Completely regular spaces.

Text Books:

1. Topology A first course by James R Munkres, Prentice Hall of India, Pvt. Ltd. New Delhi 2000.
2. Introduction to Topology and Modern Analysis by G.F. Simonons McGraw Hill Book Co.

Reference Book :

1. General Topology by J.L. Kelley, Van Nostrand, Reinhold Co. New York.

CO-PSO matrix for the Course MS-202: Complex

Analysis

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	M

CO-PO matrix for the Course MS-202: Complex Analysis

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	M	M	M	S	M
CO2	S	S	S	S	M	M	M	M	S	M
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	M	S	S	S	S	S	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **COMPLEX ANALYSIS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-202**

Unit-I

Limit and Continuity Differentiability, Functions of Complex Variables, Power Series as an Analytic Function, Exponential and Trigonometric Functions, Complex Logarithms, Zeros of Analytic Functions.

Unit-II

Complex Integration, Curves in the Complex Plane , Basic Properties of Complex Integral, Winding Number of a Curve, Cauchy – Goursat Theorem, Cauchy's Integral formula, Morera's Theorem, Laurent's Series. Maximum Modulus Principle, Schwarz Lemma, Bilinear Transformations, Mobius Transformation, Cross Ratio, Fixed Point, Conformal Mapping Liouville's theorem.

Unit-III

Removable Singularty, Poles, Singularty at Infinity, Isolated and Non-isolated Singularities, Calculus of Residues, Residue at Finite Point, Residue at the Point at Infinity, Residue Theorem, Number of Zeros and Poles, Rouche's Theorem, Hurwitz's Theorem.

Unit-IV

Evaluation of certain Integrals, Integrals of Type $\int_a^{2\pi} R(\cos\theta, \sin\theta)d\theta$, Integrals of Type $\int_{-\infty}^{\infty} f(x)dx$ Integrals of Type $\int_{-\infty}^{\infty} g(x)\cos mx \ dx$ Singularities on Real Axis.

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Text Book:

1. Foundation of Complex Analysis by S. Ponnusamy, Narosa Publishing House, 1997.

Reference Books:

1. Introduction to Complex Analysis by H.A. Priestly, Clarendon Press, Oxford, 1990.
2. Function of one Complex Variable by J.B. Conway, Springer-Verlag. International student-Edition, Narosa Publishing House, 1980.
3. Complex Analysis by L.V. Ahlfors, McGraw-Hill, 1979.
4. 4. Real and Complex Analysis by Walter Rudin, McGraw-Hill Book Co., 1966

CO-PSO matrix for the Course M S -203: Partial Differential Equation

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	S

CO-PO matrix for the Course M S -203: Partial Differential Equation

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	M	M	S	M	M	S
CO2	S	M	S	S	M	M	S	M	M	S
CO3	S	M	S	S	M	M	S	M	M	S
CO4	S	M	M	S	M	M	S	M	M	S

S=Strong, M=Medium, W=Weak

Paper Title **PARTIAL DIFFERENTIAL EQUATIONS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-203**

Unit-I

Methods of solution of dx/P=dy/Q=dz/R Where P, Q, R, are given functions of x, y, and z, Pfaffian Differential Equations and solution of Pfaffian differential equation in three variables.

Partial Differential Equations of the First order, Linear Equations of the First-Order, Integral Surfaces passing through a given curve,Surfaces Orthogonal to a given system of Surfaces,

Lagrange's equation, nonlinear partial Differential Equations of the first order, cauchy's Method of characteristics, compatible systems of first-order Equations, Charpit's Method,Special Types of first-order Equations.

Unit-II

Introduction,Classification of Second Order Partial Differential Equations (PDE), Canonical Forms, Boundary Value Problems (BVPs),Propeties of Harmonic functions, Separation of Variables method. Elliptic Differential Equations, Laplace Equation, Poisson Equation, Dirichlet Problem for a Rectangle, Neumann problem for a rectangle, Interior Dirichlet Problem for a Circle, Exterior Dirichlet, Problem for a Circle, Interior.

Unit-III

Neumann Problem for a Circle, Solution of Laplace Equation in Cylindrical Coordinates, Solution of Laplace Equation in Spherical coordinates. Parabolic Differential Equations, Diffusion Equations, Heat Equation, Occurrence of Diffusion Equation, Boundary Conditions, Elementry Solution of the Diffusion Equation,Dirac Delta Function, Separation of Variables Method, Solution of Diffusion Equation in Cylindrical Coordinates, Solution of Diffusion Equation in Spherical Coordinates

Unit-IV

Hyperbolic Differential Equations,Wave Equation,Occurrence of the Wave Equation, Solution of One-Dimensional Wave Equation by Canonical Reduction, The Initial Value Problem, D'Alemberts Solution, Vibrating String-Variables Separable Solution, Forced Vibrations-Solution of Nonhomogeneous Equation.

Books Recommended:

1. Introduction to Partial Differential Equations by K.Sankara Rao, PHI
2. Elements of Partial Differential Equations by IAN N. SNEDDON Mc GRAW-HILL Book Company.

CO-PSO matrix for the Course MS-204: Numerical Analysis

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	S	M

CO-PO matrix for the Course MS-204: Numerical Analysis

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	S	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	M	S	M	S	S
CO4	S	S	S	S	S	M	S	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **NUMERICAL ANALYSIS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-204**

Unit-I

Solution of Algebraic Transcendental & Polynomial equations: Bisection method, Iteration method based on first-degree equation: Secant method, Regula-Falsi method, Newton-Raphson method, rate of convergence of Newton-Raphson method & Secant method.

Unit-II

System of linear algebraic equations: Gauss Elimination method, Gauss-Jordan Elimination method, Cholesky method. Iteration methods: Jacobi Iteration method, Gauss-Seidel method.

Unit-III

Interpolation & approximation finite difference operators, Newton's forward and backward interpolation, Central difference interpolation, Lagrange's interpolation, Newton Divided Difference interpolation, Hermite interpolation, Spline interpolation.

Unit-IV

Differentiation and integration: Numerical differentiation, Numerical integration, Newton-cotes formula, Trapezoidal rule, Simpson's one-third rule, Gauss-Legendre integration method.

Ordinary differential equations- Euler method, Backward Euler method, Midpoint method, Taylor Series method, Runge-Kutta methods, Predictor-Corrector methods.

Text Books:

1. Numerical method for Scientific & Engineering Computation by M.K. Jain & R. K. Iyengar & R.K. Jain-Wiley Eastern Ltd.
2. Numerical Method by S S Sastry.

Reference Book:

1. Numerical Methods by V.RajaRaman, PHI.

CO-PSO matrix for the Course MS-205: Number Theory

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	S

CO-PO matrix for the Course MS-205: Number Theory

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	M	S	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **NUMBER THEORY**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-205**

Unit- I

Divisibility, Euclidean algorithm, Linear Diophantine equations, Prime numbers, Fundamental theorem of arithmetic, Prime number theorem (statement only). Congruences, solutions of linear congruences, Chinese Remainder.

Unit-II

Theorem, Euler's totient function, Euler-Fermat theorem, Wilson's theorem, non-linear congruences, Hensel's lemma, primitive roots and power residues.

Unit-III

Quadratic residues, quadratic reciprocity, the Jacobi symbols. The greatest integer function, Arithmetic functions, Mobius function and Mobius inversion formula.

Unit-IV

Finite continued fractions, infinite continued fractions, approximation to irrational numbers. Introduction to cryptography, public key cryptography, RSA.

Text Books:

1. Niven I., Zuckerman H. S., and Montgomery H. L., "An Introduction to the Theory of Numbers", John Wiley & Sons (5^{th} Ed.) 1991
2. Hardy, G., H. and Wright, E. M, "An Introduction to the Theory of Numbers ", Oxford University Press (6^{th} Ed.) 2008
3. Burton D., M., "Elementary Number Theory", McGraw Hill (7^{th} Ed.) 2010.

Reference Books:

1. Andrews G. E., "Number Theory", Dover Publications 1994
2. Koblitz N., A Course in Number Theory and Cryptography, Springer (2^{nd} Ed.) 1994

CO-PSO matrix for the Course MS-301: Functional

Analysis

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	S	M	S	S
CO3	S	S	M	S
CO4	M	S	S	S

CO-PO matrix for the Course MS-301: Functional Analysis

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	M	S	S	M
CO2	M	S	S	S	S	M	S	S	M	S
CO3	S	M	S	S	M	S	M	M	M	M
CO4	S	S	M	S	S	M	S	S	S	S

S=Strong, M=Medium, W=Weak

Paper Title **FUNCTIONAL ANALYSIS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-301**

Unit-I

Normed linear spaces, Banach spaces and examples, quotient space of normed linear spaces and its completeness, convex sets and convex functional, lower semi-continuous and upper semi-continuous functions.

Unit-II

Equivalent norms, Riesz lemma, basic properties of finite dimensional normed linear spaces and compactness.Normed linear spaces of bounded linear transformations, dual spaces with examples. Uniform boundedness theorem and some of its consequences, Open mapping and closed graph theorems, Hahn-Banach theorem for real linear spaces and complex linear spaces.

Unit-III

Reflexivity of Hilbert spaces, Reflexive spaces, Inner product spaces, Hilbert spaces, Orthonormal sets, Bessel's inequality, Complete orthonormal sets and Parseval's identity, Structure of Hilbert Spaces, Projection theorem.

Unit-IV

Adjoint of an operator on a Hilbert space, Self- adjoint operators, Riesz representation theorem, Positive, Projection, normal and unitary operators, Introduction to Sobolev spaces, Fundamental theorem of variational calculus, bilinear forms.

Text Books:

1. Functional Analysis with Applications by A. H. Siddique, Tata McGraw Hill Publishing Company Ltd. New Delhi.
2. Introductory Functional analysis with Applications by Kreyszig, John Wiley and Sons, New York.

Reference Books:

1. Real Analysis by H.L. Royden, Macmillan Publishing Co. Inc., New York, 4^{th} Edition, 1993.
2. Functional Analysis by B.V. Limaye, Wiley Eastern Ltd.

CO-PSO matrix for the Course MS-302 Measure Theory

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	S	M	S	S
CO3	S	S	M	S
CO4	M	S	S	S

CO-PO matrix for the MS-302 Measure Theory

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	M	M	S
CO2	S	S	S	M	S	S	M	M	S	S
CO3	M	S	M	S	S	M	S	S	M	S
CO4	S	M	S	S	M	S	S	S	S	M

S=Strong, M=Medium, W=Weak

Paper Title **MEASURE THEORY**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-302**

Unit- I

Basic Concept of sets, Measure, Measurable Sets, Lebesgue measure of a set, Outer, Exterior & Interior Measure, Measurable Space. Measurable functions, Equivalent functions.

Unit- II

Simple functions, Characteristic functions, Lebesgue measurable functions. Lebesgue Integral of a function, Lebesgue integral of an unbounded function, first mean value theorem. Convergence in Measure, Uniform Convergence.

Unit- III

F. Reisz's theorem, D.F. Egor's theorem, Dominated Convergence Theorem, Beppo Levi's Theorem, Fatou's Lemma, Extension of a Measure. Continuous & absolute continuous function.

Unit- IV

Indefinite Integral, Differentiable, Increasing & decreasing functions, Function of bounded variation.

Text Books:

1. Measure theory – P.R. Halmos
2. Measure Theory-K P. Gupta

CO-PSO matrix for the Course MS-303: Bio Mechanics

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	M

CO-PO matrix for the Course MS-303: Bio Mechanics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	S	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	M	S	M	S	S
CO4	S	S	S	S	S	M	S	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **BIO-MECHANICS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-303**

Unit-I

Bio-physics of Human Cardio-vascular system: Types of Blood Vessels, Properties of Blood. Flow in Tubes, Poiseuibles law, Erythrocyte sedimentation Rate I stoke's low, pulsatile flow, Flow in elastic vessels.

Unit-II

Bio-physics of Human Thermo-regulation Heat flow in Human Dermal and sub-dermal ports; Derivation of Governing partial differential Equations Incorporating Micro-circulation and Perspiration.

Unit-III

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Diffusion processes in biology: diffusion in Tissue, Fick's principle, One, two and three Dimensionals diffusion Problems and their solution, Water Transport, Diffusion Through Membranes.Solution of steady stale and Unsteady –state flow problems in one dimension, application of finite element method and exact solutions.

Unit-IV

Respiratory Gas flows, flow in Airways, Interaction Between convection and diffusion, Exchange between Alveolar Gas and Erythrocytes, Pulmonary function Test, Dynamics of Ventilation system.

Text Books:

1. Introduction to Mathematical Biology by S.I. Rubinow, J.Wiley & Sons.
2. Biomechanics by Y.C. Fung, Springer-verlag.
3. Introduction to Biomathematics by V.P. Saxena, Vishwa Prakashan (Wiley-Eastern)

Reference Book:

1. Biofluid Dynamics by Mazumdar.

CO-PSO matrix for the Course MS-401: Special Function

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	M	S	S	S
CO3	S	M	M	S
CO4	S	S	S	S

CO-PO matrix for the Course MS-401: Special Function

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	S	S	M	S	M
CO2	S	M	S	S	M	M	M	S	M	S
CO3	S	S	M	S	S	M	M	S	S	M
CO4	M	M	S	S	S	S	S	M	M	S

S=Strong, M=Medium, W=Weak

SPECIAL FUNCTION

Paper Tit

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**

Examination Time : 3 Hrs **Paper Code : MS-401**

Unit -I

Gamma and Beta Functions Gamma Function, A series for Γ' (z) / Γ (z) , Difference equation Γ(z+1) = zΓ(z), Euler's integral for Γ (z) , Beta function, value of Γ(z) Γ(1-z), Factorial Function, Legendre's duplication formula, Gauss multiplication theorem, The behaviour of log Γ(z) for large l z l

Unit-II

Bessel function and Legendre polynomials Definition of J_n (z), Bessel's differential equation, Generating function, Recurrence relations, Generating function for Legendre polynomials, Rodrigues formula, Bateman's generating function, Additional generating funtions, Hypergeometric forms of P_n (X) , Special properties of P_n, Some more generating functions, Laplace's first integral form, Orthogonality.

Unit-III

Hypergoemetric and Generalized Hypergeometric functions: Gauss hypergeometric Function ${}_2F_1$ and its convergence A simple integral form evaluation of ${}_2F_1$ (a,b;c;1), Contiguous function relations, Hyper geometric differential equation Elementary series manipulations, Simple transformation, Generalized hypergeometric function ${}_pF_q$ and its convergence, Whipple's theorem, Dixon's theorem.

Unit-IV

Hermite and Laguerre polynomials Definition of Hermite and Laguerre polynomials, Pure recurrence relations, Differential recurrence relations, Rodrigue's formula, Other generating functions, Othogonality for Laguerre and Hermite polynomials

1. Rainville, E.D ; Special Functions, The Macmillan co., New york 1971.
2. Mathai and Saxena: Generalized Hypergeometric function with Application in Statistics and physical Sciences, Springer Verlag, Heidelberg and New York, Lecture Notes No 348,1973
3. Saran, N., Sharma S.D. and Trivedi, - Special Functions with application, Pragati prakashan, 1986.

Reference Books:

1. Lebdev, N.N, Special Functions and Their Applications, Prentice Hall, Englewood Cliffs, New Jersey, USA 1995.
2. Whittaker, E.T. and Watson, G.N., A Course of Modern Analysis Cambridge University Press, London, 1963.

CO-PSO matrix for the Course MS-402: Integral Equation and Calculus of Variations

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	M	M	S
CO4	S	S	M	S

CO-PO matrix for the Course MS-402: Integral Equation and Calculus of Variations

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	S	M	S	S	S
CO2	S	S	S	S	S	M	S	S	S	M
CO3	S	M	S	S	S	M	S	S	S	S
CO4	S	S	M	S	M	S	M	S	M	M

S=Strong, M=Medium, W=Weak

Paper Title **INTEGRAL EQUATION AND CALCULUS OF VARIATIONS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-402**

Unit - I

Linear integral equations, Some basic identities, Initial value problems reduced to Volterra integral equations, Methods of successive substitution and successive approximation to solve Volterra integral equations of second kind, Iterated kernels and Neumann series for Volterra equations. Resolvent kernel as a series in ≒, Laplace transform method for a difference kernel, Solution of a Volterra integral equation of the first kind.

Unit - II

Boundary value problems reduced to Fredholm integral equations, Methods of successive approximation and successive substitution to solve Fredholm equations of second kind, Iterated kernels and Neumann series for Fredholm equations. Resolvent kernel as a sum of series. Fredholm resolvent kernel as a ratio of two series. Fredholm equations with separable kernels, Approximation of a kernel by a separable kernel, Fredholm Alternative, Non homogenous Fredholm equations with degenerate kernels.

Unit - III

Green's function, Use of method of variation of parameters to construct the Green's function for a nonhomogeneous linear second order boundary value problem, Basic four properties of the Green's function, Orthogonal series representation of Green's function, Alternate procedure for construction of the Green's function by using its basic four properties. Reduction of a boundary value problem to a Fredholm integral equation with kernel as Green's function. Hilbert-Schmidt theory for symmetric kernels.

Unit - IV

Motivating problems of calculus of variations, Shortest distance, Minimum surface of revolution, Branchistochrone problem, Isoperimetric problem, Geodesic. Fundamental lemma of calculus of variations, Euler's equation for one dependant function and its generalization to 'n' dependant functions and to higher order derivatives, Conditional extremum under geometric constraints and under integral constraints.

Books Recommended :

1. Jerri, A.J., Introduction to Integral Equations with Applications, A Wiley-Interscience Pub.
2. Kanwal, R.P., Linear Integral Equations, Theory and Techniques, Academic Press, New York.
3. Gelfand, J.M. and Fomin, S.V., Calculus of Variations, Prentice Hall, New Jersy, 1963.
4. Weinstock , Calculus of Variations, McGraw Hall.
5. Abdul-Majid wazwaz, A first course in Integral Equations, World Scientific Pub.
6. David, P. and David, S.G. Stirling, Integral Equations, Cambridge University Press.
7. Tricomi, F.G., Integral Equations, Dover Pub., New York

CO-PSO matrix for the Course MS-403: Tensor and Differential Geometry

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	M

CO-PO matrix for the Course MS-403: Tensor and Differential Geometry

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **TENSOR AND DIFFERENTIAL GEOMETRY**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-403**

Unit- I

Theory of Space Curves: Space curves, Planer curves, Curvature, Torsion and Serret-Frenet formulae. Osculating circles, Osculating circles and spheres. Existence of space curves. Evolutes and involutes of curves.

Unit- II

Theory of Surfaces: Parametric curves on surfaces. Direction coefficients. First and second Fundamental forms. Principal and Gaussian curvatures. Lines of curvature, Euler's theorem. Rodrigue's formula, Conjugate and Asymptotic lines.

Developables: Developable associated with space curves and curves on surfaces, Minimal surfaces.

Unit- III

Geodesics: Canonical geodesic equations. Nature of geodesics on a surface of revolution. Clairaut's theorem. Normal property of geodesics. Torsion of a geodesic. Geodesic curvature. Gauss - Bonnet theorem. Surfaces of constant curvature Conformal mapping Geodesic mapping. Tissot's theorem.

Unit- IV

Tensors: Summation convention and indicial notation, Coordinate transformation and Jacobian, Contra-variant and Covariant vectors, Tensors of different type, Algebra of tensors and contraction, Metric tensor and 3-index Christoffel symbols, Parallel propagation of vectors, Covariant and intrinsic derivatives, Curvature tensor and its properties, Curl, Divergence and Laplacian operators in tensor form, Physical components.

Text Books:

1. Willmore, T. J., "An Introduction to Differential Geometry", Dover publications. 2012.
2. O'Neill B., Elementary Differential Geometry, Academic press, 2nd Ed. 2006
3. Weatherburn, C.E. Differential Geometry of Three Dimensions, Cambridge University Press (digital pub) 2003
4. Spain, B., "Tensor Calculus: A concise Course", Dover Publications2003.

Refenence Book:

1. Struik, D., J., "Lectures on Classical Differential Geometry", Dover Publications. 1988.
2. Lang, S., Fundamentals of Differential Geometry, Springer. 1999.

CO-PSO matrix for the Course MS-304: Operation Research

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	S
CO2	S	M	S	S
CO3	M	S	S	M
CO4	S	S	S	S

CO-PO matrix for the Course MS-304: Operation Research

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	S	M	S
CO2	S	S	M	S	S	S	M	M	S	M
CO3	S	S	S	M	M	S	S	S	M	S
CO4	M	S	S	S	S	M	S	M	S	M

S=Strong, M=Medium, W=Weak

Elective Paper

Paper Title **OPERATIONS RESEARCH**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-304**

Unit-I

Introduction, Nature and Meaning of O.R. Modelling in operations Research, Features of Operation research, scope of operations research Linear Programming Problem: formulation of L.P.P. solution of L.P.P. Graphical Method, Simplex Methods in Duality, Integer Programming.

Unit-II

Mathematical formulation, Transportation problem formulation, basic feasible solution – North-West-corner method, Least cost method, Vogel's Approximation method, Optimum solution: MODI method, Job sequencing: Processing n jobs through 2 machines, Processing n jobs through 3 machines, Processing 2 Jobs through m machines.

Unit-III

Replacement problems: Replacement policy for items whose maintenance cost increase with time and money value is constant, Money value changes with constant rate. Project management: Introduction, network diagram representation, time estimates and critical path with saddle point, rectangular game without saddle point, Principle of dominance.

Unit-IV

Queuing Theory: Introduction, queuing system Transient and steady traffic inlets, Distribution of arrival distribution of departure, M/M/I: ∞/ FCFS model nonlinear programming: Kuhn-Tucker conditions. D composition Method. Gole Progrmming.

Text Books:

1. Linear Programming by G. Hadley, Narosa Publishing House, 1995.
2. Operations Research by R.K. Gupta.

Reference Books:

1. Introduction to Operations Research (Sixth Edition) by F.S. Hillier and G.J. Lieberman Mc Graw Hill International Edition, Industrial Engineering Series, 1995.
2. Operations Research by S.D. Sharma.

CO-PSO matrix for the Course MS-305: Fluid Dynamics

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	S	M
CO4	M	S	S	S

CO-PO matrix for the Course MS-305: Fluid Dynamics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	M	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	M	S	M	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **FLUID DYNAMICS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-305**

Unit-I

Lagrangian and Eulerian descriptions, Continuity of mass flow, circulation, rotational and irrotational flows, boundary surface, streamlines, path lines, streak lines, vorticity General equations of motion: inviscid case, Bernoulli's theorem, compressible and incompressible flows, Kelvin's theorem, constancy of circulation.

Unit-II

Stream function, Complex-potential, source, sink and doublets, circle theorem, method of images, Theorem of Blasius, Strokes stream function, Motion of a sphere. Helmholtz's vorticity equation, vortex filaments, vortex pair.

Unit-III

Navier-Stokes equations, dissipation of energy, diffusion of vorticity, Steady flow between two infinite parallel plates through a circular pipe (Hagen-Poiseuille flow), Flow between two co- axial cylinders, Energy equation, Dynamical similarity Mathematical formulation of the stability problem of incompressible flow, Stability of flows under different cases, Prandtl's momentum transfer theory. Introduction to Complex fluids.

Unit-IV

Dimensional analysis, large Reynold's numbers; Laminar boundary layer equations, Similar solutions; Flow past a flat plate, Momentum integral equations, Solution by Karman- Pohlhausen methods, impulsive flow Reyleigh problem, dynamical similarity Thermal boundary layer equation for incompressible flow; Temperature distribution in Coutte flow and in flow past a flat plate.

Text Books:

1. Batechelor, G.K., "An Introduction to Fluid Dynamics", Cambridge Press 2002
2. Schliting, H. , Gersten K., "Boundary Layer Theory", Springer, 8th edition. 2004
3. Drazin, P.G., Reid W. H., "Hydrodynamic Stability", Cambridge Press 2004

CO-PSO matrix for the Course MS-404: Fluid Mechanics

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	S

CO-PO matrix for the Course MS-404: Fluid Mechanics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	S	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	M	S	M	S	S
CO4	S	S	S	S	S	M	S	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **FLUID MECHANIC**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-404**

Unit-I

Lagrangian and Eulerian methods, equation of continuity, types of flow lines, velocity potential, stream function irrotationel and rotational motions, vortex lines. Lagrange's and Euler's equation of motion, Burnoulli's theorem, irrotational motion in two dimensions

Unit-II

complex velocity potential, sources, sinks conformal mapping, theorem of Blasius. Motion of a sphere through a liquid at rest as infinity, equation of motion of a sphere, stress components in a real fluid.

Unit-III

Relations between rectangular components of stress convection between stresses and gradients of velocity, Plane Poiceuille and Coquette flows between two parallel plate, flow through tubes of uniform, cross-section in the former of circle, Annulus under constant pressure gradient.

Unit-IV

Dynamical similarity, Reynolds number, Prandt's boundary layer, boundary layer equations in two dimension, Blasius solution, boundary layer thickness, displacement thickness, Karman integral conditions, separation of boundary layer flow.

Text Books:

1. A Text book of fluid mechanics in SI Units by R.K Rajput.
2. An Introduction to fluid Dynamics by R.K. Rathy Oxford and IBH Published Co.

Reference Books:

1. Fluid Mechanics (Springer) by Joseph H. Spurk.
2. Fluid Mechanics by Irfan A. Khan (H.R.W.).
3. An introduction to Fluid Mechanics by G.K. Batchelor, Foundation Books, New Delhi, 1994.

CO-PSO matrix for the Course MS-405: Fuzzy Set and Their Application

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	M	S	S
CO2	S	S	S	M
CO3	M	S	S	S
CO4	S	S	S	S

CO-PO matrix for the Course MS-405: Fuzzy Set and Their Application

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	S	S	S	M	S
CO2	M	S	S	S	M	S	M	S	S	M
CO3	S	M	S	S	S	S	M	S	S	M
CO4	S	S	M	S	M	M	M	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **FUZZY SETS AND THEIR APPLICATIONS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-405**

Unit- I

Fuzzy Sets-Basic definitions, A-level sets, convex fuzzy sets, Basic operations on fuzzy sets Types of fuzzy sets, Cartesian products, Algebraic products, Bounded sum and difference, t-Norms and t- co norms.

Unit-II

The Extension Principle – The Zadeh's extension principle, Image and inverse image of fuzzy sets, Fuzzy numbers, Elements of fuzzy arithmetic, Fuzzy Relation and Fuzzy Graphs-Fuzzy relation on fuzzy sets, Composition of fuzzy relations, Min-Max composition and its properties.

Unit-III

Fuzzy equivalence relation, Fuzzy compatibility relations, Fuzzy relation equations, Fuzzy graphs, Similarity relation. Possibility Theory-Fuzzy measures, Evidence theory, Necessity measure, Possibility measure, Possibility distribution, Possibility theory and fuzzy sets, Possibility theory versus probability theory.

Unit-IV

Fuzzy Logic-An overview of classical logic, Multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic variables and hedges, Inference from conditional fuzzy propositions, the compositional rule of inference.

Text Books:

1. Fuzzy set theory and its Applications by H.J. Zimmermann, Allied Publishers Ltd., New Delhi, 1991.
2. Fuzzy sets and Fuzzy logic by G.J. Klir and B. Yuan Prentice-Hall of India, New Delhi, 1995.

Refenence Book:

1. Fuzzy Sets, Uncertainty and Information by G.J.Klir, Tina A. Folger Prentice-Hall of India.

CO-PSO matrix for the Course MS-406: Wavelets

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	S
CO2	S	S	S	S
CO3	M	S	S	S
CO4	S	S	S	M

CO-PO matrix for the Course MS-406: Wavelets

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	S	M	S	S
CO2	M	S	S	S	M	M	S	S	M	S
CO3	S	S	S	M	S	S	S	S	S	S
CO4	S	M	S	S	S	M	M	M	S	M

S=Strong, M=Medium, W=Weak

Paper Title **WAVE LETS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**

Examination Time : 3 Hrs **Paper Code : MS-406**

Unit-I

Haar's simple wavelets, Haar wavelet transforms, Inverse Haar wavelet transforms, Multi dimensional wavelets, Two-dimensional Haar wavelets.

Unit-II

Application of wavelets, Noise reduction data compression, Edge detection, Daubechies wavelet (DW), approximation of samples with D' wavelets, Fast DW transform and its inverse.

Unit-III

Inner products and orthogonal projection, Applications of orthogonal projection computer graphics, Computation of functions and wavelets, Discrete and fast Fourier transform with inverse and applications.

Unit-IV

Fourier series for periodic functions, its convergence and inversion, uniform convergence of Fourier series, Bessens inequality, Parsevals inequality.

The Fourier Transform, Convolution and inversion of Fourier transform, weight function, approximate identities.

Text Books:

1. Wavelets Made Easy by Y. Nievergelt.
2. A first Course on Wavelets by E. Hernandez and G. Weiss.

Reference Book:

1. An Introduction to Wavelets by Chui, Academic Press

CO-PSO matrix for the Course MS-306: Object Oriented Programming using C++

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	M	S	M	S
CO3	S	S	S	S
CO4	S	M	S	S

CO-PO matrix for the Course MS-306: Object Oriented Programming using C++

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	M	M	S	S	S	M
CO2	S	M	S	S	S	S	M	M	M	M
CO3	M	S	S	S	S	M	S	S	M	S
CO4	S	S	M	S	M	S	M	S	S	S

S=Strong, M=Medium, W=Weak

CHOICE BASE PAPER

Paper Title **OBJECT ORIENTED PROGRAMMING USING C++**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-306**

Unit-I

Object Oriented Programming using C++ Differences between C and C++.A look at procedure Oriented programming, object oriented programming paradigm, basic concepts of OOP, Benefits of OOP, OO languages, A sample program, structure of C++ program. Introduction to OOPS :The origins of C++, What is Object Oriented Programming?, Some C++ fundamentals, Headers & Name Spaces, Introducing C++ Classes, Function overloading, Operator overloading, Inheritance, Constructors & Destructors, Function & Operator Overloading:

Unit-II

Overloading constructor functions, Localizing variables, Function overloading & Ambiguity, Finding the address of an overloaded function, this Pointer, Operator overloading, References, Using reference to overload a unary operator, Overloading, overriding, Applying operator overloading.

Unit-III

Inheritance, Virtual Functions and polymorphism Inheritance and the access specifies, Constructors and Destructors in derived classes, Multiple Inheritance, Passing parameters to a basic class, Pointers and references to derived types, Virtual Functions, Why virtual functions?, Pure virtual functions and abstract types, Early Vs Late binding.

Unit-IV

Templates Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters,

Text Books:

1. Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications
2. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH

Reference Book:

1. Let's C++ by Y. Kanetkar, BPB publications
2. Object oriented programming with C++, E Balagurusamy, 4th edition, TMH
3. Object-Oriented Programming with C++, Sourav Sahay, Oxford University Press, 2006.

CO-PSO matrix for the Course MS-307: Data Structure

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	S

CO-PO matrix for the Course MS-307: Data Structure

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	S	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	M	S	M	S	S
CO4	S	S	S	S	S	M	S	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **DATA STRUCTURE**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-307**

Unit I

Arrays, Records and Pointers Introduction, Linear Arrays, Arrays as ADT, Representation of Linear in Memory, Traversing Linear Arrays, Inserting and deleting, Sorting; Bubble Sort, Searching; Linear Search, Binary Search, Multidimensional Arrays, Representation of Polynomials Using Arrays, Pointers; Pointer Arrays, Dynamic Memory Management, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, Sparse Matrices

Unit II

Linked List Introduction, Linked Lists ,Representation of Linked Lists in Memory, Traversing a Linked List, Searching a Linked List ,Memory Allocation; Garbage Collection ,Insertion into a Linked List ,Deletion from a Linked List , Header Linked List, Circularly Linked Lists ,Two-Way Lists (or Doubly Linked Lists), Josephus Problem and its Solution, Buddy Systems.

Unit III

Stacks, Queue and Recursion Introduction, Stacks ,Array Representation of Stacks ,Linked Representation of Stacks, Stack as ADT ,Arithmetic Expression; Polish Notation ,Application of Stacks ,Recursion, Towers of Hanoi , Implementation of Recursive Procedures by Stacks ,Queue, Linked Representation of Queues ,Queues as ADT , Circular of Queues, Deques, Priority Queues ,Applications of Queues.

Unit IV

Trees Introduction, Binary Trees ,Representing Binary Tree in Memory ,Traversing Binary Trees, Traversal Algorithms Using Stacks, Header Nodes; Threads ,Threaded Binary Trees ,Binary Search Trees ,Searching and Inserting in Binary Search Trees ,Deleting in a Binary Search Tree ,Balanced Binary Trees, AVL Search Trees, Insertion in an AVL Search Tree ,Deletion in an AVL Search Tree, mway Search Trees ,Searching, Insertion and Deletion in an m-way Search tree,B-Trees ,Searching, Insertion and Deletion in a B-tree, B+-Trees.

Sorting and Searching Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort ,Radix Sort, Searching and Data Modification, Hashing , Advanced topic on Data Structure

Text Books:-

1. Seymour Lipschutz, Schaums Outlines, ‘Data Structures with C’,Tata Mc Graw Hill
2. S. Sahani, ‘Data Structures in C’

CO-PSO matrix for the Course MS-407: Mat Lab

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	M

CO-PO matrix for the Course MS-407: Mat Lab

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	S	M	S	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	M	S	M	S	S
CO4	S	S	S	S	S	M	S	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **MAT LAB**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-407**

Unit- I

MATLAB: Introduction - What is MATLAB? – Does MATLAB Do symbolic calculations? – Will MATLAB Run on My Computer? – Where do I get MATLAB? – Basis of MATLAB:

Unit- II

MATLAB windows – on line help – Input output, File types. Tutorial Lessons: A minimum MATLAB session – creating and working with arrays of numbers – creating and printing simple plots – creating , saving and executing a script file .

Unit- III

Interactive Mathematical software system : Graphic user inference, Programming styles and Tools. Mat Lab features and commands, character string, Trigonometric and matrix Function, Special function, control commands, Graphic Commands.

Unit- IV

Applications: Linear Algebra – curve fitting interpolation – Numerical Integration – Ordinary differential equation, Animation Symbolic Computation programming example.

Text Books:

1. Rudra Pratap, Getting Started with MATLAB 7, Oxford University Press, 2006.

CO-PSO matrix for the Course MS-408: Neural Network

COs	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M
CO2	S	S	S	M
CO3	S	S	S	M
CO4	S	S	S	M

CO-PO matrix for the Course MS-408: Neural Network

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	M	M	M	S	M
CO2	S	S	S	S	M	M	M	M	S	M
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	M	S	S	S	S	S	M	S	S

S=Strong, M=Medium, W=Weak

Paper Title **NEURAL NETWORK**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-408**

Unit- I

Introduction of Artificial Neural Networks, Basic concepts in neural computing, Biological and cognitive Aspects, Artificial Neural Networks Application. Characteristics of Artificial Networks overview of ANN learning Methods. Neural Network Texonomies.

Unit-II

Early Neural Networks Architectures; Simple Perceptions, Basic Perception, Learning Algorithms Perceptions Convergence Theorem ADALINE, Neural units, Widrow –Hoff Learning Algorithms ADALINE Applications.

Unit-III

MADALINE Networks. Training Algorithms for MADALINE, MADLINE Application. Associative Memory networks; Learning Algorithms for Associative Memories, Feedforward Heteroassociative Memory Networks, Feedforward Auto associative memory networks.

Unit-IV

Hopfield Networks, Energy function characterization, Cohen-Grossberg Theorem, Brain state in Box. Bidirectional Associative Memory, Multilayer Feedforward neural network and Back propagation.

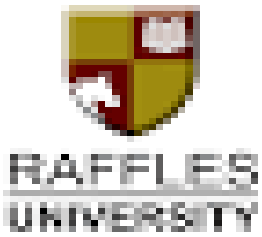
Text Books:

1. James A. Anderson “An introduction to Neural Network” Prentice-Hall of India (P) Ltd

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)
RAFFELS UNIVERSITY, NEEMRANA
M.Sc. (BOTANY) (2 Years Degree Program)

Programme Educational Objective (PEO)
Programme Outcomes (POs)
Programme Specific Outcomes (PSOs)
Course Outcomes (COs)

Raffles University Neemrana



RAFFLES UNIVERSITY

SOBAS

M.Sc. BOTANY

Total Credits = 106 **Total Marks = 2650**

Programme Outcomes for PG courses of Faculty of Life Sciences:

1. To acquaint students with recent knowledge and techniques in basic and applied biological sciences.
2. To develop understanding of organismal, cellular, biochemical and environmental basis of life
3. To provide insight into ethical implications of biological research for environmental protection and good laboratory practices and biosafety.
4. To develop problem solving innovative thinking with robust communication and writing skills in youth with reference to biological, environmental and nutritional sciences.
5. To understand the applications of biotic material in health, medicine and food security for human well being and sustainable development.
6. To impart practical and project based vocational training for preparing youth for a career in research and entrepreneurship in fields of life sciences for self reliance.

Program Specific Outcomes (PSOs):

1. Biodiversity of lower and higher plants along with their taxonomic status. The students will have in-depth knowledge about physiology and metabolism of plants.
2. Students will be able to gain in-depth knowledge regarding ethnobotany, conservation status and strategies of economically important plants.
3. This program aims to critically engage students with concepts of ecological principles,biodiversity, population, community, ecosystem structure and function, importance of environment and the problems related with it at local and global level.
4. The students will have strong base knowledge of physiological, cellular and molecular aspects of plants biology. It will help them venture into advanced research areas.
5. This program will help students to be aware of good laboratory practices in microbial technology and plant biotechnology.

SEMESTER – I

Paper – BOT-101 Algae & Fungi Credit -4 MM-80+20 T: 3hrs

Objectives: To educate and train the students for professional and research career in the field ofAlgology & Mycology.

Outcomes:

CO1 The students will be inspired to become aware and comprehend the broader aspects of Algology.
CO2 The learning outcome will be aimed towards advanced academic education to broaden the knowledge its Biodiversity, Ecological significance and Economic importance of algae.
CO3 The students will be inspired to become well versed with the fungal world in terms of recent researches.
CO4 Economic importance of Fungi with regards to its deleterious and beneficial aspects. Modern economic importance of Lichens. Working knowledge of biological laboratories and research centres in India.

Paper – BOT-102 – Bryophytes, Pteridophytes and Paleobotany Credit -4 MM-80+20 T: 3hrs

Objectives: The course has been conceived to equip students with the knowledge of characteristics, structure and development of gametophyte and sporophyte in bryophytes & pteridophytes.

Outcomes:

CO1 Classify and distinguish bryophytes and pteridophytes from other groups of plants
CO2 Learn about the origin and evolution of sporophyte, heterospory, origin of seed habit,evolutionary trends in stele and spore producing organs.
CO3 Describe the ecological, economic significance of bryophytes and pteridophytes and learn fossilization processing
CO4 Appreciate role of these group of plants in understanding basic concepts of morphogenesis,apogamy, apospory and regulation of development *in vitro*.

Paper – BOT-103 - CYTOGENETICS AND PLANT BREEDING Credit -4 MM-80+20 T: 3hrs

Objective: The purpose of this paper is to acquaint the students about structure and functions of a chromosome in detail. The course also explains the chromosomal variations and their effects on biological system. Further, it aims to draw attention to methods used for crop improvement.

Outcomes:
CO1 The students get acquainted about the different cytogenetic and molecular techniques used for genome analysis.
CO2 This course will enable the students to use linkage and recombination frequencies in gene mapping.
CO3 The students get familiarised about role of chromosomes in sex determination and generation of variations.
CO4 The students will know about the methods that can be used to create the desiredgenotype/phenotype.

Paper – BOT-104 – ECOLOGY Credit -4 MM- 80+20 T: 3hrs

Objectives: Critically engage with concepts of Ecological principles and importance of environmentand the problems related with it at global and local level.

Outcomes:
CO1 Students will be able to understand about limiting factors controlling distribution and growth of organisms.
CO2 Students will be able to develop insights about the concepts of populations, community and ecosystems and can use in management of natural resources for sustainable development.
CO3 Students will be able to comprehend interactions among components of ecosystems for better stability.
CO4 By understanding the concept of ecological principles and environmental issues, the studentswill be able to develop attitude, value system and ethics towards environmental related issues.

Paper – BOT-201 – Microbiology and Biostatistics Credit -4 MM- 80+20 T: 3hrs

Objectives: The Course has been conceived to equip the students with the knowledge of various microbial pathogens and their effect on human affairs. In addition, the course also deals with growth, collection and maintenance of microbes, their interactions and control different therapeutic methods.

Outcomes:

CO1 To acquaint the students with the knowledge of various microbes (viruses, bacteriophages, and Cyanobacteria their impacts Biological Importance.
CO2 The Course has been conceived to equip the students with the knowledge of various laboratory conditions for their culture and maintenance of microorganisms in terms of their control through physical and chemical methods.
CO3 It is aimed to impart knowledge about microbial interactions in the wider context of Environmental Microbiology biological laboratories and research centres in India.
CO4 Working knowledge of biostatistics and there importance in the plant sciences whilediscussing the results & findings in terms of correlations, regressions and other details.

Paper-BOT-202: Natural Resources and Biodiversity Credit -4 MM-80+20 T: 3hrs

Objectives: This course aims to develop knowledge regarding natural resources and their utilization. This also aims to critically engage students with biodiversity-its status, monitoring and conservation.

Outcomes: After completion of course the students will be able to understand

CO1 Resources and their sustainable uses.
CO2 Environmental issues at global and local level.
CO3 Ecosystem Restoration
CO4 Conservation status and strategies, sustainable indicators

Paper – BOT-203 – Gymnosperms &Ethnobotany Credit -4 MM- 80+20 T: 3hrs

Objective: This course is intended to provide the basic understanding of morphology and reproduction in pteridophytes and gymnosperms. It also describes the modern methods of propagation of gymnosperms.

Outcomes:

CO1 Classify and distinguish gymnosperms from other groups of plants.
CO2 Trace evolutionary trends in development of male and female gametophytes
CO3 Learn about economic importance of gymnosperms and modern methods of their propagation.
CO4 Explain the ethnobotany, its history, significance, methods and techniques used in

ethnobotanical study and research.

Paper – BOT-204 – Molecular Genetics Credit -4 MM- 80+20 T: 3hrs

Objective: This course is intended to provide the basic understanding of biological processes such as DNA replication, transposition and mutations. A key thrust of this paper is towards the molecular mechanisms involved in the control of gene expression and regulation.

Outcome:
CO1 The students will have enhanced understanding of genome structure, evolution and its replication.
CO2 This course will impart the knowledge of basics of mutations and their importance; DNA repair mechanisms.
CO3 The students will learn about the methods of genetic recombination in bacteria
CO4 The students will gain insight into the principle mechanisms of genome expression and itsregulation.

PAPER – BOT-206 – Plants for Human Welfare CREDIT -2 MM- 40+10 T: 3hrs

Objective: This course is intended to provide the basic understanding the origin, morphology, cultivation of major crops. It also deals with the traditional knowledge and utility of some common spices, condiments, medicinal plants and horticulture crops.

Outcomes:

CO1 Explain the origin of agriculture and centres of origin of various crops
CO2 Identify the plant sources of foods, modern and traditional medicines, spices, oil, fibres, dyes, gum and timbers.
CO3 Learn about plant sources of psychoactive compounds, ornamental plants and identification of common food adulterants

SEMESTER – III

Paper – BOT-301-Plant Physiology and Plant Biochemistry Credit -4 MM-80+20 T:3 hrs

Objective: The course would deal with the study of plant physiology especially the water transport, absorption, mineral nutrition, photosynthesis, respiration and nitrogen metabolism.

Outcome:

CO1 The students will be able to understand the physiology and basic metabolism of plants.
CO2 The students will be learning about the concepts of water potential, transpiration and mechanisms of water absorption in plants.
CO3 During the course students will gain in depth knowledge about mineral nutrition, photosynthesisand respiration in plants.
CO4 The students will be able to increase the understanding about enzymes, lipid metabolism and nitrogen metabolism.

Paper – BOT-302- Plant Taxonomy and Economic Botany Credit -4 MM-80+20 T: 3hrs

Objective: The course would deal with the study of the basic concepts of plant taxonomy and botanical nomenclature. The course is also designed to know about the origin of agriculture and economic importance of major crop plants.

Outcomes:

CO1 Understand the significance, basic concepts, tools of plant taxonomy
CO2 Learn about the different systems of classification of angiosperms and relevance of plant taxonomy to other branches.
CO3 Acquire knowledge about the plant sources of foods, modern and traditional medicines, spices, oil, fibres, dyes, gum and timbers.

Paper-BOT-303 Plant Biotechnology and Genetic Engineering Credit -4 MM-80+20 T: 3hrs

Objective: This course is intended to provide knowledge about Recombinant DNA Technology, DNA cloning, gene amplification, genetic transformation methods and transgenic plants.

Outcome:
CO1 The students will have better understanding of various tools and techniques of genetic engineering.
CO2 During the course students will gain in depth knowledge about different methods for genetic transformation of plants.
CO3 The students will acquire understanding of production of transgenic plants for biotic andabiotic stress resistance, male sterility and edible vaccines.
CO4 During the course students will gain in depth knowledge about gene cloning methods, PCR and fermentation technology.

Paper – BOT-304 – Biophysical and Biochemical Techniques Credit -4MM-80 +20 T: 3hrs

Objective: This paper aims to provide an introduction to various tools and techniques used to gain insight into cell structure and biological processes. The focus is on studying the techniques used for isolation, purification and characterization of biomolecules.

Outcomes:
CO1 This course will provide the students in-depth knowledge of microscopic technology.
CO2 The students will understand the various methods used in separation, purification and quantification of biomolecules.
CO3 It will provide the students a basic understanding of the techniques used for the identification of various macromolecules.
CO4 The students will know about the tools used for tracing the metabolic pathways.

Paper – BOT-306 – Biodiversity and its conservation Credit -2 MM-40+10 T: 3hrs

Objectives: This paper is meant for students to gain in-depth knowledge of different levels, threats and distribution of Biodiversity and focus on the different approaches for biodiversity conservation.

Outcomes:

CO1 Define and appreciate the value of biodiversity
CO2 Learn about the distribution patterns and threats to biodiversity
CO3 Acquire knowledge about hotspots of biodiversity
CO4 Learn about the various methods to conserve biodiversity

SEMESTER – IV

Paper – BOT-401 Physiology of Plant Growth and Develoment Credit-4 MM- 80+20 T: 3hrs

Objective: The course would deal with different aspects of plant growth and development especially germination and dormancy of seeds, plant growth regulators, senescence and abscission, photomorphogenesis and response of plant to different abiotic stresses.

Outcomes:
CO1 The students will be able to understand the basic concepts of plant growth and development.**CO2** The students will be learning about abiotic stress tolerance/adaptive physiological changes affecting plant productivity.
CO3 During the course students will gain in depth knowledge about various plant growth regulators and their role in physiology of growth and development.
CO4 Students will be acquainted with the knowledge of physiology of flowering and sensory biology.

Paper – BOT-402 Biology of Reproduction and Anatomy Credit -4 MM-80+20 T: 3hrs

Objective: The course would deal with history of Embryology. It also describe the techniqueand applications of *in vitro* culture of reproductive organs.

Outcomes:
CO1 Describe the structure and development of reproductive structures and the process of reproductionin angiosperms
CO2 Acquire knowledge about *in vitro* culturing techniques and their applications in human welfare.
CO3 Learn laboratory techniques for in-vitro fertilization and culture of plant parts
CO4 Learn about the role of anatomy in taxonomy and anomalous secondary structures in plants

Paper – BOT-403 Plant Tissue Culture Credit -4 MM-80+20 T: 3hrs

Objective: This course seeks to impart detailed knowledge of micropropagation, somatic embryogenesis, haploid production, somatic hybridization, cryopreservation and secondary metabolite production.

Outcomes:
CO1 This course will impart knowledge to students for non-conventional multiplication of plants.**CO2** Students will learn about regeneration of complete plants from plant organs/cell other than seeds.
CO3 Students will be able to apply knowledge regarding in vitro techniques in Agriculture andforestry.
CO4 Students will attain practical knowledge of preparing artificial seeds.

Paper – BOT-404 Genomics Credit -4 MM-80+20 T: 3hrs

Objective: This course seeks to impart detailed knowledge of basic methods involved in genome studies, their organization and function.

Outcomes:
CO1 The students get acquainted about the basic principles of DNA sequencing and evolution ofDNA sequencing techniques.
CO2 Help the students to understand methods/techniques employed in proteome and genomeanalysis.
CO3 This course will enable the students to learn about the various databases utilize for the storageand

analysis of proteome/genome information.
CO4 The students will learn about the various computational tools used for analysis of genomesequence data.

SCHOOL OF AGRICULTURAL SCIENCES (SOAS)

RAFFELS UNIVERSITY, NEEMRANA

B.Sc. (Hons.) Agriculture (4 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
UNIVERSITY

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Vision: To evolve as an Institution of Excellence, where scholars develop informed and inquiringminds and broaden the frontiers of pure and applied knowledge.

Mission: In graining the capacity to us usher in change by discovering nurturing and expanding
Individual skills talents and interests while standing forth as leader and path breaker in their futurecarrier.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 To providing subjective and practical knowledge as well as developing practical solutions and connections between theories

PEO 2 Hearten individual growth among the students and enhance their confidence by providing them an opportunity to become a part of agri-industry.

PEO 3 To make agriculture subjects interesting through technically, scientifically and experimentally.

PEO 4 To develop problem-solving skills through practical applications and research

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Comprehend the basic knowledge of agriculture and interrelated subjects in the current scenario of Indian and world Agriculture.
PO 2	Develop a sympathetic of communication methods, resources utilization, cultivation of crops, management of crops, and value addition of agricultural produces.
PO 3	Develop the skills and art to manage agricultural farms and orchard, enhance quality of farm-produces, and their commercial utilization.
PO 4	Demonstrate the methods used in collection, presentation of data and analysis of results of experiments in laboratories and fields and their validation.

PO 5	Understand all related methods in agriculture to increase the profit from crop fields and livestock.
PO 6	Learn to make optimum decision at various levels that enhances the success as an agricultural enterprise.
PO 7	Learn to make optimum decision at various levels that enhances the success as an agricultural enterprise.
PO 8	Harmonize the relation with Agriculture Research Institutions, State Agriculture Universities, KrishiVigyan Kendra (KVK), etc.
PO 9	Motivate for entrepreneurship, start-up through project planning and execution, research and training during field visits etc.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Department of Agricultural Sciences, offers Four Year (comprising 8 semesters) Undergraduate Programin Science with objective of empowering students to acquire all-inclusive understanding of Agriculture Knowledge both theoretical and practical as an academic discipline. Upon completion of B. Sc. (Hons) Agriculture Degree Program successfully, the students shall acquire the following skills and competencies.

PSO 1	Demonstrate the thoughts of the legal and ethical issues of the environment impacting agriculture and food security of the local and global population and exhibit an understanding and appreciation of the ethical implications of decisions
PSO 2	To create a self-motivated system of agriculture education to attain the local and global demands of agriculture professionals in agriculture, allied sectors diversity in modern agriculture organizations
PSO 3	To develop analytical ability and team work spirit for the good understanding and analysing the current events and issues that are stirring in agriculture and their futuristic effects on agriculture.

Scheme of Examinations of B.Sc. Agriculture (Hons.)

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture I year (I Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme						Duration of Exam Hours	Credits	Theory/ Practical
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total	Grand Total			
1	HORTICULTURE	AHR-T-101	Fundamentals of Horticulture	1	0	-	20	-	30	50	100	3+3	1	T+P
2		AHR-P-101	Fundamentals of Horticulture	0	2	20	-	30	-	50			1	
3	BIOCHEMISTRY/ PHYSIOLOGY/ MICROBIOLOGY/ ENVIRONMENTAL SCIENCES	ABB-T-101	Fundamentals of Plant Biochemistry and Biotechnology	2	0	-	20	-	30	50	100	3+3	2	T+P
4		ABB-P-101	Fundamentals of Plant Biochemistry and Biotechnology	0	2	20	-	30	-	50			1	
5	SOIL SCIENCE & AGRICULTURAL CHEMISTRY	ASS-T-101	Fundamentals of Soil Science	2	0	-	20	-	30	50	100	3+3	2	T+P
6		ASS-P-101	Fundamentals of Soil Science	0	2	20	-	30	-	50			1	
7 8	BIOCHEMISTRY/ PHYSIOLOGY/ MICROBIOLOGY/ ENVIRONMENTAL SCIENCES	AES-T-101	Introduction to Forestry	1	0	-	20	-	30	50	100	3+3	1	T+P
9		AES-P-101	Introduction to Forestry	0	2	20	-	30	-	50			1	
10	LANGUAGE	ECT-T-101	Comprehension & Communication Skills in English	1	0	-	20	-	30	50	100	3+3	1	T+P
11		ECT-P-101	Comprehension & Communication Skills in English	0	2	20	-	30	-	50			1	
12	AGRONOMY	AAG-T-101	Fundamentals of Agronomy	3	0	-	20	-	30	50	100	3+3	3	T+P
13		AAG-P-101	Fundamentals of Agronomy	0	2	20	-	30	-	50			1	

14	REMEDIAL COURSES	ABI-T-101	Introductory Biology*	**1***	**0**	**-**	**20**	**-**	**30**	**50**	**100**	**3+3**	**1**	T+P
15		ABI-P-101	Introductory Biology* Practical	**1***	**2***	**20**	**-**	**30**	**-**	**50**			**1**	
16	REMEDIAL COURSES	AEM-T-101	Elementary Mathematics*	**2***	**0**	**20**	**30**	**-**	**50**	**100**	**100**	**3**	**2**	**T**
17	REMEDIAL COURSES	AEX-T-101	Agricultural Heritage*	1	0	**20**	**30**	**-**	**50**	**100**	**100**	**3**	**1**	**T**
18	AGRICULTURAL EXTENSION and COMMUNICATION	ASP-T-101	Rural Sociology & Educational Psychology	2	0	**20**	**30**	**-**	**50**	**100**	**100**	**3**	**2**	**T**
19	NON-GRADIAL COURSES	HME-T-101	Human Values & Ethics (non gradial)	1	0	**20**	**30**	**-**	**50**	**100**	**100**	**3**	**1**	**T**
20	NON-GRADIAL COURSES	NS/NC/PEY-P-101	NSS/NCC/Physical Education & Yoga Practices**	0	2	-	-	-	**100**	**100**	**100**	**-**	**2****	**P**

SCHOOL OF AGRICULTURAL SCIENCES
(Syllabus & Scheme of Studies w.e.f. 2021-22)
B.Sc. (Hons) Agriculture
I Year (I semester)

1. Fundamentals of Horticulture (AHR-T-101/AHR-P-101)2(1+1)

Course Outcomes:

1. Students will be able to identify plant vegetative structure.
2. Students will understand basic principles, processes and plant propagation methods.
3. Students will understand how to propagate plant, manage and harvest a variety of plant.
4. Students will learn how horticulture relates to the economy and environments, both currently and in the future.

2. Fundamentals of Plant Biochemistry and Biotechnology (ABB-T-101/ABB-P-101)3(2+1)

Course Outcomes:

1. Educate the outlines of bio-molecules, metabolic pathways morphology and anatomy of living cells
2. Develop the understanding of energy synthesis, hereditary mechanisms, enzymatic reactions, cellular function and growth, molecular tests, etc.
3. Develop the skills for applying principles and methods biochemistry and biotechnology to understand plant growth and metabolisms
4. Develop the ability to apply advance techniques for standardization of biochemical processes in plants, optimize cell and tissue growth and culture plant cell and tissue in the laboratory.

3. Fundamentals of Soil Science (ASS-T 101/ASS-P-101)

Course Outcomes:

1. Understand the fundamentals and principles of Soil Science.
2. Explain how different soils are formed and how does soils act as a mediumfor plant growth.

3. Explain soils of India and Land use capability, soil pollution and its effect oncrop and mitigation of soil pollution.
4. Analyze the soils for basic physical, physico-chemical & chemical properties.

4. Introduction to Forestry (AES-T-101/AES-P-101) 2(1+1)

Course Outcomes:

1. Students will understand recognize various harvesting, transportation, and processing systems used in the management of forest resources and production of forest products
2. Students will understand develop and evaluate management plans with multiple objectives and constraints
3. Students will learn how to develop and apply silvicultural prescriptions appropriate to management objectives
4. Students will understand analyze forest inventory information and project future forest, stand, and tree conditions
5. Student will understand nursery preparation of forest trees, tending operations, forest mensuration, selection of trees in agro-forestry, etc.

1. **5. Comprehension and Communication Skills in English (ECT-T-101/ECT-P-101) 2(1+1)**

Course Outcomes:

1. The students acquired the significance of proficiency, both in spoken (oral) and written language.
2. The student learnt the ways to develop comprehension skills, improved vocabulary, significant use of grammar, acquired understanding on writing skills, corresponded with others and enhanced skills in spoken English.
3. Acquainted knowledge in the field of agriculture and its allied branches by incorporation of Comprehension & Communication Skills in English.
4. Develop the understanding on the significance of communication and compared different types of communication with their use.
5. Develop the skills in different categories of writing styles, their implications in various areas, formats to be followed under these styles of writing and their significance.

7. Fundamentals of Agronomy (AAG-T-101/AAG-P-101)4(3+1)

Course Outcomes:

1. In modern terminology however the word has come to mean and denote a branch of science dealing with all aspects of crop cultivation and production.
2. A study of agronomy often involves a summoning of resources from related disciplines such as Botany, Soil Science, Irrigation, and plant protection, Plant Genetics and Breeding, Agro-meteorology etc.
3. In a more fundamental sense it can be categorized as an applied Science, the object of which is crop cultivation and management for the purpose of producing food for humans, feed for animals as well as raw materials for the industry.
4. Knowledge about Indian Agriculture and importance, present status, scope and future prospect.
5. Cropping seasons of India. Soil formation, classification, physical, chemical properties. Identification of important crops and crop seeds.

8. Agricultural Heritage (AEX-T-101) **1(1+0)**

Course Outcomes:

CO1. Acquaint the knowledge on concept, objectives, principles and philosophy of extension management.
CO2. Develop an understanding on the process, steps, principles and monitoring and evaluation involved in agricultural extension programme development for transfer of technology.
CO3. Develop the skills about genesis of agricultural extension, extension efforts in pre- and post independence era along with specific agricultural programmes
CO4. Apply new trends in agricultural extension like private extension, market led extension, expert systems, farmer led extension and cyber extension.
CO5. Evaluate different facets of rural development programmes, community development programmes, and rural leadership for capacity development of extension clienteles**.**

9. **Rural Sociology & Educational Psychology (ASP-T-101)2(2+0)**

Course Outcomes:

Course Outcomes,

1. Understanding concept of rural sociology, its importance in agricultural extension,

characteristics of Indian rural society

2. Understanding social groups, social stratification, culture, social values, social control and attitudes, leadership and training

3. Understanding concept of educational psychology, intelligence, personality, perceptions,

emotions, frustration, motivation, teaching and learning

4. Acquaint with characteristics of rural society, village institutions and social organizations.

5. Assess personality types, leadership types and emotions of human beings.

1. **Human Value and Ethics (HME-T-101)1(1+0)**

Course Outcomes:

CO1. Ability to integrate moral values with professional/personal lives that can enhance psychological well-being.
CO2. Ability to develop ethical behaviour by practicing virtues.

CO3. Ability to deal with the moral issues in practical situation.

CO4. Understanding the value of harmonious relationship based on trust and respect in their life and profession.

CO5. Understanding the role of a human being in ensuring harmony in society and nature.

CO-PO MAPPING

AHR-101	PO									
CO		1	2	3	4	5	6	7	8	9
	CO1	2	2	2	1	2	1	1	1	1
	CO2	1	2	2	2	1	2	1	2	2
	CO3	2	1	2	1	2	2	2	1	1
	CO4	2	2	1	2	2	1	1	2	1

ABB-101	PO									
CO		1	2	3	4	5	6	7	8	9
	CO1	1	1	2	1	2	1	1	1	1
	CO2	1	2	1	2	1	1	1	2	1
	CO3	2	1	1	1	2	2	2	1	1
	CO4	2	2	1	2	1	1	1	2	1

ASS-101	PO									
CO		1	2	3	4	5	6	7	8	9
	CO1	2	1	2	1	2	1	1	1	1
	CO2	1	1	1	2	1	1	1	2	1
	CO3	2	1	1	1	2	2	1	1	1
	CO4	2	2	1	2	1	1	1	2	1

ECT-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	2	1	2	2	1	1	1	1
	CO2	2	1	1	2	1	2	2	2	1
	CO3	1	1	2	1	1	2	1	1	1
	CO4	2	2	1	2	2	1	1	2	1
	CO5	1	1	2	1	2	2	1	2	2

AAG-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	1	1	1	1	1	1	1	1
	CO2	1	2	2	2	1	2	2	2	1
	CO3	1	1	2	1	2	2	1	1	1
	CO4	2	1	1	2	2	1	1	1	1
	CO5	1	1	2	1	1	1	1	2	1

AEX-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	3	1	3	3	3	3	3	3	2
	CO2	1	2	2	3	1	3	2	2	3
	CO3	3	1	1	2	2	2	1	1	1
	CO4	2	3	3	1	3	2	2	2	1
	CO5	3	1	2	2	3	1	2	1	3

ASP-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	3	2	3	3	2	2	3	3	1
	CO2	2	3	1	3	2	2	2	2	2
	CO3	1	2	2	3	3	1	2	2	1
	CO4	2	3	2	1	3	3	3	1	1
	CO5	1	3	2	2	1	2	3	2	3

HME-101	PO									
CO		1	2	3	4	5	6	7	8	9
	CO1	3	2	2	3	2	2	2	2	2
	CO2	2	2	2	2	2	2	2	3	2
	CO3	2	3	2	1	2	2	3	1	2
	CO4	2	2	2	2	3	3	3	3	2
	CO5	3	2	3	1	3	2	3	2	3

PSO-PO Mapping

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment Level*	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture I year (II Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme						Duration of Exam Hours	Credits	Theory/ Practical
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total	Grand Total			
1	GENETICS AND PLANT BREEDING	AGN-T-101	Fundamentals of Genetics	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
2		AGN-P-101	Fundamentals of Genetics	0	2	**20**	-	**30**	-	**50**			1	
3	MICROBIOLOGY	AMB-T-101	Agricultural Microbiology	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
4		AMB-P-101	Agricultural Microbiology	0	2	**20**	-	**30**	-	**50**			1	
5	AGRICULTURAL ENGINEERING	AEN-T-101	Soil and Water Conservation Engineering	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
6		AEN-P-101	Soil and Water Conservation Engineering	0	2	**20**	-	**30**	-	**50**			1	
7	BIOCHEMISTRY/ PHYSIOLOGY / MICROBIOLOGY/ ENVIRONMENTAL SCIENCES	ACP-T-101	Fundamentals of Crop Physiology	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
8		ACP-P-101	Fundamentals of Crop Physiology	0	2	**20**	-	**30**	-	**50**			1	
9	AGRICULTURAL ECONOMICS	AEC-T-101	Fundamentals of Agricultural Economics	2	0	**20**	**30**	-	**50**	**100**	**100**	**3**	2	T

10	PLANT PATHOLOGY	APP-T-101	Fundamentals of Plant Pathology	3	0	-	**20**	-	**30**	**50**	**100**	**3+3**	3	T+P
11		APP-P-101	Fundamentals of Plant Pathology	0	2	**20**	-	**30**	-	**50**			1	
12	ENTOMOLOGY	AET-T-101	Fundamentals of Entomology	3	0	-	**20**	-	**30**	**50**	**100**	**3+3**	3	T+P
13		AET-P-101	Fundamentals of Entomology	0	2	**20**	-	**30**	-	**50**			1	
14	AGRICULTURAL EXTENSION and COMMUNICATION	AEX-T-102	Fundamentals of Agricultural Extension Education	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
15		AEX-P-102	Fundamentals of Agricultural Extension Education	0	2	**20**	-	**30**	-	**50**			1	
16	AGRICULTURAL EXTENSION and COMMUNICATION	AEX-T-103	Communication Skills and Personality Development	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
17		AEX-P-103	Communication Skills and Personality Development	0	2	**20**	-	**30**	-	**50**			1	
18				**Total credit**									**24(16+8)**	

1. **1. Fundamentals of Genetics (AGN-T-101/AGN-P-101) 3(2+1)**

Course Outcomes:

1. Explain the scope of studying genetics and cell division,probability, dominance relationship and epistasis.
2. Explain Mendel's law of inheritance and pattern of inheritance genetics linkage and crossing over
3. Explain the structure of DNA and its replication, central dogma of molecular biology protein synthesis and lac-operon concept
4. Describe genes structure, chromosomes; explain pleiotropism, pseudo-alleles sex linkage, chromosome aberration and mutation.
5. Describe Mutation, Qualitative & Quantitative traits cytoplasm inheritance, genetic disorder and Multiple alleles.

2. **Agricultural Microbiology** (AMB-T-101/ AMB-P-101)**2(1+1)**

Course Outcomes:

1. Acquaint with basic terms of microorganisms, prokaryotic and eukaryotic microbes, microbial growth, pure culture, microbial association, soil fertility, symbiotic, associative and a symbiotic of microbes, bio-fertilizers, bio-pesticides, bio-degradation, etc.
2. Develop the understanding of the role of microbes in soil fertility, crop production and human welfare.
3. Develop the skills in utilization of various methods, equipment, laboratory tools, glassware, etc. for isolation, identification, preservation, classification and utilization of useful microbes.
4. Develop the ability to differentiate useful, virulent and non-useful microbes.

3. **Introductory Soil and Water Conservation Engineering** (**AEN-T-101/ AEN-P-101) 2(1+1)**

Course Outcomes:

1. To know about soil erosion via water various causes of soil erosion and forms of water erosion, classification of gully control measures or structures.
2. Course will give the knowledge of soil loss equation and it can estimate long – term annual soil loss and guide conservationists on proper cropping, management, and conservation practices.
3. This course will help the students to learn about Contour strip cropping designed to minimize soil erosion and Contour bunds which can save soils from erosion.

4. By this course students get the knowledge about Grassed waterways designed to move surface water across farmland without causing soil erosion and various water harvesting techniques.
5. Students will be able to understand the wind erosion, centrifugal pumps and various pressurized irrigation methods. So overall the importance of this technology in farm is given to students by teaching this course.

4.Fundamentals of Crop Physiology (ACP-T-101/ ACP-P-101)2(1+1)

Course Outcomes:

1. Role of crop physiology in crop health plant cell diffusion osmosis and absorption of water
2. Identification of deficiency symptoms of nutrients and mineral nutrition
3. To understand the metabolic and synthetic pathway of bio molecules photosynthesis
4. To know the difference between C3, C4 and CAM plant respiration glycolysis and fat metabolism
5. To understand Importance of growth hormone in plant and its function and type of plant hormone

6. Fundamentals of Agricultural Economics (AEC-T-101)2(2+0)

Course Outcomes:

CO1. To be able to acquire knowledge and analytical skills in addressing the issues of economics and agricultural economics.

CO2. Understanding of the basic concepts and law of economics.

CO3. Understanding of the globalization, national income, tax and its impact on agricultural development and trade.

CO4. To be able to understand and synthesize the magnitude and structure of the markets, inflation and deflation, agriculture finance.

CO5. Understanding of the basic concepts, agricultural policies, banking system and its effect on sustainable agricultural development.

5.Fundamentals of Plant Pathology (APP-T-101/APP-P-101)4(3+1)

Course Outcomes:

1. Imparting concepts, nomenclature, classification and characters of pathogens.

2. Understanding of disease identification, nature of pathogens and different strategies for management of plant diseases.
3. Applying different principles and methods for plant disease management.
4. Able to differentiate the fungicides and antibiotics (mode of action and formulations) on the basis of Nature of pathogen.
5. Develop the skills of crops diseases identification and marketing of relevant pesticides

7. **Fundamentals of Entomology (AET-T-101/AET-P-101)4(3+1)**

Course Outcomes:

1. Educate the basic concept of entomology, insect collection and preservation, dissection, and morphology of insects.
2. Develop an understanding of anatomy, physiology, the taxonomy of insects, and the effect of biotic and biotic factors on insects.
3. Demonstrate the principles of Pest surveillance, Pest forecasting, recent and traditional methods of pest management including IPM
4. Evaluating the economic importance of insects and eco-friendly control measures for pest management to sustainable agriculture.
5. Formulating the application of Insecticides and mass production techniques of Bio-control agents.

8. Fundamentals of Agricultural Extension Education (AEX-T-102/AEX-P-102)3(2+1)

Course Outcome:-

CO1. Acquaint the knowledge on concept, objectives, principles and philosophy of extension management

CO2. Develop an understanding on the process, steps, principles and monitoring and evaluation involved in agricultural extension programme development for transfer of technology

CO3. Develop the skills about genesis of agricultural extension, extension efforts in pre- and post independence era along with specific agricultural programmes

CO4. Apply new trends in agricultural extension like private extension, market led extension, expert systems, farmer led extension and cyber extension.

CO5. Evaluate different facets of rural development programmes, community development programmes, and rural leadership for capacity development of extension clienteles.

2. **Communication Skills and Personality Development (AEX-T-103/AEX-P-103)2 (1+1)**

Course Outcome:-

1.Students will be able to analyze basic communication skills and intercultural communication skills.

2. Students will be able to analyze interpersonal communication skills and public speaking communication skills.

3. Students will be able to learn about structural and functional grammar; meaning and process of communication, verbal and nonverbal communication.

4. Students will be able to listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

5. Students will also be able to understand reading and comprehension of general and technical articles, precise writing, summarizing, abstracting

CO-PO MAPPING

AGN-101	**PO**									
CO		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	CO1	1	1	1	1	1	1	1	1	1
	CO2	2	1	2	1	1	1	2	1	1
	CO3	1	2	1	2	2	1	1	1	1
	CO4	1	1	1	1	1	1	1	1	1
	CO5	1	1	3	2	1	2	1	1	1

ABB-101	**PO**									
CO		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	CO1	1	1	1	2	1	1	1	1	1
	CO2	3	1	2	1	1	1	3	2	1
	CO3	1	3	1	2	2	2	1	1	1
	CO4	1	1	1	1	3	1	1	1	1

AEN-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	1	1	1	1	1	1	1	1
	CO2	2	1	3	1	1	3	2	2	1
	CO3	3	2	1	2	2	1	1	1	2
	CO4	1	1	1	1	1	1	1	1	1
	CO5	1	1	2	2	1	2	1	1	1

ACP-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	1	2	1	1	1	1	-	1
	CO2	1	1	1	1	1	1	2	-	1
	CO3	2	1	1	2	2	1	1	-	1
	CO4	1	1	3	1	1	1	1	-	1
	CO5	1	2	1	2	1	1	1	-	1

AEC-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	3	3	3	1	3	3	3	0	1
	CO2	3	3	3	3	1	1	3	2	1
	CO3	3	1	3	2	2	2	1	1	1
	CO4	3	3	1	1	1	1	1	3	1
	CO5	3	3	2	2	1	2	1	1	3

APP-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	2	1	1	1	1	1	1	1
	CO2	1	3	3	3	1	1	3	2	1
	CO3	2	1	3	2	2	2	1	1	1
	CO4	2	3	1	1	1	1	1	1	1
	CO5	3	3	2	2	1	2	1	1	1

AET-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	2	1	1	1	1	1	1	1
	CO2	1	1	2	1	1	1	2	2	1
	CO3	2	1	1	2	2	2	1	1	1
	CO4	2	1	1	1	1	1	1	1	1
	CO5	1	2	2	2	1	2	1	1	1

AEX-103	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	3	3	2	2	3	3	2	2	1
	CO2	1	3	2	3	1	3	2	2	2
	CO3	3	3	3	3	2	3	2	2	1
	CO4	2	3	1	1	2	1	3	3	1
	CO5	2	3	2	2	1	2	3	3	3

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture II year (III Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme						Duration of Exam Hours	Credits	Theory/ Practical
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total	Grand Total			
1	AGRONOMY	AAG-T-201	Crop Production Technology – I (Kharif Crops)	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
2		AAG-P-201	Crop Production Technology – I (Kharif Crops)	0	2	**20**	-	**30**	-	**50**			1	
3	GENETICS AND PLANT BREEDING	AGN-T-201	Fundamentals of Plant Breeding	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
4		AGN-P-201	Fundamentals of Plant Breeding	0	2	**20**	-	**30**	-	**50**			1	
5	AGRICULTURAL ECONOMICS	AEC-T-201	Agricultural Finance and Cooperation	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
6		AEC-P-201	Agricultural Finance and Cooperation	0	2	**20**	-	**30**	-	**50**			1	
7	STATISTICS, COMPUTER APPLICATION AND IPR	ACS-T-201	Agri-Informatics	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
8		ACS-P-201	Agri-Informatics	0	2	**20**	-	**30**	-	**50**			1	
9	AGRICULTURAL ENGINEERIN	AEN-T-201	Farm Machinery and Power	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P

10	G	AEN-P-201	Farm Machinery and Power	0	2	**20**	**-**	**30**	**-**	**50**			1	
11	HORTICULTURE	AHR-T-201	Production Technology for Vegetables and Spices	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
12		AHR-P-201	Production Technology for Vegetables and Spices	0	2	**20**	**-**	**30**	**-**	**50**			1	
13	BIOCHEMISTRY/ PHYSIOLOGY / MICROBIOLOGY/ ENVIRONMENTAL SCIENCES	AES-T-201	Environmental Studies and Disaster Management	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
14		AES-P-201	Environmental Studies and Disaster Management	0	2	**20**	**-**	**30**	**-**	**50**			1	
15	STATISTICS, COMPUTER APPLICATION AND IPR	AST-T-201	Statistical Methods	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
16		AST-P-201	Statistical Methods	0	2	**20**	**-**	**30**	**-**	**50**			1	
17	ANIMAL PRODUCTION	AAP-T-201	Livestock and Poultry Management	3	0	-	**20**	-	**30**	**50**	**100**	**3+3**	3	T+P
18		AAP-P-201	Livestock and Poultry Management	0	2	**20**	**-**	**30**	**-**	**50**			1	
				Total credit									**23(14 +9)**	

1. Crop Production Technology-I (*Kharif*Crops) (AAG-T-201/AAG-P-201) 2(1+1)

Course Outcomes:

1. In the course study the students will be able to know about origin, geographical distribution, and
2. economic importance of Kharif crops
3. In the course study the students will be able to know about Soil and climatic requirements, varieties,cultural practices and yield of Kharif crops.
4. Analysis of comparative benefits of the different Kharif crops
5. Constraints in production of oilseeds and pulses maybe identified through course content.
6. Production technology of kharif cereals and millets fulfil the need of human consumption and milchcattle.

2. Fundamentals of Plant Breeding (AGN-T-201/AGN-P-201) 3(2+1)

Course Outcomes:

1. Establish the concept of plant breeding and idea about commercial plant breedingcompany to developed new superior crops varieties.
2. Develop the insect and disease resistant varieties for environment friendlymanagement of disease and insect with better understanding of genetic and plantmorphology.
3. Develop the idea of Plant Breeding to serve quality food in the market by developinghigh yield and nutritive varieties.
4. Increase the farm yield to get higher income on farm by developing higher yield cropvarieties.
5. Start a consultant company to guide & supply the better hybrid and varieties to thefarmers and to develop skill of molecular breeding.

3. Agricultural Finance and Co-Operation (AEC-T-201/ AEC-P-201) 3(2+1)

Course Outcomes (CO)

CO1: Explain the broad feature of Indian financial institutions with instruments to control credit in the country.

CO2: Effectively narrate the kinds and components of money with its regulatory system. Be aware of the functions, objectives and limitations of commercial bank.

CO3: Identify the existence and development of non- banking financial institutions, know the important role of mutual fund. LIC investment companies etc. Utilize and

effectively participate in the development process.

CO4: Understand about different financial statements and how agricultural cooperation works

CO5: Understand the role of agricultural cooperation institutions in India

4.**Agri-Informatics (ACS-T-201/ACS-P-201) 2(1+1)**

Course Outcomes (CO)

1. Acquaint with basic terms of software and hardware, input/output devices, database, World Wide Web, DBMS in Agriculture, ICT in Agriculture, etc.
2. Develop the understanding of application software, smart phone apps, programming languages, geospatial technology for generating valuable agri-information, decision support systems, etc.
3. Develop the skills in selection of input and output devices, software utilization, appropriate ICT tools, preparation of crop-planning using IT tools, etc.
4. Applythe computer models for understanding plant processes, IT application for computation of water and nutrient requirement of crops, computer-controlled devices (automated systems) for agri-input management and smart phone apps in agriculture for farm advises market price, postharvest management, etc.

1. Farm Machinery and Power (AEN-T-201/AEN-P-201) 2(1+1)

Course Outcomes:

1. To understand the working principle of different systems and parts of internal combustion engines.
2. To equip the students with technical knowledge and skills required for the operation of Tillage, Sowing and intercultural.
3. To enable the plant protection machinery needed for agricultural farms.
4. To train the students with skills required for the operation, maintenance and evaluation of harvesting, threshing machinery needed for agricultural farms.

7.Production Technology for Vegetable and Spices (AHR-T-201/AHR-P-201) 2 (1+1)

Course Outcomes:

1. Students will understand practical knowledge on specialized production techniques of vegetables and spices.
2. Students understand will Importance of vegetables & spices in human nutrition improved and national economy.
3. Students will knowledge about quality requirement and production and techniques.

4. Managing skill for solving field problems.

7.Environmental Studies and Disaster Management (AES-T-201/AES-P-201) 3 (2+1)

Course Outcomes

1. Acquire the knowledge of the environment and its various challenges and understand the complexrelationships components of the environment.
2. Develop the skills in identification of useful natural resources and their management practices.
3. Aware about the factors sensitive to the environment and environmental challenges.
4. Understand the values, feelings and participation of society in protection activities of the environment. 5. Encourage to individual or community involvement to the overall benefit of the environment

8.Statistical Methods (AST-T-201/AST-P-201) 2(1+1)

Course Outcomes (CO)

1. Educate basics terms used in statistics and biostatistics.
2. Develop understanding of use of various formulas, principles and methods of statistical calculations used in agriculture.
3. Develop the skills in methods of collection of any type of data, classification of data, presentation of data, analysis of data, descriptive statistics, parametric and non-parametric tests, etc.
4. Develop the ability to analyze results of statistical calculations and their validation.
5. Develop the ability to make statistical hypothesis and design experiment in agriculture.

9.Livestock & Poultry Management (AAP-T-201/AAP-P-201) 4 (3+1)

Course Outcomes

Course Outcomes

1. Give knowledge of indigenous and exotic breeds of cattle, buffalo, sheep , goat and poultry birds (poultry, duck, fowl).
2. Develop the understanding of principles, planning, and technical approach for reproduction management in different farm animals. And introduce the diseases of livestock and poultry and its prevention (including vaccination schedule) and control of important diseases of livestock and poultry.
3. Develop the ability to select types of houses suited in specific climatic conditions for best management of calves, growing heifers and milch animals.

4. Develop the understanding digestion system of livestock and poultry, classification of feedstuffs, nutrients and their functions, feed supplements, feed additives and feeding of livestock and poultry and develop ability to calculate daily ration of cattle.
5. Visit of the IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records.

CO and PO Mapping

AAG-201	**PO**									
CO		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	CO1	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**
	CO2	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**2**
	CO3	**2**	**1**	**2**	**1**	**2**	**2**	**1**	**3**	**1**
	CO4	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**2**	**1**
	CO5	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**
	CO6	**2**	**1**	**3**	**1**	**1**	**1**	**2**	**1**	**2**

AGN-201	**PO**									
CO		1	1	1	2	1	1	1	-	1
	CO1	2	1	1	1	1	1	1	-	1
	CO2	1	1	1	2	2	1	1	-	1
	CO3	1	1	1	1	1	1	1	-	1
	CO4	1	1	1	2	1	2	1	-	2
	CO5	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**

AEC-201	**PO**									
CO		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	CO1	3	3	3	3	3	3	3	2	3
	CO2	3	1	2	1	2	1	2	2	2
	CO3	3	3	2	2	2	3	1	1	3
	CO4	2	1	2	3	2	1	1	1	3
	CO5	1	3	1	2	2	2	1	3	1

ACS-201	PO								
		1	2	3	4	5	6	7	8	9
CO	CO1	2	2	1	1	2	2	2	2	1
	CO2	2	1	2	1	2	1	2	2	2
	CO3	1	2	1	2	2	1	1	1	2
	CO4	2	1	2	3	2	1	1	1	2

AEN-201	PO								
		1	2	3	4	5	6	7	8	9
CO	CO1	2	3	1	1	1	1	1	2	1
	CO2	2	1	2	1	3	1	2	2	2
	CO3	1	2	1	2	2	1	1	1	2
	CO4	2	1	2	1	2	3	1	1	3

AHR-201	PO								
		1	2	3	4	5	6	7	8	9
CO	CO1	1	1	1	2	1	2	1	2	1
	CO2	2	1	2	1	2	1	2	1	2
	CO3	1	2	1	2	2	1	1	1	2
	CO4	2	1	2	1	2	2	1	1	1

AES-201	PO								
		1	2	3	4	5	6	7	8	9
CO	CO1	2	3	2	1	1	2	1	2	1
	CO2	2	1	2	1	2	1	2	1	2
	CO3	1	1	1	2	2	1	1	1	2
	CO4	2	2	2	1	2	2	1	1	1

AST-201	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	2	2	2	2	1	3	1	2	3
	CO2	2	1	3	1	3	1	2	1	1
	CO3	1	1	1	2	2	1	1	1	2
	CO4	3	2	2	1	1	2	1	1	1

AAP-201	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	2	1	2	2	1	2	1	2	2
	CO2	1	1	2	1	2	1	2	2	1
	CO3	1	3	1	2	2	3	1	1	1
	CO4	2	1	2	1	1	1	1	1	3
	CO5	1	3	1	2	2	2	1	3	1

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture II year (IV Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme						Duration of Exam Hours	Credits	Theory/ Practical
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total	Grand Total			
1	AGRONOMY	AAG-T-202	Crop Production Technology –II (Rabi Crops)	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
2		AAG-P-202	Crop Production Technology –II (Rabi Crops)	0	2	**20**	-	**30**	-	**50**			1	
3	HORTICULTURE	AHR-T-202	Production Technology for Ornamental Crops, MAP and Landscaping	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
4		AHR-P-202	Production Technology for Ornamental Crops, MAP and Landscaping	0	2	**20**	-	**30**	-	**50**			1	
5	AGRICULTURAL ENGINEERING	AEN-T-202	Renewable Energy and Green Technology	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
6		AEN-P-202	Renewable Energy and Green Technology	0	2	**20**	-	**30**	-	**50**			1	
7	SOIL SCIENCE & AGRICULTURAL CHEMISTRY	ASS-T-201	Problematic Soils and their Management	2	0	**20**	**30**	**0**	**50**	**100**	**100**	3	2	T

8	HORTICULTURE	AHR-T-203	Production Technology for Fruit and Plantation Crops	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
9		AHR-P-203	Production Technology for Fruit and Plantation Crops	0	2	**20**	-	**30**	-	**50**			1	
10	GENETICS AND PLANT BREEDING	AGN-T-202	Principles of Seed Technology	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
11		AGN-P-202	Principles of Seed Technology	0	4	**20**	-	**30**	-	**50**			2	
12	AGRONOMY	AAG-T-203	Farming System & Sustainable Agriculture	1	0	**20**	**30**	**0**	**50**	**100**	**100**	**3**	1	T
13	AGRICULTURAL ECONOMICS	AEC-T-202	Agricultural Marketing Trade & Prices	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
14		AEC-P-202	Agricultural Marketing Trade & Prices	0	2	**20**	-	**30**	-	**50**			1	
15	AGRONOMY	AAG-T-204	Introductory Agro-meteorology & Climate Change	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
16		AAG-P-204	Introductory Agro-meteorology & Climate Change	0	2	**20**	-	**30**	-	**50**			1	
17	ELECTIVE COURSE	AET-T-201*	Agrochemicals	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2*	T+P
18		AET-P-201*	Agrochemicals	0	2	**20**	-	**30**	-	**50**			1*	
19		AEC-T-203	Agribusiness Manageme	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P

			nt											
20		AEC-P-203	Agribusiness Management	0	2	**20**	-	**30**	-	**50**			1	
21		AGN-T-203	Commercial Plant Breeding	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
22		AGN-P-203	Commercial Plant Breeding	0	4	**20**	-	**30**	-	**50**			2	
23		AHR-T-204	Landscaping	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
24		AHR-P-204	Landscaping	0	2	**20**	-	**30**	-	**50**			1	
				Total credit									**19(11+8) + 3**	

1. Crop Production Technology-II (*Rabi* crops) (AAG-T-202/AAG-P-202) 2(1+1)

Course Outcomes (CO)

1. Acquaint the knowledge on the Rabi season crops, its classification (cereal crops, oilseed crops, pulse crops, sugar crops, fodder crops) and its importance in agriculture and national economy.
2. Discuss the production techniques of Rabi crops and their origin, economic importance, geographical distribution and botanical description.
3. Implement the sowing methods of Rabi crops in the field and their management.
4. Distinguish all Rabi crops (wheat, barley, pea, chickpea, mustard, sugarcane etc.) with their cultivation practices.

2. Production Technology for Ornamental Crops, MAPs and Landscaping (AHR-T-202/AHR-P-202)

2 (1+1)

Course Outcomes:

1. The production technology identifies causes of low production problems, quantify potential impacts, analyze options, identify viable solutions, and evaluate actions and consequences of treatments and interventions.

2. Identify different types of flower, ornamental and medicinal crops.
3. To planned and layout of garden and landscaping and its principles.
4. To perform intercultural operations in flowers and medicinal and aromatic crops.

3. Renewable Energy and Green Technology(AEN-T-202/AEN-P-202) 2(1+1)

Course outcome:

1. Students will be able to understand the role of renewable sources in agriculture sector.
2. Students will be able to evaluate and understand the bio fuel production and their applications in today's world.
3. Students will be able to understand and utilizing the solar energy in various aspects.
4. Students will be able to understand and learn the environmental aspects of non-conventional energy resources and know the need of renewable energy resources and latest developments.
5. Students will also be able to acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications

1. Problematic Soils and their Management(ASS-T-201/ASS-P-201) 2(2+0)

Course Outcomes

1. Students will be able to understand about waste land and problematic soils inIndia and management of the soils.
2. Students will be able to know the different reclamation and managementpractices for the development of the soils.
3. Students will be able to understand different factors responsible for saline,sodic and acidic soils and their properties.
4. Students will be able to use the fundamentals of soil science disciplines forthe reclamation of degraded soils.
5. Students will also be able to demonstrate fundamental knowledge to identifyproblematic soils and associated problems and identify processes resulting indeterioration of soil physical and chemical properties.

2. Production Technology for Fruit and Plantation Crops(AHR-T-203/AHR-P-203) 2(1+1)

Course Outcomes

1. Understand the diversity and importance of fruits, their culture and utilizationand Able to establish orchards of fruits and plantation crops.
2. Apply horticultural principles to the successful growth and production of fruitand plantation crops.
3. Synthesize and integrate information to solve fruit problems andcommunicate effectively within the discipline and also be able to transmitknowledge and skills to lay-persons in the general public.
4. Demonstrate competence with laboratory and/or field-based technologies used in modernhorticulture and anticipate and recognize problems, identifycauses of these problems, quantify potential impacts, analyze options, identifyviable solutions, and evaluate actions and consequences of treatments andinterventions.
5. Understand how global issues including climate change, energy use, wateravailability, and/or food safety impact sustainability of horticultural systemslocally, nationally, and globally and quantify economic importance of fruitsand plantation in managed ecosystems and the impact of horticultural crops infood systems.

3. Principles of Seed Technology (AGN-T-202/AGN-P-202) 3(1+2)

Course Outcomes:

1. Students will be able to define and types of seed, scope of seed technologist and relation of seed technology with other branches of agriculture.
2. Students will be able to understand different methodology of seed production for each crop.
3. Students will be able to evaluate and understand acts related to seed and at the end need of various act related to seed.
4. Students will be able to learn different method to assess the quality of seed and prevent seed from deterioration.
5. Students will also be able to understand importance and types of seed quality, seed storage and techniques of different seed treatment and seed marketing.

4. Farming System and Sustainable Agriculture (AAG-T-203)1(1+0)

Course Outcomes:

1. Student can able to understand about maximum possible return and profitability by different enterprises
2. A solid understanding of the utilization and conservation of available resources

3. To show how agricultural scientists are attempting to minimize agricultural pollution and sustain food production adequate for the increasing population
4. The student will be able to understand IFS model in different agro-climatic zones
5. The student will study about farming systems and sustainable agriculture

1. Agricultural Marketing, Trade and Prices (AEC-T-202/AEC-P-202) 3(2+1)

Course Outcomes:

CO1. Learning of marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange.

CO2. Understanding of the role of Govt. in agricultural marketing: Public sector institutions-CWC, SWC, FCI, CACP & DMI – their objectives and functions.

CO3. Gaining of knowledge of optimization of Resource use and Output Management: An efficient agricultural marketing system leads to the optimization of resource use and output management. An efficient marketing system can also contribute to an increase in the marketable surplus by scaling down the losses arising out of inefficient processing, storage and transportation. A well designed system of marketing can effectively distribute the available stock of modern inputs, and thereby sustain a faster rate of growth in the agricultural sector.

CO4. Evaluation of the efficient marketing system ensures higher levels of income for the farmers by reducing the number of middlemen or by restricting the commission on marketing services and the malpractices adopted by them in the marketing of farm products.

CO5. Understanding of the marketing system is essential for the success of the development programmes which are designed to uplift the population as a whole plan of economics.

2. Introductory Agro-meteorology& Climate Change (AAG-T-204/AAG-P-204) 2(1+1)

Course Outcomes:

1. To understand roles of agro meteorology in agriculture and its relation to other areas of agriculture to acquaint with recent developments in agro meteorology with historical development of climate change.
2. Agro meteorology or Agricultural meteorology studies meteorological and hydrological factors in relation to agriculture.
3. Agro meteorology studies the behaviour of the weather elements that have direct relevance to agriculture and their effect on crop production.
4. Weather and climate are the factors determining the success or failure of agriculture.

5. To develop weather based agro advisories to sustain crop production utilizing various.

Articulated attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	3	2	2	1	1	-	1	-	1	2	-	1
CO-2	2	2	2	1	-	1	-	-	1	2	2	1
CO-3	2	1	1	1	1	-	1	-	1	2	-	1
CO-4	2	1	1	1	-	1	-	-	1	1	1	1
Average	2.3	1.5	1.5	1	1	1	1	-	1	1.8	1.5	1

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	1	-	1	-	-	-	1	1	1
CO-2	2	2	2	-	-	-	1	-	-	2	1	1
CO-3	1	1	1	1	-	1	-	-	-	1	2	2
CO-4	1	1	1	2	-	-	1	-	-	1	2	2
Average	1.3	1.5	1.5	1.3	-	1.0	1.0	-	-	1.3	1.5	1.5

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	2	2	1	-	-	-	1	1	2
CO-2	1	1	2	2	1	1	-	-	-	1	1	2
CO-3	1	2	1	2	3	1	-	-	-	1	1	2
CO-4	1	1	1	2	2	1	-	-	-	1	1	2
Average	1.0	1.5	1.3	2.0	2.0	1.0	-	-	-	1.0	1.0	2.0

Articulated Attainment

COs	PO-1	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PSO	PSO	PSO

		2	3	4	5	6	7	8	9	-1	-2	-3
CO-1	1	1	1	1	1	2	1	-	-	1	3	1
CO-2	2	2	2	1	-	1	1	-	-	1	-	-
CO-3	1	1	-	1	2	-	1	-	-	2	-	2
CO-4	2	1	1	1	1	2	1	-	-	1	5	1
CO-5	1	1	-	1	2	-	1	-	-	2	-	2
Average	1.5	1.25	1.33	1	1.33	1.6	1	-	-	1.25	1.25	1

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3
CO-1	2	2	1	2	-	-	-	-	-	1	-	1
CO-2	1	2	2	-	-	-	-	-	-	-	-	-
CO-3	2	1	1	1	-	-	-	-	-	2	1	-
CO-4	1	1	2	-	-	-	-	-	-	-	1	-
CO-5	2	2	1	2	-	-	-	-	-	1	-	1
Average	1.5	1.5	1.5	1.0	-	-	-	-	-	0.75	0.5	0.25

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	3	1	3	1	-	-	-	-
CO2	3	3	1	1	3	3	2	-	-	-	-	-
CO3	3	3	1	1	3	2	1	-	-	-	-	-
CO4	2	2	1	-	2	-	1	-	2	-	2	-
Average	2.75	2.5	1	1	2.75	2	1.75	1	2	-	2	-

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3
CO-1	3	2	2	1	1	-	1	-	1	2	-	1
CO-2	2	2	2	1	-	1	-	-	1	2	2	1
CO-3	2	1	1	1	1	-	1	-	1	2	-	1
CO-4	2	1	1	1	-	1	-	-	1	1	1	1

CO-5	2	1	1	1	-	1	-	-	1	1	1	1
Average	2.3	1.5	1.5	1.0	1.0	1.0	1.0	-	1.0	1.8	1.5	1.0

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	2	1	2	1	-	1	1	-	-	3	1	1
CO-2	1	2	-	1	-	1	2		-	2	1	1
CO-3	2	1	2	1	2	1	2	-	-	2	2	1
CO-4	1	1	1	1	2	1	1	-	-	1	3	1
CO-5	1	1	1	1	2	1	1	-	-	1	3	1

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	3	3	2	2	1	-	-	-	-	-	-	-
CO-2	3	3	2	2	3	-	-	-	-	-	-	-
CO-3	2	2	2	2	3	1	-	-	-	-	-	-
CO-4	3	3	2	2	3	-	-	-	-	-	-	-
CO-5	3	1	1	2	-	-	-	-	-	-	-	-
Average	2.8	2.5	1.8	2.2	2.2	1.0	-	-	-	-	-	-

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture III year (V Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme					Grand Total	Duration of Exam Hours	Credits	Theory/ Practical
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total				
1	PLANT PATHOLOGY	APP-T-301	Principles of Integrated Pest and Disease Management	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
2		APP-P-301	Principles of Integrated Pest and Disease Management	0	2	**20**	-	**30**	-	**50**			1	
3	SOIL SCIENCE & AGRICULTURAL CHEMISTRY	ASS-T-301	Manures, Fertilizers and Soil Fertility Management	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
4		ASS-P-301	Manures, Fertilizers and Soil Fertility Management	0	2	**20**	-	**30**	-	**50**			1	
5	ENTOMOLOGY	AET-T-301	Pests of Crops and Stored Grain and their Management	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
6		AET-P-301	Pests of Crops and Stored Grain and their Management	0	2	**20**	-	**30**	-	**50**			1	
7	PLANT PATHOLOGY	APP-T-302	Diseases of Field and Horticultural Crops and	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P

			their Management -I											
8		APP-P-302	Diseases of Field and Horticultural Crops and their Management -I	0	2	**20**	-	**30**	-	**50**			1	
9	GENETICS AND PLANT BREEDING	AGN-T-301	Crop Improvement-I (Kharif Crops)	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
10		AGN-T-301	Crop Improvement-I (Kharif Crops)	0	2	**20**	-	**30**	-	**50**			1	
11	AGRICULTURAL EXTENSION and COMMUNICATION	AEX-T-301	Entrepreneurship Development and Business Communication	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
12		AEX-P-301	Entrepreneurship Development and Business Communication	0	2	**20**	-	**30**	-	**50**			1	
13	AGRONOMY	AAG-T-301	Geoinformatics and Nano-technology and Precision Farming	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
14		AAG-P-301	Geoinformatics and Nano-technology and Precision Farming	0	2	**20**	-	**30**	-	**50**			1	
15	AGRONOMY	AAG-P-302	Practical Crop Production – I (Kharif crops)	0	4	**20**		**80**	**0**	**100**	**100**	3	2	P
16	Intellectual Property Rights	IPR-T-301	Intellectual Property Rights	1	0	**20**	**30**	**0**	**50**	**100**	**100**	3	1	T

17	Elective Course	AFT-T-301	Food Safety and Standards	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
18		AFT-P-301	Food Safety and Standards	0	2	**20**	-	**30**	-	**50**			1	
19		AET-T-302	Biopesticides & Biofertilizers	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
20		AET-P-302	Biopesticides & Biofertilizers	0	2	**20**	-	**30**	-	**50**			1	
21		AEN-T-301	Protected Cultivation	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
22		AEN-P-301	Protected Cultivation	0	2	**20**	-	**30**	-	**50**			1	
23		AHR-T-301	Micro propagation Technologies	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
24		AHR-P-301	Micro propagation Technologies	0	4	**20**	-	**30**	-	**50**			2	
				Total credit									**21(12+09)+ 3**	

1. Principles of Integrated Pest and Disease Management (APP-T-301/APP-P-301) 3(2+1)

Course Outcomes:

1. Students knowledgeable about the effects of biotic and abiotic factors on insect development, population growth, species interactions, physiological requirements and insect behaviour.
2. Students are skilled in determining pest levels and impact on plant and animal hosts and the management of these pests by Integrated Pest Management approach.
3. To be able to address complex problems facing entomology or toxicology professionals taking into account related ethical, social, legal, economic, and environmental issues.

4. To be able to surveillance and forecasting of insect pests and assessment of insect pest population and recent pest outbreaks and manage them by using different tools and recent methods pest management.
5. To Understands about different classes of insecticides, their formulation, toxicity, poisoning, first aid and antidotes and their effect on plants, animals and environment.

1. Manures, Fertilizers and Soil Fertility Management(ASS-T-301/ASS-P-301) 3(2+1)

Course Outcomes:

1. Knowledge of different manure and fertilizers used in different crops according to soil condition
2. To understand essentiality of plant nutrients and mechanism of nutrient transport to plant and factor affecting nutrient availability.
3. To be able about procedure of soil testing and establish soil testing laboratory in future as an entrepreneur.

1. Pests of Crops and Stored Grains and their Management (AET-T-301/AET-P-301)3(2+1)

Course Outcomes:

1. Familiarized with identification of different insect pest of field, horticulture, ornamentals, vegetables and stored grains at the field level.
2. Understand how insects affect animal and Plant health and agricultural production, and be able to safely manipulate populations of beneficial and destructive species in habitats and in production agro-ecosystems with minimal environmental impact.
3. To be able about the biology, diversity, distribution of insects, and their relationships to crop and the environment condition of a particular area.
4. To understand identification of nature of damage and symptoms caused by the pest so suitable technique of pest management can be apply for effective control.
5. Management of crop pest through Integrated Pest Management approach without side effect on plant, animal and environment health.

1. Diseases of Field & Horticultural Crops & their Management-I (APP-T-302/APP-P-302) 3(2+1)

2. Crop Improvement – I (*Kharif*) (AGN-T-301/AGN-P-301) 2(1+1)

Course Outcomes:

1. Learner learn importance of wild relative to produce new varieties of Kharif crop.
2. Learner learns gene preservation method for further use to improve Kharif varieties.
3. Learner learns to apply knowledge of genetics in breeding method to improve kharif crops.
4. Learner learns identification of resistance gene relate to kharif crop with high yield, quality and potential

against pest and pathogen.

5. Learner learns new genetic approaches to achieve hybrid production in Kharif crop.

3. Entrepreneurship Development and Business Communication (AEX-T-301/AEX-P-301) 2(1+1)

Course Outcomes:

1. Development of entrepreneurial competencies among students.
2. Students may learn about the principles to develop an Enterprise or any business unit.
3. Understanding of the key risks and the most effective processes in bringing different types of products or services to market.
4. Understanding different methods that can be used to minimize uncertainties atdifferent stages of the entrepreneurial process.
5. Understanding the dynamics of how teams develop and function as well as thevarious types of conflicts that can arise during teamwork.

4. Geoinformatics, Nano-technology and Precision Farming (AAG-T-301/AAG-P-301) 2(1+1)

Course Outcomes:

1. The concept of "doing the right thing in the right place at the right time" has a strong intuitive appeal which gives farmers the ability to use all operations and crop inputs more effectively.
2. More effective use of inputs results in greater crop yield and/or quality, without polluting the environment.
3. Precision agriculture can address both economic and environmental issues that surround production agriculture today.
4. Encourage the farmers to study of spatial and temporal variability of the input parameters using primary data at field level.
5. Creating awareness amongst farmers about consequences of applying imbalanced doses of farm inputs like irrigation, fertilizers, insecticides and pesticides.

5. Practical Crop Production-I *(Kharif Crops) (*AAG-P-302*)* 2(0+2)

Course Outcomes

1. In the course study students will be acquainted with the knowledge of profitable crop production technology.
2. Course content will help to students/farmers about ruminative crop production techniques.
3. It helps to adopt diversified farming system according to available farming situation.
4. It will assist to encourage the sustainable agriculture system.
5. Profitable based farming system can we adopted with the help of course content

6. Intellectual Property Rights (IPR-T-301) 1(1+0)

Course Outcomes:

1. Skill to understand the concept of intellectual property rights.
2. Develops procedural knowledge to Legal System and solving the problem relating to intellectual property rights.
3. Skill to pursue the professional programs in Company Secretary ship, Law, Business, Agriculture, International Affairs, Public Administration and Other fields.
4. Employability as the Compliance Officer, Public Relation Officer and Liaison Officer.
5. Establishment of Legal Consultancy and service provider.

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3
CO-1	1	1	1	1	1	2	1	-	-	2	2	1
CO-2	2	2	1	1	-	1	1	-	-	1	-	-
CO-3	1	2	-	1	2	-	1	-	-	2	-	2
CO-4	1	1	2	-	1	2	1	-	-	1	1	1
CO-5	1	-	2	1	1	-	-	-	-	-	-	1
Average	1.2	1.5	1.5	1	1.2	1.3	1	-	-	1.5	1.5	1.2

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3
CO-1	1	1	1	1	1	2	1	-	-	2	2	1

CO-2	2	2	1	1	-	1	1	-	-	1	-	-
CO-3	1	2	-	1	2	-	1	-	-	2	-	2
Average	1.2	1.5	1.5	1	1.2	1.3	1	-	-	1.5	1.5	1.2

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3
CO-1	1	2	2	1	1	2	1	-	-	2	1	1
CO-2	1	1	2	1	1	1	1	-	-	1	-	-
CO-3	2	1	-	1	-	-	1	-	-	2	-	2
CO-4	1	2	1	1	1	2	1	-	-	1	2	1
Average	1.3	1.5	1.3	1.0	1.0	1.3	1.0	-	-	1.5	1.5	1.0

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	1	1	-	-	-	-	-	-	-
CO-2	1	2	1	1	1	-	1	-	-	-	-	-
CO-3	1	1	1	2	-	-	1	-	-	-	-	-
CO-4	1	-	1	1	1	-	-	-	-	-	-	-
CO-5	-	1	1	1	-	-	1	-	-	-	2	-
Average	1.3	1.3	1.0	1.3	1.0	-	1.0	-	-	-	2.0	-

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	3	1	2	3	2	1	1	-	-	-	-	-
CO2	1	1	2	2	1	2	-	-	1	-	-	-
CO3	2	-	2	2	-	-	-	-	-	-	-	-
CO4	2	-	1	1	1	1	1	-	1	-	-	-
CO5	3	2	1	1	3	2	1	-	-	-	-	-
Average	2.2	1.3	1.6	1.8	1.8	1.5	1	-	1	-	-	-

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	3	3	2	1	2	2	2	3	3	1	1	1

CO-2	3	3	2	1	2	2	2	2	3	1	1	1
CO-3	2	2	1	-	1	1	1	2	3	1	-	1
CO-4	1	1	-	-	-	1	1	1	3	-	-	-
CO-5	3	3	2	1	2	2	2	2	3	1	1	1
Average	2.3	2.3	1.7	1.0	1.7	1.5	1.5	2.0	3.0	1.0	1.0	1.0

Articulated Attainment

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	1	-	1	-	1	1	1	1
CO2	3	2	2	2	1	-	-	-	1	1	-	-
CO3	3	2	2	2	1	-	-	-	-	1	-	-
CO4	3	2	2	2	1	-	-	-	-	1	-	-
CO5	3	2	2	2	1	-	-	-	-	1	-	-
Average	3.0	2.0	2.0	2.0	1.0	-	-	-	-	1.0	1.0	1.0

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3
Average	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1	2	1	1	-	-	-	-	-	-
CO2	2	2	2	-	2	2	1	-	-	-	-	-	1
CO3	2	1	2	2	3	2	1	-	1	-	-	1	-
CO4	1	-	1	1	2	1	-	-	-	-	-	-	1
CO5	1	-	1	1	2	1	-	-	-	-	-	-	1
Average	2.0	2.0	1.8	1.3	2.3	1.5	1.0	-	1.0	-	-	1.0	1.0

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture III year (VI Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme						Dura E H
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total	Grand Total	
1	AGRONOMY	AAG-T-303	Rainfed Agriculture & Watershed Management	1	0	-	**20**	-	**30**	**50**	**100**	3
2		AAG-P-303	Rainfed Agriculture & Watershed Management	0	2	**20**	-	**30**	-	**50**		
3	AGRICULTURAL ENGINEERING	AEN-T-302	Protected Cultivation and Secondary Agriculture	1	0	-	**20**	-	**30**	**50**	**100**	3
4		AEN-P-302	Protected Cultivation and Secondary Agriculture	0	2	**20**	-	**30**	-	**50**		
5	PLANT PATHOLOGY	APP-T-303	Diseases of Field and Horticultural Crops and their Mgt. -II	2	0	-	**20**	-	**30**	**50**	**100**	3
6		APP-P-303	Diseases of Field and Horticultural Crops and their Mgt.-II	0	2	**20**	-	**30**	-	**50**		
7	HORTICULTURE	AHR-T-302	Post-harvest Management and Value Addition of Fruits and Vegetables	1	0	-	**20**	-	**30**	**50**	**100**	3
8		AHR-P-302	Post-harvest Management and Value Addition of Fruits and Vegetables	0	2	**20**	-	**30**	-	**50**		
9	ENTOMOLOGY	AET-T-303	Management of Beneficial Insects	1	0	-	**20**	-	**30**	**50**	**100**	3
10		AET-P-303	Management of Beneficial Insects	0	2	**20**	-	**30**	-	**50**		
11	GENETICS AND PLANT BREEDING	AGN-T-302	Crop Improvement-II (Rabi crops)	1	0	-	**20**	-	**30**	**50**	**100**	3
12		AGN-P-302	Crop Improvement-II (Rabi crops)	0	2	**20**	-	**30**	-	**50**		
13	AGRONOMY	AAG-P-304	Practical Crop Production – II (Rabi crops)	0	4	**20**		**80**	**0**	**100**	**100**	
14	AGRONOMY	AAG-T-305	Principles of Organic Farming	1	0	-	**20**	-	**30**	**50**	**100**	3

15		AAG-P-305	Principles of Organic Farming	0	2	**20**	-	**30**	-	**50**		
16	AGRICULTURAL ECONOMICS	AEC-T-301	Farm Management, Production & Resource Economics	1	0	-	**20**	-	**30**	**50**	**100**	3
17		AEC-P-301	Farm Management, Production & Resource Economics	0	2	**20**	-	**30**	-	**50**		
18	FOOD SCIENCE & TECHNOLOGY	AFT-T-302	Principles of Food Science and Nutrition	2	0	**20**	**30**	**0**	**50**	**100**	**100**	
19	Elective Course	AHR-T-303	Hi-tech. Horticulture	2	0	-	**20**	-	**30**	**50**	**100**	3
20		AHR-P-303	Hi-tech. Horticulture	0	**2**	**20**	-	**30**	-	**50**		
21		AAG-T-306	Weed Management	2	0	-	**20**	-	**30**	**50**	**100**	3
22		AAG-P-306	Weed Management	0	**2**	**20**	-	**30**	-	**50**		
23		AAG-T-307	System Simulation and Agro-advisory	2	0	-	**20**	-	**30**	**50**	**100**	3
24		AAG-P-307	System Simulation and Agro-advisory	0	**2**	**20**	-	**30**	-	**50**		
25		AEX-T-302	Agricultural Journalism	2	0	-	**20**	-	**30**	**50**	**100**	3
26		AEX-P-302	Agricultural Journalism	0	**2**	**20**	-	**30**	-	**50**		
				Total credit								

1. Rainfed Agriculture and Watershed Management (AAG-T-303/AAG-P-303) 2(1+1)

Course Outcomes:

1. Student can able to understand objective, principles and component of watershed management
2. Student can able to understand about rainfed agriculture and its introduction, problem and prospects in India and management of crops in rainfed areas
3. Student can able to understand about the soil and climatic conditions of rainfed areas
4. Student can able to understand about the drought , crop adaptation and mitigation to drought,

water conservation techniques and contingent crop planning for aberrant weather conditions.

5. Student can able to understand about the water harvesting and efficient utilization of water through soil and crop management practices

2. Protected Cultivation and Secondary Agriculture (AEN-T-302/AEN-P-302) 2(1+1)

Course Outcomes:

1. Students able to perform the various cultural practices under greenhouse such as drying and green house equipments.
2. To understand the response of plant to controlled conditions and irrigation system.
3. To understand the planning, design criteria cost and economic analysis of greenhouses.
4. Understanding the principle, theoretical aspects and developing skills in protected cultivation of horticultural crops.

3. Diseases of Field & Horticultural Crops & their Management-II (APP-T-303/APP-P-303**) 3(2+1)**

Course Outcomes (CO)

1. By the end of this course students studied symptoms, involved pathogens, disease cycle, best possible management practices available and able to resolve the problem of yield reduction in crops.
2. In this course students will be able to prepare culture, identify and understand the biology of pathogens in the laboratory.
3. Students will able to understand best possible management of field crops.
4. In this course students apply different fungicides and antibiotics (mode of action and formulations) on the basis of Nature of pathogen, manage crops disease corresponding to involved pathogen and examine loss in quality and yield.
5. By the end of this course students develop skills about detection and diagnosis of plant diseases and application of pesticides.

4. Post-harvest Management and Value Addition of Fruits and Vegetables (AHR-T-302/AHR-P-302) 2(1+1)

Course Outcomes:

1. To make the students aware of the new innovative technologies of processing, harvesting, drying and canning.

2. Prolong the post harvest storage life of horticultural commodities and increase income through value addition of the products and to reduce post harvest losses.
3. To understand the various packaging and storage methods for preservation of fruits and vegetables after post harvest.To learn the making various processed and fermented products.

5. Management of Beneficial Insects (AET-T-303/AET-P-303) 2(1+1)

Course Outcomes

1. Students can adopt apiculture, sericulture and lac culture as an entrepreneur according to agro climaticzone.
2. To understand commercial methods of rearing, equipment, seasonal management, insect pest anddisease and important species for commercial use of honey bee, silkworm and lac insect.
3. Identification of different bio control agents (Predator, Parasite and Parasitoids) and their use forsustainable pest management.
4. Learn about mass multiplication technique of biological control agents and established a bio control labin future as an entrepreneur.

6. Crop Improvement – II (*Rabi*) (AGN-T-302/AGN-P-302) 2(1+1)

Course Outcomes:

1. Learner learn importance of wild relative to produce new varieties of Rabi crop
2. Learner learns gene preservation method for further use to improve Rabi varieties
3. Learner learns to apply breeding method to improve Rabi crops and nature of gene action
4. Learner learns identification of resistance gene relate to Rabi crop with high yield, quality and potential against pest and pathogen and utilization genes
5. Learner learns new genetic approaches to achieve a definite ideotype of Rabi crop, hybrid production and climate resilient crop varieties

7. Practical Crop Production-II *(Rabi Crops)(AAG-P-304)* 2(0+2)

8. Principles of Organic Farming (AAG-T-305/AAG-P-305) 2(1+1)

Course Outcomes:

1. Helps in understanding the Concept, Principles, Scope and Opportunities of Organic Farming.

2. Helps in understanding the Role of an Organic Grower.

3. Can develop an organic production system

4. Use of various organic inputs for crop production.

5. Use of non-synthetic agents for crop production, will get some idea about organic certification.

6. It helps students can explain to the farmers what is organic farming, why it is needed today, how it can be promoted, how it can be used for more production in less cost, by Government of India What steps are being taken for this, and how farmers can increase the yield of their crop without using chemicals, as well as how to make their fields fertile.

1. Farm Management, Production and Resource Economics (AEC-T-301/AEC-P-301) 2(1+1)

Course Outcomes:

CO1: The course contains a comprehensive treatment of farm management and its concept traditional agricultural production economics topics employing both detailed graphics and differential calculus

CO2: Focus on cost and neoclassical factor-product, factor-factor and product- product models, and is suitable for an advanced undergraduate or a beginning graduate –level course in static production economics

CO3: Understand limited resources available in the economy. Realize the need to exploit and utilize through development and improvement of production techniques

CO4: Make them aware of the availability of rich natural endowments to achieve sustainable agricultural development with this knowledge they can challenge the problems of unemployment inequality shortage of food productions, poverty and be useful to compete advanced agricultural economies.

CO5: Gain knowledge of the causes of regional variations in productivity and production, social and economic inequality, size of land holdings and lack of quality inputs etc. And suggest appropriate measures for the whole economy.

2. Principles of Food Science and Nutrition (AFT-T-302) 2(2+0)

Course Outcomes

1. Students will be able to critically evaluate information on food science and nutrition issues appearing in the popular press.

2. Students will be able to discuss the important pathogen and spoilage microorganism in foods.
3. Students will be able to discuss basic principles and practices of cleaning and sanitation in food preparation operation.
4. Students will be able to identify and explain nutrients in foods and the specific functions in maintaining health.

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	1	1	-	1	-	1	2	-	1	1
CO-2	2	2	2	1	1	1	-	-	1	2	2	1	1
CO-3	2	2	1	2	1	-	1	-	1	2	-	1	-
CO-4	2	1	2	1	-	1	-	-	1	1	1	1	1
Average	2.3	1.8	1.8	1.3	1.0	1.0	1.0	-	1.0	1.8	1.5	1.0	1.0

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	1	1	-	1	1	-	-	1	1	2	-
CO-2	2	1	-	2	-	-	-	-	-	-	2	1	1
CO-3	1	-	2	-	-	1	-	-	-	2	-	1	2
CO-4	1	2	2	1	-	2	1	-	-	1	2	2	2
Average	1.5	1	1.3	1	-	1	-	-	-	1	1.3	1.5	1.3

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO-2	1	2	1	1	1	-	2	-	-	-	-	-	3

CO-3	1	1	1	2	-	-	1	-	-	-	-	-	-
CO-4	1	-	1	1	1	-	-	-	-	-	-	-	1
CO-5	-	1	1	1	-	-	3	-	-	-	2	-	2
Average	1.3	1.3	1.0	1.3	1.0	-	2.0	-	-	-	2.0	-	2.0

Articulated attainment

Cos	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PsO 1	PSO 2	PSO 3	PSO 4
CO1	3	-	1	-	-	-	-	-	-	1	-	-	-
CO2	2	1	-	2	-	1	-	-	-	-	2	-	-
CO3	2	1	-	2	-	1	-	-	-	-	2	-	-
CO4	-	-	1	1	-	1	1	-	1	-	-	1	-
Average	2.3	1.0	1.0	1.6	-	1.0	1.0	-	1.0	-	2.0	1.0	-

Articulated attainment

Cos	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	Ps O1	PS O2	PS O3	PS O-4
CO1	3	2	2	-	1	-	-	-	-	-	2	1	-
CO2	2	1	2	-	-	-	-	-	-	-	1	-	1
CO3	1	2	1	-	2	-	-	-	-	-	-	-	-
CO4	2	2	2	-	1	-	-	-	-	-	1	-	1
Averag e	2	1.8	1.8	-	1.3	-	-	-	-	-	1.3	1.0	1.0

Articulated Attainment

COs Pos	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PS O1	PS O2	PS O3	PS O4
CO1	3	1	2	-	2	1	1	-	-	-	-	-	-
CO2	1	1	2	-	1	2	-	-	1	-	-	-	-

CO3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO4	2	-	1	-	1	1	1	-	1	-	-	-	-
CO5	3	2	1	-	3	2	1	-	-	-	-	-	-
Average	2.2	1.3	1.6	-	1.8	1.5	1	-	1	-	-	-	-

Articulated Attainment

Cos	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PS O1	PS O2	PS O3	PS O4
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3
Average	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PS O-1	PS O-2	PS O-3	PS O-4
CO-1	1	1	1	-	1	2	1	-	-	-	2	1	-
CO-2	1	2	2	-	-	1	1	-	-	1	-	-	1
CO-3	1	1	1	-	2	-	1	-	-	2	-	2	1
CO-4	1	2	1	-	1	2	1	-	-	1	1	1	2
CO-5	1	1	1	-	2	-	1	-	-	2	-	2	1
CO-6	1	2	1	-	1	2	1	-	-	1	1	1	2
Average	1.0	1.5	1.3	-	1.3	1.6	1.0	-	-	1.3	1.5	1.0	1.3

Articulated Attainment

Cos	PO-1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PS O-1	PS O-2	PS O-3	PS O-4
CO-1	1	1	2	1	-	1	1	-	-	3	1	1	1
CO-2	1	1	-	1	-	1	2	-	-	2	1	1	1

CO-3	2	1	2	1	2	1	2	-	-	2	2	1	1
CO-4	1	1	2	1	2	2	1	-	-	1	2	1	1
CO-5	1	1	2	1	2	2	1	-	-	1	2	1	1
Average	1.3	1.0	1.5	1.0	1.0	1.3	1.5	-	-	2.0	1.5	1.0	1.0

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PsO 1	PSO 2	PSO 3	PSO 4
CO1	1	-	-	-	-	-	-	-	-	1	-	-	-
CO2	2	-	1	-	1	-	1	-	2	-	1	1	2
CO3	2	-	1	-	1	-	1	-	2	-	1	1	2
CO4	1	-	-	-	-	-	-	-	-	1	-	-	-
Average	1.5	-	1	-	1	-	1	-	2	1	1	1	2

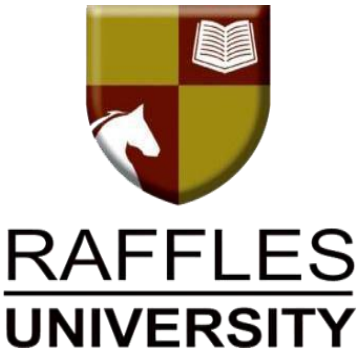
SCHOOL OF AGRICULTURAL SCIENCES			
SCHEME OF STUDIES AND EXAMINATION w.e.f.			
B.Sc. (Hons.) Agriculture IV year (VII Semester) Batch - 2022-26			
Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &AIA)			
Sl. No.	**Activities**	**No. of weeks**	**Credit Hours**
1	General orientation & On campus training by different faculties	1	14
2	Village attachment	8	
	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5	
3	Plant clinic	2	2
	Agro-Industrial Attachment	3	4
4	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		20	20

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	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5	
3	Plant clinic	2	2
	Agro-Industrial Attachment	3	4
4	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		20	20

B.Sc. (Hons.) Agriculture IV year (VIII Semester) Batch - 2021-25		
Sl.No.	**Title of the Module**	**Credits**
1	Production Technology for Bioagents and Biofertilizer	0+10
2	Seed Production and Technology	0+10
3	Mushroom Cultivation Technology	0+10
4	Soil, Plant, Water and Seed Testing	0+10
5	Commercial Beekeeping	0+10
6	Poultry Production Technology	0+10
7	Commercial Horticulture	0+10
8	Floriculture and Landscaping	0+10
9	Food Processing	0+10
10	Agriculture Waste Management	0+10
11	Organic Production Technology	0+10
12	Commercial Sericulture	0+10
Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the VIII semester.		

B.Sc. (Hons) Agriculture

Syllabus(2022-2026)



Department of Agricultural Sciences

RAFFLES UNIVERSITY
Japanese Zone, National Highway-48, Neemrana-301705,
District: Alwar, RAJASTHAN, INDIA www.rafflesuniversity.edu.in

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Fundamentals of Horticulture **Paper Code: (AHR-T-101/AHR-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Horticulture-Itsdefinitionandbranches,importanceandscope;horticulturalandbotanical classification;climateandsoilforhorticulturalcrops.

UNIT-II

Plantpropagation-methodsandpropagating structures; Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning.

UNIT-III

Juvenility and flower bud differentiation; unfruitfulness; pollination,pollinizersandpollinators;fertilizationandparthenocarpy.

UNIT-IV

Medicinalandaromatic plants; importance of plant bio-regulators in horticulture.Irrigation methods, Fertilizer application in horticulturalcrops.

Practical

Identificationofgardentools.Identificationofhorticulturalcrops.Preparationofseedbed/ nurserybed.Practiceofsexualandasexualmethodsofpropagationincludingmicro-propagation. Layoutandplantingoforchard.Trainingandpruningoffruittrees.Preparationofpottingmixture.Fertilizer applicationindifferentcrops.Visitstocommercialnurseries/orchard.

Recommended Books:

1. Parthasvathy. V. A. Chattopadhyay. P.K. and Bose.T.K., Plantation Crops.NayaProkash, Kolkatta 2006
2. Bose. T.K., Kabir.J.,Das.P. &Joy.P.P., Tropical Horticulture. NayaProkash. Calcutta 2000
3. Bal. J.S., Fruit Growing. Kalyani Publisher, New Delhi 1997
4. Singh. S.P., Commercial Fruits.Kalyani Publishers, New Delhi 1997

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Fundamentals of Plant Biochemistry and Biotechnology **Paper Code: (ABB-T-101/ABB-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Importance of Biochemistry.Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharide's, Reducing and oxidizing properties of Monosaccharide's, Mutarotation; Structure of Disaccharides and Poly saccharides. Lipid:Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids.

UNIT-II

Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis&Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

UNIT-III

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, another culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation.

UNIT-IV

Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

Practical

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids.Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/ TLC demonstration for separation of amino acids/ Mono-saccharides. Sterilization techniques.Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization.Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.

Recommended Books:

1. Lehninger AL, Principles of Biochemistry, Freeman and Company, USA2004
2. Goodwin, TW and Mercer EI, Introduction to Plant Biochemistry, Progamon Press Inc. Deffered UK

1998
3. Sahney SK and Singh RR, Introductory Practical Biochemistry, Narosa Publishing House, New Delhi 2002
4. Yadav VK and Yadav N, Biochemistry and Biotechnology-A laboratory Manual, Pointer Publishers, Jaipur 2007

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Fundamentals of Soil Science **Paper Code: (ASS-T-101/ASS-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Soilasanaturalbody,Pedologicalandedaphologicalconceptsofsoil;Soilgenesis:soilforming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components ofsoil;Soilphysicalproperties:soil-texture,structure,densityandporosity,soilcolour,consistence and plasticity.

UNIT-II

Elementary knowledge of soil taxonomy classification and soils of India; Soilwater retention, movement and availability; Soil air, composition, gaseous exchange, problem andplantgrowth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth.

UNIT-III

Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation.

UNIT-IV

Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

Study of soil profile in field.Study of soil sampling tools, collection of representative soil sample, its processing and storage.Study of soil forming rocks and minerals.Determination of soil density, moisture content and porosity.Determination of soil texture by feel and Bouyoucos Methods.Studies of capillary rise phenomenon of water in soil column and water movement in soil.Determination of soil pH and electrical conductivity.Determination of cation exchange capacity of soil.Study of soil map.Determination of soil colour.Demonstration of heat transfer in soil.Estimation of organic matter content of soil.

Recommended Books:

1. Sharma, N.L. & Singh, T.B. Soil Science, Rama pub. House, BarotMerrut(U.P) 1996
2. Das, D.K. Introductory Soil Science, Kalyani publisher, New Delhi 2002
3. Mehra R.K. Text book of Soil Science, ICAR, New Delhi 2004

4. Biswas, T.D. and Mukherjee, S.K. Text book of soil science. Tata McGraw Hill publishing Co. Ltd, New Delhi 2006

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Introduction to Forestry **Paper Code: (AES-T-101/AES-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, and salient features of Indian Forest Policies. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration objectives, choice between natural and artificial regeneration, essential preliminary considerations.

UNIT-II

Crown classification, Tending operations – weeding, cleaning, thinning-: mechanical, ordinary, crown and advance thinning. Forest menstruation – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method.

UNIT-III

Instrumental methods of height measurementgeometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.

UNIT-IV

Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

Practical

Identification of tree-species.Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees.Height measurement of standing trees by shadow method, single pole method and hypsometer.Volume measurement of logs using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Comprehension and Communication Skills in English **Paper Code: (ECT-T-101/ECT-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond, B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw.

UNIT-II

Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.

UNIT-III

Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.

UNIT-IV

The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications.Synopsis Writing. Interviews: kinds, Importance and process.

Practical

Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness &Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions.

Lecture Per Week : 4

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Fundamentals of Agronomy **Paper Code: (AAG-T-101/AAG-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Cropnutrition,manuresandfertilizers,nutrientuseefficiency.

UNIT-II

Waterresources,soil-plant-water relationship, crop water requirement, water use efficiency, irrigation-scheduling criteria and methods, quality of irrigation water,logging.

UNIT-III

Weeds-importance,classification,cropweedcompetition,conceptsofweedmanagement-principlesandmethods,herbicides-classification,selectivityandresistance,allelopathy.

UNIT-IV

Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotationanditsprinciples,adaptationanddistributionofcrops,cropmanagementtechnologies inproblematicareas,harvestingandthreshingofcrops.

Practical

Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agro- climatic zones of India, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

Recommended Books:

1. De, Gopal Chandra, Fundamentals of Agronomy. Oxford & IBH Publishing Co., New-Delhi 1989
2. ICAR, Handbook of Agriculture, Indian Council of Agricultural Research, New-Delhi 1989
3. Michael, A.M. and Ojha, T.P. Principles of Agricultural Engineering, Vol.II Jain Brothers , New Delhi. 1986
4. Morachan, Y.B., Crop production and management, Oxford & IBH Publishing Co., New-Delhi 1986

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Introductory Biology **Paper Code: (ABI-T-101/ABI-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Introduction to the living world, diversity and characteristics of life, origin of life.

UNIT-II

Evolution and Eugenics.Binomial nomenclature and classification Cell and cell division.

UNIT-III

Morphology of flowing plants.Seed and seed germination.

UNIT-IV

Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae.Role of animals in agriculture.

Practical

Morphology of flowering plants – root, stem and leaf and their modifications.Inflorescence, flower and fruits.Cell, tissues & cell division. Internal structure of root, stem and leaf. Study of specimens and slides.Description of plants - Brassicaceae, Fabaceae and Poaceae.

Recommended Books:

1. Biology NCERT 2015
2. General Biology I: Molecules, Cells and Genes Dog Ear Publishing, LLC 2017
3. General Biology II: Organisms and Ecology Dog Ear Publishing, LLC 2017

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Elementary Mathematics **Paper Code: (AEM-T-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

THEORY

UNIT-I

Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.

UNIT-II

Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2,y_2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.

UNIT-III

Differential Calculus: Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of xn , ex , sin x &cos x from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form y=f (x) (Simple problems based on it).

UNIT-IV

Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.

Recommended Books:

1. Algebra: Hall & Knight
2. Trigonometry: S.L. Loney

3. Coordinate- Geometry: S. L. Loney
4. Differential –Calculus: Gorakh-Prasad

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Agricultural Heritage **Paper Code: (AEX-T-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society.

UNIT-II

Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world.

UNIT-III

Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications.

UNIT-IV

National agriculture setup in India;Current scenario of Indian agriculture; Indian agricultural concerns and future prospects

RAFFLES UNIVERSITY

Lecture Per Week : 1

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Rural Sociology & Educational Psychology **Paper Code: (ASP-T-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology, Rural society, Social Groups.

UNIT-II

Social Stratification, Culture concept, Social Institution, Social Change & Development.

UNIT-III

Educational psychology: Meaning & its importance in agriculture extension.

UNIT-IV

Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

Recommended Books:

1. Bhatia, H.R. A Text Book of Educational Psychology, Asia Publishing House, New Delhi 1965

2. Chitamber, J.B., Introductory Rural Sociology: Willey Easter Ltd. New Delhi. 1990

3. Dhama, O.P. &Bhatnagar, O.P., Education & Communication for Development,

RAFFLES UNIVERSITY

Lecture Per Week : 1

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Human Value and Ethics **Paper Code: (HME-T-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Values and Ethics-An Introduction.Goal and Mission of Life.

UNIT-II

Vision of Life.Principles and Philosophy.Self Exploration.Self Awareness.Self Satisfaction.

UNIT-III

Decision Making.Motivation.Sensitivity.Success.Selfless Service.Case Study of Ethical Lives.

UNIT-IV

Positive Spirit.Body, Mind and Soul.Attachment and Detachment.Spirituality Quotient.Examination.

Recommended Books:

1. R.R. Gaur, R. Sangal and G.P. Bagaria A Foundation Course in Human Values and Professional Ethics 2010

2. Govindarajan M Professional Ethics &Human Value 2013

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : **Fundamentals of Genetics** **Paper Code: (AGN-T-101/AGN-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity.Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes.Chromosomal theory of inheritance- cell cycle and cell division- mitosis and meiosis.Probability and Chi-square.Dominance relationships, Epistatic interactions with example.

UNIT-II

Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping. Structural and numerical variations in chromosome andtheir implications, Use of haploids, dihaploids and doubled haploids in Genetics.Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation.

UNIT-III

Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance.Genetic disorders.Nature, structure & replication of genetic material.

UNIT-IV

Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Practical

Study of microscope.Study of cell structure. Mitosis and Meiosis cell division. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division, Experiments on probability and Chi-square test. Determination of linkage and cross-over analysis (through two point test cross and three point test cross data). Study on sex linked inheritance in Drosophila. Study of models on DNA and RNA structures.

Recommended Books:

1.Singh, B.D., Plant Breeding. Kalyani Publishing House, New Delhi. 2005
2.Singh, P., Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi.

2001
3.Singh, P., Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi. 2001
4.Alard, R.W., Principles of Plant Breeding. John Willey & Sons, New York. 2000

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Agricultural Microbiology **Paper Code:** (AMB-T-101/ AMB-P-101)

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Agricultural Microbiology

Theory

UNIT-I

Introduction Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.

UNIT-II

Bacterial genetics: Genetic recombination- transformation, conjugation and transduction, plasmids, transposon.

UNIT-III

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and asymbiotic.Azolla, blue green algae and mycorrhiza.Rhizosphere and phyllosphere.

UNIT-IV

Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Practical

Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture.Methods of sterilization.Nutritional media and their preparations.Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.Methods of isolation and purification of microbial cultures.Isolation of *Rhizobium* from legume root nodule.Isolation of *Azotobacter* from soil.Isolation of *Azospirillum*from roots.Isolation of BGA.Staining and microscopic examination of microbes.

Recommended Books:

1. Mukherjee, N. and Ghosh T., Agricultural Microbiology, Kalyani Publishers, New Delhi. 1998.

2. Pelczar, Jr. Michel J. Chan, E.C.S. and Krieg, Noel R., Microbiology. Tata McGraw - Hill Edition, 1993. India. 1997.

3. Mukherjee, N. and Ghosh T., Agricultural Microbiology, Kalyani Publishers, New Delhi. 1998.

4. Rao, N.S., Soil Microbiology, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. 2000.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : **Introductory Soil and Water Conservation Engineering** **Paper Code: (AEN-T-101/ AEN-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Introduction to Soil and Water Conservation causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures.

UNIT-II

Soil loss estimation by universal Loss Soil Equation.Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping. Contour bund.

UNIT-III

Graded bund and bench terracing.Grassed water ways and their design.Water harvesting and its techniques.

UNIT-IV

Winderosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.

Practical

General status of soil conservation in India.Calculation of erosion index.Estimation of soil loss.Measurement of soil loss.Preparation of contour maps.Design of grassed water ways.Design of contour bunds.Design of graded bunds.Design of bench terracing system.Problem on wind erosion.

Recommended Books:

1. Majumdar, D.K. Irrigation Water Management- Principles and Practice. Prentice Hall of India New-Delhi. 2004
2. Reddy,S.R. Principles of Crop Production , Kalyani Publishers, New-Delhi. 2000
3. Lenka, D. Irrigation and Drainage .Kalyani Publishers, New-Delhi. 1999
4. Sankara Reddy, G.H. and YellamandaReddi, T. Efficient use of Irrigation Water.Kalyani Publishers, NewDelhi. 1995
5. Parihar, S.S. and Sandhu, B.S. Irrigation of Field Crops- Principles and Practices, ICAR, New-Delhi. 1978

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : **Fundamentals of Crop Physiology** **Paper Code: (ACP-T-101/ ACP-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology.

UNIT-II

Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants.

UNIT-III

Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown.

UNIT-IV

Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Practical

Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue testfor mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO2 assimilation by Infra Red Gas Analyzer (IRGA).

Recommended Books:

1. N.K. Gupta &Sunita Gupta, Plant Physiology. Oxford & IBH Publication, New Delhi 2004 2. R.L. Agarwal, Seed Technology, Oxford & IBH Publication, New Delhi 1995
3. J.B. Salisbury and C.W. Ross. Plant Physiology, Wadswar Publishing Company, Belmont, California 1992
4. S.N. Pandey& B.K. Sinha.Vikas, Plant Physiology, Publishing House Pvt. Ltd., New Delhi. 1995

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : **Fundamentals of Agricultural Economics** **Paper Code: (AEC-T-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.

UNIT-II

Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. Demand: meaning, law of demand, schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity.

UNIT-III

Production: process, creation of utility, factors of production, input output relationship. Laws of returns: Law of variable proportions and law of returns to scale. Cost: concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points.

UNIT-IV

Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio- economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation, VAT. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

Recommended Books:

1. G.B. Jathar and S.G. Beri, Elementary Principles of Economics, Oxford University Press (10th Edition), Delhi. 1996

2. S.K. Mishra and V.K. Puri, Indian Economy, Himalaya Publishing House, New Delhi 1996 3. P.A. Samuelson & W.D. Nordhaus, Economics, McGraw-Hill, Singapore 1987
4. K.K. Dewett and J.D. Verma, Elementary Economic Theory, S.Chand& Company, New Delhi. 1986

RAFFLES UNIVERSITY

Lecture Per Week : 4

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Fundamentals of Plant Pathology **Paper Code: (APP-T-101/APP-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Introduction: Importance of plant diseases, scope and objectives of PlantPathology, History of Plant Pathology with special reference to Indian work, Terms and concepts in Plant Pathology. Pathogenesis, Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, different groups**:** fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.

UNIT-II

Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders and classes.

UNIT-III

Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction.*Viruses*: nature, structure, replication and transmission. Study of phanerogamic plant parasites. *Nematodes:* General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (*Heterodera, Meloidogyne, Anguina, Radopholus*etc.)

UNIT-IV

Growth and reproduction of plant pathogens.Liberation / dispersal and survival of plant pathogens.Types of parasitism and variability in plant pathogens.Pathogenesis.Role of enzymes, toxins and growth regulators in disease development.Defense mechanism in plants**.**Epidemiology: Factors affecting disease development. Principles and methods of plant disease management.Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Practical

Acquaintance withvarious laboratory equipmentsandmicroscopy.Collectionandpreservation of disease specimen.Preparation of media, isolation and Koch's postulates.General study of different structures of fungi.Study of symptoms of various plant diseases.Study of representative fungal genera.Staining and identification of plant pathogenic bacteria.Transmission of plant viruses.Study of phanerogamic plant

parasites.Study of morphological features and identification of plant parasitic nematodes.Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting.Study of fungicides and their formulations.Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations**.**

Recommended Books:

1. Mehrotra, R.S. and Aggarawal, A. Plant Pathology. Tata McGraw Hill Publishing Co. Ltd., New Delhi. 2007
2. Agrios, G.N. Plant Pathology, Academic Press, New Delhi. 1996
3. Singh, R.S. Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi. 1996
4. Alexopolus, C.J., Mims, C.W. and Blackwell, M. Introductory Mycology, John Wiley Estern Private Limited, New York. 1996

RAFFLES UNIVERSITY

Lecture Per Week : 4

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Fundamentals of Entomology **Paper Code: (AET-T-101/AET-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropodaupto classes.Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation.Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ.Metamorphosis and diapause in insects.Types of larvae and pupae.Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects.Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

UNIT-II

Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors– temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents.Effect of biotic factors – food competition, natural and environmental resistance.

UNIT- III

Categories of pests.Concept of IPM, Practices, scope and limitations of IPM.Classification of insecticides, toxicity of insecticides and formulations of insecticides.Chemical control- importance, hazards and limitations. Recent methods of pest control, repellents, anti feed ants, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Application techniques of spray fluids.Symptoms of poisoning, first aid and antidotes.

UNIT – IV

Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insectaupto

Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera:Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae.

Practical

Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus. Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); Dissection of male and female reproductive systems in insects (Grasshopper); Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. Insecticides and their formulations.Pesticide appliances and their maintenance.Sampling techniques for estimation of insect population and damage.

Recommended Books:

1. ShravanHaldhar, Agricultural Entomology, New Vishal Publication, New Delhi
2. T. V. Prasad, Handbook of Entomology, New Vishal Publication, New Delhi
3. S. V. Sai Prasad, Agri Facts – Entomology & Nematology, New Vishal Publication, New Delhi
4. K. SankariMeena, P. Manji, Glimpses of Crop Protection, New Vishal Publication, New Delhi
5. K. SankariMeena, P. Manji, Plant Nematology - a quick glance, New Vishal Publication, New Delhi

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : **Fundamentals of Agricultural Extension Education** **Paper Code: (AEX-T-102/AEX-P-102)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process, objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.)

UNIT-II

Various extension/ agriculture development programs launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

UNIT-III

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.

UNIT-IV

Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition; Principles and Functions of Communication, models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Practical

To get acquainted with university extension system. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

Recommended Books:

1. Dhama, O.P. &Bhatnagar, O.P., Education and Communication for Development, Oxford & IBH

Publishing Co. New-Delhi. 1985
2. Kelsey, L.D. & Hearne, C.C., Cooperative Extension Work: Cornell University Press, New York, USA. 1963
3. Ray, G.L., Extension Communication and Management, NayaPrakash, 206 BidhanSarni, Calcutta-6. 2003
4. Reddy, A.A., Extension Education, ShriLaxmi Press, Baptala. 1993

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Communication Skills and Personality Development **Paper Code:(AEX-T-103/AEX-P-103)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Communication Skills: Structural and functional grammar; meaning and process of communication.

UNIT-II

Verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

UNIT-III

Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation.

UNIT-IV

Public speaking; Group discussion.Organizing seminars and conferences.

Practical

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Crop Production Technology-I (*Kharif*Crops) **Paper Code:(AAG-T-201/AAG-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif*crops. Cereals – rice, maize, sorghum, pearl millet and finger millet.

UNIT-II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Pulses-pigeonpea, mungbean and urdbean.

UNIT-III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Oilseeds- groundnut, and soybean.

UNIT-IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Fibre crops- cotton & jute; forage crops-sorghum, cowpea, cluster bean and napier.

Practical

Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton, effect of seed size on germination and seedling vigour of *kharif*season crops, effect of sowing depth on germination of *kharif*crops, identification of weeds in *kharif*season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of *kharif*season crops, study of crop varieties and importantagronomic experiments at experimental farm. Study of forage experiments, morphological description of *kharif*season crops, visit to research centers of related crops.

Recommended Books:

2) Dr. Rajendra Prasad, Text book of Field crops production Volume-I & II, Publisher ICAR, New Delhi.
3) S.R. Reddy &Ramu Y. Reddy, Agronomy of Field Crops, Kalyani Publishers 2006
4) U.S.Walia, Science of Agronomy, Scientific Publishers 2012
5) P. Balasubrananiyan, S.P.Palaniappan, Principles and Practices Of Agronomy, Agrobios India 2010
6) S.R. Reddy., Principles of Agronomy, Kalyani Publishers 2015

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Fundamentals of Plant Breeding **Paper Code: AGN-T-101/AGN-P-101**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Historical development, concept, nature and role of plant breeding, majorachievements and future prospects; Genetics in relation to plant breeding, modes of reproductionandapomixes, self-incompatibilityandmale-sterility- genetic consequences, cultivar options.

UNIT-II

Domestication, Acclimatization and Introduction; Centre's of origin/ diversity, components of Genetic variation; Heritability and genetic advance.Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept.

UNIT-III

Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes- Ear to row method, Modified Ear to Row, recurrent selection schemes. Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection.

UNIT-IV

Wide hybridization and pre- breeding; Polyploidy in relation to plant breeding.Mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

Practical

Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops.Consequences of inbreeding on genetic structure of resulting populations.Study of male sterility system.Handling of segregationpopulations.Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiments, analysis of Randomized Block Design. To work out the mode of pollination in a given crop and extent of natural out-crossing.Prediction of performance of double cross hybrids.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Agricultural Finance and Co-Operation **Paper Code: (AEC-T-201/ AEC-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks.

UNIT-II

Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit.

UNIT-III

Preparation and analysis of financial statements – Balance Sheet and Income Statement.Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

UNIT-IV

Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Practical

Determination of most profitable level of capital use.Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures. Estimation of credit requirement of farm business – A case study.Preparation and analysis of balance sheet – A case study.Preparation and analysis of income statement- A case study.Appraisal of a loan proposal-A case study.Techno-economic parameters for preparation of projects. Preparation of Bankable projects for various agricultural products and its value added products. Seminar on selected topics.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Agri-Informatics **Paper Code: (ACS-T-201/ACS-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Introduction to Computers, Operating Systems, definition and types, Applications of MS- Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (www): Concepts and components.

UNIT-II

Introduction to computer programming languages, concepts and standard input/output operations.e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes.

UNIT-III

IT application for computation of water and nutrient requirement of crops, Computer controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc.

UNIT-IV

Geospatial technology for generating valuable agri-information.Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions.Preparation of contingent crop-planning using IT tools.

Practical

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW).Introduction of programming languages. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools. Introduction of Geospatial Technology for generating valuable information for Agriculture.Hands on Decision Support System.Preparation of contingent crop planning.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Farm Machinery and Power **Paper Code: (AEN-T-201/AEN-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Status of Farm Power in India, Sources of Farm Power, I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines , Study of different components ofI.C. engine, I.C. engine terminology and solved problems.

UNIT-II

Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor.

UNIT-III

Tractor types, Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations,

UNIT-IV

Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practical

Study of different components of I.C.engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow . Familiarization with seed- cum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter- cultivation equipment, Familiarization with harvesting and threshing machinery.

Recommended Books:

1. Michael, A.M. and T.P. Ojha. Principles of Agricultural Engineering.Vol. I. Jain Brothers, Jodhpur. 1987
2. Rai and Jain, Farm Tractors, Maintenance and Repair. Tata McGraw Hill Publ. New Delhi. 1989
3. Elements of Farm Machinery. Srivastava, A.C. Oxford IBH Publ. Company, New Delhi. 1989
4. Singhal, O.P., Elements of Agricultural Engineering, Vol. I & III.SurajPrakashan, Allahabad. 1989
5. Sahay and Jagdishwar, Element of Agricultural Engineering. Agro.Book Agency, New Chitragupta Nagar, Patna. 1990

RAFFLES UNIVERSITY

Lecture Per Week	**: 2**	
Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Production Technology for Vegetable and Spices**	**Paper Code: (AHR-T-201/AHR-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

UNIT-I

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices **Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin.**

UNIT-II

Brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices -**French bean, Peas Cole crops such as Cabbage, Cauliflower, Knol-khol.**

UNIT-III

Brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices **Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot.**

UNIT-IV

Brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices **Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables).**

Practical

Identification of vegetables & spice crops and their seeds. Nursery raising. Direct seed sowing and transplanting.Study of morphological characters of different vegetables & spices.Fertilizers applications.Harvesting & preparation for market.Economics of vegetables and spices cultivation.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Environmental Studies and Disaster Management **Paper Code: (AES-T-201/AES-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Multidisciplinary nature of environmental studies Definition, scope and importance.Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non- renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.

• Equitable use of resources for sustainable lifestyles.

UNIT-II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity and its conservation: - Introduction,

definition, genetic, species & ecosystem diversity and bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation.Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-III

Environmental Pollution: definition, cause, effects and control measures of: a. Air pollutionb. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution, g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies. Wasteland reclamation.Consumerism and waste products.Environment Protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare.Role of Information Technology in Environment and human health.

UNIT-IV

Disaster Management

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.Disaster Management- Effect to migrate natural disaster at national and global levels.International strategy for disaster reduction.Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media.Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical

Pollution case studies. Case Studies- Field work: Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain, visit to a local polluted site-Urban/Rural/Industrial/ Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Statistical Methods **Paper Code: (AST-T-201/AST-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability.

UNIT-II

Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram.Karl Pearson's Coefficient of Correlation.Linear Regression Equations.

UNIT-III

Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification.

UNIT-IV

Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Practical

Graphical Representation of Data.Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles& Percentiles.Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles& Percentiles.Measures of Dispersion (Ungrouped Data).Measures of Dispersion (Grouped Data).Moments, Measures of Skewness& Kurtosis (Ungrouped Data).Moments, Measures of Skewness& Kurtosis (Grouped Data).Correlation & Regression Analysis.Application of One Sample t-test.Application of Two Sample Fisher's t-test.Chi-Square test of Goodness of Fit.Chi-Square test of Independence of Attributes for 2 ×2 contingency table.Analysis of Variance One Way Classification.Analysis of Variance Two Way Classification.Selection of random sample using Simple Random Sampling.

Recommended Books:

1. C.H. Goulden, Method of Statistical Analysis.
2. G.W. Snedecor and W.G. Cochran, Statistical Methods.
3. R.G. Steel and J.H. Torrie, Principles and Procedures of Statistics (with special reference to Biological Sciences)
4. V.G. Panse and P.V. Sukhatme, Statistical Methods for Agricultural workers.
5. .Ram Singh Chandel, A Handbook of Agricultural Statistics.
6. R.Rangaswamy, A Text Book of Agricultural Statistics.

RAFFLES UNIVERSITY

Lecture Per Week **: 4**

Examination Time **: 3 Hrs** **Maximum Marks: 50 (20+30)**

Subject **: Livestock & Poultry Management** **Paper Code:(AAP-T-201/AAP-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Role of livestock in the national economy.Reproduction in farm animals and poultry.Housing principles, space requirements for different species of livestock and poultry.Management of calves, growing heifers and milch animals.

UNIT-II

Management of sheep, goat and swine.Incubation, hatching and brooding.Management of growers and layers.Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry.Improvement of farm animals and poultry.

UNIT-III

Digestion in livestock and poultry.Classification of feedstuffs.Proximate principles of feed.Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.

UNIT-IV

Introduction of livestock and poultry diseases.Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry.Culling of livestock and poultry.Planning and layout of housing for different types of livestock.Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments.Management of chicks, growers and layers.Debeaking, dusting and vaccination.Economics of cattle, buffalo, sheep, goat, swine and poultry production.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Crop Production Technology-II (*Rabi* crops) **Paper Code: (AAG-T-202/AAG-P-202)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; **Cereals –wheat and barley**

UNIT-II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of **Pulses-chickpea, lentil, peas**

UNIT-III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of **Oilseeds-rapeseed, mustard and sunflower**

UNIT-IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of **Sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass**

and citronella, Forage crops-berseem, lucerne and oat.

Practical

Sowing methods of wheat and sugarcane, identification of weeds in *rabi*season crops, study of morphological characteristics of *rabi*crops, study of yield contributing characters of *rabi*season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of *rabi*crops at experimental farms. Study of *rabi*forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

Recommended Books:

1. S.R. Reddy &Ramu Y. Reddy, Agronomy of Field Crops, Kalyani Publishers 2006
2. U.S.Walia, Science of Agronomy, Scientific Publishers 2012
3. P. Balasubrananiyan, S.P.Palaniappan, Principles and Practices Of Agronomy, Agrobios India 2010
4. S.R. Reddy., Principles of Agronomy, Kalyani Publishers 2015

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Production Technology for Ornamental Crops, MAPs and Landscaping**	**Paper Code: (AHR-T-202/AHR-P-202)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping.Principles of landscaping.Landscape uses of trees, shrubs and climbers.

UNIT-II

Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.

UNIT-III

Package of practices for loose flowers like marigold and jasmine under open conditions.

UNIT-IV

Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

Practical

Identification of Ornamental plants.Identification of Medicinal and Aromatic Plants.Nursery bed preparation and seed sowing.Training and pruning of Ornamental plants.Planning and layout of garden.Bed preparation and planting of MAP.Protected structures care and maintenance.Intercultural operations in flowers and MAP. Harvesting and post harvest handling of cut and loose flowers. Processing of MAP. Visit to commercial flower/MAP unit.

Recommended Books:

1. S.K. Bhatacharjee& L.C. De., Post Harvest Technology of Flowers and Ornamental Plants, M/s. Advance Books Shastri Nagar, Jaipur 2006
2. Bose,Maity,Dhua and Das, Floriculture and Landscaping, N.P Sales Pvt.Ltd 2014
3. J.S. Arora, Introduction to Floriculture, Kalyani Publishers 2001

4. G.S. Randhawa& A. Mukhopadhyay, Floriculture in India, Allied Publishers, New Delhi 2001

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Renewable Energy and Green Technology**	**Paper Code: (AEN-T-202/AEN-P-202)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application.

UNIT-II

Familiarization with types of biogas plants and gasifiers, biogas, bio-alcohol, biodiesel and bio-oil production and their utilization as bio-energy resource, introduction of solar energy, collection and their application.

UNIT-III

Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application.

UNIT-IV

Introduction of wind energy and their application.

Practical

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.

Recommended Books:

1. Ghanshyan Das, Hydrology and Soil Conservation Engineering, McGraw Hill
2. Dutta SK., Soil Conservation and Land Management, International Distributors, Dehradun
3. Loucks D.P., Water Resource System Planning and Analysis, Prentice Hall

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Problematic Soils and their Management**	**Paper Code: (ASS-T-201/ASS-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties.

UNIT-II

Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.

UNIT-III

Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.

UNIT-IV

Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems.

Recommended Books:

1. D. K. Das, Introductory Soil Science, Kalyani Publishers 2015
2. R.K Mehra, Textbook of Soil Science, ICAR Publication 2006
3. V.N. Sahai, Fundamentals of Soil, Kalyani Publishers 2015
4. A. Rathinasamy& B. BakiyathuSaliha, Fundamentals of Soil Science, Scientific Publisher 2014

4. Production Technology for Fruit and Plantation Crops(AHR-T-203/AHR-P-203) 2(1+1)

Theory

UNIT-I

Importance and scope of fruit and plantation crop industry in India; Importance of **rootstocks.**

UNIT-II

Production technologies for the cultivation of **major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond.**

UNIT-III

Production technologies for the cultivation of **minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry.**

UNIT-IV

Production technologies for the cultivation of **plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.**

Practical

Seed propagation.Scarification and stratification of seeds.Propagation methods for fruit and plantation crops.Description and identification of fruit. Preparation of plant bio regulators and their uses, Importantpests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchards.

Recommended Books:

1. S. N. Ghosh, Tropical & Sub Tropical Fruit Crops : Corp Improvement& Varietal Wealth 2 Vols Set, Narendra Publishing House 2014
2.Nirmal Sharma, V. K. Wali, ParshantBakshi, Biometrical Methods in Horticulture Sciences, New India Publishing Agency 2016
3.Dhillon& Bhatt, Fruit Tree Physiology, Narendra Publishing 2011
4.A.S. Salaria, B.S. Salaria, A2Z Solutions Horticulture at a Glance Vol. - I,(Fruits and Plantation Crops), Intellects - Nurture to Excel 2016

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Principles of Seed Technology **Paper Code: (AGN-T-202/AGN-P-202)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed.

UNIT-II

Foundation and certified seed production of important **cereals, pulses, oilseeds, fodder and vegetables**. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement.

UNIT-III

Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production.

UNIT-IV

Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage. Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

Practical

Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi. Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Field bean, pea. Seed production in major oilseeds: Soybean, Sunflower, Rapeseed, Groundnut and Mustard. Seed production in important vegetable crops. Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.

Recommended Books:

1. P.K. Agrawal, Principles of Seed Technology, Indian Council of Agricultural Research 2010
2. Phundan Singh, Principles of Seed Technology, Kalyani Publishers 2013
3. P. Ravishankar, G. Sarika, G.V. Basauaraju, A Text Book of Seed Science and Technology 2014
4. Phundan Singh, Seed Technology at a Glance, Kalyani Publishers 2016

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Farming System and Sustainable Agriculture**	**Paper Code: (AAG-T-203)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system.

UNIT-II

Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture.

UNIT-III

HEIA, LEIA and LEISA and its techniques for sustainability, Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques.

UNIT-IV

Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

Recommended Books:

1. S.R. Reddy., Principles of Agronomy, Kalyani Publishers 2015
2. P.L. Maliwal, Agronomy at a Glance, Jain Brothers 2013
3. S.C. Panda, Organic Farming for Sastainable Agriculture, Kalyani Publishers 2014
4. S.Krishnaprabu, Agronomy: Theory and Practice, Satish Serial Publishing House 2016

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Agricultural Marketing, Trade and Prices**	**Paper Code: (AEC-T-202/AEC-P-202)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Agricultural Marketing: Conceptsanddefinitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets**;** demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities.

UNIT-II

Product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark).

UNIT-III

Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel;number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs.

UNIT-IV

Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

Plotting and study of demand and supply curves and calculation of elasticity's**;** Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.

Recommended Books:

1. S.S. Acharya, Agricultural Marketing in India, OXF-IBH
2. A N Sadhu, Amarjit Singh, Fundamentals of Agricultural Economics, Himalayan Publishing House
3. Lakshmi DharHatai, Agricultural Marketing Management, NIPA Publications, New Delhi
4. H. S. Agarwal, A Textbook Of Economic Analysis, Ane Books Pvt Ltd.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Introductory Agrometeorology& Climate Change**	**Paper Code: (AAG-T-204/AAG-P-204)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Meaningandscopeofagriculturalmeteorology;Earthatmosphere-itscomposition,extent andstructure;Atmosphericweathervariables;Atmosphericpressure,itsvariationwithheight; Wind,typesofwind,dailyandseasonalvariationofwindspeed,cyclone,anticyclone,landbreeze andseabreeze;Natureandpropertiesofsolarradiation,solarconstant,depletionofsolarradiation, short wave, longwave and thermal radiation, net radiation, albedo.

UNIT-II

Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, verticalprofile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure,processofcondensation,formationofdew,fog,mist,frost,cloud;Precipitation,process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification;Artificialrainmaking.

UNIT-III

Monsoon-mechanismandimportanceinIndianagriculture, Weatherhazards-drought,floods,frost,tropicalcyclonesandextremeweatherconditionssuchas heat-waveandcold-wave.Agricultureandweatherrelations.

UNIT-IV

Modificationsofcropmicroclimate, climaticnormalsforcropandlivestockproduction.Weatherforecasting-typesofweatherforecast andtheiruses.Climatechange,climaticvariability,globalwarming,causesofclimatechangeand itsimpactonregionalandnationalAgriculture.

Practical

Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law.Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity.Determination of dew point temperature.Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of wind rose. Measurement, tabulation and

analysis of rain.Measurement of open pan evaporation and evapo-transpiration.Computation of PET and AET.

Recommended Books:

1. G.S. Mahi, P.K. Kingro, Fundamentals of Agrometerology, Kalyani Publishers 2015
2. K. Govindan, K. Thirumurugan, Agricultural Metrology and Dry Farming, Kalyani Publishers 2013
3. S.R. Reddy, D.S. Reddy, Agrometerology, Kalyani Publishers 2015
4. P. Balasubrananiyan, S.P. Palaniappan, Principles and Practices Of Agronomy, Agrobios India 2010

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Agrochemicals **Paper Code: (AET-T-201/AET-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture.Herbicides-Major classes, properties and important herbicides.Fate of herbicides.Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride.

UNIT-II

Organicfungicides-Modeofaction-Dithiocarbamates-characteristics,preparationanduse of Zineb andmaneb.Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroidsNeonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricteduse,Fateofinsecticidesinsoil&plant.IGRsBiopesticides,Reducedriskinsecticides, Botanicals,plantandanimalsystemicinsecticidestheircharacteristicsanduses.

UNIT-III

Fertilizersandtheirimportance.Nitrogenousfertilizers:FeedstocksandManufacturingof ammoniumsulphate,ammoniumnitrate,ammoniumchloride,urea.SlowreleaseN-fertilizers.
Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag.Potassic fertilizers: Natural sources of potash, manufacturing of potassiumchloride, potassium sulphate and potassiumnitrate.

UNIT-IV

Mixedandcomplexfertilizers:Sourcesandcompatibility–preparationofmajor,secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates,

nitrophosphatesandNPKcomplexes.Fertilizercontrolorder.Fertilizerlogisticsandmarketing.Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Practical

Sampling of fertilizers and pesticides.Pesticides application technology to study about various pesticides appliances.Quick tests for identification of common fertilizers.Identification of anion and cation in fertilizer.Calculation of doses of insecticides to be used.To study and identify various formulations of insecticide available kin market.Estimation of nitrogen in Urea.Estimation of water soluble P2O5 and citrate soluble P2O5 in single super phosphate.Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer.Determination of copper content in copper oxychloride.Determination of sulphur content in sulphur fungicide.Determination of thiram.Determination of ziram content.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Agri-business Management **Paper Code: (AEC-T-203/AEC-P-203)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems.Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries. Institutional arrangement, procedures to set up agro based industries.

UNIT-II

Constraints in establishing agro-based industries.Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget.

UNIT-III

Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation.Ordering, leading, supervision, communications, control. Capital Management and Financial management of Agribusiness. Financial statements and their importance.Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies.

UNIT-IV

Consumer behaviour analysis, Product Life Cycle (PLC).Sales & Distribution Management.Pricing policy,

various pricing methods.Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation.Project Appraisal and evaluation techniques.

Practical

Study of agri-input markets: Seed, fertilizers, pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product markets, retails trade commodity trading, and value added products. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD.Preparations of projects and Feasibility reports for agribusiness entrepreneur.Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques.Case study of agro-based industries. Trend and growth rate of prices of agricultural commodities. Net present worth technique for selection of viable project.Internal rate of return.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Principles of Integrated Pest and Disease Management **Paper Code: (APP-T-301/APP-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis.

UNIT-II

Methods of detection and diagnosis of insect pest and diseases.Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.

UNIT-III

Ecological management of crop environment.Introduction to conventional pesticides for the insect pests and disease management.Survey surveillance and forecasting of Insect pest and diseases.Development and validation of IPM module.

UNIT-IV

Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM.Case histories of important IPM programmes.Case histories of important IPM programmes.

Practical

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM,Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of *Trichoderma, Pseudomonas, Trichogramma,* NPV etc.Identification and nature of damage of important insect pests and diseases and their management.Crop (agro- ecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases . Awareness campaign at farmer's fields.

Recommended Books:

1. Reddy, S M & H N Gour, Integrated Plant Pathology, Today & Tomorrows Printers and Publishers 2009
2. Amerika Singh, O.P. Sharma, D.K. Garg, Integrated Pest Management: Principles and Applications, CBS Publishers 2005
3. J.N. Sharma, R.C. Sharma, Integrated plant Disease Management, Scientific Publishers 2011
4. A. Ciancio, K.G. Mukerji, General Concepts in Integrated Pest and Disease Management, Springer 2007

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Manures, Fertilizers and Soil Fertility Management **Paper Code: (APP-T-301/APP-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures.Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

UNIT-II

Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

UNIT-III

History of soil fertility and plant nutrition.criteria of essentiality. role, deficiency and toxicity symptoms of

essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients.

UNIT-IV

Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants.Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under Rainfed and irrigated conditions.

Practical

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry.Estimation of soil organic carbon, Estimation of alkaline hydrolysable N in soils.Estimation of soil extractable P in soils. Estimation of exchangeable K; Ca and Mg in soils . Estimation of soil extractable S in soils..Estimation of DTPA extractable Zn in soils.Estimation of N in plants.Estimation of P in plants.Estimation of K in plants.Estimation ofS in plants.

Recommended Books:

1. K.S Yawalkar, J.P Agarwal, S. Bokde, Manures and Fertilizers, Agri Horticultural House 1996
2. Sharma, Renuka, Fertilizer and manures, Discovery Publishing house 2014
3. M.V Durani, A Handbook of Soil- Plant-Water-Fertilizer, NIPA Publisher 2014
4. Rakshit, A., Manures Fertilizers and Pesticides Theory and Applications, CBS Publishers & Distributors 2015.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : **Pests of Crops and Stored Grains and their Management** **Paper Code: (AET-T-301/AET-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

General account on nature and type of damage by different arthropods pests.

UNIT-II

Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests and scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spices and condiments.

UNIT-III

Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management.

UNIT-IV

Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods.Assessment of losses due to insects.Calculations on the doses of insecticides application technique.Fumigation of grain store / godown.Identification of rodents and rodent control operations in godowns.Identification of birds and bird control operations in godowns.Determination of moisture content of grain.Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI Godowns.

Recommended Books:

1. M.C. Bhargava, K.C. Kumawat, Pests of Stored Grains and Their Management, NIPA Publishers, New Delhi
2. B.P. Khare, Stored grain pests and their management, CRC Press
3. Omkar, Pests and their Management, Springer 2018
4. AbhishekShukla, Crop Pest and Their Management, LAP Lambert Academic Publishing 2011

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Diseases of Field & Horticultural Crops & their Management-I **Paper Code: (APP-T-302/APP-P-302)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Symptoms, etiology, disease cycle and management of major diseases of following crops:

Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro;Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold and anthracnose.

UNIT-II

Bajra :downy mildew and ergot; Groundnut: early and late leaf spots, wilt, Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic.

UNIT-II

Castor: Phytophthorablight;Tobacco: black shank, black root rot and mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top;Papaya: foot rot, leaf curl and mosaic, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot andblack rot.

UNIT-IV

Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust.

Practical

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well- mounted specimens.

Recommended Books:

1. A.K. Misra, Diseases of Fruit Crops, Indian Phytopathological Society 2014
2. S.K. Gupta, T. S. Thind, Disease Problems in Vegetable Production, Scientific Publishers 2012
3. M. K. Kalita, Diseases of Field Crop and their Management, Kalyani Publishers 2014
4. Tarlochan S. Thind, Diseases of Field Crops and Their Management, Daya Publishing House 2007

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Crop Improvement – I (*Kharif*)**	**Paper Code: (AGN-T-301/AGN-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops.

UNIT-II

Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self pollinated, cross pollinated andvegetatively propagated crops.

UNIT-III

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stresstolerance and quality (physical, chemical, nutritional);

UNIT-IV

Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. Maintenance breeding of different *kharif*crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in *Kharif*crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

Recommended Books:

1. D.A. Sleper, J. M. Poehlam, Breeding Field Crops 5th edn, Wiley Publication 2006
2. J.A.S. Watson, Crops: Varieties and Plant Breeding, Satish Serial Publishing House 2005 3. G.A. Slafer, Genetic Improvement of Field Crops, Marcel Dekker 1993
4. M.Jackson, B.Fordloyd, M. Parry, Plant Genetic Resource and Climate Change, Cabi Publication 2013

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Entrepreneurship Development and Business Communication**	**Paper Code: (AEX-T-301/AEX-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs.

UNIT-II

SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises, Entrepreneurial Development Process.

UNIT-III

Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills).

UNIT-IV

Problem solving skill, Supply chain management and Total quality management, Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri- entrepreneurship and rural enterprise.

Practical

Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.

Recommended Books:

1. RenuArora, S. K. Sood, Entrepreneurship & Fundamentals of Small Business, Kalyani Publishers 2012
2. H. S. Mukerjee, Business Communication, Oxford University Press 2016
3. S. Sharma, Entrepreneurship Development, PHI Learning Pvt. Ltd. 2017
4. S.S. Khanka, Entrepreneurial Development, S. Chand & Company 2006

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Geoinformatics, Nano-technology and Precision Farming**	**Paper Code: (AAG-T-301/AAG-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.

UNIT-II

Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture.

UNIT-III

Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture.

UNIT-IV

Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

Introductionto GIS software, spatial data creationandediting.Introductiontoimage processing software.Visual and digital interpretation of remote sensing images.Generation of spectralprofiles of different objects.Supervised and unsupervised classification and acreage estimation.Multispectral remote sensing for soil mapping.Creation of thematic layers of soil fertility based on GIS.Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology.Use of GPS for agricultural survey.Formulation, characterization and applications of nanoparticles in agriculture. Projects formulation and execution related to precision farming.

Recommended Books:

1. A.K. Singh & U.K. Chopra, Geoinformatics application in Agriculture, New India Publishing Agency, NewDelhi-110088
2. B.L.Jana, Precision Farming, Agrotech Publishing Academy, New Delhi
3. K.S. Subramanian, Nano-Technology in Agriculture New India Publishing Agency, 2015 New Delhi110088

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Practica Crop Production-I **Paper Code: *(*AAG-P-302*)***
(Kharif Crops)

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Practical

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

Recommended Books:

1. S.Krishnaprabu, Agronomy: Theory and Practice, Satish Serial Publishing House 2016
2. P.C.Das, Crops and their Production : Technology under Different Conditions, Kalyani Publishers 2010
3. S.R. Reddy, Ramu Y. Reddy, Agronomy of Field Crops, Kalyani Publishers 2006
4. S.S. Singh, Rajesh Singh, Crop Management, Kalyani Publishers 2016

RAFFLES UNIVERSITY

Lecture Per Week : 1

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Intellectual Property Rights **Paper Code: (IPR-T-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights,Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.

UNIT-II

Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

UNIT-III

Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights.

UNIT-IV

Traditional knowledge-meaning and rights of TK holders.Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

Recommended Books:

1. N. Pandey, Intellectual Property Rights, PHI Learning 2014
2. P. Singh, IPR and Plant Breeder's Rights, New Vishal Publications 2009
3. B.L. Wadehra, Law Relating to Intellectual Property, Universal Law Publishing 2016
4. M. Venkataraman, An Introduction to Intellectual Property Rights, Innovative Timber leaf 2015

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Biopesticides & Biofertilizers **Paper Code: (AET-T-302/AET-P-302)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

History and concept of biopesticides.Importance, scope and potential of biopesticide.Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales.Botanicals and their uses.Mass production technology of bio-pesticides.Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.Methods of application of biopesticides.Methods of quality control and Techniques of biopesticides.Impediments and limitation in production and use of biopesticide.

UNIT-II

Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia*; Cynobacterial biofertilizers- *Anabaena, Nostoc*, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza.

UNIT-III

Nitrogen fixation -Free living and symbiotic nitrogen fixation.Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Productiontechnology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers.

UNIT-IV

FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

Practical

Isolation and purification of important biopesticides: *Trichoderma Pseudomonas, Bacillus, Metarhyzium*etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field

condition.Quality control of biopesticides.Isolation and purification of *Azospirillum , Azotobacter, Rhizobium*, P-solubilizers and cyanobacteria. Mass multiplication and inoculums production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Protected Cultivation **Paper Code: (AEN-T-301/AEN-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, artificial lights, Automation.

UNIT-II

Soil preparation and management, Substrate management.Types of benches and containers.

Irrigation and fertigation management.Propagation and production of quality planting material of horticultural crops.

UNIT-III

Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

UNIT-IV

Cultivation of economically important medicinal and aromatic plants.Off-season production of flowers and vegetables.Insect pest and disease management.

Practical

Raising of seedlings and saplings under protected conditions, use of protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Rainfed Agriculture and Watershed Management **Paper Code: (AAG-T-303/AAG-P-303)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India.

UNIT-II

Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants,

UNIT-III

Crop adaptation and mitigation to drought; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas.

UNIT-IV

Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops.Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed.Field demonstration on soil & moisture conservation measures.Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Protected Cultivation and Secondary Agriculture**	**Paper Code: (AEN-T-302/AEN-P-302)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.

UNIT-II

Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

UNIT-III

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.

UNIT-IV

Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, re-circulatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house.Study of green house equipments. Visit to various Post Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods.Determination of engineering properties (shape and size, bulk density and porosity of biomaterials).Determination of Moisture content of various grains by moisture meter.Field visit to seed processing plant.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Diseases of Field & Horticultural Crops & their Management-II **Paper Code: (**APP-T-303/APP-P-303**)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Symptoms, etiology, disease cycle and management of following diseases:

Field Crops:Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and PokkahBoeng;Sunflower: Sclerotinia stem rot andAlternaria blight.

UNIT-II

Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

UNIT-III

Horticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leaf curl.Strawberry: leaf spot

UNIT-IV

Potato: early and late blight, black scurf, leaf roll, and mosaic; Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, andStemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spotCoriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.

Practical

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems.Collection and preservation of plant diseased specimens for herbarium.

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Management of Beneficial Insects**	**Paper Code: (AET-T-303/AET-P-303)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication.Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.

UNIT-II

Types of silkworm, voltinism and biology of silkworm.Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.

UNIT-III

Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac-products. Identification of major parasitoids and predators commonly being used in biological control.

UNIT-IV

Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.

Practical

Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease.Bee pasturage, bee foraging and communication.Types of silkworm, voltinism and biology of silkworm.Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies. Identification and techniques for mass multiplication of natural enemies.

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Crop Improvement – II (*Rabi*)**	**Paper Code: (AGN-T-302/AGN-P-302)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops;

UNIT-II

Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters;

UNIT-III

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).

UNIT-IV

Hybrid seed production technology of *rabi*crops. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion; Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in *Rabi* crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Practical Crop Production-II *(Rabi Crops)***	**Paper Code: *(AAG-P-304)***

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Principles of Organic Farming (AAG-T-305/AAG-P-305)**	**Paper Code: (AAG-T-305/AAG-P-305)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Organic farming, principles and its scope in India; Initiatives taken by Government (central/ state), NGOs and other organizations for promotion of organic agriculture.

UNIT-II

Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming;

UNIT-III

Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP.

UNIT-IV

Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical

Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Farm Management, Production and Resource Economics**	**Paper Code: (AEC-T-301/AEC-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. Principles

of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product- product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage.

UNIT-II

Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labour income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises.

UNIT-III

Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises.

UNIT-IV

Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies**,** Crop/livestock/machinery insurance- weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practical

Preparation of farm layout.Determination of cost of fencing of a farm. Computation of depreciation cost of farm assets. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. Determination of most profitable level of inputs use in a farm production process. Determination of least cost combination of inputs. Selection of most profitable enterprise combination.Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. Collection and analysis of data on various resources in India.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Principles of Food Science and Nutrition **Paper Code: (AFT-T-302)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.).

UNIT-II

Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colors, miscellaneous bioactive, important reactions).

UNIT-III

Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods); Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.).

UNIT-IV

Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/ modified diets, Menu planning, New trends in food science and nutrition.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Hi-tech. Horticulture**	**Paper Code: (AHR-T-303/AHR-P-303)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods.

UNIT-II

Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding.

UNIT-III

Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA).

UNIT-IV

Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Practical

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Weed Management**	**Paper Code: (AAG-T-306/AAG-P-306)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.

UNIT-II

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use.Introduction to mode of action of herbicides and selectivity.Allelopathy and its application for weed management.

UNIT-III

Bio-herbicides and their application in agriculture.Concept of herbicide mixture and utility in agriculture.Herbicide compatibility with agro-chemicals and their application.

UNIT-IV

Integration of herbicides with non chemical methods of weed management.Herbicide Resistance and its management.

Practical

Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds.Study of herbicide formulations and mixture of herbicide. Herbicide and agro- chemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: System Simulation and Agro advisory**	**Paper Code: (AAG-T-307/AAG-P-307)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.

UNIT-II

Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis.Potential and achievable crop production- concept and modeling techniques for their estimation.

UNIT-III

Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars.

UNIT-IV

Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

Preparation of crop weather calendars. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts. Working with statistical and simulation models for crop growth. Potential & achievable production; yield forecasting, insect & disease forecasting models.Simulation with limitations of water and nutrient management options. Sensitivity analysis of varying weather and crop management practices. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast.Feedback from farmers about the agro-advisory.

Alabbar School of Management

Program: Masters of Business Administration (Two Years Course)

2021-23

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)



RAFFLES UNIVERSITY,
NEEMRANA, ALWAR, RAJASHTHAN
301705

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MASTERS OF BUSINESS ADMINISTRATION (M.B.A)- 2 Years

1. Vision

To educate and inspire capable and competent leaders with a futuristic business acumen & entrepreneurial spirit.

2. Mission

To equip the students of school of commerce & management with the ability to explore, examine, think critically and develop professional skills to become responsible global leaders who can contribute meaningfully to the industry and society through excellence in learning and practice-oriented research.

3. Program Educational Objectives

PEO1: To acquire the contemporary knowledge of the Business Concepts and their application in problem solving.

PEO2: To develop and apply different tools for decision making required for solving complex managerial problems with a passion to innovate.

PEO3: To develop the leaders who are able to adapt to the needs of the domestic and global Business requirements.

4. Programme Outcomes (POs)

After completing the program students will be able to

PO1: Exhibit memory of previously learned management knowledge by recalling facts, terms, basic concepts and answers.

PO2: Demonstrate understanding of management facts and ideas by organizing, comparing, translating, interpreting, giving descriptions and stating main ideas.

PO3: Explain contemporary management issues and their implications in real life situations.

PO4: Identify solutions to the problems relating to new situations by applying acquired knowledge, facts, techniques and rules in a different way.

PO5: Apply effective strategies to solve future problems and constraints, and devise feasible solutions.

PO6: Utilize the knowledge of statistics, accounting, finance, marketing and HR for devising effective business models,

PO7: Analyze and break information into parts by identifying motives or causes. Make interfaces and find evidence to support generalizations.

PO8: Appraise techniques, skills and latest management tools to meet the competition,

PO9: Present and defend opinions clearly and effectively in the corporate and business world,

PO10: Develop the right social, ethical and legal knowledge and value systems to become responsible citizens of the country.

PO11: Create innovative strategies in their chosen field of specialization like Finance, HR, Operations and Marketing.

PO12: Engage in a lifelong learning process

5. Programme Specific Outcomes (PSOs):

After completing the program students will be able to:

- **PSO 1: Demonstrate** effective leadership skills and **build** the ability to face the challenges of corporate world.
- **PSO 2: Develop** judgements about information, validity of ideas, or quality of work based on a set of criteria,
- **PSO 3: Improve** their competency in working with and managing multi-disciplinary teams.

	FIRST SEMESTER							
SL NO	COURSE CODE	COURSE	CREDIT PATTERN L:T:P	TOTAL CREDITS	EXAMINATION MARKS			
					MT	IA	ETE	TOTAL
1	MGTM-101	Principles of Management	4:0:0	4	20	40	40	100
2	MGTM-102	Managerial Economics	4:0:0	4	20	40	40	100
3	MGTM-103	Accounting for Managers	4:0:0	4	20	40	40	100
4	MGTM-104	Business Communication	4:0:0	4	20	40	40	100
5	MGTM-105	Information Technology for Managers	3:0:2	4	20	40	40	100
6	MGTM-106	Quantitative Techniques for Managers	4:0:0	4	20	40	40	100
7	MGTM-107	Organizational Behaviour	4:0:0	4	20	40	40	100
TOTAL				28				700

MT- MID TERM
IA-INTERNAL ASSESSMENT
ETE- END TERM EXAM

L-Lecture, T-Tutorial, P-Practical

COURSE OUTCOMES (COs):

Course	Course outcomes: - After completion of these courses' students should be able to
Semester - I	
Principles of Management	**CO1:** Define the nature of management and the planning and decision making. **CO2:** Develop the knowledge and capacities related to management concepts **CO3:** Apply the concepts Organizing, Directing, Leadership, Co-ordination and Controlling in the different organizational situations. **CO4:** Analyze employee's behavior, from a corporate, Dynamism. **CO5:** Evaluate Directing, Leadership, Co-ordination and Controlling.
Managerial Economics	**CO1:** Understand the application of modern economic concepts, tools and techniques in valuating business decisions taken by a firm. **CO2:** Identify needs of businessman to locate various factors affecting demand and supply of his product and plan marketing & business strategies accordingly. **CO3:** Apply the concepts and economic theories for practical use in business decision making. **CO4:** Compare and contrast the causes of inflation and deflation; National Income, business cycle, fiscal and monetary policy and plan accordingly to overcome the challenges. **CO5:** Evaluate the principals of Economics in Managerial Decision Making.
Accounting for Managers	**CO1:** Describe the accounting principles and standards and rules. **CO2:** Interpret the business transactions for making the summery for final accounting purpose. **CO3:** Prepare the financial statement of an organization. **CO4:** Identify various costs and apply techniques of costing. **CO5:** Prepare cost sheet and cost accounts and apply the concept of standards costing.
Business Communication	**CO1:** Find how development of the students' ability to think critically, reason through a problem. **CO2:** Explain & develop a cogent argument or explanation for all types of daily communication. **CO3:** Identify & understand the need of effective communication & apply requires clarity of thought, ability to listen intentionally and deliver messages in the most optimal way. **CO4:** Categorise the communication skills for variety of communication activities like discussion, presentation, task – based activities, such as group work, task work. **CO5:** Evaluating the learnings of the students about how to communicate

	effectively.
Information Technology for Managers	**CO1:** Define the basic concepts of information technology and their applications to business processes. **CO2:** Explain the Basic Framework of Information Technology & its Security. **CO3:** Apply the Practical aspect of MS Excel usage. Using practical of MS Excel **CO4:** Make use of various Functions of information technology for reporting purpose. **CO5:** Prioritize the data and information required for decision making.
Quantitative Techniques for Managers	**CO1:** Define data and various data collection techniques, which will enable them to make evidence based decisions. **CO2**: Apply the various Statistical tools & techniques in field. **CO3:** Construct a research design. **CO4:** Analyse the primary and secondary data for arriving at a conclusive decision. **CO5:** Decide the use of suitable statistical tools and techniques to assist in managerial decision making.
Organizational Behavior	**CO1:** Define the various behavioural aspects when working in an organization at any level. **CO2**: Explain the implications of individual and group behaviour in organizational Context. **CO3:** Identify the components of individual and group behaviour at various work, situations and apply behavioral techniques. **CO4:** Analyse & implement the importance of attitude, values, beliefs, assumptions and Motivation & to make aware about dynamic nature of groups in the organisation. **CO5:** Apply and create good organization culture and manage cultural diversity.

Mapping: Semester – I

MGTM-101	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	2	3	3	1	2	3	-	1	3
CO2	3	2	3	3	3	1	2	3	1	2	3	3
CO3	2	3	1	2	-	3	3	3	3	3	2	3
CO4	3	3	3	1	2	2	2	-	2	3	3	3
CO5	-	1	-	2	3	1	1	3	-	3	2	-

MGTM-102	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	2	2	2	-	2	-	3
CO2	3	3	2	3	3	-	2	2	2	-	2	3
CO3	2	3	2	2	3	2	-	1	-	-	-	3
CO4	3	2	3	3	2	2	-	2	1	-	-	3
CO5	3	3	3	3	2	3	2	3	2	2	2	3

MGTM-103	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2	2	1	2	2	-	2	2
CO2	2	2	2	-	2	3	2	2	2	-	-	3
CO3	2	2	3	3	3	2	2	-	-	-	2	2
CO4	3	3	1	2	1	2	2	-	-	2	2	3
CO5	3	3	2	3	3	2	3	2	3	-	2	3

MGTM-104	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	2		3		2	3				3
CO2	3	2		3			3	3	2			3
CO3	3	3		2		3			3	3	3	3
CO4	2	3	3		3			3	3	2	3	3
CO5	3	3	3	3			3			3		

MGTM-105	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2		2		2	2	2	2	3
CO2	3	2	3	3	2	3	2		2	3	3	3
CO3	2		2	2		3	2	2	3	2	2	3
CO4	1	2	2	2	2	2		2	2		2	3
CO5	3	3	2	3	3	2	3	3	2		3	3

MGTM-106	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	-	2	1	3	2	3	2	1	3
CO2	3	3	1	2	1	3	3	3		3	2	3
CO3	2	2	3	3	2	3	1	3	3	-	3	3
CO4	2	2	3	2	2	-	3		2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTM-107	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	2	2		3	2		2	2	2	3
CO2	2		3		3	2		3		3	2	3
CO3	2	2		3	2		3	2	3	1		3
CO4		2	2	2		2	2		2		2	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

	SECOND SEMESTER							
SL NO	COURSE CODE	COURSE	CREDIT PATTERN L:T:P	TOTAL CREDITS	EXAMINATION MARKS			
					MT	IA	ETE	TOTAL
1	MGTM-201	Business Environment	4:0:0	4	20	40	40	100
2	MGTM-202	Research Methodology	3:0:2	4	20	40	40	100
3	MGTM-203	Human Resource Management	4:0:0	4	20	40	40	100
4	MGTM-204	Corporate Finance	4:0:0	4	20	40	40	100
5	MGTM-205	Marketing Management	4:0:0	4	20	40	40	100
6	MGTM-206	Operations Management	4:0:0	4	20	40	40	100
7	MGTM-207	International Business	4:0:0	4	20	40	40	100
TOTAL				28				700

MT- MID TERM
IA-INTERNAL ASSESSMENT
ETE- END TERM EXAM

L-Lecture, T-Tutorial, P-Practical

Course	Course outcomes: - After completion of these courses' students should be able to
Semester - II	
Business Environment	**CO1:** Define various laws & force, explain regulatory measures governing business operations in India. **CO2:** Identify the latest developments in business Environment. **CO3:** Examine Political and Legal environment, Social and Cultural Environment, Technological environment and Competitive Environment **CO4:** Determine International Environment, evaluate the complexities of business environment and their impact on business & to analyze the relationship between Government and business and understand the Political, Economic, legal and social policies of the country. **CO5:** Evaluate the student's cognizance about the concepts of business environment and its application practically.
Research Methodology	**CO1:** Understand the research process, tools and techniques in order to facilitate managerial decision-making. **CO2:** Explain the basic concepts of research methods and its usefulness in business situations. **CO3:** Apply research design, sample design and sampling methods & apply appropriate methods for data collection for research work by implementation of statistical tools for data analysis and interpretation for business decision making. **CO4:** Discover the analytical abilities and research skills with hands on experience and learning in Business Research. **CO5:** Interpret the various research methods and its usefulness in real business situations.
Human Resource Management	**CO1:** Define the concepts, methods and techniques and issues involved in managing human resource. **CO2:** Understand the concept of Managing Human Resources and work situations. **CO3:** Apply the effective Human Resources and working environment of the organizations, the importance of Management; Training, performance appraisal. **CO4:** Analyse the need of employing, maintaining and promoting a motivated force in an organization. **CO5:** Impart knowledge on Industrial Relations- Trade unions, Grievance Management, Contemporary Issues in HRM and Strategic Issues confronting IR.

Corporate Finance	**CO1:** Define the concepts, vital tools and techniques applicable for financial decision making by a business firm. **CO2:** Explain the functions of Finance in organization and methods in managing funds for business **CO3:** Apply the concepts of budgeting, working capital, cost of capital including the choice of source of funds. **CO4:** Analyse the practical problems relating to the financing of funds including pricing and dividend theories. **CO5:** Select the methods and techniques for analysing the data for financial decision making.
Marketing Management	**CO1:** Relate the concepts, philosophies, processes and techniques of Marketing Management to real operations of a firm. **CO2:** Interpret & relate the fundamental concepts & practices from business perspective in the organisation. **CO3:** Make use of various opportunities available in various sectors in the field of marketing management & apply the concepts related to market research. **CO4:** Analyse the consumer buying behavioural process & take part in the process of developing new product & market segmentation. **CO5:** Evaluate various marketing campaigns and could decide on effective strategies.
Operations Management	**CO1:** Define the basic concepts and theories of the production management & comprehend the operations management situations with greater confidence. **CO2:** Understand the strategic significance of Production & Operation management. **CO3:** Understand quality management and the evolution of practice; assess the relationship between quality and capability, and betweenquality and competitiveness; **CO4:** Apply Planning, Scheduling and Control of Production and Operations Management functions in both manufacturing and Services. **CO5:** Analyse the effectiveness of operations by job & work design, process design, layout design, design & control system.
International Business	**CO1:** Define the concepts of international business management. **CO2:** Explain the scope of international business creating awareness about international finance decisions and impact on operations. **CO3:** Identify basics of WTO, SRC& different investment theories from the perspective of a business manager. **CO4:** Analyse & inform the Modes of Entry in international market, Marketing mix, Factors affecting Decisions for International Business & define the Finance aspects of International Business, Capital Movement, Risk in international operations, international investment, Financing for foreign trade. **CO5:** Evaluate the learning of the students about the various aspects of the international business concepts.

Mapping: Semester – II

MGTM-201	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2		2	3		2		2		3	3
CO2	3		2	2	3	2		2	3	2		3
CO3	2	3	1	1		3	2	2	3	2	2	3
CO4	2	2	2		3	3	2	2		3	3	3
CO5	2	3	3	3		1	3	3				

MGTM-202	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	3	2	3	2	2	1	2	2	2
CO2	2	2	3	1	1	-	-	-	2	-	2	2
CO3	3	3	2	3	3	2	-	3	-	-	2	3
CO4	2	2	1	1	2	2	2	-	-	2	-	3
CO5	3	3	2	2	3	3	2	3	3	3	3	3

MGTM-203	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2		2	2	2		3	2	3
CO2	2	2	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	1	3	2	2		2	2	2	2
CO4	2			3	3	1	3	3	3	2	2	2
CO5		3	2	2	1	2		2	3	1		

MGTM-204	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	2	2			3	3
CO2	2	2	2	2	3		2	2	3	3	2	3
CO3	1		2	2	3	3	3		2		2	3
CO4			2	2	3	2		2			2	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTM-205	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	-	-	3	2	2	3
CO2	2	2	2	3	3	3	3	2	2	-	2	3
CO3	2	3	3	-	3	2	3	3	3	3	3	3
CO4	2	-	2	3	2	2	2	3	-	3	3	3
CO5	3	3	2	2	2	2	3	2	3	2	2	3

MGTM-206	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	2	2	2	-	3	2	3
CO2	-	2	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	1	3	2	2	-	2	2	2	2
CO4	2	-	-	3	3	1	3	3	3	2	2	2
CO5	3	2	1	3	3	1	2	3	3	3	2	2

MGTM-207	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	2	-	2	2	-	2
CO2	-	2	2	3	-	-	-	2	2	2	2	-
CO3	-	-	2	-	-	3	2	-	1	-	1	2
CO4	2	1	-	-	3	1	-	2	1	-	2	-
CO5	3	3	3	3	3	3	3	3	3	3	3	3

	THIRD SEMESTER							
SL NO	COURSE CODE	COURSE	CREDIT PATTERN L:T:P	TOTAL CREDITS	EXAMINATION MARKS			
					MT	IA	ETE	TOTAL
1	MGTM-301	Management Information System	4:0:0	4	20	40	40	100
2	MGTM-302	Legal Aspects of Business	4:0:0	4	20	40	40	100
3	MGTM-303	Business Strategy	1:0:2	4	20	40	40	100
4		Elective-I	4:0:0	4	20	40	40	100
5		Elective-II	4:0:0	4	20	40	40	100
6		Elective-III	4:0:0	4	20	40	40	100
7	MGTM-304	Summer Internship/ Project (PAP/PCP)		4			100	100
TOTAL				28				700

MT- MID TERM
IA-INTERNAL ASSESSMENT
ETE- END TERM EXAM

L-Lecture, T-Tutorial, P-Practical

Total credit = 114

Specialization electives for III semester:

Specialization Area	Elective	Specialization paper
Marketing	MGTM-301M	Retail Management
	MGTM-302M	Consumer Behaviour
	MGTM-303M	Marketing Research
Human Resource	MGTM-301H	Human Resource Planning & Development
	MGTM-302H	Compensation Management
	MGTM-303H	Management Training & Development
Finance	MGTM-301F	Security Analysis & Portfolio Management
	MGTM-302F	Financial Markets and Institutions
	MGTM-303F	Financial Services
Production & Operations	MGTM-301P	Production and Operation Management
	MGTM-302P	Procurement Management
	MGTM-303P	Material Management
International Business	MGTM-301I	International Economics
	MGTM-302I	International Business Laws
	MGTM-303I	International Marketing

Course	Course outcomes: - After completion of these courses' students should be able to
Semester – III	
Management Information System	**CO1:** Explain the Information Systems used in Business. **CO2:** Make use of design, development, and security of Management Information System & its utility. **CO3:** Classify the ethical and social issues in using information system. **CO4:** Compile the utility of Decision Support System. **CO5:** Prioritise the use and analysis of data and information for decision making.
Legal Aspects of Business	**CO1:** Relate the rights and liabilities of a person based on the contract under Indian contract Act, Companies Act, 2013, **CO2:** Explain the utility of negotiable instrument Act and Partnership Act with new concept of limited liability partnership. **CO3:** Develop with case law studies related to Business Laws, labor laws. **CO4:** Analyse and define the concept of business law, its application and source. Rights of customers and seller under Sale of Goods Act, different provisions. Negotiable instruments Act and Partnership Act etc. **CO5:** Evaluate the major law enactments in India.
Business Strategy	**CO1:** Define & understand of the Business Strategy process in a dynamic and Competitive global environment. **CO2:** Explain the growing importance of strategies in uncertain business Environment & learn the unique challenges faced by firms in competitive environment. **CO3:** Identify the applicability of various Strategies in varied situations & also in general and competitive business environments. **CO4:** Examine how to resolve cases through strategic decision making, & the use strategic management concepts and techniques. **CO5:** Evaluate the understanding of the students about the application of various strategic models through different business perspectives.

Retail Management	**CO1:** The student will be able to systematically approach personal selling and sales targets **CO2:** The student will be able to explain the basics of retail store management **CO3:** The student will be able to systematically choose a location and layout of the store **CO4:** The student will be able to explain the concepts related to merchandise management **CO5:** Relate store management and visual merchandising practices for effective retailing
Consumer Behaviour	**CO1:** Understand environmental variables affecting consumer behavior **CO2:** Explain the process of consumer behavior, the various external and internal factors that influence consumer behaviour and to apply this understanding to the development of marketing strategy. **CO3:** Utilize the knowledge of consumer decision making process and its applications in marketing function of firms & examine influence of social class, group dynamics on consumer behavior. **CO4:** Create consumer-oriented marketing strategies & correlate the impact ofpersonality, perception, learning, motivation and attitude to the choices consumers make. **CO5:** Create an ability to strategize and execute marketing strategies as per thepreferences of customers.
Security Analysis and Portfolio Management	**CO1:** Remember the basics of financial market of India, focused on the Stock Market (Capital Market), various theories of portfolio, risk-return concepts and behavioural finance. **CO2:** Understand the various investment & revenues & to understand the functions and importance of Indian security market. **CO3:** Apply the concepts of TVM (Time Value of Money) concepts and calculations; including future value of a present sum, present value, and present and future values of annuities to management decision making. **CO4:** Analyse and predict the trend of stock price movement & design portfolioof investment to reduce risk and earn profit & interpret the evidence relating to market efficiency. **CO5:** Formulate the portfolio and evaluate the performance with revision if required.
Summer Internship andReport	**CO1:** Understand the real-time working of organizations. **CO2:** Demonstrate professional knowledge, skills and attitude along with the experience needed to constitute a successful career. **CO3:** Analyse career opportunities in their areas of interest. **CO4:** Build aptitude for gaining supervised professional experiences. **CO5:** Create a clear understanding of industry trends and advancements.

Management Training & Development	**CO1:** Demonstrate their conceptual Skills in understanding benefits of training, training need assessment and compare training and development. **CO2:** Demonstrate conceptual Skills and application of designing training programme and apply the same to business situations. **CO3:** Demonstrate their conceptual Skills in various training techniques and methods and to analyze target audience to identify typical style and needs. **CO4:** Demonstrate conceptual understanding of evaluation of training. 5. **CO5:** Demonstrate the ability in applying the training and development concepts learnt to analyze a case let
Financial Services	**CO1:** The Student will be acquainted to various Banking and Non-Banking financial services in India. **CO2:** The Student will understand the activities of Merchant Banking and credit rating. **CO3:** The Student will be equipped to understand micro financing and other financial services in India. **CO4:** The Student will understand how to evaluate and compare leasing & hire purchase. **CO5:** The students will be able to understand the mutual funds functioning.

international marketing	**CO1:** The students aware about the challenges of positioning the same product or service indifferent cultural markets. **CO2:** The students will demonstrate their conceptual knowledge of Pricing decisions andproduct & services in international marketing. **CO3:** To demonstrate their conceptual skill of analyzing global marketing channels,distribution and logistics management. **CO4:** To anticipate problems and take proactive steps.
Material Management	**CO1:** Explain the scope of materials and spare parts management in an organization. **CO2:** Explain the key characteristics of the purchasing system. **CO3:** Apply the policies of Inventory Management and Develop overall materials requirement plan. **CO4**: Explain the ERP System for Materials management. **CO5:** Understand the importance of warehouse and supplier development in materials management.
Production and operation Management	**CO1** To identify the elements of operations management and various transformation processesto enhance productivity and competitiveness. Explain the techniques of location and facility planning. **CO2** To Analyze and Make use of various methods of work study, method study and work measurement. **CO3** To define and examine the materials management function starting from demand management through Inventory Management. **CO4** Apply various Statistical Quality Control tools including the analysis of various Quality costs and quality circles. Explain the concept of TQM.

International Economics	**CO1.** Identify the basics of international economics, difference between inter-regional and international trade, understand how international economics has helped countries to acquire goods at cheaper cost and explain it through the various international trade theories. **CO2.** Show the benefits of international trade in a way how nations with strong international trade have become prosperous and have the power to control world economy and how global trade can be one of the major contributors of reducing poverty. **CO3.** Explain how restrictions to international trade would limit a nation in the services and goods produced within its territories and at the same time explain that a rise in international trade is essential for the growth of globalization. **CO4.** Show the importance of maintaining equilibrium in the balance of payments and suggests suitable measures to correct disequilibrium as well. **CO5.** Be aware of trade policy and the changes in the composition as well as direction of foreign trade after international trade and know the causes and effects of deficits in the balance of payments, measures adopted to correct the deficits and identify the need for having trade reforms.

Human Resource Planning & Development	**CO1:** To understand the various concepts, principles, importance of Human Resource Management for an organization. **CO2:** To design a Human Resource Plan for an organization and construct its Selection Process **CO3:** To develop a job analysis and produce a job description and job specification for a given job profile. **CO4:** To evaluate/justify the applicability of various techniques of Training **CO5:** To identify the performance appraisal process, Job evaluation, Compensation factors and explain the utility of various methods involved in it.

Mapping: Semester – III

MGTM-301	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2		2		3	2	3	2	3
CO2	3	2	3	3	2	3	2		2	3	3	3
CO3	2		2	2		3	2	2	3	2	2	3
CO4	2	2	2	2	2	2		2	2		2	3
CO5	3		3	3		3			3	3	3	3

MGTM-302	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3		2	2	2		3	2	3
CO2		3	3	2	2	3	3	3	3	3	3	2
CO3	3	3	3	2	3	3	2		3	2	2	2
CO4	2			3	3	1	3	3	3	2	2	2
CO5	1	2	1		2		1	1	2		2	2

MGTM-303	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2			2	1	2	2			
CO2		2	1	3	1				2	2		
CO3				2	2			2	1		2	2
CO4		2		1			2	2	1			2
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTM-301M	PO1	PO2	PO3	PO4	PO5
CO1		3			
CO2	3				
CO3			3		
CO4				3	
CO5					2

MGTM-302M	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	3	2	3	2	2	3	3
CO2	1	-	2	-	-	1	-	2	3	3	2	2
CO3	-	2	2	2	3	-	3	2	-	3	-	-
CO4	-	2	2	2	-	3	2	-	3	-	3	-
CO5	-	2	2	2	-	3	2	-	3	-	3	3

MGTM-301F	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	2	-	2	1	-	1	1	3

CO2	-	1	3	-	2	2	2	2	2	-	3	3
CO3	2	2	3	2	-	-	-	3	2	2	-	3
CO4	2	2	1	3	3	-	3	2	-	1	2	3
CO5	3	3	2	3	2	3	3	2	3	2	3	3

MGTM-304	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	3	3	3	2	2	2	2
CO2	-	3	3	2	1	-	1	2	1	-	2	-
CO3	1	1	2	3	3	-	2	-	-	2	3	1
CO4	1	1	2	1	-	2	3	3	2	1	1	1
CO5	2	2	3	1	-	2	3	3	2	1	2	1

MGTM-303H	PO1	PO2	PO3	PO4	PO5
CO1	3				
CO2		3			
CO3		2		3	
CO4					
CO5					2

MGTM-303F	PO1	PO2	PO3	PO4	PO5
CO1	3	1			
CO2	3		2		3
CO3	3		2		3
CO4	3				3
CO5	3				3

MGTM-303I	PO1	PO2	PO3	PO4	PO5
CO1	3				
CO2		3			2
CO3			3		
CO4		3			

MGTM-303P	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3			3
CO2	3	3	3	2		3
CO3	3	3				3
CO4	3	3	3			3
CO5	3	3	3			3

MGTM-301P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					3				3		3	3
CO2	3		3	3	2	-			2	-		
CO3			2		3	-		-	-	2		3
CO4	3		2		-							
CO5	2			3	-							3

MGTM-303I	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	2	2	2	-	2	-	3
CO2	3	3	2	3	3	-	2	2	2	-	2	3
CO3	2	3	2	2	3	2	-	1	-	-	-	3
CO4	3	2	3	3	2	2	-	2	1	-	-	3
CO5	3	3	3	3	2	3	2	3	2	2	2	3

MGTM-301H	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2		2	2	2		3	2	3
CO2	2	2	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	1	3	2	2		2	2	2	2
CO4	2			3	3	1	3	3	3	2	2	2
CO5		3	2	2	1	2		2	3	1		

	FOURTH SEMESTER							
SL NO	**COURSE CODE**	**COURSE**	**CREDIT PATTERN L:T:P**	**TOTAL CREDITS**	**EXAMINATION MARKS**			
					MT	**IA**	**ETE**	**TOTAL**
1	MGTM-401	Project Management	4:0:0	4	20	40	40	100
2	MGTM-402	Entrepreneurship	4:0:0	4	20	40	40	100
3	MGTM-403	Business Ethics	4:0:0	4	20	40	40	100
4		Elective-IV	4:0:0	4	20	40	40	100
5		Elective-V	4:0:0	4	20	40	40	100
6		Elective-VI	4:0:0	4	20	40	40	100
7	MGTM-404	Research Project		6			100	100
TOTAL				30				700

MT- MID TERM
IA-INTERNAL ASSESSMENT
ETE- END TERM EXAM

L-Lecture, T-Tutorial, P-Practical

Specialization electives for IV Semester:

Specialization Area	Elective	Specialization paper
Marketing	MGTM-404M	Sales & Distribution Management
	MGTM-405M	Brand Management
	MGTM-406M	Digital Marketing
Human Resource	MGTM-404H	Labour Law
	MGTM-405H	Industrial Relations
	MGTM-406H	Performance Appraisal and Evaluation
Finance	MGTM-404F	Financial Derivatives and Risk Management
	MGTM-405F	Corporate Tax Planning
	MGTM-406F	International Finance Management
Production & Operations	MGTM-404P	Total Quality Management & Six Sigma
	MGTM-405P	Process Management and Consultancy
	MGTM-406P	Enterprise Resource Planning
International Business	MGTM-404I	Global Brand Strategy
	MGTM-405I	International Business Operations and Logistics
	MGTM-406I	Export Import Procedures & Documentation

Course	Course outcomes: - After completion of these courses' students should be able to
Semester – IV	
Project Management	**CO1:** Demonstrate an understanding of various phases of Project Management i.e. planningas well as implementing **CO2:** Demonstrate the use of various tools available for Risk analysis in Capital budgeting to measure the financial feasibility of the project. **CO3:** Demonstrate an understanding of various means of project financing and their meritsand demerits **CO4:** Demonstrate a systematic project implementation and review
Entrepreneurship	**CO1:** Define how to search financing alternatives for specific new concepts /idea of being an entrepreneur. **CO2:** Develop Entrepreneurship Skills by explaining different stories of some leading entrepreneurs are and develop competences are needed to become an entrepreneur. **CO3:** Apply 3S Model: Stimulate Sustain and Support so that a spirit of Entrepreneurship & explain about Management of Small Family Business. **CO4:** Analyse management function of a company with special reference to SME sector, start–ups and Entrepreneurship along with government subsidies available to them & also understand the role of entrepreneurship in the economic development. **CO5:** Analyze the entrepreneurial skills within individual by correlating the concepts & models taught.
Business Ethics	**CO1:** Find about business ethics, emerging trends in good governance practicesand corporate social responsibility in the global and Indian context. **CO2:** Explain the significance of ethics and ethical practices in businesses which are indispensable for progress of a country & recite the applicability of ethics in functional areas of management. **CO3:** Identify the emerging need and growing importance of effective governance by the management of organizations. **CO4:** Analyse ethical issues related to business and suitable corporate governance necessary for long term survival of business by applying integrates contemporary Ethics in business. **CO5:** Evaluate the learning of various business ethics concepts that can be applied in the business models and decisions.

Sales and Distribution Management	**CO1:** Find the necessary skills and knowledge needed to manage sales force, distribution management. **CO2:** Relate the theoretical concepts of sales and distribution to real working infield. **CO3:** Apply sales forecasting methods, sales budgeting techniques and methodsto manage selling expenses. **CO4:** Analyse personal selling strategies and will be able to function as a team member in sales meetings & could build relationship with its team members. **CO5:** Choose appropriate selling strategies in professional life.
DigitalMarketing	**CO1:** Define the importance of the digital marketing for marketing success. **CO2:** Demonstrate customer relationships across all digital channels and buildbetter customer relationships. **CO3:** Identify a digital marketing plan, starting from the SWOT analysis anddefining a target group. **CO4:** Classify digital channels, their advantages and limitations, to perceivingways of their integration taking into consideration the available budget. **CO5:** Propose different ways of their integration taking into consideration theavailable budget.
Financial Derivatives and Risk Management	**CO1:** The students will understand the mechanism of forwards/futures, options, financialswaps, commodity derivative. **CO2:** The students will assess the application of derivative instruments using numericalproblems **CO3:** The students will suggest and make better decisions for their company in riskmanagement. **CO4:** The students will become more curious to research on the new developments that aretaking place in business environment
International Financial Management	**CO1:** The student will be able to demonstrate a better understanding of international trade. **CO2:** The students will be able to learn about current exchange rate regime, functioning offoreign exchange markets and various participants. **CO3:** The students will be able to demonstrate with managing firm's exposure to risk. **CO4:** The students will be able to demonstrate with currency trading and swaps.
Global Brand Strategy	**CO1:** Identify the steps in brand building **CO2:** Use techniques for brand positioning **CO3:** Measure and interpret brand performance **CO4:** Design and implement brand strategies **CO5:**Analyze and suggest solutions for brand problems

Performance appraisal & Evaluation	**CO1:** Define the of issues related to the performance evaluation or rewarding Human Resources in the Corporate Sector, public services and other forms of organizations. **CO2:** Understand the importance of performance appraisal and informed them of how organizations manage performance. **CO3:** Apply the skills for handling the issues relating to not only appraising staff but also managing their performance. **CO4:** Analyse the skills in designing, analyzing and restructuring compensationpackages related systems, policies and strategies. **CO5:** Evaluate the strategic role of HR in executing compensation packages for business excellence
Industrial Relation	**CO1:** Learners will recognize the concept of performance management in organizations. **CO2:** Learners will realize the Industrial Disputes and its related concepts. **CO3:** Learners will aspire about the Trade Union, Collective Bargaining and Worker's Participation in Management. **CO4**: Learners will comprehend Employee Discipline, Grievance Handling and also Industrial Related Laws in India.
International Business Operations and Logistics	**CO 1:** The students will be able to identify and define the Meaning, Nature, importance and types of International Business. **CO 2:** It will make the students able to understand the International business environment and the theories related to it. **CO 3:** It will make the students able to analyse the Modes of Entry in international market, Marketing Mix, Factors Affecting Decision For International Business. **CO 4:** The students will be able to evaluate the trends in International Trade and Documentation
Total Quality Management and Six Sigma	**CO1:** Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems. **CO2:** Evaluate the performance measures using various quality and management tools **CO3:** Apply the Quality Function Deployment, Taguchi principles, Total Productive Maintenance and Failure Mode and Effect Analysis concepts to solve industrial problems. **CO4:** Practice the various quality system in industry.

Enterprise Resource Planning	**CO1:** Analyze concepts of Business Functions, Business Model and Business Processes. **CO2:** Evaluate various benefits and risks in the Implementation of ERP **CO3:** Asses the need for ERP applications in a business function and recommend a right package. **CO4**: Create implementation Methodology while identifying the resources for the implementation process.
Research Project	**CO1:** Understand the relevance of learned concepts and its applicability in real-life corporate environment. **CO2:** Apply his learning of subjects in writing the dissertation report on theproblem undertaken for study. **CO3:** Analyse & prepare tabulation for the data collected. **CO4:** formulate the analysis and interpretation of data & also know about itscorrect presentation to use in professional manner. **CO5:** Create the logical and critical skills for correctly analysing the industrialprogress.

Mapping: Semester – IV

MGTM-401	PO1	PO2	PO3	PO4	PO5
CO1	3				
CO2	3				2
CO3	3			3	
CO4	3				1
CO5	3				2

MGTM-402	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3	2	1	3		1	1	2	2	2
CO2	1	3	2	3		3	3	2	2	3	3	2
CO3	3	2	3	1	3	2	3	3	2	2	2	3
CO4	2			3	3	1	3	3	2	2	2	2
CO5	3	1	1	3	3	1	3	2	3	2	2	2

MGTM-403	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1		2	2					
CO2		2	2						3	2	2	2
CO3			2	2	3	2	2	3				
CO4					1		2	2	2	2		2
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTM-404M	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	2	3	3	2	2	3	-	2	3
CO2	3	2	3	3	3	2	2	3	2	2	3	3
CO3	2	3	2	2	-	3	3	3	3	3	2	3
CO4	3	3	3	2	2	2	2	-	2	3	3	3
CO5	-	2	2	-	3	3	2	3	2	3	2	3

MGTM-406M	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3		3			3	2	2		2
CO2	3		3	3		3	3	3	3		3	3
CO3		3		3		3			3	2	3	3
CO4	3	3	3	3				3	3	3	3	
CO5	2		2		3	3	3		3		3	3

MGTM-404F	PO1	PO2	PO3	PO4	PO5
CO1	3				
CO2			3	3	
CO3	2	3	2		
CO4	3		2		2

MGTM-406F	PO1	PO2	PO3	PO4	PO5
CO1	3				
CO2	3			3	
CO3	3				
CO4	3		1		
CO5		2	2		

MGTM-404I	PO1	PO2	PO3	PO4	PO5
CO1	3				
CO2		3			
CO3			3		
CO4				2	
CO5					1

MGTM-406H	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3		3		3	2	3	2		3
CO2		3		3	2	3	3	3		3	3	3
CO3	2	3	3	3		3		3	3		3	3
CO4	3	2	3	2	3	2	3		2	3	3	3
CO5	2	2	1	1	1	3		3	1	2	1	

MGTM-405H	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3		2		1				
CO2	2		2		2	1	1	1	2
CO3	2		3		1	1	1	2	2
CO4	2	2	2		1	2	2	2	1

MGTM-405I	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	2	-	2	2	-	2
CO2	-	2	2	3	-	-	-	2	2	2	2	-
CO3	-	-	2	-	-	3	2	-	1	-	1	2
CO4	2	1	-	-	3	1	-	2	1	-	2	-
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTM-404P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2					-					2
CO2	1	2				-	-			-		2
CO3	2	2	2			-						2
CO4	2	2	2	2	-	-	-					2

MGTM-406P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2		2	2	2		3	2	3
CO2	2	2	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	1	3	2	2		2	2	2	2
CO4	2			3	3	1	3	3	3	2	2	2

MGTM 404	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	3	-	2	2	2	2	2
CO2	-	2	-	2	2	-	-	2	2	-	2	-
CO3	2	-	1	3	2	-	3	3	-	2	3	2
CO4	2	3	2	-	-	-	-	-	2	2	2	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MBA: Semester-I

Paper MGTM-101: PRINCIPLES OF MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

This module provides students with a wide-ranging introduction to management and understanding its key principles, concepts & theories and tools & techniques. The objective of this course is for each student to be able to know, comprehend, apply, analyze, synthesize and evaluate the basic principles of the fundamentals of managing organizations. Students will complete specific activities, as identified in the syllabus, related to each of the four functions of management: planning, organizing, leading and controlling.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Define the nature of management and the planning and decision making.

CO2: Develop the knowledge and capacities related to management concepts

CO3: Apply the concepts Organizing, Directing, Leadership, Co-ordination and Controlling in the different organizational situations.

CO4: Analyze employee's behavior, from a corporate, Dynamism.

CO5: Evaluate Directing, Leadership, Co-ordination and Controlling Course Contents.

Unit I: Evolution & Growth of Management Thought

Concepts, Theory and Practice: The Evolution of Management Thought – Scientific Management School, Behavioural School, Quantitative School, Integration School, Contemporary School, McKinsey's 7-S approach.

Unit II: Planning, Organizing & Direction

Planning- Nature, Purpose, Types & Process of Planning; Concept of MBO, MBE & MBWA.
Decision Making- Approaches, Decision Making under certainty, uncertainty & risk; Group Decision Making.
Organizing- Line/ Staff Authority, Decentralization & Delegation, Effective Organizing.
Direction- Supervision, Span of Supervision, Graicuna's Theory of Span of Management.

Unit III: Motivation, Control & Coordination

Motivation- elements, importance, methods, theories.
Controlling- Control Process, Importance, Critical Control Standards & Techniques, Maintenance Vs Crisis Management, Overall Control Process.
Coordination- Definition, Characteristics, Objectives, Techniques.

Unit IV: Modern approaches to Management

Concept of Knowledge management, change management, technology management, supply chain management, process and project quality standards – six sigma, CMM, CMMI, PCMM, Impact of IT quality management systems, learning organizations

Unit V: Contemporary Issues

Social Responsibility & Ethics,

Globalization & Management
Inventing & Reinventing Organizations
Culture & Multiculturalism

Recommended Books

- Koontz, Essentials of Management, Tata McGraw Hill
- L. M. Prasad: Principles of Management

Reference Books

- Robbins, De Cenzo, Bhattacharya and Agarwal, (2009): Fundamentals of Management- Essential Concepts & Applications 6e, India, Pearson
- Hellriegel, Jackson and Sloceum, (2008): Management- A Competency Based Approach 10e, India, South- Western Cengage Learning.
- Stoner, Freeman, Gilbert, Jr., (2006), Management 6e, India, Prentice- Hall
- Anil Bhat, Arya Kumar, Management Principles, Process and Practices, Oxford.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Principles of Management, Management Thoughts, Planning and Decision Making, Organizing and Directing, Controlling and Coordination, Contemporary Management Issues.

MBA: Semester-I

Paper MGTM-102: MANAGERIAL ECONOMICS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

The basic objective of this course is to make the students aware of the various economic issues that they are expected to face as managers at the corporate level and to equip them with the tools and techniques of economic analysis for improving their decision-making skills.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Understand the application of modern economic concepts, tools and techniques in valuating business decisions taken by a firm.

CO2: Identify needs of businessman to locate various factors affecting demand and supply of his product and plan marketing & business strategies accordingly.

CO3: Apply the concepts and economic theories for practical use in business decision making.

CO4: Compare and contrast the causes of inflation and deflation; National Income, business cycle, fiscal and monetary policy and plan accordingly to overcome the challenges.

CO5: Evaluate the principals of Economics in Managerial Decision Making.

Course Contents

Unit I: Introduction to Economics

Nature and Scope of Management Economics, Significance in decision-making and fundamental concepts. Objectives of a firm. Gap between theory and practice and role of managerial economist.

Unit II: Demand Analysis

Law of Demand, Exceptions to the law of Demand, Determinants of Demand. Elasticity of Demand- Price, Income, Cross and Advertising Elasticity; Uses of Elasticity of Demand for managerial decision making, measurement of Elasticity of Demand. Demand forecasting meaning, significance and methods.

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Unit III: Supply Analysis

Law of Supply, Supply Elasticity; Analysis and its uses for managerial decision making. Production concepts & analysis; Production function, single variable-law of variable proportion, two variable- Law of returns to scale. Cost concept and analysis, short-run and long-run cost curves and its managerial use.

Unit IV: Market Equilibrium and Average Revenue Concept. Market Structure

Perfect Competition, features, determination of price under perfect competition. Monopoly: Feature, pricing under monopoly, Price Discrimination. Monopolistic: Features, pricing under monopolistic competition, product differentiation. Oligopoly: Features, kinked demand curve, cartels, price leadership. Pricing Strategies; Price determination, full cost pricing, product line pricing, price skimming, penetration pricing.

Unit V: National Income

Concepts and various methods of its measurement, Inflation, types and causes, Business Cycle, Profit concept and major theories of profits; Dynamic Surplus theory, Risk & Uncertainty bearing theory and Innovation theory.

Recommended Book:

- Dwivedi D.N., Managerial Economics, Vikas Publication, 7th Edition.
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Reference Books:

- Paul A Samuelson, Economics, Mc-Graw Hill, 2011.
- Petersen, Jain, Managerial economics-4e, Prentice Hall.
- Mehta, P. L.; Managerial Economics, Sultan Chand & Sons., 2010.
- Peterson, Lewis; Managerial Economics, 4th Pearson Education, 2010.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive classroom sessions with the help of PowerPoint presentations, reflective assessment and case study discussions to ensure active participation and continuous learning.

Assessment Methods

The assessment method of this course is properly aligned with teaching learning processes and anticipated learning outcomes. It includes oral and written tests, problem solving exercises, presentations and end semester examinations.

Keywords

Micro Economics, Law of Demand, Law of Supply, Consumer Behavior, Theory of Production, Cost Function, Pricing, National Income.

MBA: Semester-I

Paper MGTM-103: ACCOUNTING FOR MANAGERS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

This module provides students with a comprehensive introduction to Financial Accounting and Cost accounting, its meaning, principles, core concepts and usage. By the end of the module, students will be fully equipped with the knowledge and skills required to prepare and understand the financial and cost records.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Describe the accounting principles and standards and rules.
CO2: Interpret the business transactions for making the summery for final accounting purpose.
CO3: Prepare the financial statement of an organization.
CO4: Identify various costs and apply techniques of costing.
CO5: Prepare cost sheet and cost accounts and apply the concept of standards costing.

Course Contents

Unit I: Introduction to Accounting

Meaning, Objectives, Basic accounting terms, Accounting principles, Meaning and nature, Accounting concept and conventions, Basis of accounting – Cash and Accrual, Origin of Transactions – Source documents and vouchers, Accounting equations, Rules of Debit and Credit, Difference between Financial Accounting, Cost accounting and Management accounting.

Unit II: Recording of transactions

Books of Original entry- Journal, How to record a Transaction in Journal; Subsidiary Books; Book of Principal Entry-Ledger, Opening of Accounts, Posting and Balancing, Closing of Accounts; Trial Balance- Meaning, Objective & Preparation.

Unit III: Financial Statements

Meaning of Capital Expenditure, Revenue expenditure and Deferred Revenue Expenditure; Meaning of Financial Statement; Preparation of Manufacturing Account Trading Account, Profit and Loss Account and Balance Sheet. Depreciation: Concept, WDV and SLM methods.

Unit IV: Introduction to Cost Accounting

Meaning of Cost, Costing and Cost Accounting; Objectives of Cost Accounting, Types of Costs; Cost and Expense- Meaning & Differences; Cost Centre-Meaning, Purpose, Types, Methods and Techniques of Costing.

Unit V: Cost Records & variance analysis

Meaning of Cost Sheet, Objectives of preparing Cost Sheet, Preparation of Cost Sheet. Cost Accounting System: Job Costing, Process Costing, Contract Costing, Service/ Operating Costing. Cost Analysis: Make or buy decisions, Accept or reject decisions, Process Costing

Concept of Standards Costing, Setting and revision of Cost Standards, Concept Variance, Calculating Material, Labour and Overhead Variance.

Recommended book:

- P.C. Tulsian, Financial Accounting, Pearson
- Hanif & Mukherjee, Financial Accounting, Tata McGraw Hill
- M.N.Arora, Cost Accounting, Principles & Practice, Vikas Publishing House

Reading List

- Dr. D.K.Goyal, Accountancy, Arya Book Depot
- Khan & Jain, Cost Accounting, Tata McGraw Hill
- Hongren, Datar, Foster, Rajan, Ittner, Cost Accounting, A Managerial Emphasis, Prentice Hall
- Nigam & Jain, Cost Accounting, Principles & Practice, Prentice Hall
- P. C. Tulsian, Cost Accounting, Pearson

Note: Latest edition of readings may be used.

Teaching Learning Process

Theory/ numerical with examples, Problem solving sessions.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination.

Keywords

Financial Statements, Depreciation, Inventory Valuation, Cost Sheet, Standard costing.

MBA: Semester-I

Paper MGTM-104: BUSINESS COMMUNICATION

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

Communication is a two-way interactive process and its importance can be found in our professional as well as in our daily personal lives. We have intentionally taken a holistic approach in this module. This communication module is focused on the effective use and handling of communication situations, that individuals find themselves in both professional and personal environments. This module focuses on communication processes and key elements. It specifically explores the linkages between perception, personality, and communication including non-verbal communication. The prime purpose is to educate learners to effectively use and interpret verbal and nonverbal communication and understand what communication styles and skills can be adopted for different persons so as to ensure effective communication.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Find how development of the students' ability to think critically, reason through a problem.

CO2: Explain & develop a cogent argument or explanation for all types of daily communication.

CO3: Identify & understand the need of effective communication & apply requires clarity of thought, ability to listen intentionally and deliver messages in the most optimal way.

CO4: Categorise the communication skills for variety of communication activities like discussion, presentation, task – based activities, such as group work, task work.

CO5: Evaluating the learnings of the students about how to communicate effectively.

Course Contents

Unit I: Elements of Communication

Communication: Meaning, Importance and Process

Objectives of Communication

Media and Types of Communication

CT-Lab

Phonetic Symbols and Transcriptions

Word Formation.

Unit II: Basics of Communication

Verbal and Non-Verbal Communication

Formal and Informal Channels of Communication

Qualities of Good Communication

CT-Lab

Affixes

Listening and speaking Skills

Unit III: Skills of Communication

Barriers to Communication

Professional Communication

Interpersonal Communication and methods to improve it

CT-Lab

Words often Mis-spelt and Mis- Pronounced

One Word for Many.

Unit IV: Grammar

Subject-Verb Agreement (Concord)

Linking Words (Conjunctions)

Relative Clauses

Common Errors

CT-Lab

Synonyms and Antonyms

Seminar Presentation.

Unit V: Composition

Resume Writing

Business Letter Writing: Sales, Credit, Enquiry, Order, Claim, Complaint, Job Applications, etc

E-mail messages

Telephone Etiquettes

CT-Lab

Group Discussion.

Job Interview.

Recommended Book:

- Essentials of Business Communication by Mary Ellen Guffey
- Business Communication Today by Courtland L. Bovee and John V. Thill

Reference Books:

- Communication Skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning Pvt. Ltd. (New Delhi)
- Current English Grammar and Usage with Composition, R.P. Sinha, Oxford University Press (New Delhi)
- Business Communication, Meenakshi Raman & Prakash Singh, Oxford University Press (New Delhi)
- Professional Communication, Aruna Koneru, Tata McGraw Hills, New Delhi.
- A Practical Course for Developing Writing Skills in English, J.K. Gangal, PHI Learning Pvt. Ltd., New Delhi.
- Advanced Manual for Communication Laboratories and Technical Report Writing, D.Sudha Rani, Pearson, (New Delhi)
- A Course in Phonetics and Spoken English, J. Sethi & P.V. Dhamija, PHI Learning Pvt.Ltd. (New Delhi)
- English Language Laboratories: A Comprehensive Manual, Nira Konar, PHI Learning Pvt .Ltd. (New Delhi)
- Communication Skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning Pvt. Ltd.(New Delhi).

- Oxford English Learning Package.(With CDs: Headway Series)
- Tata McGraw Hills English Learning Package (With CDs)\
- "Oxford Advanced Learners' Dictionary" published by Oxford University Press (New Delhi)

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords:
English, Oral Communication, Business letters, Basic Grammar, Reported Speech.

MBA: Semester-I

Paper MGTM-105: INFORMATION TECHNOLOGY FOR MANAGERS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objectives: The primary objective of this course is to familiarize the student with basic concepts of information technology and their applications to business processes.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Define the basic concepts of information technology and their applications to business processes.
CO2: Explain the Basic Framework of Information Technology & its Security.
CO3: Apply the Practical aspect of MS Excel usage. Using practical of MS Excel.
CO4: Make use of various Functions of information technology for reporting purpose.
CO5: Prioritize the data and information required for decision making.

Course Contents

Unit I: Computer Hardware and Number System

CPU, Basic Logic Gates, Computer Memory and Mass Storage Devices, Computer Hierarchy, Input Technologies, Output Technologies. Number Systems and Arithmetic: Basic understanding of Decimal, Binary, Octal and Hexadecimal Number System.

Unit II: Computer Software

Application and System Software, Programming Languages and their Classification, Assemblers, Compilers and Interpreters. Operating Systems- Functions of Operating Systems, Types of Operating Systems (Batch Processing, Multitasking, Multiprogramming and Real time Systems).

DBMS: Traditional File concepts and Environment, Database Management Systems Concepts, Types of Data Models, ER Modeling, Integrity Constraints, SQL queries.

Unit III: Data communication and Networks

Concepts of data communication, Types of data communication Networks, Communications Media, Concepts of computer networks, Primary Network Topologies, Network Architectures-The OSI Model, Inter-networking devices. The Internet, Intranet and Extranets: Operation of the Internet, Services provided by Internet, World Wide Web.

Unit IV: Functional and Enterprise Systems

Data, Information and Knowledge concepts, Decision making process, Physical components of Information systems, Classification of Information systems.

Unit V: Security Issues in Information Technology

Overview of Security Issues in Information Technology, Ransomware attack, Code injection, Cross-Site Scripting (XSS) Attack, Data Breach, Malware and Virus Infection, DDoS Attack, Weak Passwords and Authentication Issues, SPAM and Phishing, No Backups, Not Updating or Patching Regularly.

Recommended book:

- ITL Education Solutions (2009). Introduction to Information Technology, Pearson Education.
- Turban Efraim, Ephraim McLean, James Wetherbe (2006), Information Technology for Management–Transforming organizations in the digital economy, 6th Edition, Wiley India.

Reference books:

- Sinha, P.K. and Sinha, Priti, *Computer fundamentals*, BPB Publications, New Delhi, Sixth Edition, 2011.
- Norton, P. (2001). Introduction to computers. TMH
- Rajaraman, V. (2004). Introduction to Information Technology. PHI.
- Ram, B. (2003). Computer Fundamentals. New Age Publications

Note: Latest edition of readings may be used.

Teaching Learning Process

Theory/ numerical with examples, Practical Lab Lectures

Assessment Methods

There shall be 4 credit hours for lectures + one credit hour (Two Practical Periods per week per batch) for practical lab + one credit hour for tutorials (per group).

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Binary, Database Management Systems, OSI Model, Microsoft Office, Information Technology, Primary Network Topologies.

MBA: Semester-I

Paper MGTM-106: QUANTITATIVE TECHNIQUES FOR MANAGERS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

The focus of this course is to equip the students with the knowledge of various statistical tools and techniques used in business decision making. The course aims at providing fundamental knowledge and exposure to the students to use various statistical methods in order to understand, analyze and interpret data for managerial decision making.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Define data and various data collection techniques, which will enable them to make evidence-based decisions.
CO2: Apply the various Statistical tools & techniques in field.
CO3: Construct a research design.
CO4: Analyse the primary and secondary data for arriving at a conclusive decision.
CO5: Decide the use of suitable statistical tools and techniques to assist in managerial decision making.

Course Contents

UNIT-I

Statistics: Meaning, evolution, scope, limitations and applications; data classification; tabulation and presentation: meaning, objectives and types of classification, formation of frequency distribution, role of tabulation, parts, types and construction of tables, significance, types and construction of diagrams and graphs.

UNIT-II

Measures of Central Tendency and Dispersion: Meaning and objectives of measures of central tendency, different measure viz. arithmetic mean, median, mode, geometric mean and harmonic mean, characteristics, applications and limitations of these measures; measure of variation viz. range, quartile deviation mean deviation and standard deviation, co-efficient of variation and skewness.

UNIT-III

Correlation and Regression: Meaning of correlation, types of correlation – positive and negative correlation, simple, partial and multiple correlation, methods of studying correlation; scatter diagram, graphic and direct method; properties of correlation coefficient, rank correlation, coefficient of determination, lines of regression, co-efficient of regression, standard error of estimate.

UNIT-IV

Index numbers and time series: Index number and their uses in business; construction of simple and weighed price, quantity and value index numbers; test for an ideal index number, components of time series viz. secular trend, cyclical, seasonal and irregular variations, methods of estimating secular trend and seasonal indices; use of time series in business forecasting and its limitations, calculating growth rate in time series.

UNIT -V

Probability: Basic concepts and approaches, addition, multiplication and Bayes' theorem.
Probability distributions - meaning, types and applications

Recommended book:

- Gupta, S.P. & M.P. Gupta, Business Statistics
- Gupta, C.B., An Introduction to Statistical Methods
- Richard I. Levin, David S. Rubin Statistics for Management by Pearson

Reference books:

- Business Statistics By Mr. R. S. Bharadwaj , pub: Excel Book
- Business Statistics by Richard Levin
- Business Statistics by Ken Black, pub: Tata Macgraw Hill
- Schaum's Series for problem practice
- Mathematical Statistics by Ray, Sharma and Choudhary
- Business Statistics by V. K. Kapoor, pub: S. Chand

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords:

Statistics, Central tendencies, Dispersion, Correlation, Regression, Probability, Bays' Theorem.

MBA: Semester-I

Paper MGTM-107: ORGANIZATIONAL BEHAVIOR

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

This module provides students with an elaborative understanding of organizational behavior, its key principles, concepts & theories. The range of concepts & theories that students will be introduced to include foundation of organizational behavior, groups & group dynamics, motivation, leadership, organization design, organization structure, work stress, organization culture, organization effectiveness and development. By the end of the module, students will be fully equipped with the knowledge and skills required to understand & deal human behavior in the organization as individual, group member & organization as a whole.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Define the various behavioural aspects when working in an organization at any level.
CO2: Explain the implications of individual and group behaviour in organizational Context.
CO3: Identify the components of individual and group behaviour at various work, situations and apply behavioral techniques.
CO4: Analyse & implement the importance of attitude, values, beliefs, assumptions and Motivation & to make aware about dynamic nature of groups in the organisation.
CO5: Apply and create good organization culture and manage cultural diversity.

Course Contents

Unit I: Foundations of Organizational Behavior

Conceptual framework of OB- Nature & Scope of Organizational Behavior, Determinants of Organizational Behavior, Challenges of Organizational Behavior.

Individual Dimensions of OB- Nature of Human Behavior, Personality, Perception, Learning, attitudes & Values, Emotional Intelligence, Individual Decision Making, OB Mod

Unit II: Group & Group Dynamics

Defining and classifying groups, group structure and processes, individual vs group behavior, group dynamics theories, group decision making process, organizational conflicts, types and causes, techniques of conflict resolution.

Team vs groups, team development, Ingredients of effective teams, team life cycle, interpersonal skills - Johari window and transactional analysis, employee counseling.

Unit III: Motivation & Leadership Theories

Motivation - Needs, contents and processes, Maslow's hierarchy of needs, Herzberg's two factory theory, ERG theory, Vroom's Expectancy theory, Reinforcement theory and Behavior modification.

Leadership - Ohio State Studies, Michigan studies, and managerial grid. Contingency theories - Fiedler's model, Hersey and Blanchard's situational theory, leader-member exchange theory, path goal theory, and charismatic leadership.

Unit IV: Structural & Cultural Dimensions of OB

Design of Organization Structure, Forms of Organization Structure, works Design & Work Stress, Organizational Climate & Culture.

Unit V: Organization Effectiveness & Change

Organization Effectiveness, Organization Change, Organization development

Recommended book:

- L. M. Prasad, (2011): Organizational Behavior, India, Sultan Chand & Sons
- Robbins, Judge & Sanghi, (2009): Organizational Behavior 13e, India, Pearson, Prentice Hall

Reference books:

- Hersey, Blanchard & Johnson, (2009), India, Pearson/ Prentice Hall
- Keith Davis: Organizational Behavior
- Fred Luthans: Organizational Behavior

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Organizational Behavior, Personality traits, Group behavior, Motivation, Leadership, Stress Management.

MBA: Semester-II

Paper MGTM-201: BUSINESS ENVIRONMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

The basic objective of this course is to familiarize the participants with various aspects of economic, social, political and cultural environment of India. This will help them in gaining a deeper understanding of the environmental factors influencing Indian business organizations.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Define various laws & force, explain regulatory measures governing business operations in India.

CO2: Identify the latest developments in business Environment.

CO3: Examine Political and Legal environment, Social and Cultural Environment, Technological environment and Competitive Environment

CO4: Determine International Environment, evaluate the complexities of business environment and their impact on business & to analyze the relationship between Government and business and understand the Political, Economic, legal and social policies of the country.

CO5: Evaluate the student's cognizance about the concepts of business environment and its application practically.

Course Contents

Unit I: An Overview of Business Environment

Type of Environment-Internal, External, Micro and Macro Environment, Competitive Structure of Industries, Environmental Analysis and Strategic Management, Nature of the economy, structure of the economy, economic policies. Nature of Indian planning, Planning Commission. Achievement and failure of economic planning in India. Recent GNP trends, Major economic reforms.

Unit II: Industrial & Legal Environment

Industrial policy up to 1991, the new industrial policy, Public, private, joint and cooperative sectors, privatisation through disinvestment, village and small industries, industrial sickness, Regulatory role of the government, MRTP act, trade practices act, FEMA, patents and trade mark. Competition act 2000. Rational and extent of state intervention.

Unit III: **Demographic and Societal Environment**

Size of Population, Age Structure, Other demographic trends, population control policy, human development. Impact of foreign culture on business. Business and society, Business ethics and corporate governance. Social responsibility of business, social audit, consumer rights and business. Poverty and unemployment in India, planning for poverty elevation.

Unit IV: Monetary and Fiscal Environment

Measure of money supply, Monetary and fiscal policies, liquidity and interest rate environment. Overall structure and trends of taxation; direct taxes; recommendations of the 10^{th} plan advisory Group; Kelkar Committee Recommendations, indirect taxes - Kelkar Committee Recommendations; fiscal deficit and its management, alternate deficit concepts, deficit trends, challenges of deficit management, public borrowings in the fiscal environment.

Unit V: International Business Environment

Evaluation of WTO, function of WTO, Doha declaration, significance of foreign investment, FDI in India trends and pattern, FII, cross-border M&As. Trade balance and BOP. Globalisation of world economy, trend in globalisation, foreign trade policy, export promotion, EXIM policy, EPZs, EOUs, TPs & SEZs.

Recommended Book

- Aswathappa, K., (2000), Essentials of Business Environment, 7th edition, Himalaya Publishing House.
- Cherunilam, Francis, (2007), Business Environment - Text and Cases, Himalaya Publishing House.

Reference Book

- Gupta C. B., (2008), Business Environment, 4th edition, Sultan Chand.
- Bedi, Suresh, ((2004)), Business Environment Excel Book
- Agrawal Raj, Business Environment, Excel book
- Shaikh, Saleem, (2010), Business Environment, 2nd edition, Pearson Education.

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Business Environment, Societal Environment, Monetary and fiscal policies, WTO, FDI, FII, EXIM policy.

MBA: Semester-II

Paper MGTM-202: RESEARCH METHODOLOGY

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

Any body of knowledge cannot develop without the underlying research. This module introduces the fundamentals of research, its process and the way in which findings of a research initiative is presented and reported. It exposes the students to the various statistical tools being used to analyze data and draw inferences.

To provide a fundamental understanding of the research process, its tools and techniques and to help the students learn the art and science of presenting research finding in the form of a well formatted report.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Understand the research process, tools and techniques in order to facilitate managerial decision-making.

CO2: Explain the basic concepts of research methods and its usefulness inbusiness situations.

CO3: Apply research design, sample design and sampling methods & applyappropriate methods for data collection for research work by implementation of statistical tools for data analysis and interpretation for business decision making.

CO4: Discover the analytical abilities and research skills with hands on experience and learning in Business Research.

CO5: Interpret the various research methods and its usefulness in real business situations.

Course Contents

Unit I: Introduction to Research

Meaning, types, process, research problem, Research design: Meaning, types of research design, features of a good research design, components of theory – definitions, concepts, constructs, variables, hypothesis, process of research and structure of research proposal.

Unit II: Data collection techniques

Data: Meaning, types, Data collection methods, Data collection instruments, Questionnaire vs. Schedule, Allied data collection instruments: Warranty cards, Distributor/Store audits, Pantry audits, Consumer panels, Mechanical devices, Projective techniques, Depth interviews, Content analysis, Case study method, its advantages & disadvantages.

Unit III: Sampling design

Introduction, Methods of the sampling: Sampling concepts, non-probability sampling, probability sampling, dependent and interdependent methods, Merit and limitation of sampling, sampling and non-sampling error, Test of hypothesis chi square test & goodness of fit.

Unit IV: Data compilation and analysis

Data processing: Editing, Coding, Classification, Tabulation, Issues in data processing

Data analysis: Types, Percentage analysis, Computer aided Charts (Pie chart, Bar diagram, Doughnut, Line diagram), Descriptive analysis, t-test, F-test, Z test and interpretation of the results.

Unit V: Report writing

Steps of writing research report, Report Layout: Preliminary pages, Main text, End matter, Mechanics of writing research report, Bibliography and references format, Precautions in writing research report.

Recommended books:

- Kothari, C. R., Research Methodology Methods and Techniques, New Age International Publishers, New Delhi, 2nd Edition.
- Paneerselvam, R., Research methodology, PHI Learning Pvt. Ltd., New Delhi.

Reference books:

- Green, Paul E., Tull, Donald S. and Albaum, Gerald, Research for marketing decisions, Prentice Hall of India Pvt. Ltd., New Delhi
- Saunders, Mark, Lewis, Philip and Thornhill, Adrian, Research methods for business students, Pearson Education, New Delhi
- Krishnaswamy, K.N., Sivakumar, Appa Iyer and Mathirajan, M., Management Research Methodology, Dorling Kindersley (India) Pvt. Ltd., New Delhi, Fourth Impression, 2010

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords:

Statistics, Central tendencies, Dispersion, Correlation, Regression, Probability, Bays' Theorem.

MBA: Semester-II

Paper MGTM-203: HUMAN RESOURCE MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

This module introduces the students with the key concepts, theories, tools & techniques of human resource management. The range of concepts that students will be introduced to include philosophy of HRM, human resource planning, job analysis, recruitment & selection, training & development, compensation & labor relation. By the end of the module, students will be fully equipped with the skills & techniques required to plan & manage the human resource in the organization.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Define the concepts, methods and techniques and issues involved inmanaging human resource.

CO2: Understand the concept of Managing Human Resources and work situations.

CO3: Apply the effective Human Resources and working environment of the organizations, the importance of Management; Training, performance appraisal.

CO4: Analyse the need of employing, maintaining and promoting a motivated force in an organization.

CO5: Impart knowledge on Industrial Relations- Trade unions, Grievance Management, Contemporary Issues in HRM and Strategic Issues confronting IR.

Course Contents

Unit I: Human Resource Management - An Overview

Human Resources Management (HRM): Meaning, Nature and Scope, Difference between HRM and Personnel Management, HRM functions and objectives, Evolution of HRM environment – external and internal. HRM within organization structure.

Human Resources Development in India: evolution and principles of HRD, HRD vs. Personnel functions, Role of HR managers. Strategic Human Resource Management

Unit II: Human Resource Planning (HRP), Recruitment and Selection

Human resources planning: definition, purposes, processes and limiting factors; human resources information systems (HRIS): personnel records and statistics, the use of information systems in HRM, HR accounting and audit.

Recruitment: recruitment policy, recruitment procedures, job analysis, job description, job specification, recruitment methods, and evaluation.

Selection: the selection procedure, the design of application form, selection methods, the offer of employment, and evaluation of process.

Unit III: Training & Development Performance Appraisal and Compensation Administration

Training and development: purpose, methods, and issues in training and management development programs.

Performance appraisal: definition, purpose of appraisal, procedures and techniques including 360 Degree Appraisal, the appraisal interview, and follow up.

Compensation Administration: Nature and Objectives of compensation, components of pay structure in India, Wage Policy in India – Minimum Wage, Fair Wage and Living Wage.

Incentive Payments: Meaning and Definition, Prerequisites for an effective incentive system, Types and Scope of incentive scheme, Incentive Schemes in Indian Industries, Fringe Benefits.

Unit IV: Grievance Handling and Industrial Relation

Discipline and grievance procedures: definition, disciplinary procedure model, the other procedures, grievance procedures and interview

Industrial relations: aspect of industrial relations (IR), nature and importance of union-management relations

Unit V: Promotion, Transfer and Separation

Promotion and Transfer: Promotion: purpose, principles and types; Transfer – reason, principles and types.

Separation: retirement, resignation, and termination of contract: layoff and exit interviews. Dealing with the human aspects of terminations: procedures for terminations, counseling, training and notice of dismissal.

Recommended Book

- K. Aswathappa, (2009): Human Resource Management- Text & Cases 5e, India, McGraw Hill.

Reference Books

- Dessler & Varkkey, (2010): Human Resource Management 11e, India, Prentice Hall.
- Decenzo & Robbins, (2006): Fundamentals of Human Resource Management, Wiley.
- Dipak Kr. Bhattacharyya, (2010): Human Resource Management 2e, India, Excel Books.
- Bernardin, (2007): Human Resource Management- An Experimental Approach, India, TATA McGraw Hill.
- Snell & Bohlander, (2008): Human Resource Management, India, South- Western Cengage Learning

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Human Resource Management, Recruitment, Selection, Training & Development, Performance Appraisal, Promotion, Transfer.

MBA: Semester-II

Paper MGTM-204: CORPORATE FINANCE

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

The focus in this paper would be on issues related to finance in the Indian Corporate Sector. The contents are related to the practices observed in Indian Corporate Sector. The objective is to enable and equip the future managers with basic tools for applying financial analysis.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Define the concepts, vital tools and techniques applicable forfinancial decision making by a business firm.

CO2: Explain the functions of Finance in organization and methods inmanaging funds for business

CO3: Apply the concepts of budgeting, working capital, cost of capitalincluding the choice of source of funds.

CO4: Analyse the practical problems relating to the financing of fundsincluding pricing and dividend theories.

CO5: Select the methods and techniques for analysing the data forfinancial decision making.

Course Contents

Unit I: Introduction to Financial Management

Meaning, objectives and scope, conflicts in profit versus wealth or value maximization principle, Time value of money.

Unit II: Valuation of Securities and Investment Decisions

Definitions. Types of Securities, Valuations of Bond, Types of Yield associated with Bond, Valuation of Preference share, Valuations of Equity. Capital budgeting techniques-Net Present Value Method, Internal Rate of Return Method. Cost of Capital-equity and debt.

Unit III: Cost of Capital and capital Structure

Cost of individual source of finance, cost of debenture, cost of preference share, cost of equity, cost of Term loan, weighted cost of capital, theory of capital structure, traditional approach, Net income, Net operating Income, MM approach.

Unit IV: Risk and Return

Calculating risk and return for individual security, Beta estimation, overview of capital market theory, Characteristic line, Securities market line.

Unit V: Short term financing, Leverage and Dividend Policy:

Management of Working Capital, Cash management, Inventory Management, Receivables Management, working capital leverage. Leverage- operating, financial and composite leverage, Dividend policy. Grahm-Dodd model, Walter Model, Gordon model, MM model.

Reading List

Recommended Book

- I. M. Pandey, (2010): Financial Management, Vikas Publishing House

Reference Books

- M Y Khan & P K Jain, Financial Management- Text, problems and cases, Tata McGraw Hills
- Dr. R. P. Rustagi (2011): Financial Management- Theory, concept and problems, Taxman Publications.

Note: Latest edition of readings may be used.

Teaching Learning Process

Theory/ numerical with examples, Problem solving sessions.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination.

Keywords

Financial Management, Time value of money, Investment decisions, Cost of capital, Risk and return, Financial Leverage, Dividend policy.

MBA: Semester-II

Paper MGTM-205: MARKETING MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

The course introduces a wide range of marketing concepts and explores the various functional areas of marketing management. The course provides an opportunity to the students to explore and relate the conceptual and applied learning of the subject to the real market situations.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Relate the concepts, philosophies, processes and techniques of Marketing Management to real operations of a firm.

CO2: Interpret & relate the fundamental concepts & practices from business perspective in the organisation.

CO3: Make use of various opportunities available in various sectors in the field of marketing management & apply the concepts related tomarket research.

CO4: Analyse the consumer buying behavioural process & take part in theprocess of developing new product & market segmentation.

CO5: Evaluate various marketing campaigns and could decide on effective-strategies.

Course Contents

Unit-I: Introduction to Marketing

Marketing defined, Marketing process, Core marketing concepts (Need, want, demand, market offering, marketing myopia, Markets), Marketing Management orientations (Production, Product, Selling, Marketing, Societal marketing), Marketing vs. Selling, Marketing mix (4 P's of marketing).

Marketing environment, Internal environment, External environment, Micro environment, Macro environment and their impact or influences on marketing decisions.

Unit-II: Consumer Behavior

Introduction to Consumer buying behavior, Buyer Vs Consumer, factors influencing the Consumer buying behavior

Classification of CB (High & Low involvement) Dissonance reducing Buying Behavior, Habitual Behavior, Complex Buying Behavior, Variety Seeking Buying Behavior, Impulse Behavior, Buying Decision process, Stimulus Response model.

Unit-III: Market research & Customer oriented marketing

Marketing information system, Sources of customer related information

Marketing research, Concepts, Steps of marketing research process

Customer oriented marketing: Market segmentation, bases of market segmentation, patterns of segmentation, Targeting, Differentiation & Positioning, positioning maps

Strategic Marketing plan: Contents of a structured marketing plan.

Unit-IV: Segmentation, Targeting and Positioning:

Introduction to STP, STP Process, Requirement for Effective Segmentation, Bases for Segmenting

Consumer Markets, Steps in STP, Segmentation Strategy.
Market Targeting (developing selection criteria), Types of Market Targeting, Targeting Strategy, Positioning, Positioning for Competitive Advantage, Steps & Positioning Strategy.

Unit-V: NPD & Marketing Mix

Product life cycle & strategies, BCG Matrix, SWOC Analysis, Porters five force Model.
Product: Introduction to Product, Level of the product, New product development, Product mix & strategies.
Price: pricing objectives, selection of pricing policy, approaches to price adjustment, pricing strategies.
Distribution: Channel Management & Distribution methods.
Promotion: Promotion mix, Promotion strategies.

Recommended book:

- Kotler, Philip; Armstrong, Gary; Agnihotri, Prafulla and Haque, Ehsan Ul., *Principles of Marketing A South Asian Perspective*, Dorling Kindersley (India) Pvt. Ltd., New Delhi, 13th Edition.

Reference books:

- Panda, Tapan K, *Marketing Management Text and Cases*, Excel Books, New Delhi, 2nd Edition.
- Ramaswamy, V.S. and Namakumari, S, *Marketing management Global perspective Indian Context*, Macmillan Publishers India Ltd., New Delhi, 4th Edition, 2009.

Note: Latest edition of readings may be used.

Teaching Learning Process

Theory with examples, case study, market research etc.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination.

Keywords

Marketing Management, Consumer behaviour, Market Research, Product Mix, Segmentation, Targeting, Positioning.

MBA: Semester-II

Paper MGTM-206: OPERATIONS MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

Production/operations management involves the integration of numerous activities and processes to produce products and services in a highly competitive global environment. Many companies have experienced a decline in market share as a result of their inability to compete on the basis of product design, cost or quality. Most now agree that world class performance in operations i.e., in product design, manufacturing, engineering and distribution, is essential for competitive success and long-term survival.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Define the basic concepts and theories of the production management & comprehend the operations management situations with greater confidence.

CO2: Understand the strategic significance of Production & Operation management.

CO3: Understand quality management and the evolution of practice; assess the relationship between quality and capability, and between quality and competitiveness;

CO4: Apply Planning, Scheduling and Control of Production and Operations Management functions in both manufacturing and Services.

CO5: Analyse the effectiveness of operations by job & work design, process design, layout design, design & control system.

Course Contents

Unit-I: Introduction to Operations management

Importance and functions of operation management, types of production system, facilities location, facilities layout and materials handling, Product design and process selection, Types of layouts, Analysis and selection of layout-product and process layout, Computer integrated manufacturing system and line balancing.

Unit-II: Production planning and control,

Introduction, functions aggregate planning and master production scheduling; materials requirement planning. BOM, capacity requirement planning, techniques, problems in MRP and CRP, business process reengineering, TPM, method study & work measurement.

Unit-III: Materials management

Introduction, meaning, importance and functions; purchasing management; stores management and inventory management, types of inventories, inventory control systems-perpetual, periodic, JIT, KANBAN; quality assurance-six sigma concepts acceptance sampling, statistical quality control; quality movement, quality circles, ISO quality certification and types, maintenance management.

Unit-IV: Operations Research

Introduction, Linear programming –Graphical method, Trans-shipment, Transportation problems, Assignment model, travelling salesman problems, PERT/CPM, Inventory Model, Game theory

Unit-V: Logistics Management

Introduction to logistics management, significance of logistics, Total distribution concepts, Integrated logistics, Materials handling packaging and transportation system. Case-special cases on Japanese manufacturing systems.

Recommended book

- Panneerselvam, Production and Operations Management, Prentice Hall of India, N. Delhi.

Reference books

- Krajewski Lee J. & Ritman, Larry P.; Operations Management: Strategy & Analysis; 5th edition; Pearson Education; New Delhi; 1999.
- Chase Richard B., Aquilano, Nicholas J, et al; Production & Operations Management Manufacturing & Services; 8th edition; Tata McGraw Hill., New Delhi; 1999.
- Adam, Everett E. & Ebert, Ronald J.; Production and Operations Management: Concepts,
- Models and Behaviour; 5th edition; Prentice Hall of India Private Ltd., New Delhi.

- Kaizen-One Small Step Can Change Your Life: The Kaizen Way by Robert Maurer

Note: Latest edition of readings may be used.

Teaching Learning Process

Theory/ numerical with examples, Problem solving sessions.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination.

Keywords

Operations Management, Production Panning, Material Management, Operation Research, Logistic.

MBA: Semester-II

Paper MGTM-207: INTERNATIONAL BUSINESS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

To get the knowledge of the business ramifications of Globalization. To understand the meaning and rationale of Globalization. To get an awareness about the international orientations and stages of Globalization. To have a detailed knowledge about the environment of international business. To examine the significance of economic, political, socio-cultural, demographic, natural and technological factors for international business. To get an idea of the trade strategies and their implications for international business. To get an understanding of the tariff and non-tariff barriers to trade. To get an overview of Multilateral Trade Negotiations. To understand the functions, role, functions and impact of GATT and WTO. To get an overall idea of the WTO Agreements. To get an overall knowledge about the concepts such as International Corporation, Multinational Corporation, Global Corporation and Transnational Corporation. To know the elements of the Code of Conduct for MNC's. To understand the types of foreign investment. To get an idea about the theories of foreign investment and factors affecting Foreign direct investment and Portfolio investment.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Define the concepts of international business management.

CO2: Explain the scope of international business creating awareness about international finance decisions and impact on operations.

CO3: Identify basics of WTO, SRC& different investment theories from theperspective of a business manager.

CO4: Analyse & inform the Modes of Entry in international market, Marketing mix, Factors affecting Decisions for International Business & define the Finance aspects of International Business, Capital Movement, Risk in international operations, international investment, Financing for foreign trade.

CO5: Evaluate the learning of the students about the various aspects of the international business concepts.

Course Contents

Unit I: International Business Environment

Introduction, Concept, Scope, Trends, Challenges and Opportunities; Globalization - Forces, Meaning, dimensions and stages in Globalization - Introduction to theories of International Trade by Adam Smith, Ricardo and Ohlin & Heckscher, Firm Specific Theories like Product Life Cycle Theory by Raymond Vernon and the Porter's Competitive Advantage Theory by Porter - Trading Environment of International Trade - Tariff and Non-tariff Barriers - Trade Blocks – Forms of Integration like Free Trade Area, Customs Union, Common Market, Economic Union and Economic Integration-NAFTA, SAPTA, SAARC, Indo-Lanka Free Trade Agreement, India-Singapore CECA-Rise of new economies like Japan, South East Asia and China (with comparison to India)

Unit II: International Economic Institutions and Agreements

General Agreement on Trade and Tariffs (GATT), The Uruguay Round, WTO (Seattle & Doha and Hongkong round of talks), Agreement on Textiles and Clothing (ATC), TRIPS, TRIMS, GATS-Dispute Settlement IMF, Asian Bank, World Bank, IBRD, IFC, IDA, UNCTAD, ILO, WIPO, UNIDO- GSP, GSTP and other international agreements and strategic alliances; International

Commodity Trading and Agreements.

Unit III: Multinational Corporations and Foreign Direct Investment

Nature of Multinational Corporations; MNC's and International Trade; Dominance of MNC's; India's Presence; Goals of MNC's; Fundamental Goals of Host Governments; Defenders and Critics of MNCs; In Defense of MNC's Foreign investments - Introduction, Patterns, Structure, Issues and Effects; Types of Foreign Investment-like FDI and Portfolio Investments; Theories of International Investments; FDI AND Production Linkages; Foreign Investment in India; Foreign Investment by Indian Companies; Cross-Border Mergers and Acquisitions

Unit IV: International Financial Environment

Financial Markets and Instruments - Introduction to Export and Import Finance - Methods of payment in International Trade – International Trade Financing- Institutional Finance for Trade-EXIM Bank-Forfaiting- Balance of Trade and Balance of Payments- Components of balance of payments- balance of payment disequilibrium and correction of disequilibrium-Financing of BOP deficit.

Unit V: Emerging Developments and Other Issues

Globalization and internal reform process - India's competitive advantage in industries like IT, pharmaceuticals, Steel, Textiles, Gems and Jewelry etc. – Potential Opportunities and threats

Recommended books:

- International Business by Hill and Jain, Sixth Edition Published by Tata McGraw Hill, New Delhi
- International Business by K Aswathappa, 4th Edition published by Tata McGraw Hill, New Delhi

Reference books:

- International Business by Justin Paul, 4th Edition published by Prentice Hall of India, New Delhi
- International Business-Text and Cases by Francis Cherunilam, 4th Edition, Published by Prentice Hall of India

Note: Latest edition of readings may be used.

Teaching Learning Process

Theory/ numerical with examples, Problem solving sessions.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination.

Keywords

Operations Management, Production Panning, Material Management, Operation Research, Logistic.

MBA: Semester-III

Paper MGTM-301: MANAGEMENT INFORMATION SYSTEM

Duration: 3Hrs. Marks: 100 Credits: 4

Objective

Today, the management of information systems is mostly associated with databases, the Internet, and server rooms. However, "information management" has been around since before the invention of these tools. It is as old as commerce itself, as traders, bankers, and merchants have always had reason to track sales and inventory. Creditors must be aware of how much capital has been lent to borrowers and how much money has been deposited at banks. In its most general terms, information systems encompass any interactions between organized data and people.

MIS can be the means by which information is transmitted (such as the Internet), the software that displays the information (such as Microsoft Excel), or the systems that manage the data. In this course, you will learn about the various components of information systems and how to leverage them in business.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Explain the Information Systems used in Business.

CO2: Make use of design, development, and security of ManagementInformation System & its utility.

CO3: Classify the ethical and social issues in using information system.

CO4: Compile the utility of Decision Support System.

CO5: Prioritise the use and analysis of data and information for decision-making.

Course Contents

Unit-I: Introduction

Concept of Data and Information, Information Systems, Classification, Operations Support System (OSS), Management Support System (MSS), Transaction Processing System (TPS), Process Control System (PCS), Enterprise Collaboration System (ECS), Management Information System (MIS), Decision Support System (DSS).

Unit-II: Artificial Intelligence (AI)

Artificial Intelligence (AI), Applications of Artificial Intelligence, Neural Networks, Fuzzy Logical Control System, Virtual Reality, Expert System (ES), Executive Information System (EIS), Cross Functional Information Systems.

Unit-III: Role of MIS

Strategic Advantage with MIS, Competitive Strategy Concept, The Value Chain and Strategic IS, Using IT for Strategic Advantage, Business Process Re-engineering, Creating a Virtual Company, Improving Business Quality, Total Quality Management, Becoming an Agile Company, Building a Knowledge Creating Company.

Unit-IV: Developing MIS Systems

System Development Life Cycle, Investigation Phase, Prototyping, Feasibility Analysis, System Analysis (DFD and ER Diagram), System Design, Implementing Business Systems, Testing, Documenting, Training, Conversion and Maintenance.

Unit-V: Applications

Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Security and Ethical Challenges of IT, Ethical Responsibility - Business Ethics, Technology Ethics; Cyber Crime and Privacy Issues.

Recommended Book

- Laudon K C and Laudon J P - Management Information Systems: Managing the Digital Firms (Prentice Hall, 1 Ed.)
- O'Brien James - Management Information System (Tata Mc Graw Hill, 12 Ed.)
- Jawedkar W S - Management Information System (Tata Mc Graw Hill, 3 Ed.)

Reference Books

- Arora Ashok, Bhatia Akshaya – Management Information System (Excel, 1 Ed.)
- Davis & Olson – Management Information System (TMH, 2 Ed.)
- Murdick, Ross, Claggett – Information System For Modern Management (PHI, 3 Ed.)
- Stair & Reynolds – Fundamentals of Information Systems (Thompson, 2 Ed.)

MBA: Semester-III

Paper MGTM-302: LEGAL ASPECTS OF BUSINESS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

'*Ignorantia juris non excusat*' meaning thereby, 'ignorance of law cannot be excused'. So whether a person is aware of law or not, any violation of law even if unintentional, attracts penal action. It is therefore essential for a businessman to understand the fundamental legal aspects which directly affect the business operations. Some of such 'must-understand' legal areas covered in this module include provisions relating to Contracts, Sale of goods and matters associated with the formation and functioning of companies in India.

To provide a fundamental understanding of the various provisions of Indian Contract Act, 1872 Sale of Goods Act, 1930, Nagotiable Instrument Act, 1881, Indian Companies Act, 1956 and the consumer Protection Act, 1986 pertaining to Indian business scenario.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Relate the rights and liabilities of a person based on the contractunder Indian contract Act, Companies Act, 2013,

CO2: Explain the utility of negotiable instrument Act and Partnership Actwith new concept of limited liability partnership.

CO3: Develop with case law studies related to Business Laws, labor laws.

CO4: Analyse and define the concept of business law, its application and source. Rights of customers and seller under Sale of Goods Act, different provisions. Negotiable instruments Act and Partnership Actetc.

CO5: Evaluate the major law enactments in India.

Course Contents

Curriculum

Unit I: The Indian Contract Act 1872

The Indian Contract Act 1872: Meaning and Essentials of contract; Kinds of contract based on validity, formation & performance; law relating to offer and acceptance, consideration, competency to contract, free consent, void agreements, performance of contracts, discharge of contracts, breach of contracts and quasi contract; Special contracts: contract of indemnity and guarantee, bailment and pledge, and agency.

Unit II: Sale of Goods Act 1930

Sale of Goods Act 1930: Sale and agreement to sell, implied conditions and warranties, sale by non-owners, rights of unpaid seller.

Unit III: Negotiable Instruments Act 1881

Negotiable Instruments Act 1881: Meaning of negotiable instruments, type of negotiable instruments, promissory note, bill of exchange, cheque.

Unit IV: The Companies Act 2013

The Companies Act 2013: Meaning and types, Incorporation, Memorandum & Articles of association, Prospectus, Issue of shares and bonus shares, rights issue, sweat equity, role of directors, share

qualification, company meetings. The Limited Liability Partnership Act 2008: Meaning and nature of limited partnership, formation, partners & their relations, extent and limitation of liability.

Unit V: Consumer Protection Act 1986

Consumer Protection Act 1986: Objectives and machinery for consumer protection, defects and deficiency removal, rights of consumers. The Right to Information Act 2005: Salient features and coverage of the act, definition of terms information, right, record, public authority; obligations of public authorities, requesting information and functions of PIO. Information Technology Act 2000: The rationale behind the act, Digital signature and Electronic signature, Electronic Governance

Recommended books:

- Tulsian, P C, Business Law, Tata McGraw Hill Education Private Limited, New Delhi.
- Garg, Sharad, Case Laws in Mercantile Law, Ramesh Book Depot, Jaipur.
- Kuchhal, M C, Modern Indian Company Law, Shree Mahavir Book Depot, New Delhi.

Reference books:

- Aggarawal, Rohini, Mercantile & Commercial Laws, Taxmann Publications, New Delhi, 2012.
- Majumdar, A K and Kapoor, G K, Company Law, Taxmann Publications, New Delhi, 2012.
- Gogna, P P S, A Text book of Mercantile Law (Commercial Law), S Chand, New Delhi.
- Singh Avtar, Principle of Mercantile Law, Eastern Book Company.

MBA: Semester-III
Paper MGTM-303: BUSINESS STRATEGY

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

Strategy is at the heart of general management education. It explores how firms compete and what they need to do to be successful. Clear strategic thinking should inform the decisions of every general manager and is the basic competence of management consultants everywhere. The Course structure gives an insight into the strategic planning process done by organizations. The student is required to learn basics of that how a strategy is formed and finally implemented by organization.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Define & understand of the Business Strategy process in a dynamic and Competitive global environment.

CO2: Explain the growing importance of strategies in uncertain business Environment & learn the unique challenges faced by firms in competitive environment.

CO3: Identify the applicability of various Strategies in varied situations & also in general and competitive business environments.

CO4: Examine how to resolve cases through strategic decision making, & the use strategic management concepts and techniques.

CO5: Evaluate the understanding of the students about the application of various strategic models through different business perspectives.

Course Contents

Unit I:

Concept of strategy: Defining strategy, Levels at which strategy operates, Strategic Decision Making and Approaches to Strategic Decision making, essence of strategic thinking, replacing planning with strategic thinking, strategic management process, Mission and Purpose, Objectives and Goals, Strategic Business Units.

Unit II:

Environment Analysis and Diagnosis - Concept of Environment and its components, Environment scanning and appraisal, organizational appraisal, Strategic advantage analysis and diagnosis, SWOT analysis.

Unit III:

Grand Strategies –Stability, growth, retrenchment & combination strategies- Modernization, Diversification, Integration, Merger, Take-over and Joint Venture strategies, Turnaround – divestment and Liquidation strategies. Strategies for competing in globalizing markets.

Process of Strategic Choice – Process of strategic choice – Gap analysis. Industry analysis, competitor analysis - Porter's Five forces Model of competition. SWOT analysis- Synergy and Dysergy, Mckinsey's 7's framework; GE-9 Cell Model, Bostan's Consultancy Model. Distinctive competitiveness; Factors affecting Strategic Choice.

Unit IV:

Inter-relationship between formulation and implementation; Issues in strategy implementation, Resource Allocation, Budgets, Behavioural Issues – Leadership styles – Charismatic, transformational, visionary, team, cross-cultural & ethical leadership, Corporate culture and values power Social Responsibilities – Ethics, Building capable organization.

Functional Issues – Financial, Marketing, Operations and Personnel Plans and policies. Strategy and Structure: Organization structure, Structural Considerations, Structure for strategies, Organizational design and change, Matching structure and strategy.

Unit V:

Strategy Evaluation: Importance, Overview of strategic evaluation, strategic control, techniques of strategic evaluation and control, Operational Control.

Corporate Governance – Introduction & meaning, stakeholders, ownership & management, governing board, governance issues, governance & strategic implementation.

Recommended books:

- Business policy and strategic Management, Azhar Kazmi, Tata McGraw -Hill

Reference books:

- Strategic management and business policy, William F. Glueck, Tata McGraw -Hill
- Strategic Management, Michael Porter, Prentice hall of India
- Cases in Strategic Management, S.B. Budhiraja & Atheya, Excel Books

MBA: Semester-III

Paper MGTM-307: SUMMER INTERNSHIP/ PROJECT (PAP/PCP)

Marks: 100 **Credits: 4**

Objective

Student has to undergo a practical training of minimum forty-five days after second semester. MBA being professional course it is essential for each student to practically apply or understand theoretical concepts what he/she learn during the course. During the training programme student is expected to collect vital information through internal and external source so as to reach concrete conclusions on the given subject. Student has to prepare the project report under the guidance of internal teacher. Director/Principal of the institution/college will decide the last date of submission of final copy. Student should submit two typed copies to the Institute. One copy for the institute and another copy for his/her personal record. Students may prepare additional copies for the organization, guide etc.

A viva-voce examination will be conducted before the Semester III examination. A viva-voce committee of minimum two members will be appointed by the university.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Understand the real-time working of organizations.

CO2: Demonstrate professional knowledge, skills and attitude along withthe experience needed to constitute a successful career.

CO3: Analyse career opportunities in their areas of interest.

CO4: Build aptitude for gaining supervised professional experiences.

CO5: Create a clear understanding of industry trends and advancements.

Course Contents

Guidelines for the project report

Declaration from the student that the research work is not copied from any other existing reports.
Certificate of the guide. Guide should certify that the research work is original and completed satisfactorily under his guidance.

The Chapter scheme for the project report will be as follows-.

CHAPTER NO-I – Introduction to the study.

Introduction
Objectives and importance of the study
Scope and limitations of study
Research Methodology

CHAPTER NO.II – Introduction to the organisation

Introduction to the industry
Brief History of organisation
Subsidiaries, Associates of the company
Departments / Manufacturing process

Important statistical information
Future prospect
Organisation Structure

CHAPTER – III - Theoretical Background

Basic concepts
Necessary theoretical inputs may be added to support the research work.

CHAPTER –IV – Data Analysis and Interpretation

Data should be analyzed with help of various tools studied in the Subject "Application of Research Methods in Management".

CHAPTER-V Findings / Observations

CHAPTER VI- Suggestions / Conclusion

Appendix

Questionnaire / Charts / Data / Diagrams / Tables / etc.

Bibliography

The above guidelines are not the prescription on writing the project report but can be used as milestones while writing the Project Report. The guide has the every discretion to change the chapter scheme as per the requirement

Note

1. There should be proper linkage between objectives, data analysis and interpretation, findings and suggestions.
2. Student should not use logos and name of company on the project report pages.
   Header and Footer shall consist of university name and institute name respectively. No other information should be included in the Header and Footer.
3. Use of colors in text matter should be avoided.

MBA: Semester-III

Paper MGTM-301F: SECURITY ANALYSIS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

Integration of the world's Financial Markets has undoubtedly Increased the Investment Opportunities Manifold. A number of Transformations have taken place in India ever since the Economy was Opened up. A Constitution of Securities Exchange Board of India (SEBI) as Regulator was a Major Step in the Direction of Reforms in this subject, we Included A sense of Awareness is Included Among the Investors and they are encouraged to invest in the capital markets.

The aims of the students for taking a long -term view of the markets and taking wise investment decisions. it Covers in depth, the Investment Climate in India, Various Investment Avenues, Risk Return Profiles, Fundamental Analysis etc.

CO1: Remember the basics of financial market of India, focused on the Stock Market (Capital Market), various theories of portfolio, risk-return concepts and behavioural finance.

CO2: Understand the various investment & revenues & to understand the functions and importance of Indian security market.

CO3: Apply the concepts of TVM (Time Value of Money) concepts and calculations; including future value of a present sum, present value, and present and future values of annuities to management decision making.

CO4: Analyse and predict the trend of stock price movement & design portfolio of investment to reduce risk and earn profit & interpret the evidence relating to market efficiency.

CO5: Formulate the portfolio and evaluate the performance with revision if required.

Curriculum:

Unit I

Investment Scenario:

Concept of Investment, Investment Objective and Constraints, Investment Classification, Financial Market, Real Investment Avenues.

Units II

Risk and Return:

Concept of Risk and Return, Reduction of risk through Diversification, Quantify Portfolio Return and Risk, Security Market lines and its Applications.

Unit III

Fundamental Analysis and Equity Valuation Model:

Objective and Beliefs of Fundamental Analysis, Industry Analysis, Structural Analysis, Company Analysis, Valuation Methods, Dividend Discount Models, Measures of Relative Value, Price Earnings Ratio, Price to Book Value Ratio, Price to Sales Ratio, Free Cash Flow Model to Equity Model.

Units IV:

Technical Analysis and EMH:

Concept of Technical Analysis, Fundamental vs Technical, Technical Trading Rule, The Dow Theory, Charting, Price Patterns, Trendiness, Advances Technical tools, EMH-Concepts of Efficiency of the Stock Markets Forms of EMH, Test of EMH in Indian Market.

Unit V:

Bond Valuation, Bond With Warrants and Embedded Options:

Role of Bond from an Investors point of View, Tipes of Bonds, Value of Bond, Bond Yield Measures,

Forecasting Inerest Rates and Determinants of Interest Rates , Theory of Interest Rates, Types of Risks, Duration, Immunization of Risk Convexity, Term Structure of Interest rates. Bond With Warant, Convertible Bonds, Callable Bond.

Sugested Readings:

1.Investments :williams F. Sharpe,Gordon J .Alexander: PHI
2.Investments: Zvi Bodie, Alex kane, Alan J . Marcus TMH.
3. Introduction to Investment :Herbert B . MAYO: Cengage Learning.
4.Investment management Yogesh maheshwari.: PHI
5. Investment Analusis and manegment.:Charles P.james: WILEY India

MBA: Semester-III

Paper MGTM-302F: PORTFOLIO MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

Portfolio Management is the ultimate guide to understand the Various of Investment Management and How Managers run Money. Tthe Selection of Investment vehicles ,how they are valued, and how various strategies can be used, this Understanding is essential to Accomplish Investment Objectives.
This subject, aims to Enable the Student of Portfolio Management to Specify Appropriate Investment Policy or to be Frame an Investment Policy for the Business Organizations.
CO1 : Understand the capital market theory
CO2 : Understand investment policy, framework and constraints
CO3 : Understand the Asset Allocation, various approaches of asset allocation
CO4 : Gain knowledge and skills in portfolio diversification
CO5 : Develop proficiency in performance measurement by understanding portfolio evaluation measures

Curriculum

Unit I

Capital Market Theories: Markowitz Portfolio Theory, Capital Asset pricing model(CAPM),Capital Market Line(CML), Security market line (SML), Aebitrage pricing theory(APT).

Unit II

Investment Policy: Investment Objectives, Individual Investors, Determination of Investment Policies, Institutional Investors, Investment Constraints**.**

Unit III

Asset Allocation: Asset Allocation Process, Types of Asset Allocation, Asset Allocation-Management Style, Different Approaches to Asset Allocation Decision**.**

Unit IV

Portfolio Revision: Portfolio Diversification, PortfolioRevision, Transaction Costs,Constraints in Portfolio Rebalancing, Portfolio Monitoring and Rebalancing, Portfolio Revision Techniques, Issues in portfolio Rebalancing,Selection and Revision of equity portfolios.

Unit V

Performance Measurement: Portfolio Evaluation Measures, measures of returns , portfolio segment measurment, eugene Fama"s portfolio decomposition, use of maltiple benchmark and multiple index models for performance, performance attribution analysis, monitoring influance of asset allocation decisions, sector and security selection, performance evaluation of the portfolio manager.

Suggested Readings:

1. Investments :williams F. Sharpe,Gordon J .Alexander: PHI
2. Investments: Zvi Bodie, Alex kane, Alan J . Marcus TMH.
3. Introduction to Investment :Herbert B . MAYO: Cengage Learning.
4. Investment management Yogesh maheshwari.: PHI
5. Investment Analusis and manegment.:Charles P.james: WILEY India

MBA: Semester-III

Paper MGTM-303F: FINANCIAL MARKETS AND SERVICES

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

The focus in this paper would be on issues related to the financial markets & instruments along with different financial services and current scenario of Indian financial system & markets.

This paper provides an introduction to the financial markets products and services, markets and market participants. The objective of this course is to familiarize the student with the operations of Indian financial markets and basic concepts of different financial services along with the banking system.

CO1: The Student will be acquainted to various Banking and Non-Banking financial services in India.
CO2: The Student will understand the activities of Merchant Banking and credit rating.
CO3: The Student will be equipped to understand micro financing and other financial services in India.
CO4: The Student will understand how to evaluate and compare leasing & hire purchase.
CO5: The students will be able to understand the mutual funds functioning.

Curriculum

Unit I: Introduction to the Financial System

Nature and role of financial system, financial system and financial markets, government intervention in the financial system, informal and formal financial system, components of formal financial system-institutions, intermediaries, markets and services, functions and weaknesses of Indian Financial System.

Unit II: Introduction to Financial Markets

Money market and Capital market, money market instruments- T Bills, CPs & CDs. Capital Market-primary and secondary, methods of raising capital, Derivative concepts, Role of SEBI.

Unit III: Introduction to Financial services

Fund based and Fee based service. Conceptual aspect of factoring, forfeiting, credit rating, bill discounting, leasing, securitization and consumer finance. Evaluation of strategic decisions regarding factoring, leasing and merger & acquisitions.

Unit IV: Insurance and Mutual funds

Basic concepts of insurance and mutual funds, role of IRDA and AMFI

Unit V: Introduction to Banking

An overview of the different activities performed by a bank. Retail Banking: Concepts, forms and products of retail banking. Corporate Banking: meaning, nature, functions and products.

Recommended books:

- "Financial Markets and Services" E. Gordon & K. Natarajan, Himalaya Publishing House

Reference books:

- "Financial Markets, Institutions and Financial Services" Clifford Gomez, Prentice Hall of India
- “Financial Markets and Institutions-An Introduction to the Risk Management Approach” A. Saunders & M. M. Cornett. Tata McGraw Hills Publication
- “Indian Financial System” Bharti Pathak, Pearson Education.
- “Financial Institutions and Markets- structure, growth and innovations” L. M. Bhole & Jitendra Mahakud. Tata McGraw Hills Publication

MBA: Semester-III

Paper MGTM-301H: HUMAN RESOURCE PLANNING & DEVELOPMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

This paper has been designed keeping in mind the current need of organizations. Human resource planning and management has become a bigger challenge for organization due to growing globalization and emerging new trends specially because of changing environment. This paper addresses all those challenges and suggests ways to handle them efficiently.

The objective of this paper is to develop a conceptual as well as a practical understanding of Human Resource Planning and Development in organizations. It includes almost every basic aspect of human resource management orientation.

COURSE OUTCOMES:

CO1: To understand the various concepts, principles, importance of Human Resource Management for an organization.

CO2: To design a Human Resource Plan for an organization and construct its Selection Process

CO3: To develop a job analysis and produce a job description and job specification for a given job profile.

CO4: To evaluate/justify the applicability of various techniques of Training

CO5: To identify the performance appraisal process, Job evaluation, Compensation factors and explain the utility of various methods involved in it.

Curriculum

Unit-I

Overview of Human Resources, Historical evolution, Integrated HR function, Corporate and HR environment, Strategic environment, Strategic Management

Unit-II

HR planning at Enterprise level, Need for systematic planning, Planning process, Operating Environment-Internal & External, Job description, Models & techniques of Manpower demand and Supply forecasting. Retention-Redeployment and Exit strategies

Unit-III

Career management-Recruitment and Selection, Employee Induction Programme, Employee training, Training needs & objective setting, Methods of training, Development & Development needs, Human Resource Development, Development process

Unit-IV

Performance planning – Performance appraisal, Measures of appraisal, System components appraisal methods, Ethics of appraisal, Problems & issues

Unit-V

Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of

Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level

Recommended Book

- Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia

Reference Books

- John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A Reader, SAGE Publications, 1998
- Christopher Mabey, Rosemary Thomson (2011): Developing Human Resources, Routledge, Taylor and francis group, New York, USA.
- Dessler & Varkkey, (2010): Human Resource Management 11e, India, Prentice Hall
- Richard D. Johnson, Michael J. Kavanagh, Mohan Thite (2011): Human Resource Information System 2e, SAGE Publications, 2011.

MBA: Semester-III

Paper MGTM-303H: MANAGEMENT TRAINING & DEVELOPMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

Training and development is one of the key areas where rapid changes have been observed. Introduction of new technology in the market has made it compulsory for managers to train their employee for the survival of the enterprise. Secondly, training makes an employee efficient and effective resulting in better job satisfaction and increased overall production of the company which ultimately leads to profitability.

This paper has been designed, keeping in view the needs of the organizations. Successful managerial performance depends on the individual's ability to observe, interpret the issues and modify his approach and behavior. All organizations need to pay adequate attention to equip their employees. Rapid progress in technology has changed not only in the physical facilities but also in the abstract qualities required of the men who are using them. This paper will attempt to orient the students to tailor themselves to meet the specific needs of the organizations in training and development activities.

Course outcomes:

CO1: Demonstrate their conceptual Skills in understanding benefits of training, training need assessment and compare training and development.

CO2: Demonstrate conceptual Skills and application of designing training programme and apply the same to business situations.

CO3: Demonstrate their conceptual Skills in various training techniques and methods and to analyze target audience to identify typical style and needs.

CO4: Demonstrate conceptual understanding of evaluation of training.

CO5: Demonstrate the ability in applying the training and development concepts learnt to analyze a case let.

Curriculum

Unit-I

Training: Introduction - Conceptual framework of training - approaches on training – Difference between Training and Development - Training and applied psychology - principles of training - Learning and skills acquisition - Transfer and retention of skills.

Unit-II

Need for Training - Methods of Identification of Training needs - Training policy - Planning and organizing the training programmes - Methods of Training - – on the job training – off the job training – choosing optimum method – the lecture –panel discussion – behaviour modeling – interactive demonstrations – brain storming – case studies, incident process, in-baskets, team tasks, agenda setting, role plays, simulations, business games, critical incidents, grouping methods, transactional analysis, exception analysis.

Unit-III

Management Development (MD) and Organisational Development (OD) - Difference between MD and OD - Aims and objectives of MD and OD - Methods of MD -OD interventions – Succession Planning and Career development.

Unit-IV

Evaluation of training-need for evaluation, Principles of evaluation, Criterion and Approaches: Return on investment in training, Process of calculating ROI in training; emerging trends in training and development; New perspectives on training- Cross culture training.

Unit-V

Technology in training: CBT, Multimedia training, e-learning/Online learning, Distance learning

Recommended Book

- B.L. Gupta(2011), Management Training and Development, Vrinda Publication, New Delhi.

Reference Books

- Alan M. Saks, Robert R. Haccoun (2010): Managing Performance Through Training and Development, 5e, Nelson Education ltd. USA.
- Craig Eric Schneier, Craig J. Russell (1994): The Training and Development Sourcebook
- 2e, Human Resource Development Press Inc, USA.
- Wendell L. French, Cecil. H. Bell (2008): Organization Development, 6/e, India, Pearson Prentice Hall.
- Donald L. Anderson (2012): Organization Development: The Process of Leading Organizational Change, 2e, sage publication Inc.

MBA: Semester-III

Paper MGTM-301I: INTERNATIONAL ECONOMICS

Duration: 3Hrs. **Marks: 100**

Credits: 4

Objective

The course stresses policy topics that are topical. It is intended to provide an introduction to select economic and policy issues for advanced economies, the economies in transition, and emerging and developing countries

Course learning outcomes:

CO1. Identify the basics of international economics, difference between inter-regional and international trade, understand how international economics has helped countries to acquire goods at cheaper cost and explain it through the various international trade theories.

CO2. Show the benefits of international trade in a way how nations with strong international trade have become prosperous and have the power to control world economy and how global trade can be one of the major contributors of reducing poverty.

CO3. Explain how restrictions to international trade would limit a nation in the services and goods produced within its territories and at the same time explain that a rise in international trade is essential for the growth of globalization.

CO4. Show the importance of maintaining equilibrium in the balance of payments and suggests suitable measures to correct disequilibrium as well.

CO5. Be aware of trade policy and the changes in the composition as well as direction of foreign trade after international trade and know the causes and effects of deficits in the balance of payments, measures adopted to correct the deficits and identify the need for having trade reforms.

Curriculum

Unit-I: Meaning, Nature and Scope of International Economics:

Theoretical and descriptive international economics; features of global economy; categories of economies; developing and developed economies; characteristics of developed and developing economies; growing economic power of developing countries; factors promoting global economic co-operation; India and the global economy

Unit-II: The Pure Theory of International Trade

Features of international trade; International trade equilibrium-some analytical tools; the classical theory of comparative advantage; the classical theory of comparative costs;

refinements of the comparative costs theory; the modern theory of factor endowments: the Heckscher-Ohlin theory; international trade and factor prices; factor intensity reversals: Stopler-Samuelson and Rybezynski Theorems; New theories of international trade; economic growth and international trade; technical progress and international trade; the gains from trade; the terms of trade; terms of trade and economic development.

Unit-III: Commercial Policy:

Free trade versus protection: Tariffs; effective rate of protection; on-tariff barriers; import quotas; dumping; exchange control; international cartels; state trading; international economic integration; ASEAN and NAFTA

Unit-IV: Balance of Payments:

Meaning and components; adjustment mechanism of the balance of payments; balance of payments policies; internal and external balance; income adjustment: foreign trade multiplier; foreign exchange rate; foreign exchange rate policy; devaluation; optimum currency area; the foreign exchange market; international capital movements; the transfer problem.

Unit-V: Trade Policy and Co-operation:

Trade strategy; trade barriers; social issues in international trade; south-south co-operation; SAARC; SAPTA; Indo-lanka free trade agreement; indo-Singapore CECA; GSTP

Recommended Book

- International Economics by Francis Cherunilam published by Tata McGraw Hill, New Delhi
- International Economics by M.L Jhingan published by Vrinda Publications

MBA: Semester-III

Paper MGTM-303I: INTERNATIONAL MARKETING

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

To improve the learning and knowledge of the students about the concepts of International marketing; making the students understand marketing in all cultures; to create awareness about the economic, political and social changes that have occurred over the last decade which have altered the landscape of global business; to brief the students about the strategic implications of competition in different country markets.

Course Outcomes:

1. The students aware about the challenges of positioning the same product or service indifferent cultural markets.
2. The students will demonstrate their conceptual knowledge of Pricing decisions andproduct & services in international marketing.
3. To demonstrate their conceptual skill of analyzing global marketing channels, distribution and logistics management.
4. To anticipate problems and take proactive steps.

Curriculum

Unit I: An Overview of International Marketing

The scope and challenges of international marketing: global perspective, international marketing defined, the international marketing task, environmental adaptation, the self-reference criterion and Ethnocentrism, stages of international marketing involvement, strategic orientation; The dynamic environment of international trade: global perspective, balance of payments, protectionism, easing trade restrictions, IMF and World Bank

Unit II: The Cultural Environment of Global Markets

Global perspective; geography and global markets; geography, nature and economic growth; social responsibility and environmental management; world population trends; world trade routes; communication links; historical perspective in global business; Cultural dynamics in assessing global markets:

Global perspective; culture: definition and scope; cultural knowledge: factual versus interpretive knowledge, cultural sensitivity and tolerance; cultural values: business customs in global markets; political risks in global business

Unit III: Assessing Global Market Opportunities

Developing a global vision through marketing research: breadth and scope of international marketing research, problems of availability and use of secondary data, problems in analyzing and interpreting research information; Emerging markets: marketing and economic development, marketing in a developing country, developing countries and emerging markets; strategic implications of marketing; patterns of Multinational Corporations; global markets and multinational markets.

Unit IV: Developing Global Marketing Strategies

Global Marketing Management: planning and organization; products and services for consumers; products and services for businesses; International marketing channels; Exporting and logistics: special issues for business; integrated marketing communications and international advertising; personal selling and sales management; pricing for international markets;

Unit V: Implementing Global Marketing Strategies

Negotiating with international customers, partners and Regulators; the danger of stereo types; the pervasive impact of culture on negotiation behavior; implications for managers and negotiators

Recommended Book:

- Cateora, Philip R and Graham, John L, *International Marketing,* Tata Mc Graw Hill, New Delhi

Reference Books:

- International Marketing: Analysis and Strategy by Sak Onkvisit and John J. shaw published by Pearson Education, Fifth Impression
- International Marketing by P. K. Vasudeva published by Excel Books, latest edition.
- International Marketing by Michael and IKKA, PUBLISHED BY South-Western Cengage Learning, latest edition

MBA: Semester-III

Paper MGTM-301M:RETAIL MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

With International retailers like Wal-mart, Metro, Carrefour etc. expanding their arms in India, organized retailing is set to take Indian retail scenario by storm. The organized retailing sector is generating huge demand for management professionals to handle retailing operations in a professional manner. This necessitates the introduction of Retail management courses for the management professionals.This paper helps the students learn the functional aspects of organized Retailing and its management.

Course Outcomes:

CO1: The student will be able to systematically approach personal selling and sales targets.

CO2: The student will be able to explain the basics of retail store management.

CO3: The student will be able to systematically choose a location and layout of the store.

CO4: The student will be able to explain the concepts related to merchandise management.

CO5: Relate store management and visual merchandising practices for effective retailing.

Curriculum

Unit-I:Introduction to Retail Management

Retailing: Meaning, Retail format, types of retailers (store, non-store retailing), Indian retailing scenario, Functions performed by retailers.

Unit-II: Retail Consumer behavior and communication mix

Types of buying decisions, Retail buying process, Factors influencing retail buying decisions.
Retail communication mix: Meaning, methods, Retail communication process.

Unit-III:Retailing strategy

Definition, strategic retail planning process
Location & site analysis: Types of retail locations, factors affecting Trade area demand, factors affecting attractiveness of a site.

Unit-IV: Retail operations

Supply chain management: Meaning, process, importance, retail logistics.
CRM: Meaning, Importance, CRM process (customer data collection, data analysis, target customer identification, Development of CRM program implementation)
Retail Pricing: Pricing strategies (EDLP, HLP), Price adjustments (Mark downs, coupons, Rebates, Price bundling, multiple-unit pricing, variable pricing, online pricing)

Unit-V: Store management

Functions of store manager, Layout and Visual merchandising: Types of store layout designs, planograms, Merchandise presentation techniques.
Customer service: Importance, SERVQUAL GAPS MODEL.

Recommended book:

- Levy, Michael,Weitz, Barton A.&Pandit, Ajay,*Retailing Management*, Tata McGraw-Hill Education Private Ltd., New Delhi, Eighth edition, 2012

Reference book:

- Vedamani, Gibson G., *Retail Management*, Jaico Publishing House, Mumbai
- Pradhan, Swapna, *Retailing Management: Text and Cases*, Tata McGraw-Hill Publishing Company, New Delhi, 2nd ed.
- *Retail Management*, ICFAI Centre for Management Research, Hyderabad, May, 2003.

MBA: Semester-III
Paper MGTM-302M: CONSUMER BEHAVIOUR

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

The course introduces a wide range of behavioral concepts, and explores the strategic implications of customer behavior for marketers. The course challenges students to explore and relate the realities and implications of buyer behavior in modern cut throat markets.

The core objectiveof the course is to demonstrate to the student as to how an understanding of buyer behavior can help to improve and facilitate effective strategic decision making in the field of marketing. It also aims to help them understand and legitimize the behavior of a consumer in response to a variety of marketing stimuli.

Course Outcomes:

CO1: Understand environmental variables affecting consumer behavior

CO2: Explain the process of consumer behavior, the various external and internal factors that influence consumer behaviour and to apply thisunderstanding to the development of marketing strategy.

CO3: Utilize the knowledge of consumer decision making process and its applications in marketing function of firms & examine influence of social class, group dynamics on consumer behavior.

CO4: Create consumer-oriented marketing strategies & correlate the impact ofpersonality, perception, learning, motivation and attitude to the choices consumers make.

CO5: Create an ability to strategize and execute marketing strategies as per the preferences of customers.

Curriculum

Unit I: Consumer research, segmentation & motivation

- Consumer research, Quantitative vs. Qualitative research, Consumer research process
- Consumer segmentation, basis of segmentation, segmentation patterns, Targeting, Positioning
- Consumer motivation, Buying motives and their application in advertising appeals

Unit II: Consumer personality, perception & learning

- Personality concept, theories, Personality types (Type A, Type B) and their impact on consumer behavior
- Perception & individual information processing
- Learning, Cognitive learning (Classical conditioning, Instrumental conditioning)
- Brand equity, Brand loyalty

Unit III: Consumer attitude, reference group & family influence:

- Consumer attitudes, Measurement (Semantic differential scale, Likert scale), effecting attitude change
- Reference groups and their influence
- Family influences

Unit IV: Socio-cultural influence & consumer decision making:

- Social class, stratification in India, Social class mobility, Social class influence
- Culture, Sub-culture, their influences
- Consumer decision making, types, process

Unit V: Consumer behavior in market, post purchase behavior & organizational consumer

- Consumers in real markets, factors affecting outlet selection, In-store influences
- Consumer post purchase behavior, dissonance, consumer satisfaction/dissatisfaction
- Organizational consumer-Buying process, factors influencing organizational buying behavior

Recommended book:

1. Schiffman, Leon G. and Kanuk, Leslie Lazar, *Consumer behavior*, Dorling Kindersley (India) Pvt. Ltd., New Delhi, Ninth Edition.

Reference books:

1. Loudon, David L. and Bitta, Albert J. Della, *Consumer behavior Concepts and Applications*, Tata McGraw-Hill Publishing Company Ltd., New Delhi, Fourth Edition, 2008.

1. Blackwell, Roger D.; Miniard, Paul W. and Engel, James F., *Consumer behavior*, Cengage Learning India Pvt. Ltd., New Delhi, India Edition, 2009.

MBA: Semester-III

Paper MGTM-302P: PROCUREMENT MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

This course will put the emphasis on the design and management of processes and control systems of the inbound supply chain. The content that is covered in this course include procurement processes and strategies, risk pooling and multi-stage inventory control systems, value of collaboration and streamlined information and financial flow in supply chains, supplier relationship management as well as elementary and advanced methods for analysis and planning.

CO1 : Develop a foundational understanding of procurement management
CO2 : Acquire knowledge and skills in supplier identification, enabling effective supplier management
CO3 : Develop the skills and knowledge of global sourcing and international procurement
CO4 : Understand of the nature of outsourcing, and successful outsourcing implementation
CO5 : Understand the meaning and functionalities of an e-procurement system, enabling effective utilization of e-procurement systems

Curriculum

Unit-I: Introduction to Procurement management

Function of procurement, purchasing cycle, roles in the purchasing organization for a large project, contribution of shipping and freight forwarding agents in procurement management, preparation of purchase specifications, nature and relevance of purchase requisition, importance of procurement management.

Unit-II: Supplier Selection

Supplier identification, Key issues in Supplier selection, Supplier selection Methods, Contract with the supplier, bidding process, Bargaining and Negotiation.

Unit-III: Sourcing

Global sourcing and international procurement, problems associated with international sourcing and recommend solutions, nature of arbitration in international sourcing, implications of customs and countertrade in global sourcing.

Unit-IV: Outsourcing

Nature of outsourcing, Meaning by outsourcing, Methodologies of outsourcing, Drawbacks of outsourcing and ways of avoiding or managing such drawbacks.

Unit-V: E-Procurement Systems

Meaning by an e-procurement system, Benefits of e-procurement, barriers to e-procurement, key indicators for measuring the benefits of e-procurement.

Recommended Book

- Peter Bailey et 2008; Procurement, Principles and Management. Prentice Hall

Reference Books

- Kenneth Lysons et al 2008; Excellence in Procurement: How to optimise costs and add value.
- Purchasing and Materials Management - K S Menon.

MBA: Semester-III
Paper MGTM-303P: MATERIAL MANAGEMENT
Duration: 3Hrs. Marks: 100 Credits: 4

Objective

The course intends to equip students with updated knowledge of modern materials management concepts and aims to develop their functional expertise in the store and purchase management discipline. To increase the profitability of industry, the course intends to prepare the fleet of students equipped with latest tools and techniques of materials management so that they can face the challenges arising out of present scenario of competitiveness due to globalization of economy

Course Outcomes

CO1: Explain the scope of materials and spare parts management in an organization.
CO2: Explain the key characteristics of the purchasing system.
CO3: Apply the policies of Inventory Management and Develop overall materials requirement plan.
CO4: Explain the ERP System for Materials management.
CO5: Understand the importance of warehouse and supplier development in materials management.

Curriculum

Unit-I: Introduction to Material management

Introduction: Materials Management - Evolution, Importance, Scope and Objectives - Interface with other functions. Concept of Logistics and Supply Chain Management and evolution to 4PL, Trade off Customer Service & Cost.

Unit-II: Material Requirement Planning

Advantages over conventional planning (Order Point Method) – Input and output of MRP system - Forecasting – Overview of quantitative and qualitative methods of forecasting - Master Production Schedule - Bill of Materials – BOM Explosion - Material flow in MRP. MRP II. Concept of ERP. (Numericals expected on BOM Explosion, estimating Net requirements)

Unit-III: Inventory Management

Need of Inventory, Costs associated with Inventory, Types of Inventory , Basic EOQ Model, EOQ with discounts, Classification of material, ABC Analysis, VED, HML, FSN, GOLF, SOS (Numericals expected on Basic EOQ, EOQ with discounts & ABC)

Unit-IV: Inventory control & Cost Reduction techniques

Inventory turns ratios, Standardization, need and importance, Codification, concept, benefits. Value Engineering and Value Analysis, concept and process.

Unit-V: Purchasing Management and Materials Handling

Responsibilities of Purchase Department, Purchase Cycle, Negotiation & Bargaining, Vendor relations, Purchasing Methods, Global sourcing.
Principles of Materials Handling system - Materials Handling Equipments – Safety issues.

Recommended Book

- An integrated approach to Materials Management – Gopal krishnan & Sundersan
- Materials Management - Dutta

Reference Books

- Materials Management – Mr. K. K. Ahuja
- Purchasing and Materials Management - K S Menon
- Handbook of Materials Management - Gopalkrishnan
- Materials & Logistics Management - L.C.Jhamb

MBA: Semester-IV

Paper MGTM-401: PROJECT MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

This course examines business planning and project management in theory and practice. It offers a practical approach to managing projects, focusing on organizing, planning, and controlling the efforts of the project.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Demonstrate an understanding of various phases of Project Management i.e. planning as well as implementing

CO2: Demonstrate the use of various tools available for Risk analysis in Capital budgeting to measure the financial feasibility of the project.

CO3: Demonstrate an understanding of various means of project financing and their merits and demerits

CO4: Demonstrate a systematic project implementation and review

Course Contents

Unit I: Introduction to Business Planning and Project management

Business Planning: Importance of Planning; the planning process-objectives vis-a vis a plan; the benefits of planning; types of plans used by the managers-short-range and long-range plans, strategic and operational plans; policies and procedures; budgets and projects.

Overview of the Project Management: Capital investment - Investment and Difficulties, Types of capital Investment, Phase of Capital Budgeting, Levels of Decision Making.

Unit-II: Planning Tools & Techniques and the Control Process

Forecasting; contingency planning; Benchmarking; Best Practices; use of staff planners; participatory planning; Importance of controlling; steps in the control process; types of controls; internal and external controls; organizational control; information and financial controls; operations management and controls.

Unit III: Project Risk Analysis:

Sources, Measures, and perspectives on Risk, Sensitivity Analysis, Scenario Analysis, Break even Analysis, Simulation Analysis, Decision tree Analysis Project selection under P

Unit IV: Multiple projects and Constraints:

Constraints, Method of Ranking, Mathematical programming Approach, Linear Programming Approach, Integer Linear Programing model, Goal Programing Model.

Unit V: Network Techniques for Project Management:

Development of Project network, Time Estimation, Determinations of Critical Path, PERT Model, CPM Model, Network Cost system.

Recommended Book

- Projects: Prasanna Chandra: Tata McGraw- HILL.
- Project Management :Panneerselvam:PHI

Reference Books

Project Management: Choudhary: TMH.

- Project Management For Business and Technology: Nicholas,:Pearson

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Project Management, Business Planning, Risk Analysis, Linear Programming Approach, Project network.

MBA: Semester-IV

Paper MGTM-402: ENTREPRENEURSHIP

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

The course aims to acquaint the students with challenges of starting new ventures and enable then to investigate, understand and internalize the process of setting up a business.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Define how to search financing alternatives for specific new concepts /idea of being an entrepreneur.

CO2: Develop Entrepreneurship Skills by explaining different stories of some leading entrepreneurs are and develop competences are needed to become an entrepreneur.

CO3: Apply 3S Model: Stimulate Sustain and Support so that a spirit of Entrepreneurship & explain about Management of Small Family Business.

CO4: Analyse management function of a company with special reference to SME sector, start–ups and Entrepreneurship along with government subsidies available to them & also understand the role of entrepreneurship in the economic development.

CO5: Analyze the entrepreneurial skills within individual by correlating the concepts & models taught.

Course Contents

Unit I: Introduction to Entrepreneurship

Definition of Entrepreneur, Internal and External Factors, Functions of an Entrepreneur, Entrepreneurial motivation and Barriers, Classification of Entrepreneurship, Theory of Entrepreneurship, Concept of Entrepreneurship, Development of entrepreneurship; Culture, stages in entrepreneurial process.

Unit II: Creativity and Entrepreneurial Plan

Creativity and Entrepreneurial Plan: Idea Generation, Screening and Project Identification, Creative Performance, Feasibility Analysis: Economic, Marketing, Financial and Technical; Project Planning: Evaluation, Monitoring and Control segmentation. Creative Problem Solving: Heuristics, Brainstorming, Synectics, Value Analysis, Innovation.

Unit III: International Entrepreneurship Opportunities

International Entrepreneurship Opportunities: The nature of international entrepreneurship, Importance of international business to the firm, International versus domestics' entrepreneurship, Stages of economic development.

Institutional support for new ventures: Supporting Organizations; Incentives and facilities; Financial Institutions and Small-scale Industries, Govt. Policies for SSIs.

Unit IV: Family and Non-Family Entrepreneur

Family and Non-Family Entrepreneur: Role of Professionals, Professionalism vs family entrepreneurs, Role of Woman entrepreneur.

Unit V: Venture Capital

Venture Capital: Venture capital, Nature and Overview, Venture capital process, locating venture capitalists.

Recommended Book:

- Hisrich, Robert D., Michael Peters and Dean Shepherded, Entrepreneurship, Tata McGraw Hill, ND

Reference Books:

- Barringer, Brace R., and R., Duane Ireland, Entrepreneurship, Pearson Prentice Hall, New Jersy (USA).
- Lall, Madhurima, and Shikha Sahai, Entrepreneurship, Excel Book, New Delhi.
- Charantimath, Poornima, Entrepreneurship Development and Small Business Enterprises, Pearson Education, New Delhi.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Entrepreneurship, Creative Performance, Govt. Policies, Family Entrepreneur, Non-Family Entrepreneur, Venture Capital

MBA: Semester-IV

Paper MGTM-403: BUSINESS ETHICS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

The main objective of teaching Business Ethics and Corporate Governance to students of Management is to provide detailed knowledge to the students about the significant contribution of ethics and corporate Governance in the welfare of the society at large. Ethics constitutes the value and social system for individuals and organizations. It promotes an orderly corporate life and a disciplined society. Ethics and values are deep rooted in our traditional heritage of culture and beliefs. In fact, it has been realized that a successful business is one that is ethical and upholds its contribution to the society at large. Similarly, corporate governance is the acceptance by the management of the inalienable rights of the shareholders as the true owners of the corporation and of their role as trustees on behalf of the shareholders.

To improve the learning and knowledge of the students about the concepts of values and ethics, display of values, role of ethics and values in building an organization, aligning individual and organizational values for optimal gains and also to improve the knowledge and learning of the students about the best corporate governance practices.

Course Learning Outcomes

Upon successful completion of the course a student will be able to:

CO1: Find about business ethics, emerging trends in good governance practicesand corporate social responsibility in the global and Indian context.

CO2: Explain the significance of ethics and ethical practices in businesses whichare indispensable for progress of a country & recite the applicability of ethics in functional areas of management.

CO3: Identify the emerging need and growing importance of effective governance by the management of organizations.

CO4: Analyse ethical issues related to business and suitable corporate governance necessary for long term survival of business by applying integrates contemporary Ethics in business.

CO5: Evaluate the learning of various business ethics concepts that can be applied in the business models and decisions.

Course Contents

Unit I: Management Models in the Socio-Political Environment

Business and the new world, management challenges for the 21st Century, models of management in the current environment, management process and ethics, ethical issues, work ethics, promoting ethical climate in the business, relationship between values and behavior, similarities between attitudes and values, value system for managers

Unit II: Normative Ethics in Management

Theories of ethics, ethical reasoning, ethical relativism, ethical conflict and ethical congruence, normative ethics in management, categories of ethical theories, virtue ethics in business, strengths and weaknesses of virtue ethics

Unit III: Managing Ethics

Ethical activities, code of ethics, ethics training programs, ethics committees, law enforcing ethical conduct, company codes, key organizational and program design factors associated with ethics

compliance management, recipients of intended ethical action, the rational organization, Employees obligations to the firm, firm's duties towards employees.

Unit IV: SEBI Committee on Corporate Governance

The key mandatory recommendations focusing on strengthening the responsibilities of audit committees, improving the quality of financial disclosures including the proceeds from initial public offerings, corporate executive boards to assess and disclose business risks in the annual reports of companies, position of nominee directors, stock holder approvals and disclosures relating to compensation to non-executive directors

Unit V: Corporate Governance and Performance

Government failure: Corporate frauds and regulatory responses; an overview of corporate governance; internal control mechanisms; ownership concentration; contractual theory of the firm; executive compensation; outside control mechanisms; multiple control mechanisms; alternate governance systems.

Recommended Book:

- Business Ethics: Text and Cases by C.V.S Murthy published by Himalaya Publishing House, New Delhi

Reference Books:

- Ethics in Management and Indian Ethos by Biswanath Ghosh published by Vikas Publishing House
- Report of the SEBI Committee on Corporate Governance
- Takeover, Restructuring and Corporate Governance by Weston, Mitchell and Mulherin published by Pearson Education

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Socio-Political Environment, Normative Ethics, Ethical code, SEBI, Corporate governance.

MBA: Semester-IV

Paper MGTM-407: RESEARCH PROJECT AND VIVA-VOCE

Marks: 100 **Credits: 4**

MBA: Semester-IV

Paper MGTM-404I: GLOBAL BRAND STRATEGY

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective:

To develop the ability to Understand the methods of managing brands and strategies for brand management. Learn nature, scope and structure of International Business. Understand the influence of global environmental factors on international business operations.

Course Learning Outcomes:

On the completion of this course the student will be able to:

CO1: Identify the steps in brand building.
CO2: Use techniques for brand positioning.
CO3: Measure and interpret brand performance.
CO4: Design and implement brand strategies.
CO5: Analyze and suggest solutions for brand problems.

Curriculum

Unit-I: Evolution of Global Branding:

Colonialism- a major force of globalization and created a multitude of cross-border trade links. The Second World War- new consumer brands came to Europe and Asia. Big push for branding - erosion and subsequent demise of communism. The fall of the Berlin Wall-opened up previously inaccessible markets to foreign brands in Eastern and Central European markets, other markets such as Chile and South Africa. Opening up of China- a massive market and a massive production location for U.S, Japanese and European Brands.

Unit-II: Defining a Global Brand:

A brand-a construct and not a living and breathing organism. Brands- created, stimulated and applied by people working in organizations seeking to create worthwhile experiences for their customers that will induce behaviour beneficial to the organization. Global brands- as brands that are available across multiple geographies, without specifying any lower limit or any continental requirements.

Unit-III: The Brand Environment:

The brand environment- brand's own expression, perception and recognition-surrounded by internal and external factors that have an influence on the brand. Operation of a brand in an environment-the elements of the strategic planning cycle and, on the other hand, organizational conventions, competitive forces, market structures, cultural factors, consumer motivation and media attention; the lenses and filters

through which consumers perceive and experience the brand.

Unit-IV: The Management of Global Brands:

Local brands versus a global brand-multiple markets; a conflict between finding an optimum fit of the brand with local circumstances, and the desire to obtain brand consistency across markets; global and local brand management-a common basis for their brand strategy and planning. Common basis-a shared language, definitions, interpretations, assessments and most importantly a clear understanding of the relationships between the factors that shaped a brand in its global and local context; success and failure of global brands; the global brand proposition model-the internal and external analysis; emerging market firms and branding.

Unit-V: Applied Analytics In Brand Management:

Environmental Analysis, Competitor Analysis, Market Sizing, TAM, SAM, Target Market, R&D, Interviews, Surveys.

Recommended Book

- Global Marketing with a special Indian focus by Svend Hollensen and Madhumita Banerjee, 4th edition, published by Pearson
- Global Marketing by Johny K Johansson, 4th edition published by Tata McGraw Hill Publishing Limited, New Delhi

MBA: Semester-IV

Paper MGTM-405I: INTERNATIONAL BUSINESS OPERATIONS AND LOGISTICS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective

Business today is set in a global environment. The global environment is forcing companies, regardless of their location or primary market base, to consider the rest of the world in their competitive strategy analysis. Firms cannot isolate themselves or ignore external factors such as economic trends, competitive situations, or technology innovation in other countries if some of their competitors are competing or are located in those countries. Now a days it not uncommon for a company to develop a new product in the United States, manufacture it in Asia, and sell it in Europe.

International markets are predominated by Multinational Corporations who have perfected the principles, procedures, and practices of operations management. Most of the International business originates from developed countries who have a long history of industrial growth and this has kept the MNC's in good stead. MNC's have deep pockets, spend vast sums on R&D, carve core competencies for themselves, come out with innovative products, maintain quality, and fix low prices for their products.

Course learning Outcomes:

CO1: Develop basic understanding of operations and logistics, types of shipping, international laws related to logistics and transportation of goods, strategy process.

CO2: Learn discussion of terms of global market, current global marking approach

CO3: Discuss current practices, issues, and concerns in the field of international logistic operations.

CO4: Understand the reason of existence of International Trade.

CO5: Apply logistics principles in international business decisions.

Curriculum

Unit I: Global Operations & Logistics: Evolution and Design

Forces of Globalization; operations and logistics: application and objectives; Strategic role of operations and logistics; the strategic framework; flow management; global operations and logistics: an integrated approach; the concept of an operations and logistics strategy; the strategic process.

Unit II : The globalization of Operations and Marketing Strategies

The four driving forces of globalization process; global market, technological , cost, political and macroeconomic forces; changing consumer behaviour; global versus local marketing; functional integration of logistics and operations; the global product; sectorial integration: Manufacturer/distributor; efficient consumer response (ECR); The need for a global marketing approach; current and future challenges.

Unit III: Global Operations and Logistic Planning

The evolving concept of outsourcing; the importance of channels of distribution in physical distribution; the architecture of a physical distribution network in a globalised operations approach; logistic service firms and Third Party Logistics; demand, volatility, information distortion and the Bullwhip Effect in supply chains; from domestic to global supply chains: added complexities and uncertainties; vertical integration issues in global supply chains.

Unit IV : Risk Management in Global Operations

Operating exposure to exchange rate; risk and its management; the concept of operating exposure; managing operating exposure; pricing strategies for exporting firms; use of operational flexibility to minimize operating exposure; global sourcing strategies under exchange rate uncertainty; impact of exchange rates and classification of hedging strategies in global sourcing; basic function of foreign exchange markets; micro and macro level strategies for managing exchange rate risk.

Unit V: Effective Management of Global Operations and Logistics

The global LIS/LITS (Logistics Information system/Global Logistics and Telecommunications System); characteristics of LITS; Logistics organization and its relationship with LITS; Functional and geographic dimensions of LITS; Operations and logistics control: key activities need performance information; measuring performance in functional integration; new organizations related to manufacturing and logistics operations; the organizational implications of sect oral logistics co-operation; the international factor in global organizations.

Recommended Book

- Global Operations and Logistics: Text and Cases by Dornier, Ernst, Fender and Kouvelis published by John Wiley and Sons

Reference Books

- International Business, 2nd Edition by Roger Bennett published by Pearson Education.
- International Business, 3rd Edition by K Aswathappa published by Tata McGraw Hill Publishing Company Limited, New Delhi

- International Business by Hill and Jain, Sixth Edition published by Tata McGraw Hill Publishing Company Limited, New Delhi
- International Business: Environment and operations, 11th Edition by Daniel, radebaugh and Sullivan published by Pearson Education.

MBA: Semester-IV

Paper MGTM-406I: EXPORT IMPORT PROCEDURES AND DOCUMENTATION

Duration: 3Hrs. **Marks: 100** **Credits: 4**

Objective: To get students aware of the procedures of export and imports. MBA students will be able to compile the documents required for the purpose of the foreign trade. The roles of different regulatory and controlling bodies will be well known to the students.

Course learning outcomes:

CO1: understand Import/export trade organizations, the procedure of licensing, documents required at the time of export and import.

CO2: understand the nature of trading houses.

CO3: understand export sales contract and its processing.

CO4: understand export payment methods and Export-Import trade regulatory framework in India.

CO5: understand institutional set up for export promotion and export assistance in India.

Curriculum

Unit-I

Significance of procedures and documentation in international trade; procedures and documentation as trade barriers; WTO provisions; Aligned Documentation System (ADS); official machinery for trade procedures and documentation;

Unit-II

ITC(HS) classification System ;Role of ICC; INCOTERMS; nature of export/trading houses.

Unit-II

Export order processing; export contract; export price quotations; shipping and custom clearance of export and import cargo; central excise clearance; main export and import documents; Role of forwarding agents; cargo insurance and claim procedure.

Unit-III

Methods of payment in international trade; documentary collection of export bills; UCPDC guidelines; realization of export proceeds – provisions of RBI's Exchange Control Manual;

Unit-IV

Pre-shipment and post-shipment finance; role of EXIM bank and ECGC in India.

Unit-V

Major export promotion schemes in India – EPCGS, duty exemption scheme; DEPB scheme; SIL; facility for deemed exports; Export promoting institution's – role of export promotion councils, commodity boards and ITPO.

Recommended Book

- M.D. Jitendra, Export Procedures and Documentation, Rajat Publications, Delhi.

Reference Books

- Pervin Wadia, Export Markets And Foreign Trade Management, Kanishka Publications, New Delhi.
- Nabhi's Exporters Manual and Documentation.
- Nabhi's New Import-Export Policy Procedures.

Alabbar School of ManagementRaffles University

MBA- SEM IV

Derivatives Analysis and Valuation (MGTM-404F)

Course Credits: 4 **Contact Hours: 48 Hrs**

Objective

This course provides inputs that cater to the requirement of a reader intending to gain expertise in the area. the contents are divided into five chapters. these cover various features, dynamics and impact of Derivative markets and instruments, Forward markets and instrument futures markets options, markets. It is to explain the Structure of Global Derivative Market vis-a-vis the Indian Market . it Include Fundamental Concepts of Instruments ,their Characteristics, Mechanics of their Trading, Pricing Principles, Hedging and various applications of Derivative Instruments.

Course Learning Outcomes:

On the completion of this course the student will be able to:

CO1: The students will understand the mechanism of forwards/futures, options, financialswaps, commodity derivative.

CO2: The students will assess the application of derivative instruments using numericalproblems

CO3: The students will suggest and make better decisions for their company in riskmanagement.

CO4: The students will become more curious to research on the new developments that aretaking place in business environment.

Curriculum

Unit I: Derivative Markets and Instruments: Global scenario, indian scenario,Tipes of risk, tipes of Derivative Instruments, International Derivative market, Elementary pricing principles,purpose of Derivatives.

Unit II:Forward Market and Instruments:

TheStructure of Global Forward Markets types and Features of Forward Contracts, ValuingForward Contracts ,Forward contracts strategies.

Unit III: Futures: Structure of Global Futures Markets, Types of Contracts and Charecteristics,The Machanics of Future Trading, Valuation of Future Contracts, Applications of Futures(Hedging)

Unit IV: Option markets:

Introduction to options: srtucture of global option market option trading, option pricing - principle and models. Facors Influancing Option prices Intrinsic and time value of an Option.valuation of option(call and put). option pricing models-(Binomial option pricing model and Black -scholes model).sensitivity of option premium.

Unit V: Swap Markets :

The structure of Global Swaps Markets , Types and charecteristics of swaps , Vluaing swaps,Swap strategies, Forward swap ands Swaptons.

Recommended books:

- Financial Derivatives: S L Gupta:PHI learning pvt limited.
- Option Future and Other Derivatives :John.C.Hull: Pearson

MBA- SEM IV

International Finance and Trade (MGTM-406F)

Objective

Liberalization and Globalization of Economies in the recent years has increased the Prominence of International Finance and Trade, which prompted the Finance Managers to concentrate on the International Perspective as well, and it is Vital for a Student learning Finance to know the Intricacies of the Foreign Exchange Market and the Methods to Combat the Forex Risk.

Aim of this subject is to develop a body of knowledge and skills, and make it available to the students to make them successful managers in the new era of liberalization and globalization.

Course Credits: 4 **Contact Hours**: 48 Hrs

Course Learning Outcomes:

On the completion of this course the student will be able to:

CO1: The student will be able to demonstrate a better understanding of international trade.

CO2: The students will be able to learn about current exchange rate regime, functioning offoreign exchange markets and various participants.

CO3: The students will be able to demonstrate with managing firm's exposure to risk.

CO4: The students will be able to demonstrate with currency trading and swaps.

Curriculum

Unit I: Introduction to International Finance and Theory of International Trade:

Increasing interdependence in the global economy, trends in international trade and cross-border financial flow, recent developments in global financial markets, liberalization, Integration and Innovation, Challenges of International Financial Management, Theory of Absolute Advantage, Theory of Comparative advantage, Heckscher-Ohlin Model, Imitation -Gap Theory.

Unit II Balance of Payments

concept of Economic transactions, Resident, General Government institution, principles of accounting, Components of theBOP Account, factor affecting the components of the Bop account, balance of payments compilation, BoP- The Indian Perspective, Importance and limitations of BoP Statistics.

Unit III Foreign Exchange Market and Exchange rate determination, Introduction toExchange risk and Management of Rxchange Risk:

Structure and the Participants, Types of Transactions,Mechanics of Currency dealing,exchange rate quotations, arbitrage, forward rates evolution of Exchange control and the foreign exchange market in india, relation between forex and money market, coverd interest arbitrage, covered parity theorem, option forwards, cancelation of forward contracts, purchasing power parity, interest rate parity, defining foreign exchange expoxure, measuring foreign rxchange exposure, management of exchange risk, Internal vs External Hedging Strategies.

Unit IV:Short Term Financial Management:

Short Term Funding and Investment, Centralized vs. Decentralized Cash Management, Netting, Pooling, Exposure Management,Offshre Invoicing Centers.

Unit V: Inroduction to Trade block, WTO**, GATT, EXIM POLICY:**

Formation of Trade Blocks, OPEC, its Objective, Function of Euiropean Community(EC), Function and Structure of WTO Agreements,trade releted Aspects of Interllectual Property Rights (TRIPS), trade releted aspects of Investment Measures (TRIMS), Genral Agreement on Trade in Services (GATS), Trade Negotiations under GATT, EXIM Policy Historical Perspective, Objective,Highlight of Current policy, imports export import formation capital goods scheme (EPCG).

Recommended Book

- International Financial Management: P G APTE : The Mcgrow Hill Companies.

Reference books:

- International Economics: Francis Cherunilam: The Mc Graw Hill Companies.
- International Corporate Finance:JEFF MADURA:CENGAGE Learning.
- International money and Finance: michal melvin : Pearson Education.

MBA Sem-IV
Total Quality Management and Six Sigma (MGTM-404P)

Objective

The course is developed exclusively for the Management and Strategy Institute and is designed to give the student a strong understanding of TQM and how to apply it in a professional work environment. It also covers all basic TQM principles and gives the student a solid understanding of TQM and how it is implemented in a business environment.

Course Credits: 4 **Contact Hours**: 48 Hrs

Course Learning Outcomes:

On the completion of this course the student will be able to:

CO1: Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems.

CO2: Evaluate the performance measures using various quality and management tools

CO3: Apply the Quality Function Deployment, Taguchi principles, Total Productive Maintenance and Failure Mode and Effect Analysis concepts to solve industrial problems.

CO4: Practice the various quality system in industry.

Curriculum

Unit-I: Introduction to Total Quality Management

Basics of Total Quality: Evolution of Quality, Definitions of Quality, Symptoms of a Non Quality Business, What is Total Quality, Total Quality Control (TQC), Dimensions of Quality (Kano's Model), Quality Challenge to Industry, Need for Quality Improvement: Impact of quality improvement, Differences between ISO 9000 and TQM.

Unit-II: Problem Solving and QC Tools

Types of problems, QC Tools, Approaches to problem Identification, Quality improvement Methodologies, Problem solving process, Seven basic QC Tools, Applications of problem solving Tools, Seven Management Tools: Tree diagram, Matrix diagram, Matrix data analysis, Process decision program chart, Arrow diagram.

Unit-III: TQM Principles and Tools

Continuous process improvement, Juran trilogy, PDSA cycle, 5S, Supplier partnership, Partnering, Sourcing, Benchmarking, Quality Function Deployment (QFD), House of quality, Taguchi quality

loss function, Total Productive Maintenance (TPM).

Unit-IV: Kaizen

Continuous Improvement: Kaizen Umbrella, Kaizen and Management, Kaizen and Innovation, Main Kaizen practice: Management, Kaizen and Labour-Management relations, Cultural change for Kaizen, 3- MUs checklist of Kaizen activities, 5-S Kaizen movement, 4 Ms checklist.

Unit-V: Six Sigma

Quality engineering and Six Sigma, DMAIC process for process and design improvement, Acceptance Sampling, SPC (Statistical Process Control), Taguchi methods for robust design, Six Sigma sustainability; Case studies.

Recommended Book

- Total Quality Management, Sharma D D, Sapna Book House
- Six Sigma Fundamentals: A Complete Guide to the System, Methods and Tools, D.H. Statmatis

Reference Books

- Six Sigma: The Breakthrough Management Strategy Revolutionizing The World's Top Corporations, Mikel J. Harry, Richard Schroeder, Don R. Linsenmann, Richard
- Total Quality Management, Poornima M Charantimath, Sapna Book House

MBA Sem-IV
Enterprise Resource Planning (MGTM- 406P)

Objective

To know the basics of ERP
To understand the key implementation issues of ERP
To know the business modules of ERP
To be aware of some popular products in the area of ERP
To appreciate the current and future trends in ERP

Course Credits: 4 **Contact Hours**: 48 Hrs

Course Learning Outcomes:

On the completion of this course the student will be able to:

CO1: Analyze concepts of Business Functions, Business Model and Business Processes.
CO2: Evaluate various benefits and risks in the Implementation of ERP
CO3: Asses the need for ERP applications in a business function and recommend a right package.
CO4: Create implementation Methodology while identifying the resources for the implementation process.

Curriculum

Unit-I: Introduction to Enterprise Resource Planning

Basic Concept & Introduction to Enterprise Resource Planning*;* Related Technologies – Business Intelligence, E-Commerce and E-Business, Business Process Reengineering, Data Warehousing, Data Mining , OLAP, Product life Cycle management, SCM , CRM

Unit-II: ERP Implementation

Implementation Challenges, Strategies, Life Cycle, Pre-implementation Tasks, Requirements Definition, Methodologies, Package selection, Project Teams, Process Definitions, Vendors and Consultants, Data Migration, Project management, Post Implementation Activities.

Unit-III: ERP in Action and Business Module

Operation and Maintenance, Performance, Maximizing the ERP System, Business Modules, Finance, Manufacturing, Human Resources, Plant maintenance, Materials Management, Quality management, Marketing, Sales, Distribution and service.

Unit-IV: ERP Market

ERP Marketplace, Dynamics, SAP AG, Oracle, PeopleSoft, JD Edwards, QAD Inc, SSA Global, Lawson Software, Epicor, Intutive.

Unit-V: Recent trends in ERP

Enterprise Application Integration, ERP and E-Business, ERP II , Total quality management, Future Directions, Trends in ERP.

Recommended Book

- Alexis Leon, “ERP DEMYSTIFIED”, Tata McGraw Hill, Second Edition, 2008.
- Mary Sumner, “Enterprise Resource Planning”, Pearson Education, 2007.

Reference Books

- Jim Mazzullo,”SAP R/3 for Everyone”, Pearson, 2007.
- Jose Antonio Fernandz, “The SAP R /3 Handbook”, Tata McGraw Hill, 1998.
- Biao Fu, “SAP BW: A Step-by-Step Guide”, First Edition, Pearson Education.

MBA Sem-IV
E-Marketing (MGTM-406M)

Objective

The course describes the internet and the various business models employed in online marketing, and it explores methods for conducting online market research and developing competitive intelligence for an organization.

Its detail processes for planning and implementing comprehensive e-marketing strategies using alternative online pricing strategies, Web-based advertising and promotion, and internet distribution channels. E marketing also considers other critical issues such as customer acquisition and retention, customer relationship management (CRM), and the challenges faced by firms in the application of e-marketing strategies in global markets.

Course Credits: 4 **Contact Hours**: 48 Hrs

Course Learning Outcomes:

On the completion of this course the student will be able to:

CO1: Define the importance of the digital marketing for marketing success.

CO2: Demonstrate customer relationships across all digital channels and buildbetter customer relationships.

CO3: Identify a digital marketing plan, starting from the SWOT analysis anddefining a target group.

CO4: Classify digital channels, their advantages and limitations, to perceivingways of their integration taking into consideration the available budget.

CO5: Propose different ways of their integration taking into consideration theavailable budget.

Curriculum

Unit I: E-Marketing in Context

Past, Present, and Future
Strategic E-Marketing and Performance Metrics
The E-Marketing Plan

Unit II: E-Marketing Environment
Building Inclusive E-Markets Ethical and Legal Issues

Unit III: E-Marketing StrategyE-Marketing Research Consumer Behaviour Online
Segmentation, Targeting, Differentiation, and Positioning Strategies

Unit IV: E-Marketing Management

Product: The Online Offer
Price: The Online Value The
Internet for Distribution
E-Marketing Communication Tools

Unit V: Customer engagement strategies

Engaging Customers with Social Media
Buying Digital Media Space
Customer Relationship Management

Recommended book:

- Strauss, J., & Frost, R. (2012). *E-Marketing* (6th ed.). Upper Saddle River, NJ: PearsonPrentice Hall

Reference books:

- Creating a Winning **E-Business**, Second Edition, Thompson - Course Technology

MBA Sem-IV

Sales & Distribution Management (MGTM-404M)

Objective

The course exposes the students to a wide range of activities and sub-activities involved in the field of Sales & distribution management and attempts to equip them with skill sets required to handle this marketing sub-function dexterously.

To apprise the student with the detailed conceptual and functional aspects of Sales management as also to augment and reinforce conceptual learning with application in real corporate framework.

Course Credits: 4 **Contact Hours**: 48 Hrs

Course Learning Outcomes:

On the completion of this course the student will be able to:

CO1: Find the necessary skills and knowledge needed to manage sales force, distribution management.

CO2: Relate the theoretical concepts of sales and distribution to real working infield.

CO3: Apply sales forecasting methods, sales budgeting techniques and methodsto manage selling expenses.

CO4: Analyse personal selling strategies and will be able to function as a team member in sales meetings & could build relationship with its team members.

CO5: Choose appropriate selling strategies in professional life.

Curriculum

Unit I: Sales Management & personal selling

- Conceptual understanding, Sales objectives, Importance
- Personal selling: Buying decision process, Classification of buyer accounts, Personal sellingprocess, Selling methods
- Sales forecasting, budgeting, Territories, Quotas

Unit II: Sales force management

- Need assessment, Recruitment, Selection
- Sales organization structures
- Sales force development: Training, Motivating, Compensating
- Sales force control mechanism

Unit III: Distribution management:

- Importance, Types of distribution channels, Channel decisions
- Selecting & motivating distribution channel partners
- Distribution channel cost control

- Retailing explored
- Wholesaling explored

Unit IV: Logistics & Supply Chain Management:

- Logistics: Conceptual understanding
- Functional areas of Logistics management
- Key decision areas of logistics management:
  - Inventory management
  - Warehousing
  - Transportation
  - Merchandize shrinkage/theft

Unit V: Recent trends in Sales management:

- Sales Management Information system
- Relationship marketing
- E-selling/e-marketing/Selling with internet leverage
- Direct marketing
- International Sales Management

Recommended book:

- Still Richard R, Cundiff Edward W and Govoni Norman A P, *Sales Management Decisions,Strategies and Cases*, Prentice Hall of India Pvt. Ltd., New Delhi, 5th Ed., 2008.

Reference books:

- Havaldar Krishna K and Cavale, Vasant M, *Sales and Distribution Management Text andCases*, Tata McGraw Hill Education Pvt. Ltd. , New Delhi, 2009.
- Gupta S L, *Sales and Distribution Management Text & Cases An Indian Perspective*, Excel Books, New Delhi, 2005.

MBA-SEM IV
International Business Operations and Logistics (MGTM-405I)

Objective

Business today is set in a global environment. The global environment is forcing companies, regardless of their location or primary market base, to consider the rest of the world in their competitive strategy analysis. Firms cannot isolate themselves or ignore external factors such as economic trends, competitive situations, or technology innovation in other countries if some of their competitors are competing or are located in those countries. Now a days it not uncommon for a company to develop a new product in the United States, manufacture it in Asia, and sell itin Europe.

International markets are predominated by Multinational Corporations who have perfected the principles, procedures, and practices of operations management. Most of the International business originates from developed countries who have a long history of industrial growth and this has kept the MNC's in good stead. MNC's have deep pockets, spend vast sums on R&D, carve core competencies for themselves, come out with innovative products, maintain quality, and fix low prices for their products.

International businesses are in a position to take advantage of location economies. An MNC can locate its subsidiary in any part of the world where cost of production is the lowest. If American and Canadian firms invest in Mexico or European companies go to China or India, the motive behind such move is to take advantage of the low cost of labour in those countries. China has proved to be a low wage country. Its wage rates are a third of Mexico and Hungry and five percent of those in U.S or Japan.

Course Credits: 4

Course Outcomes **Contact Hours**: 48 Hrs

CO 1: The students will be able to identify and define the Meaning, Nature, importance and types of International Business.

CO 2: It will make the students able to understand the International business environment and the theories related to it.

CO 3: It will make the students able to analyse the Modes of Entry in international market, Marketing Mix, Factors Affecting Decision For International Business.

CO 4: The students will be able to evaluate the trends in International Trade and Documentation

Unit I: Global Operations & Logistics: Evolution and Design

Forces of Globalization; operations and logistics: application and objectives; Strategic role of operations and logistics; the strategic framework; flow management; global operations and logistics: an integrated approach; the concept of an operations and logistics strategy; the strategicprocess.

Unit II : The globalization of Operations and Marketing Strategies

The four driving forces of globalization process; global market, technological , cost, political and

macroeconomic forces; changing consumer behavior; global versus local marketing; functional integration of logistics and operations; the global product; sectorial integration: Manufacturer/distributor; efficient consumer response (ECR); The need for a global marketing approach; current and future challenges.

Unit III: Global Operations and Logistic Planning

The evolving concept of outsourcing; the importance of channels of distribution in physical distribution; the architecture of a physical distribution network in a globalised operations approach; logistic service firms and Third Party Logistics; demand, volatility, information distortion and the Bullwhip Effect in supply chains; from domestic to global supply chains: added complexities and uncertainties; vertical integration issues in global supply chains.

Unit IV : Risk Management in Global Operations

Operating exposure to exchange rate; risk and its management; the concept of operating exposure; managing operating exposure; pricing strategies for exporting firms; use of operationalflexibility to minimize operating exposure; global sourcing strategies under exchange rate uncertainty; impact of exchange rates and classification of hedging strategies in global sourcing; basic function of foreign exchange markets; micro and macro level strategies for managing exchange rate risk.

Unit V: Effective Management of Global Operations and Logistics

The global LIS/LITS (Logistics Information system/Global Logistics and Telecommunications System); characteristics of LITS; Logistics organization and its relationship with LITS; Functional and geographic dimensions of LITS; Operations and logistics control: key activities need performance information; measuring performance in functional integration; new organizations related to manufacturing and logistics operations; the organizational implications of sect oral logistics co-operation; the international factor in global organizations.

Recommended Book

- Global Operations and Logistics: Text and Cases by Dornier, Ernst, Fender and Kouvelis published by John Wiley and Sons

Reference Books

- International Business, 2nd Edition by Roger Bennett published by Pearson Education.
- International Business, 3rd Edition by K Aswathappa published by Tata McGraw Hill Publishing Company Limited, New Delhi
- International Business by Hill and Jain, Sixth Edition published by Tata McGraw Hill Publishing Company Limited, New Delhi
- International Business: Environment and operations, 11th Edition by Daniel, radebaugh and Sullivan published by Pearson Education.

MBA Sem-IV

Performance Appraisal and Evaluation (MGTM-406H)

Objective

To acquaint the student to develop an understanding of the performance management of employees and its implications. Study of performance management that aid in motivation, employee development and productivity improvement to meet organization goals.

Course Credits: 4 **Contact Hours**: 48 Hrs

Course Outcomes:

CO1: Define the of issues related to the performance evaluation or rewarding Human Resources in the Corporate Sector, public services and other forms of organizations.

CO2: Understand the importance of performance appraisal and informed them of how organizations manage performance.

CO3: Apply the skills for handling the issues relating to not only appraising staff but also managing their performance.

CO4: Analyse the skills in designing, analyzing and restructuring compensationpackages related systems, policies and strategies.

CO5: Evaluate the strategic role of HR in executing compensation packages for business excellence.

Unit I

Introduction to Performance Management, Definition, nature, scope, importance, Business and sub functional Performance Management, Performance Management as a management Tool, Performance objectives and standards, Standards of Performance. Performance Domains and dimensions.

Unit II

Performance Planning Process, Contents of Performance Plan, 8 Step Model, Individual and Group Performance Planning, Role clarity and Job description.

Meaning of Performance appraisal, methods and approaches to performance appraisal, Obstaclesin appraisal, Designing appraisal for better results, Performance Appraisal Interview, Potential Appraisal.

Unit III

Introduction, Definition, Purpose and Role of appraisal in Performance Management, Methods and Steps in Performance Appraisal. Why Appraisal Fail, Types of Appraisal, Approaches and Design, MBO, 360*, Potential Appraisal, Performance Review, Performance counseling/ Mentoring. Team Performance Appraisal.

Unit IV

Introduction to PMS, Importance, Features, Process of Building PMS, PMS Dimensions, Conceptual Framework. 4 pillars of PMS, PMS Prism, Strategic Performance Management, Performance and Strategy linkage, Components of SPM, SPM- Balanced Score Card, SPM and Metrix, SPM Environment teatre and Risks.

Unit V

Competency Based Performance Management System, Performance Measurement, Performance Measurement through BSC, Performance and Succession Plan/ Career Development,

International Performance Management, Performance Audit, Human Resource Valuationaccounting and Audit.

Recommended Book:

- D. K. Bhattacharya, Performance Management Systems and Strategies- Text book, Pearson.

Reference Books:

- Aquinis, Performance Management, Pearson.
- Chadha, Performance Management, Macmillan.
- Armstrong, Michael, Baron, Jaico, Performance Management.
- Cardy, Performance Management, PHI.
- Kohli, Deb, Performance Management, Oxford.
- D Sharma, Performance Management, HPH.
- R.K. Sahu, Performance Management System, EB.
- TV Rao, Performance Management and Appraisal, Sage.

MBA- SEM IV

Global Brand Strategy (MGTM-404I)

Objective

- To help the students appreciate the relationship between Corporate Strategy and Product and Brand Management.
- To provide a framework to understand the new product development process, the organizational structures for new product development and product management functions within an organization.

Course Credits: 4 **Contact Hours**: 48 Hrs

Course Outcomes:

CO1: Identify the steps in brand building.
CO2: Use techniques for brand positioning.
CO3: Measure and interpret brand performance.
CO4: Design and implement brand strategies.
CO5: Analyze and suggest solutions for brand problems.

Unit-I: Evolution of Global Branding:

Colonialism- a major force of globalization and created a multitude of cross-border trade links.The Second World War- new consumer brands came to Europe and Asia. Big push for branding - erosion and subsequent demise of communism.The fall of the Berlin Wall-opened up previously inaccessible markets to foreign brands in Eastern and Central European markets, other markets such as Chile and South Africa.Opening up of China- a massive market and a massive production location for U.S, Japanese and European Brands.

Unit-II: Defining a Global Brand:

A brand-a construct and not a living and breathing organism. Brands- created, stimulated and applied by people working in organizations seeking to create worthwhile experiences for their customers that will induce behavior beneficial to the organization. Global brands- as brands that are available across multiple geographies, without specifying any lower limit or any continental requirements.

Unit-III: The Brand Environment:

The brand environment- brand's own expression, perception and recognition-surrounded by internal and external factors that have an influence on the brand. Operation of a brand in an environment-the elements of the strategic planning cycle and, on the other hand, organizational conventions, competitive forces, market structures, cultural factors, consumer motivation and media attention; the lenses and filters through which consumers perceive and experience the brand.

Unit-IV: The Management of Global Brands:

Local brands versus a global brand-multiple markets; a conflict between finding an optimum fit of the brand with local circumstances, and the desire to obtain brand consistency across markets; global and local brand management-a common basis for their brand strategy and planning. Common basis-a shared language, definitions, interpretations, assessments and most importantly a clear understanding of the relationships between the factors that shaped a brand in its global and local context; success and failure of global brands; the global brand proposition model-the internal and external analysis; emerging market firms and branding.

Recommended Book

- Global Marketing with a special Indian focus by SvendHollensen and Madhumita Banerjee, 4th edition, published by Pearson
- Global Marketing by Johny K Johansson, 4th edition published by Tata McGraw Hill Publishing Limited, New Delhi

MBA-SEM IV

Industrial Relations (MGTM-405H)

OBJECTIVE:

Industrial relations constitute one of the most delicate and complex problems of the modern industrial society. This paper has been made keeping in mind all kind of Industrial relation problems and how to handle them effectively. The objective of this paper is to develop a conceptual and practical framework of Industrial relations i.e. Relationship between employee and management.

Course Credits: 4 **Contact Hours**: 48 Hrs

Course Outcomes

CO1: Learners will recognize the concept of performance management in organizations.
CO2: Learners will realize the Industrial Disputes and its related concepts.
CO3: Learners will aspire about the Trade Union, Collective Bargaining and Worker's Participation in Management.
CO4: Learners will comprehend Employee Discipline, Grievance Handling and also Industrial Related Laws in India.

Unit I

Industrial Relations- Concept and scope, Stake holders; Approaches to Industrial Relations; Labor Market, Demand and Supply of Labor, Nature and composition of Indian labor, Employment and Unemployment Scenarios.

Unit II

History: Evolution of Industrial Relations UK), Emergence of Industrial relations/ Trade Union movement in India, Government initiatives, Industrial relations machineries, ILO and its impact on Indian IR scenarios.

Unit III

Industrial Disputes resolutions: Sources – Wages, service conditions and discipline, Concept of wages, Wage theories, wage differentials, Regulations for protection of wages, service conditions and Work discipline. Law of natural justice and domestic enquiries; Workers participation in Management, Works committees, Joint Councils.

Unit IV

Industrial Conflict: Negotiation, Mediation/ Conciliation, Arbitration, Adjudication- Labor court, Industrial Tribunal, National Tribunal; Special reference to Pay Commissions.

Unit V

Trends: Globalization and its impact on Industrial Relations, Employee Engagement practices, current trends in Industrial Relations in India, Industrial Relations bill- ifs and buts, Ethics, governance and Industrial Relations.

Recommended Book

- P. N. Singh, Neeraj Kumar, Employee Relations Management, Pearson.
- Personnel Management and Industrial Relations, P.C. Tripathi, Sultan chand and sons.

RAFFLES UNIVERSITY

ALABBAR SCHOOL OF MANAGEMENT
RAFFLES UNIVERSITY, NEEEMRANA

Bachelor of Business Administration (BBA 3 Years)

Programme Objectives (PO)

The objectives of BBA Programme are:

PO1: To remember the conceptual knowledge with an integrated approach to various functions of management.

PO2: To develop leadership and communication skills to become successful business leaders and managers.

PO3: To encourage and develop critical thinking, analysis and initiative ability skills.

PO4: To develop problem-solving skills through experiential learning and innovative pedagogy to ensure utilization of knowledge in professional careers.

PO5: To apply the various concepts, theories and models in the area of HR, Marketing, Finance.

PO6: To develop a positive attitude and life skills to become a multi facet personality with a sense of environmental consciousness and ethical values.

Programme Learning Outcomes (PLO)

The expected outcomes after completing the program would be:

PLO1: Management knowledge: Acquire adequate knowledge through principles, theory and models of business management, Accounting, Marketing, Finance, IT, Operations and Human

Resource.

PLO2: Communication: Demonstrate proficiency for Business Communication for effective and professional business management.

PLO3: Technical Knowledge: Acquire employability skills through practical exposure of IT and its usage in management.

PLO4: Investigation of Business Problems: Analyze and comprehend the applicability of management principles in solving complex business issues.

PLO5: Entrepreneurial Perspective: Develop entrepreneurial skills to become an entrepreneur.

PLO6: Environment and Sustainability: To build perspective about global environment including cultural, social and sustainability issues.

PLO7: Leadership Skills: Ability to develop group behavior and lead a team to achieve the individual, group and organizational goals.

PLO8: Ethics: Understand importance of ethics in business decision-making and inculcate the spirit of social responsibility.

PLO9: Global Perspective: Comprehend the applicability of management principles in the situations pertaining to global business world.

PLO10: Area Specific Expertise: Apply various concepts, theories and models in the functional areas of business like Marketing, HR and Finance in the Organizations.

PLO11: C**ross-Disciplinary Integration and Strategic Perspective**: Acquire and apply knowledge of economics, mathematics, statistics and production and operation management and its integration relevant to business decisions.

PLO12: Legal Knowledge: Obtain legal knowledge of various business operations for effective decision-making.

Program Specific Outcomes (PSO)

PSO1 Acquire Practical learning through summer internship, industrial visit and Business Plan etc.

PSO2 Demonstrate analytical and problem-solving skills through core elective area of specialization in Finance, Human Recourse, and Marketing to solve the business issues.

PSO3 Understand and develop the new dimensions of knowledge through open electives to cater the need of the industry.

BBA
I Year: I Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	BMG1003	Business Organization	3	1	-	40	60	100	4
2.	BCM1002	Financial Accounting	3	1	-	40	60	100	4
3.	BMG1004	Principles of Management	3	1	-	40	60	100	4
4.	BMA1003	Basic Mathematics	3	1	-	40	60	100	4
5.	BCS1002	Computer Foundation Course	3	-	-	40	60	100	3
AECC									
6.	BHU1001	Functional English	3	-	-	40	60	100	3
EC									
7.	BHU1501	English Language Lab	-	-	2	80	20	100	1
8.	BCS1503	Computer Foundation Lab	-	-	2	80	20	100	1
		Total	**18**	**4**	**4**	**400**	**400**	**800**	**24**

BBA
I Year: II Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	BST2003	Business Statistics	3	1	-	40	60	100	4
2.	BEM2001	Applied Micro Economics	3	1	-	40	60	100	4
3.	BMG2008	Principles of Marketing	3	1	-	40	60	100	4
4.	BMG2009	Human Resource Management	3	1	-	40	60	100	4
AECC									
5.	BES2001	Environmental Studies	2	-	-	20	30	50	2
6.	BMG2010	Business Communication	3	1	-	40	60	100	4
SEC									
7.	BMG2503	Industrial Visit-1	-	-	-	100	-	100	1
8.	BMG2504	Comprehensive Viva-1	-	-	-	100	-	100	1
		Total	**17**	**5**	**0**	**420**	**330**	**750**	**24**

BBA

Year: III Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
THEORY									
	CORE								
1.	BCS3003	Introduction to MIS	3	-	-	40	60	100	3
2.	BMG3007	Business Environment	3	1	-	40	60	100	4
3.	BCM3006	Financial Management	3	1	-	40	60	100	4
4.	BEM3001	Macro Economics	3	1	-	40	60	100	4
GE(Choose any one)									
5.	BMG3005	Operations Management	3	1	-	40	60	100	4
6.	BCM3004	Fundamentals of Insurance							
AECC									
7.	BMG3501	Assignment on Business Problem Framing	-	-	2	100	-	100	1
SEC									
8.	BMG3503	Introduction to SPSS	-	-	4	80	20	100	2
		Total	**15**	**4**	**6**	**380**	**320**	**700**	**22**

University Mandatory Non-Credit Course									
1.	**XHUX601**	Human Values and Ethics	2	-	-	100	-	100	0

BBA
Year: IV Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	BMG4013	Business Law	3	1	-	40	60	100	4
2.	BMG4012	Behavioral Science	3	1	-	40	60	100	4
3.	BMG4014	Marketing of Services	3	-	-	40	60	100	3
4.	BMG4015	Entrepreneurship Development	3	-	-	40	60	100	3
GE(Choose any one)									
5.	BMG4006	E-Commerce	3	1	-	40	60	100	4
6.	BMG4016	Banking Operations							
AECC									
7.	BAP4501	Aptitude & Reasoning and Online Test	-	-	2	100	-	100	1
	SEC								
8.	BMG4504	Industrial Visit-II	-	-	-	100	-	100	1
9.	BSS4501	Soft Skill	-	-	2	100	-	100	1
10.	BMG4505	Comprehensive Viva-II	-	-	-	100	-	100	1
		Total	**15**	**3**	**4**	**600**	**300**	**900**	**22**

BBA
Year: V Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	BMG5001	Corporate Governance and Business Ethics	3	-	-	40	60	100	3
2.	BMG5012	International Business	3	-	-	40	60	100	3
3.	BCM5007	Direct and Indirect Taxes	3	-	-	40	60	100	3
4.	-	Specialization-1	3	1	-	40	60	100	4
Open Elective									
5.	-	Choose any one from the list of Open Electives	3	-	-	40	60	100	3
AECC									
6.	BMG5501	Summer Training	-	-	2	-	100	100	2
7.	BAP5501	Aptitude & Reasoning and Online Test	-	-	2	100	-	100	1
8.	BSS5501	Soft Skill	-	-	2	100	-	100	1
		Total	**15**	**1**	**6**	**400**	**400**	**800**	**20**

BBA
III Year: VI Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	BMG6017	Introduction to Strategic Management	3	-	-	40	60	100	3
2.	BMG6018	Marketing Communication and Advertising	3	-	-	40	60	100	3
3.	---	Specialization Paper-2	3	1	-	40	60	100	4
4.	---	Specialization Paper-3	3	1	-	40	60	100	4
Open Elective									
5.	-	Choose any one from the list of Open Electives	3	-	-	40	60	100	3
AECC									
6.	BMG6501	Project- Preparation of a Business Plan	-	-	2	100	-	100	2
SEC									
7.	BMG6505	Comprehensive Viva-III	-	-	-	100	-	100	1
		Total	**15**	**2**	**2**	**400**	**300**	**700**	**20**

List of Electives

S.No	Subject Code	Subject	Semester
Specialization Group : Marketing			
1	BMG5001-MK	Customer Relationship Management	V Semester
2	BMG6001-MK	Retailing	VI Semester
3	BMG6002-MK	Sales & Distribution Management	VI Semester
Specialization Group :Finance			
1	BCM5001-FM	Security Analysis and Portfolio Management	V Semester
2	BCM6001-FM	Indian Financial System	VI Semester
3	BCM6002-FM	Cost and Management Accounting	VI Semester
Specialization Group : Human Resource			
1	BMG5001-HR	Basics of Labour Laws	V Semester
2	BMG6001-HR	Performance Appraisal and Compensation	VI Semester
3	BMG6002-HR	Team Building and Leadership	VI Semester
Specialization Group : International Business			
1	BMG5001-IB	Export Import Procedure and Documentation	V Semester
2	BMG6001-IB	International Logistics Management	VI Semester
3	BMG6002-IB	International Finance	VI Semester
Specialization Group : Family Business			
1	BMG5001-FB	Business Analysis and Development Planning	V Semester
2	BMG6001-FB	Management of Funds for Small Business	VI Semester
3	BMG6002-FB	Managing Growing and Exiting the New Venture	VI Semester

Open Elective: Choose any one from the list of Open Electives

List of Open Electives

S. No.	Subject	Subject Code	Semester
1	International Trade Blocks and Multilateral Agencies	BMG5001-OE	V
2	Strategic Human Resource Management	BMG5002-OE	V
3	Stock and Commodity Markets	BMG5003-OE	V
4	Organizational Change and development	BMG5004-OE	V
5	Tourism Management	BMG6001-OE	VI
6	Digital Marketing	BMG6002-OE	VI
7	Rural Marketing	BMG6003-OE	VI
8	International Trade	BMG6004-OE	VI

BBA
Syllabus

BBA
I Semester

BUSINESS ORGANIZATION
BMG1003

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):

CO1) Students would understand the concept of commerce, trade and industry.
CO2) They would be able to differentiate between various forms of business organizations.
CO3) They would be prepared with the knowledge of financing the business from various sources.

Course learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1) Remember and understand the basics of Business and Business Organization. Understand and analyze the components and objectives of Business, Role of business in the present-day Society, Trade, Industry and Commerce. Remember and understand the concepts of joint Hindu family and Sole proprietorship

CLO2) Remember and understand the Forms of business organizations: Understand and evaluate Partnership Firm. Remember and understand the concept of Company. To understand creating Memorandum of Association, Articles of Association and Prospectus

CLO3) Remember and understand the Co-operative Society. Analyze and apply requisites of an Ideal Form of Business Organization .Analyze and applying sources of Business Finance in small business models

CLO4) Understand the importance and role of Business Combinations. Remember and understand Rationalization. Understand and analyses Stock Exchanges

UNIT - I **(10 Hours)**

Introduction:

Business: Meaning, Nature and Importance, Components and Objectives of Business of Business,

Meaning and Role of Business Organization in the present-day Society. Trade, Industry and Commerce.

Sole Proprietorship – Meaning, Merits, Limitations, Social utility and future;

Joint Hindu Family: Meaning, Features, Merits and Demerits.

UNIT - II **(10 Hours)**

Forms of business organizations:

Partnership Firm – Meaning, Characteristics, Partnership Deed, Registration of a firm, Merits and Demerits, Features of Limited Liability Partnership (LLP);

Company – Definition, Characteristics, Incorporation of a Company, Private and Public Company, Merits and Demerits, Memorandum of Association, Articles of Association and Prospectus.

UNIT - III **(10 Hours)**

Co-operative Society – Meaning, Features, Importance, Merit and Limitations Requisites of an Ideal Form of Business Organization; Criteria for the Choice of Business Organization; Comparison of Various Forms of Business Organizations

Sources of Business Finance: Sources of Long Term, Medium Termand Short-Term Business Finance.

UNIT - IV **(10 Hours)**

Business Combinations: Meaning, Causes, Types and Forms of Combinations;

Advantages and Evils of Combination

Rationalization: Concept, Objectives, Causes, Principles, Benefits of Rationalization

Stock Exchanges – Meaning, Functions of Stock Exchanges

TEXT BOOKS

T1. Singh, B. P.& Chhabra, T. N.: "An Introduction to Business Organisation & Management"; Kitab Mahal, Allahabad

REFERENCE BOOKS:

R1. Prakash, Jagdish: "Business Organisation & Management"; Kitab Mahal, Allahabad

R2. Basu; "Business Organization and Management", TMH, New Delhi

R3. Gupta, C. B.; "Modern Business Organization", Mayur Paper Backs,New Delhi

R4. Mishra, N.; "Modern Business Organization", Sahitya Bhawan, New Delhi

R5. Lele, R. K. & J. P.Mahajan; "Business Organization", Pitambar Publishing Company, New Delhi

R6. Bhushan, Y.K.; "Fundamentals of Business Organization", Sultan Chand and Sons, New Delhi

R7. Shukla, M. C. & Gulshan, S. S.; "Business Organization", Sultan Chand and Sons, New Delhi

R8. Varadarajan, B. & Mahajan, G. P.; "Business Organization", Pitambar Publishing Company, New Delhi

Course learning outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Remember** and **understand** the basics of Business and Business Organization. Understand and **analyse** the components and objectives of Business, Role of business in the present-day Society, Trade, Industry and Commerce. Remember and understand the concepts of joint Hindu family and sole proprietorship	1,2,4 Remember, Understand, Analyse
CLO2	**Remember** and **understand** the Forms of business organizations. Understand and **evaluate** Partnership Firm. Remember and understand the concept of Company. To understand **creating** Memorandum of Association, Articles of Association and Prospectus	1,2,5,6 Remember, Understand, Evaluate, Create
CLO3	**Remember** and **understand** the Co-operative Society. **Analyse** and **apply** requisites of an Ideal Form of Business Organization. Analyse and applying sources of Business Finance in small business models	1,2,3,4 Remember, Understand, Apply, Analyse
CLO4	**Understand** the importance and role of Business Combinations. **Remember** and understand Rationalization Understand and **analyse** Stock Exchanges	1,2,4 Remember, Understand, Analyse

Mapping of CLOs with PLOs and PSOs

Course Learning Outcomes	Program Learning Outcomes(PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	L	H		M	L		H	L		L		L	H	M	
CLO2	M	L		L			M			L	L	H	M	M	
CLO3	M			M			L			M			M	L	L
CLO4	L			M									L	L	

H: High M:Medium L:Low

FINANCIAL ACCOUNTING
BCM1002

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):

CO1) To understand the conceptual knowledge of financial accounting and apply the process of double entry system in recording and analyzing business transactions.

CO2) To apply the methods of charging deprecation and valuation of stock.

CO3) To prepare the final accounts of a business.

CO4) To understand the accounting procedure for the preparation of bank reconciliation statement, bills of exchange and consignment accounts.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO 1) Define and Understand the accounting principles and recording of business transactions in Journal. Prepare ledgers and subsidiary books.

CLO 2) Understand and Apply the various methods of charging depreciation and valuation of stock. Prepare trial balance and evaluate the different errors in trial balance.

CLO 3) Understand the needs of preparing financial statements. Prepare and analyze the financial statements of a business with adjustment entries

CLO 4) Prepare and analyze the bank reconciliation statement, bills of exchange, and consignment accounts.

UNIT - I **(8 Hours)**

Conceptual Framework of Accounting:

Definition of Accounting, Accounting as an information system Accounting-Principles, Concepts and Conventions,

Accounting standards in India Journal and Ledger

Subsidiary Books

UNIT – II **(10Hours)**

Accounting Mechanism:

Depreciation-Meaning, Causes and Needs

Methods of Depreciation – Fixed Installment Method and Diminishing Balance Method

Provisions and Reserves

Trial Balance, Rectification of Errors

Meaning, Definition and Uses of Stock in a Business

Valuation of Stock: LIFO, FIFO and Weighted Average Method

UNIT – III Preparation of Final Accounts **(12 Hours)**

Final Accounts I- Trading & Profit and Loss Account

Final Accounts II- Balance Sheet

Accounts of Non-profit Organizations

UNIT – IV **(10 Hours)**

Accounting for Special Transactions:

Bank Reconciliation Statement

Bill of Exchanges Consignment Accounting

TEXT BOOK:

T1. Shukla, S.M. & Gupta, S.P.; "Advanced Accounting", Vol 1, Edition2008, Sahitya Bhawan Publications, Agra.

REFERENCE BOOKS:

R1. Maheshwari, S.N.: "Financial Accounting", Sultan Chand, New Delhi

R2. M.C. Shukla, T.S. Grewal, and S.C. Gupta," Advanced Accountancy"; S Chand & Sons

R3. A.N. Agarwala, "Higher Sciences of Accounting", Kitab Mahal,Allahabad

R4. R.L. Gupta & M. Radhaswamy, "Financial Accounting", Sultan Chand, New Delhi

R5. Hanif & Mukherjee, "Financial Accounting", Tata McGraw Hill, NewDelhi

R6. Shukla, M.B., "Financial Accounting", Kitab Mahal, Allahabad

R7. Shah, Paresh; "Basic Financial Accounting", Oxford university Press, (Forthcoming)

R8. Arulanandan, Raman & Srinivasan; "Advanced Accountancy",Revised Edition-2, Himalaya Publishing House

R9. Dr. V.K. Goyal; "Financial Accounting", 2nd Edition, Excel Books,2008 (Reprint)

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Define and Understand** the accounting principles and recording of business transactions in Journal. **Prepare** ledgers and subsidiary books.	1, 2, 3 Remember, Understand, Apply
CLO2	**Understand** and **Apply** the various methods of charging depreciation and valuation of stock. **Prepare** trial balance and **evaluate** the different errors in trial balance.	2, 3, 5, Understand, Apply, Evaluate
CLO3	**Understand** the needs of preparing financial statements. **Prepare** and **analyze the** financial statements of a business with adjustment entries,	2, 3, 4 Understand, Apply, Analyze
CLO4	**Prepare** and **analyze** the bank reconciliation statement, bills of exchange, and consignment accounts.	3, 4 Apply, Analyze

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H									M				M	L
CLO2	H									M				M	L
CLO3	H			L						M				M	L
CLO4	H			L						M				M	L

H: High M: Medium L: Low

PRINCIPLES OF MANAGEMENT

BMG1004

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):

CO1) To familiarize the students with the conceptual framework of Management.

CO2) To enable students to understand the concept of planning and decision making.

CO3) To outline the various methods of performance appraisal and training.

CO4) To provide an insight about conflict and controlling.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1) Gain insight about various management styles and apply them in real business conditions and understand their implications.

CLO2) Understand the process of staffing, performance appraisal and training. Analyze and apply the best management practices in the organization.

CLO3) Analyze and evaluate the various issues and challenges arises due to organizational conflict. And making the decision effectively and efficiently for achieving organizational goal.

CLO4) Determine and Construct various controlling measures to solve various problems.

UNIT - I **(10 Hours)**

Introduction to Management: Definition, importance, functions; Nature-as profession, science and art, universality of management; Levels of management; managerial skills and tasks.

Evolution of Management Thought: Contribution of Taylor and Fayol, Neo-classical School- Human Relations approach and Behavioral science approach; Modern School-Systems approach and Contingency approach

UNIT - II **(10 Hours)**

The Planning Function: Concept, importance, types, steps, premises barriers to planning and remedial measures: Strategic planning –concepts; Forecasting-concepts .

The Complexities of Decision Making: Meaning of a decision, Types of decision, Steps in rational decision making, Common difficulties in decision-making.

Challenge of Organization: Concepts, importance, types ,process, principles of organizing.

UNIT - III **(10 Hours)**

Staffing: Importance and need of proper staffing, Manpower planning, Job analysis, Recruitment, Selection, Placement, Induction (Orientation).

Performance Appraisal: Introduction, Meaning of performance appraisal, purpose and criteria of performance appraisal and its different methods.

Training, Development: Types of training program, Advantages of training program, Selection and evaluation of training methods.

UNIT - IV **(10 Hours)**

Motivational Theories & Applications: Concepts of motivation, its importance, contribution of McGregor, Maslow's and Herzberg's. Reward system: Incentives(Financial and non- Financial)

Controlling: Introduction and scope of control, Types of control, steps of control, process and need of control, Limitation of control

Organizational Conflict: Levels of Organizational conflict, Stages of conflict, Causes of conflict, its prevention and resolution.

TEXT BOOKS:

T1. Robbins, DeCenzo, "Fundamentals of Management",(1995) Prentice Hall Publishers.

T2. "Management", by Kinicki and Williams Irwin McGraw Hill

REFERENCE BOOKS:

R1. "Training In Interpersonal Skills" by Stephen P.Robbins and Phillip L. Hunsaker Koontz and Weirich.

R2. Drucker, PF, "Management challenges for the 21st century"-Butterworth Oxford

R3. Luthans, F, "Organisationalbehaviour" –Tata McGraw Hill New York.

R4. Allen, LA, "Management and Organisation"-Tokyo

R5. Stoner and Freeman, "Management"—Prentice Hall, New Delhi.

R6. Griffin, RW, "Management", HoughtanMiffin, Boston.

R7. ParagDeewan, "Management, Principles and practices"-Excel Books.

R8. JwalkarGhanekar and Bhivpathaki, "Principles and Practices of management"- Everests publishing house.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy
CLO1	Gain insight about various management styles, **choose** and **apply** them in real business conditions and **understand** their implications.	1,2,3 Remembering understanding Applying
CLO2	**Understand** the process of staffing, performance appraisal and training. **Analyze** and **apply** the best management practices in the organization.	2, 3 Understand, Applying Analyzing
CLO3	**Analyze** and **evaluate** the various issues and challenges arises due to organizational conflict. And making the **decision** effectively and efficiently for achieving organizational goal.	4, 5 Analyzing, Evaluating
CLO4	**Determine and construct** various controlling measures to solve various problems.	5,6 Evaluating , Creating

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M		L							M				L	
CLO2	H		M							H				L	
CLO3	H		H	L	L					H		L		H	
CLO4	H		H	L	L					H		L		H	

H: High M: Medium L: Low

BASIC MATHEMATICS

BMA1003

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):
CO 1) To understand the basics of Quadratic Equation andProgression.
CO 2) To understand the basics of Matrix and Determinant.
CO 3) To know the principles of Differentiation and Integration
CO 4) To understand about Business Mathematics

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:
CLO1) Understanding and Applying the quadratic equation and progression.
CLO2) Recall, Understand and Evaluating the matrix and determinate.
CLO3) Recall, understand, analyzing the matrix and determinate.
CLO4) Remembering and understanding about business mathematics. Evaluating Ratios, Profit and loss, Interest etc.

UNIT-I: QUADRATIC EQUATION& PROGRESSION (10 Hours)

General form of a Quadratic Equation with real coefficient, relation between roots and coefficient of a Quadratic Equation, discriminant and nature of roots of a Quadratic Equation. Arithmetic progressions, Arithmetic means, Geometric progression, Geometric means, Sum of geometric series.

UNIT-II: MATRIX& DETERMINANT (10 Hours)

Determinants, Minor and cofactor of the elements of a determinant, Properties of determinant, Matrices, Types of matrices, Algebra of matrices, Transpose and Adjoint of a square matrix, finding inverse of a matrix through adjoint, Solution of system of linear equations using matrix inversion method.

UNIT-III: DIFFERENTIATION & INTEGRATION (12 Hours)

Differentiation of function (excluding trigonometric functions), Rules of differentiation of sum, product and division of functions, differentiation of implicit function, second order differentiation, Maxima and Minima of functions of one variable, Methods of integration – by substitution, by parts.

UNIT-IV: BUSINESS MATHEMATICS (08 Hours)

Ratio, Proportion, Percentage, Profit and loss, Problems involving cost price and selling price, Simple interest, Compound interest.

TEXT BOOKS:

T1. J.K. Sharma "Business Mathematics", ANE Books Pvt. Ltd. New Delhi.

T2. D.C. Sancheti and V.K. Kapoor, "Business Mathematics", Sultan Chand and Sons.

REFERENCE BOOKS:

R1. V.K. Kapoor "Essentials of Mathematics for Commerce and Economics", Sultan Chand.

R2. R. D. Sharma, "Mathematics" Dhanpat Rai Publications.

R3. Dr. K. L. Gupta, "Business Mathematics", Navneet Prakashan.

R4. Qazi Zameeruddin, "Business Mathematics", Vikas Publishing House Pvt Ltd.

Course Learning Outcome (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Understanding** and **Applying** the quadratic equation and progression.	2, 3 Understanding, Applying
CLO2	**Recall, Understand Evaluate** the matrix and determinate.	1, 2, 5, Recall, Understanding, Evaluating
CLO3	**Recall, understand, analyzing** the matrix and **determinate.**	1,2,4, 5 Remembering, Understanding, Analyzing, Evaluating
CLO4	**Remembering a**nd **understanding** about business mathematics. **Evaluating** Ratios, Profit and loss, Interest etc.	1, 2, 4,5 Remembering, Understanding, Analyzing, Evaluating

Matching of PLOs and CLOs:

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1				H					L	M	H		L	H	L
CLO2			L	H					L		H		L	H	L
CLO3			L	H							H		L	H	L
CLO4				H							H		L	H	L

H: High M: Medium L: Low

COMPUTER FOUNDATION COURSE
BCS1002

L	T	P	C
3	0	0	3

(40 Hours)

Course Learning Objectives(CO):

CO1) To analyze the need for dataorganization.

CO2) To develop the understanding of software concept.

CO3) To Understand Basics of Internet.

CO4) To analyze word, power point and excel concept.

Course Learning Outcomes (CLOs): On completion of this course,

the students will be able to

CLO1) Recall and understand all the concept of peripheral devices, Analyzing the role of data and information .

CLO2) Understand the concepts of IPO cycle .Analyze input, output components.

CLO3) Applying word processing concepts ,power point concepts. Analyze animation features and components.

CLO4) Understand spreadsheet environment. Analyze chart and table data. Applying formula to sort and filter data.

UNIT - I **(08 Hours)**

Basics of Computer and its Evolution: Definition of Computer, Data and Information, Characteristics of computers, Advantages and Limitations of computer, Different Generation of computers various fields of computer, Block diagram of computer, Function of different units of computer, Classification of computers, Number Systems and their Inter-conversion.

UNIT - II **(08 Hours)**

Input and Output Devices: Keyboard, Mouse, Joystick, Digitizer, Scanner and its types, Touch Screen, Monitor, Printer and it's type, Plotter and its use.

Computer Memory: Primary Memory (ROM and it's types – PROM, EPROM, EEPROM, RAM) Secondary memory- SASD and DASD Concept, Magnetic Disks, Hard disks, CD & DVD, flash memory.

UNIT - III **(08 Hours)**

Operating System Concept: Introduction to operating system; Function of OS, Types of operating systems, Introduction to windows operating system and android.

Disk Operating System: DOS and its need, History of DOS, GUI and CUI, Sub-directory, Internal and external Commands.

UNIT - IV **(08 Hours)**

Concept of Data Communication and Networking: Networking concepts, Types of Networks (LAN, MAN, WAN), Simplex, Half Duplex and Full Duplex, Internet, Intranets, Extranets, Topology, Types of Topology.

UINT-V **(08 Hours)**

Different Topics of Computer: Software, Types of software, Computer Languages, History of Computer Language, Types of Computer Language, Compiler and Interpreter, File System, Database management concepts.

TEXT BOOKS:

T1. Thareja, "Computer Fundamental & Programming in C", Oxford University Press.

T1. P.K. Sinha, "Computer Fundamentals", BPB Publication.

T2. Turban, Rainer and Potter (2003). "Introduction to Information Technology". John Wiley & Sons.

REFERENCE BOOKS:

R1. Quantum, "MS Office Project", Pearson Education.

R1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley.

R2. Elmasri, Navathe, " Fudamentals of Database Systems", Pearson Education.

R3. A.S. Tanenbaum, "Computer Networks", Pearson Education.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Recall** all the concept of internet, **Analyzing** the role of data and information .	1, 4 Remembering, Analyzing,
CLO2	**Understand** the concepts of IPO cycle .**Analyze** input, output components.	2, 4 Understanding, Analyzing,
CLO3	**Applying** word processing concepts, power point concepts. **Analyze** animation features and components.	3, 4 Applying, Analyzing,
CLO4	**Understand** spreadsheet environment. **Analyze** chart and table data. **Applying** formula to sort and filter data.	2, 3, 4 Understanding, Applying, Analyzing

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	L									M			L		
CLO2		M								M				M	
CLO3			H							M					M
CLO4	L									M	H				L

H:High M: Medium L: Low

FUNCTIONAL ENGLISH

BHU-1001

L	T	P	C
3	0	0	3

(40 Hours)

Course Learning Objectives (CO):

CO1) To improve student's written and oral communication skills in English.
CO2) To help them acquire professional and interpersonal skills to attain both their career and organization needs.
CO3) To make the students apply effective communication skills in a variety of public and interpersonal settings.
CO4) To help the students to develop reasoning, analytical and research skills.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1) Recall the basics of grammar without error. The students will list the usage of parts of speech and avoid the common errors in spoken and written communication. The students will summarize and develop the appropriateness of grammar in speech and writing and use English language correctly and effectively.

CLO2) Analyze information learnt about communication to become a good communicator. The students will assess the types, flows and levels of communication and effectively plan an appropriate level of communication developing interpersonal skills. The students will be acquainted with LSRW (Listening, Speaking, Reading and Writing) skills as well.

CLO3) Distinguish between the process of listening and hearing. The students will choose the accurate way of communicating effectively by becoming an effective listener as well. The students will design a well-equipped communication channel by not only becoming a good speaker but also a good listener and will be well acquainted with LSRW (Listening, Speaking, Reading and Writing) skills.

CLO4) Compare the usage between reading and writing skills and evaluate the importance of both the skills to make process of communication successful and will improve language comprehension ability. The students will construct an accurate way to share their views and ideas in a professional and competent manner by acquainting themselves with LSRW (Listening, Speaking, Reading and Writing) skills.

UNIT I **(10 HOURS)**

COMMON ERRORS AND CORRECT USE OF TENSE

Common Errors related to various Parts of Speech—Noun, Pronoun, Adjective, Adverbs, Preposition, Conjunction, Articles, etc.; Verbs & Verbal's, Time and Tense, Tense Sequence, and Conditionals.

UNIT II **(08HOURS)**

READING COMPREHENSION AND PROFESSIONAL WRITINGS

Reading Comprehension, Précis Writing and Expansion, Note Making &Note Taking; Paraphrasing, Letter Writing, Job Application, Press Notes, Short Reports (Letter and Memo form of Report), Article Writing.

UNIT III **(08HOURS)**

COMMUNICATION BARRIERS AND VOCABULARY BUILDING

Communication Skills &Barriers, Organization of Speech, Developing Conversational Ability; The Process of Listening, Types of Listening; Vocabulary Building—Word Formation, One-word Substitution, Antonyms, and Synonyms.

UNIT-IV **(07HOURS)**

BODY LANGUAGE AND PROFESSIONAL ETIQUETTES

Personal appearance, Body Language at Job Interview, Time Management, Dos' & Don'ts of Interview, Proxemics, Chronemics, Olfactics; Basic Etiquettes,
Telephone Etiquettes, Telephone Language, Interview Etiquettes/Skills, Attentiveness, Meeting & Greeting, Introducing Yourself, Personality Traits.

UNIT V **(07HOURS)**

SPEECH DELIVERY AND PRESENTATION SKILLS

Group Discussion, Extempore, Debate, Situational Conversation; Presentation Strategies: Audience Analysis, Locale, Planning/Making PPT, Speech Delivery, etc.

Text Books

T1: Ramesh, G. and Ramesh, M. "The ACE of Soft Skills: Attitude, Communication and Etiquette for Success" Pearson Education India, 2010

T2: Raman, M. and Sharma, S. "Technical Communication: Principles and Practice" Oxford University Press.

T3: Sinha, R.P. "Current English Grammar and Usage with Composition"Oxford University Press, New Delhi

T4: Kaul, A. "Business Communication" (2nd Edition) PHI Learning Pvt. Ltd.

REFERENCE BOOKS:

R1. Lesiker, R.V. et al., "Business Communication", Tata Mc-Graw Hill

R2. Brians, P."Common Errors in English Usage", Franklin, Beedle& Associates, 2003

R3. Nitin, B. "Communicative English for Engineers and Professionals", Pearson Education India, 2010

R4. Bakshi, R.N. "A Course in English Grammar", Orient Longman

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to

CLO	Description	Bloom's Taxonomy Level
CLO1	**Recall** the basics of grammar without error. The students will **list** the usage of parts of speech and avoid the common errors in spoken and written communication. The students will **summarize** and **develop** the appropriateness of grammar in speech and writing and use English language correctly and effectively.	1,2,3 Remembering, Understanding, Applying
CLO2	**Analyze** information learnt about communication to become a good communicator. The students will **assess** the types, flows and levels of communication and effectively **plan** an appropriate level of communication developing interpersonal skills. The students will be acquainted with LSRW (Listening, Speaking, Reading and Writing) skills as well.	4 , 5 Analyzing, Evaluating,
CLO3	**Distinguish** between the process of listening and hearing. The students will **choose** the accurate way of communicating effectively by becoming an effective listener as well. The students will **design** a well-equipped communication channel by not only becoming a good speaker but also a good listener and will be well acquainted with LSRW (Listening, Speaking, Reading and Writing) skills.	3,4,5 Applying Analyzing, Evaluating,
CLO4	**Compare** the usage between reading and writing skills and **evaluate** the importance of both the skills to make process of communication successful and will **improve** language comprehension ability. The students will **construct** an accurate way to share their views and ideas in a professional and competent manner by acquainting themselves with LSRW (Listening, Speaking, Reading and Writing) skills.	3,4,5 Applying, Analyzing, Evaluating

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLO's)														
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO 7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO1 2**	**PSO1**	**PSO2**	**PSO3**
CLO1		M		M		M	M		M	M			M	M	
CLO2		H		M		M	H	M	M	M		H	M	M	
CLO3	M	H		H		M	H	M	M	M		H	M	M	
CLO4	H	M		M		M	H	M	M	M		H	M	M	

H: High M: Medium L: Low

ENGLISH LANGUAGE LAB
BHU 1501

L T P C 0 0 2 1

Course Learning Objectives (CO):

CO1) To develop skills like effective communication, team spirit, presentation, interpersonal skills, and corporate etiquette
CLO 2) To improve the diction and pronunciation of the students.
CLO 3) To impart training and confidence for public speaking
CLO 4) To enhance overall personality of the learner.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1) Understand the nuances of language use, pronunciation, and the various connotations of language. Explain and discuss the various language-oriented activities.
CLO2) Demonstrate the language skills and apply it in formal communication and literary texts. Determine speaking practice.
CLO3) Define the concept of the activity, demonstrate the presentation skills. Explain and discuss the construction of the activity in various fields.
CLO4) Illustrate the nuances of Public Speech and Interview skills. Discuss the various levels of public speech and interview Skills. Demonstrate the interview skills in order to examine the confidence
CLO5) Define the purpose of group discussion and debate, demonstrate the discussion skills. Explain and discuss the construction of the activity in various fields.

LIST OF ACTIVITIES

1. **PRONUNCIATION PRACTICE** **(2 lab days)**

   i. Sounds of English
   ii. Syllable
   iii. Accent
   iv. Intonation
   v. Pronunciation Practice

2. **SPEAKING PRACTICE** **(2 lab days)**

   i. Phenomenon Description
   ii. Live commentary
   iii. Process Description
   iv. Routine and Properties
   v. Future Plans
   vi. Story Telling

3. **PRESENTATION** **(2 lab days)**
   i. Use of Power Point Presentation
   ii. Salient Features of Effective PPT
   iii. Slide Making
   iv. Delivery
   v. Practice

4. **PUBLIC SPEECH** **(1 lab day)**
   i. Use of Public Speech
   ii. Salient Features of an Effective Speech
   iii. General Challenges
   iv. Audience Analysis
   v. Persuasion Techniques: Ethos, Pathos, Logos
   vi. Body Language, Tone, and Delivery
   vii. Speech Practice

5. **INTERVIEW** **(1 lab day)**
   i. Making an Effective CV
   ii. Preparation for an Interview
   iii. Interview Etiquettes
   iv. Most Common Interview Questions
   v. Mock Interview

6. **GROUP DISCUSSION** **(2 lab days)**
   i. Purpose
   ii. GD Etiquettes
   iii. Rules and Techniques
   iv. GD Practice

7. **DEBATE** **(1 lab day)**
   i. Purpose
   ii. Rules and Techniques
   iii. Debate Practice

8. **SITUATIONAL CONVERSATION** **(2 lab days)**
   i. At Hotel
   ii. At the Air-Port
   iii. At Bank
   iv. At Shop
   v. At Workplace

TEXT BOOKS:

T1. Beebe, S.A.*et al*. "Communication: Principles for Lifetime"(3rd edition), Pearson

T2. Raman, M. and Sharma, S. "Technical Communication: Principles and Practice" Oxford University Press

T3. Sethi, J. and Dhamija, P.V. "A Course in Phonetics and Spoken English"(2nd Ed.),PHI Learning Pvt. Ltd

REFERENCE BOOKS:

R1. Hencock, M. "English Pronunciation in Use", Cambridge University Press.

R2. Carter, R. "Seeing Through Language: A Guide to Styles of English Writing", Blackwell Publications,

R3. Balasubramanian, T. "A Textbook of Phonetics for Indian Students", Macmillan

R4. Humes, J.C."Speak Like Churchill, Stand Like Lincoln: 21 Powerful Secrets of History's Greatest Speakers",Three Rivers Pre

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Understand** the nuances of language use, pronunciation, and the various connotations of language. **Explain** and **discuss** the various language-oriented activities.	2, 5, 6 Understanding, Evaluating, Creating
CLO2	**Demonstrate** the language skills and **apply** it in formal communication and literary texts. **Determine** speaking practice.	2,3, 5 Understanding, Applying, Evaluating
CLO3	**Define** the concept of the activity, **demonstrate** the presentation skills. **Explain** and **discuss** the **construction** of the activity in various fields.	1, 2, 6 Remembering, Understanding, Creating
CLO4	**Illustrate** the nuances of Public Speech and Interview skills. **Discuss** the various levels of public speech and interview Skills. **Demonstrate** the interview skills in order to **examine** the confidence	2, 5,6 Understanding, Evaluating Creating,
CLO5	**Define** the purpose of group **discussion** and **debate, demonstrate** the discussion skills. **Explain** and discuss the construction of the activity in various fields.	1, 2, 6 Remembering, Understanding Creating

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLO's)														
	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO7**	**PLO 8**	**PLO 9**	**PLO10**	**PLO11**	**PLO 12**	**PSO1**	**PSO2**	**PSO3**
CLO1	L	H	M	H	H	H	M	H	H	H	M	M	H	M	M
CLO2	L	H	M	H	H	M	M	H	M	H	M	M	H	M	M
CLO3	L	H	M	H	H	M	H	H	H	H	M	M	H	M	H
CLO4	M	H	L	H	H	H	H	H	H	H	M	M	H	M	H
CLO5	M	L	H	M	H	H	H	M	M	H	H	M	H	M	M

H: High M: Medium L: Low

BBA

II Semester

COMPUTER FOUNDATION LAB
BCS1503

L	T	P	C
0	0	2	1

Course Learning Objectives (CO):

CO 1) To analyze the need for peripheral devices of computersystem.
CO 2) To develop the understanding of software concept.
CO 3) To Understand Basics of MS Office.
CO 4) To analyze word, power point and excel concept.

Course Learning Outcomes (CLOs) : On completion of this course, the students will be able to:

CLO 1) Recall and understand all the concept of peripheral devices, Analyzing the role of data and information.
CLO 2) Understand the concepts of MS.Office .Analyze input, output components.
CLO 3) Applying word processing concepts ,power point concepts. Analyze animation features and components.
CLO 4) Understand spreadsheet environment. Analyze chart and table data. Applying formula to sort and filter data.

Lab 1-Introduction to Peripheral Devices of Computer
Lab 2- Introduction to Windows, Software, Start Menu, Desktop etc
Lab 3- Working with Note Pad, Word Pad, Paint and Accessoriesoptions
Lab 4- Introduction to Internet and surfing
Lab 6- Introduction to Control Panel and Options
Lab 5- Introduction in DOS Commands
Lab 7- Working with MS Word
Lab 8- Working with PowerPoint

Lab 9- Working with MS Excel
Lab 10- Creation of a Database Using MS Excel

REFERENCE BOOKS:

R1. Quantum, "MS Office Project", Pearson
R2. Microsoft Word 2003 Step By Step (PHI Pvt.Ltd.).
R3. Microsoft Excel 2003 Step By Step (PHI Pvt. Ltd.).
R4. Microsoft PowerPoint2003 Step By Step (PHI Pvt. Ltd.).

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Recall** and **understand** all the concept of peripheral devices, **Analyzing** the role of data and information .	1,2, 4 Remembering, Understanding, Analyzing,
CLO2	**Understand** the concepts of MS.Office. **Analyze** input, output components.	2, 4 Understanding, Analyzing,
CLO3	**Applying** word processing concepts ,power point concepts **Analyze** animation features and components.	3, 4 Applying, Analyzing,
CLO4	**Understand** spreadsheet environment. **Analyze** chart and table data. **Applying** formula to sort and filter data.	2, 3, 4 Understanding, Applying, Analyzing

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	L		L							M			L		
CLO2		M								M				M	
CLO3			H							M					M
CLO4	L		L							M	H		L		L

H: High M: Medium L: Low

BUSINESS STATISTICS
BST 2003

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):

CO1. Explain and evaluate about central tendency and dispersion.
CO2. Evaluate the relationship between variables by correlation and regression.
CO3. Describe about various permutation and combinations and explain about Probability.
CO4. Compare various Probability Distributions and tell about their properties.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Explain measures of central tendency, variability and dispersion.
CLO2. Compute the correlation coefficient of random variables and formulate regression equations.
CLO3. Simplify the probability of events, their Permutations and Combination.
CLO4. Analyze and evaluate Binomial, Poisson and Normal Distribution.

UNIT-I: **(9 Hours)**

Measures of Central Tendency

Measures of Central Tendency – Arithmetic Mean, Median, Mode, Geometric Mean. Measures of Dispersion, Range, Quartile, Mean Deviation, Standard Deviation, Coefficient of Variation, Skewness and Kurtosis.

UNIT-II: **(9 Hours)**

Curve Fitting

Fitting of the Curves by method of least square – Straight line, parabola, Correlation and Regression, Meaning of correlation & regression, Coefficient of Correlation, rank correlation, Simple Regression (Linear).

UNIT-III: **(14 Hours)**

Probability Theory

Permutations, Combinations, Probability Theory- definitions of probability, Dependent, independent and compound events, Addition and multiplication theorems of probability, conditional probability, Baye's theorem, Mathematical expectation and its properties.

UNIT-IV: **(8 Hours)**

Distributions

Probability Distributions-Discrete distributions – Binomial & Poisson distributions and their properties. Continuous distributions – Distribution function, Probability density function, Normal distributions and their properties.

TEXT BOOKS

T1. Bhat B.R., Srivenkataramana T. and Rao Madhava K.S. (1996) Statistics, A Beginner's Text, Vol. I and II, New Age International (P) Ltd.

T2. Goon A.M., Gupta M.K. and Das Gupta B. (1991) Fundamental of Statistics, Vol. I, World Press, Calcutta

REFERENCE BOOKS

R1. Snedecors G.W. and Cochran W.G. (1967): Statistical Methods, Iowa State University Press.

R2. Mood A.M., Greybill F.A. and Bose D.C. (1974): Introduction to the Theory of Statistics, McGraw Hill.

R3. Spiegel M.R. (1967): Theory and problem of Statistics, Schaum's Publishing Series.

R4. Meyer P.L. (1970): Introductory Probability and Statistical Applications, Addision Wesley.

R5. Parzen E. (1960): Modern Probability Theory and its Applications, Wiley Eastern.

R6. Hogg R.V. and Craig A.T. 91972): Introduction to mathematical Statistics, Amerind Publishing Co.

R7. Hoel P.G. (1971): Introduction to Mathematical Statistics, Asia Publication

R8. Rohtagi, V.K. (1967) An Introduction to Probability Theory and Mathematical Statistics, John Wiley and Sons.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Explain** measures of central tendency, variability and dispersion	2 Understand
CLO2	**Compute** the correlation coefficient of random variables and formulate regression equations	3 Apply
CLO3	**Simplify** the probability of events, their Permutations and Combination	4 Analyze
CLO4	**Analyse and Evaluate** Binomial, Poisson and Normal Distribution.	4,5 Analyse, Evaluate

Mapping of CLO with PLOs and PSOs

COURSE LEARN--ING OUT-COMES	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1				H									H		
CLO2											H			H	
CLO3											H			H	
CLO4										H				H	H

-H igh, M-Medium, L-Low

APPLIED MICRO ECONOMICS
BEM2001

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):

CO1. To understand the scope and basic concepts of economics.
CO2. To understand the concept of supply and demand.
CO3. To evaluate the features of different kinds of markets and also analyze the real aspects of managerial decision-making process also.
CO4. To understand various market structures along with their business issues and strategy formulation process for each of them. Illustrate the real-world business and aspects of business cycle with a systematic theoretical framework.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Remember, Understand, and analyze the link between business economics and business decision, the economic environment in which business entities operate

CLO2. Develop the Understand of how managerial decisions can be vary under different constraints that each economic environment places on a manager's pursuit of its goals, focusing on analyzing the functioning of markets and the economic behavior of firm.

CLO3. Realizing the importance of demand forecasting and method of demand forecasting **analyze** the real aspects of managerial decision making process.

CLO4. Evaluating and Demonstrate various production theories and **Explain** the meaning of Marginal, average, total revenue, and Marginal, average and total cost and its implication. **Implement** various market structures along with their business issues and strategy formulation process for each of them

UNIT - I **(8 Hours)**

Introduction to Applied Micro Economics:

Nature, Scope and Significance of Business Economics; Role of Business Economist; Relationship of Business Economics with other branches of Knowledge. Objectives of the firm. Concepts of demand, supply and equilibrium price and quantity. Restoration of equilibrium after price shocks.

UNIT – II **(12 Hours)**

Theory of Consumer Behavior:

Demand function and demand; factors affecting demand; Law of Demand; Elasticity of Demand: Concept and Measurement; Price, Income, Cross and Advertising Elasticity; Significance of Elasticity of Demand.

Demand Forecasting Techniques.

Utility, Total, Marginal and Average Utility. Diminishing Marginal Utility and Equi-Marginal Utility; Marginal rate of substitution; Indifference Maps- Meaning, properties and determination of Consumer's Equilibrium; Consumer's Surplus.

UNIT - III **(12 Hours)**

Theory of the Firm:

Concept of Production function; Laws of Variable Proportion; Average, Total and marginal product; Returns to Scale; Cobb-Douglas and CES forms of production functions; Isoquant Maps; Marginal Rate of Technical Substitution; firm equilibrium by output maximization; Marginal Revenue and Elasticity of demand.

Cost functions; Total, Average and Marginal Costs; Economies of Scale; firm equilibrium and cost minimization.

UNIT - IV **(8 Hours)**

Different Types of Market Structures:

Concept; types of markets; Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly; characteristics and price determination under each structure.

Cost-Volume-Profit analysis , Product-life-cycle and pricing.

TEXT BOOK:

T1. D.N. Dwivedi, "Managerial Economics",Vikas Publishing House (2008), 7th edition

REFERENCE BOOKS:

R1. Mithani, D. M.; "Managerial Economics- Theory and Application", Himalaya Publishing House, Mumbai, fifth Revised Edition, 2009

R2. Maheshwari, K. L. & Varshney, R. L.; "Managerial Economics", 18th Revised Edition andEnlarged Edition, 2004, Sultan Chand and Sons, New Delhi

R3. Gitika, Ghosh Piyali & Choudhary P.R., "Managerial Economics", TMH, New Delhi, 3rd reprint 2010.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Remember, Understand, and analyze** the link between business economics and business decision, the economic environment in which business entities operate	1,2,4 Remembering, Understanding, Analyzing
CLO2	**Develop the understand** of how managerial decisions can be vary under different constraints that each economic environment places on a manager's pursuit of its goals, focusing on analyzing the functioning of markets and the economic behavior of firm.	2,3,4 Understanding Applying Creating
CLO3	**Realizing** the importance of demand forecasting and method of demand forecasting **analyze** the real aspects of managerial decision-making process.	2,4 Understanding, Analyzing
CLO4	**Evaluating and Demonstrate** various production theories and **Explain** the meaning of Marginal, average, total revenue, and Marginal, average and total cost and its implication. **implement** various market structures along with their business issues and strategy formulation process for each of them.	2,4,5 Understanding, Analyzing, Evaluate

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H	H		H			M		H	M	H		L	H	
CLO2	H	H	M	H	H		M		H	M	H	M	L	H	
CLO3	H	H	M	H	H		M		H	M	H	M	L	H	
CLO4	H		M	H	H		M		H	M	H		L	H	

: High M: Medium L: Low

PRINCIPLES OF MARKETING
BMG2008

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):

CO1. To introduce students to the various dimensions of marketing and the methods of targeting the elements for maximum mileage.

CO2. To facilitate students to place their knowledge in a frame to comprehend how each element Contributes to the potency and effectiveness of a marketing plan.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Define and explain the fundamental concepts of marketing and its environment.
CLO2. Demonstrate and categorize the marketing strategies for the companies
CLO3. Assess and conclude the product, price, place and promotion framework of any company.
CLO4. Design and develop strategies for new product development

UNIT – I **(8 Hours)**

Marketing Concepts – Approaches to Marketing ,Core concepts of marketing, Process & Functions of Marketing

Marketing Environment– Components of marketing environment**, t**he changing marketing environment – Analyzing needs and trends in Macro and Micro Environment.

Industrial goods and services vs Consumer goods & services

Marketing Mix – Four P's, Its significance in the competitive environment

UNIT – II **(10 Hours)**

Market Segmentation – Basis for market segmentation of consumer goods, Industrial goods and services

Target Market Strategies : Aggregation Strategy, Focus (Single Segment) Strategy, Multiple Segment Strategy

Positioning strategies: Select the positioning concept, Designing the dimension conveyingposition, Coordinate positioning.

UNIT –III **(12 Hours)**

New Product Decision Process – Types of new products – Test Marketing of a new product, Packaging – Purpose, Types and New Trends in packaging.

Product and Product Line – Product Mix – Product Life Cycle – Managing the product in Product Life Cycle and different strategies for each stage of the PLC.

Pricing: importance, different methods of pricing, objectives, factors affecting pricing.

UNIT - IV **(10 Hours)**

Physical Distribution – Importance and role of distribution in marketing – Introduction to the various channels of distribution,

Promotion and its Tools –Definition, significance in marketing. Sales Promotion, Advertising, Personal Selling, Direct Marketing and Online Marketing.

Marketing Ethics

TEXT BOOKS:

T1. "Marketing Management" - Philip Kotler
T2. "Marketing Management Text and Cases"-Biplab Bose
T3. "Marketing Management" - V.S.Ramaswamy and S.Namakumari

REFERENCE BOOKS:

R1. "Marketing" - Stanton,,MichaelEtzel,Walker(Tata)
R2. "Principles of Marketing 9th Edition" - Philip Kotler and GaryArmstrong
Marketing - Bovee and John Thill
R3. "Marketing Models" - Lilien&Kotler&Moorthy
R4. "Case Studies in Marketing" – Indian context - R.Srinivas
R5. "Marketing Management Text And Cases in Indian Context"-Dr.K.Karunakaran
R6. "Marketing Management" -S.A. Sherlekar13th Edition

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Define** and **Explain** the fundamental concepts of marketing and its environment.	1, 2 Remembering, Understanding
CLO2	**Demonstrate** and categorize the marketing strategies for the companies.	3, 4 Applying, Analyzing
CLO3	**Assess** and **conclude** the product, price, place and promotion framework of any company.	5 Evaluating
CLO4	**Design** and **develop** strategies for new product development.	6 Creating

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)			
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M		M			L		M	H				H	M	
CLO2	H	L		M					L	H				H	M	
CLO3	H	L		M			L			H				H	M	
CLO4	H	M		H			L		M					H	M	

H: High M: Medium L: Low

HUMAN RESOURCE MANAGEMENT

(BMG2009)

L	T	P	C
3	1	0	4

((40 Hours)

Course Learning Objectives (CO) -

CO1. To understand the scope of HRM for any industry. CO2. To differentiate between recruitment and selection. CO3. To formulate the competency-based pay structure. CO4. To discover various methods of performance appraisal.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Define the role of HR managers in understanding various dynamics of human resource environment.

CLO2. Make use of training methods and their advantages and disadvantages to evaluate various training methods.

CLO3. Create the various trends of compensation and explain the influence of a good compensation system on human capital.

CLO4. Analyze the various traditional and modern methods of performance appraisal along with their implementation.

UNIT-I (10 Hours)

- Nature and Scope of HRM. HRM and competitive advantage.
- Changing environment of HRM
- Role and qualities of an HR manager

Concept of international HRM.

UNIT –II (10 Hours)

Job analysis: Concept, and collecting data for it.

Job descriptions and job specifications.

HRP - Planning and forecasting HR needs.

Recruitment- Internal and outside sources of candidates. Workforce diversity.

Selection – Introduction and process of selection.

UNIT-III (10 Hours)

Employee orientation.

Training: process and methods

Concept of performance management.

Methods of performance appraisal

UNIT-IV **(10 Hours)**

Nature and objective of compensation management, Components of Pay structure in India. Competency based pay and other trends in compensation management and Fringe benefits. . Individual and Team based incentives.

Retirement and policy, VRS.

TEXTBOOK:

T1. Human Resource Management**,** VSP Rao, 2nd ed. Excel books.

REFERENCE BOOKS:

R1. Human Resource Management, Dessler and Varkkey, 11th ed., Pearson.
R2. Human Recourse management by K. Aswathappa Mc Graw Hill education(2013).
R3. Human Resource management by C. B Mernoria
R4. Aswathappa K - Human Resource and Personnel Management (Tata McGraw Hill.).
R5. Ivansevich – Human Resource Management (Tata McGraw Hill)

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Define** the role of HR managers in **understanding** various dynamics of human resource environment.	1, 2 Remembering, Understanding
CLO2	**Make use of** training methods and their advantages and disadvantages to **evaluate** various training methods.	3, 5 Applying, Evaluating
CLO3	**Create** the various trends of compensation and **explain** the influence of a good compensation system on human capital.	2, 6 Understanding, Creating
CLO4	**Analyze** the various traditional and modern methods of performance appraisal along with their implementation.	4 Analyzing

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H	H		M		H	H	H	M	H		M			H
CLO2	H	H	M					M		L			H		L
CLO3	H	H							L	L		L	L		
CLO4	H	H	M												

H: High M: Medium L: Low

ENVIRONMENTAL STUDIES
(BES2001)

L	T	P	C
2	0	0	2

Course Learning Objectives (CO):

CO1. To tell some introductory knowledge on concepts and general principles regarding environment.
CO2. To illustrate role of education, religions, cultures, movements and sustainable developmental Activities in ecological preservation.
CO3. To aim at understanding the sources, effects and control measures of pollution of air, water, land, noise, solid wastes and also creating awareness on globally recognized environmental challenges.
CO4. To examine the role of ways, legal methods and accountabilities in safeguarding environment.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Recall, analyze and respond on the basic understanding of their environmental complexes.

CLO2. Understand and analyze the ways education, social movements and fair developmental practices help in maintaining ecological balance.

CLO3. Understand and analyze various aspects of deteriorating environmental components and also prevailing environmental threats.

CLO4. Interpret and elaborate various tools viz. policies, rules/acts, mechanisms, compliances, institutions/agencies in securing the planet.

UNIT-I: (12 Hours)

Fundamentals of Environment

Definition, scope and importance of environmental studies. Concept of ecology and ecosystem- structure and function of ecosystem, types of ecosystem, degradation of ecosystem. Food chain, Food Web, Ecological Pyramids, Ecological Succession, Energy flow in ecosystem.
Biodiversity – Issues and challenges, biogeographic classification of India, endangered and endemic species of India. In situ and ex situ conservation of biodiversity.
Sustainable Development - Definition, Components, Objectives.

UNIT-II: (08 Hours)

Natural Resources & Their Management

Types – renewable and non renewable resources. Renewable resources – water, mineral, forest, land, foodand energy resources. Availability, Applications, problems, environmental effects and conservation of each type of resource.
Role of an individual in conservation of resources and its equitable use for sustainable development. Need for public Awareness.

UNIT-III: (06 Hours)

Environmental Pollution

Causes and effect of - air pollution, water pollution, soil pollution, marine pollution, noise pollution and thermal pollution.
Solid waste management – its causes and effects, of urban and industrial waste. Introduction to disaster management.

UNIT-IV: (08 Hours)

Social Issues and Environment

Basics of - Climate Change, Global Warming, Ozone Depletion & Acid Rain. Population Explosion & its consequences, Urbanization - Urban problems related to energy. Water conservation, rainwater harvesting. Conservation ethics and tradition value system of India, resources for future generation. Environmental Values – equitable use of resources. Environment and human health – environmental health, water related diseases, infectious diseases, chemicals in food.

UNIT-V (06 Hours)

Environmental Legislation & International Efforts

Introduction to - Environment Protection Act-1986, Air (prevention and control of pollution) Act-1981, Water (prevention and control of pollution) Act-1974,Wildlife Protection Act and Forest conservation Act. Pollution Control Boards & their Functions.

Text Books:

1. Text book of environmental studies for undergraduate courses – Erach Bharucha (University Press pub.)
2. Environmental Status of India by Sukumar Devotta and CV Chalapati Rao (Atlantic Publishersand Distributors P Ltd.)

Reference Books:

1. Environmental Impact Assessment Methodologies – Y. Anjaneyulu and ValliManickam(BS Publication)
2. Environmental Pollution Control Engineering – CS Rao (New Age International Pub.)

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Recall, analyze** and respond on the basic understanding of their environmental complexes.	1, 4 Remembering, Analyzing
CLO2	**Understand** and **analyze** the ways education, social movements and fair developmental practices help in maintaining ecological balance.	2, 4 Understanding, Analyzing
CLO3	**Understand** and **analyze** various aspects of deteriorating environmental components and also prevailing environmental threats.	2, 4 Understanding, Analyzing
CLO4	**Interpret** and **elaborate** various tools viz. policies, rules/acts, mechanisms, compliances, institutions/agencies in securing the planet.	5, 6 Evaluating, Create

Matching of PLOs and CLOs:

Course Specific Outcomes (CLO)	Programme Learning Outcomes (PLO)												Programme Specific Outcomes (PSO)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7		PLO8 PLO9	PLO10	PLO11	PLO12	PSO 1	PSO 2	PSO 3
CLO1	M	M	H	M	L	M	H	M	-	M	-	M	M	-	-
CLO2	M	H	H	M	L	M	H	L	H	M	M	-	-	H	M
CLO3	M	M	H	-	-	H	M	L	M	H	M	M	M	H	M
CLO4	-	-	L	H	H	-	H	-	M	H	M	M	-	-	H

H:High; M:Medium; L:Low

BUSINESS COMMUNICATION
(BMG2010)

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO)-

CO1. To provide an overview of prerequisites to Business Communication.

CO2. To put in use the basic mechanics of Grammar.
CO3. To provide an outline to effective organizational communication.
CO4. To underline the nuances of Business Communication.
CO5. To examine the correct practices of these strategies of Effective business writing

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:
CLO1. Understand the basic concepts of communication and help them to transform their communication abilities.
CLO2. To develop the students to acquire necessary skills of Business Etiquettes for handling day-to-day managerial responsibilities and evaluate the facilitators of business Communication.
CLO3. To choose their body language more correctly and impressively in accordance with an organizational requirement and international standards
CLO4. To analyze the forms of Communication and make the students to understand the verbal and non-verbal Communication and to design impressive documents.
CLO5. The students will illustrate the correct practices of the strategies of Effective business writing

Unit I (10 Hours)

Introduction to Business Communication, Characteristics of Effective Organizational Communication, Basic Forms of Communication, Process of Communication, Principles of Effective Business Communication, 7 C 's.

Unit II (10 Hours)

Barriers to Communication, Facilitators to Communication, Effective Listening, Perception & Reality, Role of Opinion, Attitudes & Beliefs, Mal-functions of communication, Business Etiquettes.

Unit III (10 Hours)

Forms of Business Communication, Written Communication, Oral Communication, Non-verbal Communication, Technology of Business Communication, Peculiarities of Communication in Indian Organizations, Conflict Management.

Unit IV (10 Hours)

Conduct of Meeting -Agenda, Notice, Notes, Minutes, Office Memorandum, Office Orders, Press Release, Business Letter Writing -Need, functions & kinds, layout of letter writing, Types of letter writing, Report writing problems, organization and techniques of writing

Text Books

T1. N Gupta, K.Jain, “Business Communication”, Sahitya Bhawan Publication

Reference Book

R1. V.K.Jain, O.Biyani, “Business Communication”, S.Chand

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Understand** the basic concepts of communication and help them to transform their communication abilities.	2 Understanding
CLO2	To **develop** the students to acquire necessary skills of Business Etiquettes for handling day-to-day managerial responsibilities and **evaluate** the facilitators of business Communication.	3, 5 Applying, Evaluating
CLO3	To **choose** their body language more correctly and impressively in accordance with an organizational requirement and international standards.	1 Remembering
CLO4	To **analyze** the forms of Communication and make the students to understand the verbal and non-verbal Communication and to **design** an impressive documents.	4,6 Analyzing, Creating
CLO5	The students will **illustrat**e the correct practices of the strategies of Effective business writing	2 Understanding

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M	M	L				M						L		
CLO2		M	M		M		L		M	L	L				
CLO3		L	L	M	M		M	M		L			L	M	
CLO4					L				L	L					
CLO5	L	M						L	L	M	M				

H: High M: Medium L: Low

INDUSTRIAL VISIT II

BMG 2503

L	T	P	C
0	0	0	1

Course Learning Objectives:
CO1: To know about the business activities and challenges that organizations come across on a routine basis.
CO2: To understand how the organizations interpret the challenges and try and find solutions to them.
CO3: To gain insights about on-ground issues and how they are dealt with inside the organization.

Course Learning Outcomes: On completion of the course students will be able to:
CLO1: Identify and describe the various business activities and challenges of modern World

CLO2: Illustrate and criticize the various probable solutions of the business challenges

CLO3: Examine the business activities/issues for the better decision making

CLO4: Develop and improve their critical thinking and communication skills

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify and describe the various business activities and challenges of modern World.	1, 2 Remember, Understand
CLO2	Illustrate and criticize the various probable solutions of the business challenges.	3, 4 Apply, Analyze
CLO3	Examine the business activities/issues for the better decision making.	5 Evaluate
CLO4	Develop and improve their critical thinking and communication skills.	6 Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)			
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3	PSO4
CLO1	H									L			M			
CLO2	H	M				M				M			H			
CLO3	H	M	L	L		M	L			M			H			
CLO4	H	M	L	L			M			M			H			

H: High M: Medium L: Low

COMPREHENSIVE VIVA

BMG 2504

L	T	P	C
0	0	0	1

Course Learning Objectives (CO):

CO1. To prepare comprehensively about the concept and overall knowledge of all courses.

CO2. To gain confidence and develop interpersonal skills in the relevant field.

CO3. To acquaint the students with the overall framework of management concepts in business administration.

CO4. To build professional conduct within any team activities.

.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. The students will be able to understand the concept of management principles and various dimensions.

CLO2. The students will be able to Develop problem solving skills by gathering and assessing appropriate management information.

CLO3. The students will be able to Assess management concepts, plans and decision in business administration.

CLO4. The students will be able to Analyze and build professional conduct within any team activities.

Methodology:

The confidence level, presentation and communication skills, decision-making ability and a comprehensive understanding will be assessed.

The viva voce is of 100 marks and is to be conducted by the external examiners appointed by the University. A weightage of 2 credits has been given to this to highlight its importance.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	The students will be able to understand the concept of management principles and various dimensions.	2 Understand
CLO2	The students will be able to Develop problem solving skills by gathering and assessing appropriate management information.	3 Apply
CLO3	The students will be able to **Assess** management concepts, plans and decision in business administration.	4 Evaluate
CLO4	The students will be able to **Analyze** and **build** professional conduct within any team activities.	4,6 Analyze, Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)			
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	M	M	M	H	M	H	M	H	M	M	H	H	M	
CLO2	H	M	M	M	M	M	H	M	M	M	M	H	M	M	H	
CLO3	H	H	M	H	H	M	H	M	M	M	M	M	M	M	M	
CLO4	H	H	M	H	H	H	H	H	M	H	M	M	L	M	M	

H: High M: Medium L: Low

BBA

III Semester

INTRODUCTION TO MIS

BCS3003 **L T P C**
3 0 0 3

(40 Hours)

Course Learning Objectives (CO):

CO1) To develop conceptual understanding about latest developments in the field of Information Technology and the impact of I.T. in managing a business

CO2) To understand various MIS operating in functional areas of an organization and explain its relationship with the various activities of the organization.

CO3) To understand how MIS is developed and implemented for various levels in an organization.

CO4) To learn to use Information Technology to gain competitive advantage in business.

CO5) To Explain applications as group ware, the Internet, executive information systems, telecommunications, and other organizational support technologies and relate them to solving organization problems.

Course Learning Outcomes (CLOs) : On completion of this course, the students will be able to:

CLO1) Define and Understand the concept, need and types of Information Systems and applications of Information Systems at different businesslevels.

CLO2) Illustrate concept of organizational planning and Planning Process and examine the control process in organizations.

CLO3) Understand and illustrate various networking concept and Electronic Commerce applications . Assess Risks and challenges of E-Commerce and examine use of Information System for Strategic Advantage.

CLO4) Implement, Assess and Develop Managing Information Technology in Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management.

UNIT I (10 Hours)

Introduction:

Information System and framework,
Trends in Information System,
Types of Information Systems,
Components of IS,
Concept & Role of MIS,
Decision Support Systems, Relationship between MIS & TPS,

MIS based on organizational function.

UNIT II **(10 Hours)**

Concepts of planning & control:

Concept of organizational planning,
The Planning Process,
Computational support for planning,
Characteristics of control process,
The nature of control in an organization.

UNIT III **(09 Hours)**

Business applications of Information Technology:

Web Browser, Internet Security,
Electronic Commerce,
Risks and challenges of E-Commerce,
Information System for Managerial Decision Support,
Using Information System for Strategic Advantage

UNIT IV **(11 Hours)**

Managing Information Technology:

Enterprise & Global management,
Security & Ethical challenges,
Enterprise Resource Planning,
Supply Chain Management,
Customer Relationship Management.

References:

Text Book:

T1. Laudon and Laudon, "Management Information System, Pearson.
T2. Steven Alter, "Information System the Foundation of E Business", Pearson.

Reference Book:

R1. Dr. sushila madan, "management information and control systems", TAXMANN'S .
R2. Jaiswal& Mittal, "Management Information Systems", Oxford University Press.
R3. Gordon B. Davis & Margrethe H. Olson, "Management Information System", TMH.
R4. O Brian, "Introduction to Information System", MCGRAW HILL.
R5. Murdick, "Information System for Modern Management", PHI.
R6. Jawadekar, "Management Information System", TMH.
R7. Jain Sarika, "Information System", PPM
R8. Davis, "Information System", Palgrave Macmillan.
R9. Dr. sushila madan, "information technology", TAXMANN'S .

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Blooms Taxonomy Level
CO1:	**Define and Understand** the concept, need and types of Information Systems and **applications** of Information Systems at different business levels.	1, 2,3 Remember, Understand, Apply
CO2:	**Illustrate** concept of organizational planning and Planning Process and **examine the** control process in organizations.	2,4 Understand, Analyze
CO3:	**Understand** and **illustrate** various networking concept and Electronic Commerce **applications** . **Assess** Risks and challenges of E-Commerce and **examine** use of Information System for Strategic Advantage	2, 3, 4, 5 Understand, Apply, Analyze, Evaluate
CO4:	**Implement, Assess** and Develop Managing Information Technology in Enterprise Resource **Planning**, Supply Chain Management, Customer Relationship Management.	5, 6 Evaluate, Create

Mapping of CLOs with PLOS and PSOs:

Course Learning Outcomes (CLO):	**Programme Learning Outcomes (PLOs)**												**Programme Specific Outcomes (PSOs)**		
	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PSO 1	PSO 2	PSO 3
CO 1	H		H	H				L	H	H	L	L		H	
CO 2	H		H	H				L	H	H	M	L		M	
CO 3	H		H	H				H	H	H	M	H		H	
CO 4	H	L	H	H				H	M	H	H	H		H	

H: High, M: Medium, L: Low

BUSINESS ENVIRONMENT

BMG 3007

L T P C
3 1 0 4

(40 Hours)

Course Learning Objectives (CO):

CO1) To make students aware of about various external and internal factors that impact business.

CO2) To understand the economic, cultural, legal and political issues associated with national and international business.

CO3) To develop skills on strategies formulation to effectively cope-up with Environmental challenges.

CO4) To acquaint students with the issues of domestic and global environment in which business has to operate, and to relate the impact of environment on business in an integrated manner.

CO5) To give an exposure to important commercial and industrial laws.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1) Define the environment of business in terms of factors affecting it and to analyze the impact of such factors. Determining the relationship of concurrent business environment with Strategic Management through Environmental scanning & monitoring

CLO2) Critically assessing the business environment with respect to prevailing Economic framework of a Country. Explain the role of the regulatory authorities and the principal effects of regulation upon Business.

CLO3) Identify and Analyze the existence of Business under various Policies Framework laid by Legal Environment. Formulate the potential ethical dilemmas and decisions the organization may face in relation to potential opportunities to gain competitive advantage.

CLO4) Analyze and Evaluate Global Business Environment in terms of Global Trade Policies by respective Institutions along with determining the impact and prospects of Technology in shaping Business.

UNIT -I (8 Hours)

Theoretical Framework of Business Environment:

Concept, Significance and Nature of Business Environment
Elements of Environment- Internal and External
Business Environment and Strategic Management

Techniques of Environment Scanning and Monitoring

Unit -II (10 Hours)

Economic Environment of Business:

Significance and Elements of Economic Environment
Economic Systems and Business Environment
Economic planning in India
Government Policies- Industrial Policy, Fiscal Policy, Monetary Policy, EXIM Policies
Overview of Union Budget
Economic Reforms: RBI-Role and functions, banking structure reforms.

UNIT -III (12 Hours)

Political and Legal Environment of Business:

Critical Elements of Political Environment; Government and Business
Changing dimensions of Legal environment in India; FERA, FEMA and Licensing Policy
Need for Tax Reforms GST Concepts – Advantages and Limitations of VAT– GST as the preferred Tax Structure.
GST Principles – Single GST, Dual GST – Transactions covered under GST – Impact of GST.

Social Values and Attitude, Social Responsibility of business

- Consumerism in India.

UNIT -IV (10 Hours)

International and Technological Environment

Multinational Corporations
Foreign collaborations and Indian Business
International Economic Institutions: WTO, World Bank, IMF and their importance to India
Foreign Trade Policies; Devaluation of Rupee

- Technological Environment and its impact on business

TEXT BOOKS:

R1. AC Fernando, "Business Environment", Pearson Publishing, 2011
R2. Mittal Vivek, "Business Environment", Excel Books, New Delhi, Reprint 2010.

REFERENCE BOOKS:

R1 Cherunilam Francis "Business Environment –-Text and Cases", Himalya Publishing House, 18th revised edition 2009 (reprint).

R2 Mishra S. K. and Puri V. K., "Economic Environment of Business"sixth revised edition, Himalya Publishing House, 2010.

R3 Saleem Shaikh, ''Business Environment'' Pearson, 2nd Edition, 2010.

R4Agarwal, Raj- "Business Environment", 2nd Revised Edition, 2006, Excel Books, New Delhi

R5Paul Justin, "Business Environment" –-Text and Cases, Third edition, TMH, 201

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Define** the environment of business in terms of factors affecting it and to **analyze** the impact of such factors. **Determining** the relationship of concurrent business environment with Strategic Management through Environmental scanning & monitoring.	2, 4,5 Understand, Analyze, Evaluate
CLO2	Critically **assessing** the business environment with respect to prevailing Economic framework of a Country. **Explain** the role of the regulatory authorities and the principal effects of regulation upon Business.	2, 5 Understand, Evaluate.
CLO3	**Identify and Analyze** the existence of Business under various Policies Framework laid by Legal Environment. **Formulate** the potential ethical dilemmas and decisions the organization may face in relation to potential opportunities to gain competitive advantage.	3, 4,6 Apply, Analyze, Create
CLO4	**Analyze** and **Evaluate** Global Business Environment in terms o Global Trade Policies by respective Institutions along with determining the impact and prospects of Technology in shaping Business.	4, 5 Analyze, Evaluate

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M			L									H	L	L
CLO2				M	L								L	M	M
CLO3				M	H	L			M			H	H	M	L
CLO4			M			H	M		M		L	L	L	H	M

H: High M: Medium L: Low

FINANCIAL MANAGEMENT

BCM3006

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):

CO 1) To understand the concept of financial management and identify the tools for best financial management practices.

CO 2) To acquaint the students with the skills for reporting and decision making in areas of investment, finance and dividend decisions by applying the various tools and techniques.

CO3) To give an insight about Finance manager role and responsibility and develop those skills in students. Analysis of qualitative and quantitative information needed to develop a financial plan.

CO4) To impart knowledge for efficient utilization of organization funds and evaluation of financial instruments.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1) Understanding the concept of maximization of shareholders wealth by applying financial techniques. Understanding and analyzing the real life situations in the corporate world and public sector.

CLO2) Understanding the concept of Investment Decision and Cost of capital for optimum allocation of funds. Application of evaluation criteria like Pay back period, NPV, IRR, PI etc. in decision-making.

CLO3) Developing understanding about various sources of finance and financial assets such as shares, debenture etc. Analyzing risk return characteristics of different alternative capital structure through leverage and EBIT-EPS Analysis.

CLO4) Evaluation and selection of Dividend decision that maximizes shareholders wealth. Understanding concept of Working Capital Management. Examine and formulate trade off between Liquidity and profitability for optimum utilization of fixed assets.

UNIT - I (8 Hours)

Conceptual Framework of Financial Management:

Meaning, Nature and Scope of Financial Management
Financial Goal- Profit Vs. Wealth Maximization
Role and Functions of Finance Manager

UNIT - II (12 Hours)

Investment Decision:

Investment Decisions- Nature of Investment Decisions, Investment Evaluation Criteria-Traditional Approach – Payback Period, Accounting Rate of Return (ROR), Modern Approach – Net Present Value (NPV), Internal Rate Of Return (IRR), Profitability Index (PI) and Capital Rationing

Cost of Capital: Significance of Cost of Capital, Calculation of Cost of Equity, Preference Shares, Debentures and Retained Earnings and Weighted Average Cost of Capital (WACC)

UNIT - III (11 Hours)

Financing Decision:

Sources of Business Finance: Long – Term Sources of Finance – Equity Shares, Preference Shares, Debentures and Bonds

Concept and Approaches of Capital Structure Decision: Net Income Approach (NI), Net Operating Income Approach (NOI), Traditional and Modigliani Miller Approach

Leverage Analysis – Financial, Operating and Combined Leverage; EBIT-EPS Analysis and Indifference Points

UNIT - IV (09 Hours)

Dividend Decision: Concept of Retained Earnings and Plough Back of Profits, Relevance and Irrelevance Theories of Dividend Decision: Walter's Model, Gordon's Model and Modigliani Miller Model; Factors Affecting Dividend Decision.

Working Capital Management: Concept of working capital, *c*omponents of working capital, working capital cycle, factors affecting working capital requirement, management of working capital, financing of working capital, approaches in working capital financing.

TEXT BOOK:

T1. Khan and Jain; "Financial Management- Text and Problems" Tata McGraw Hill, 6th Ed., 2012.

T2. S.A. Ross, R.W. Westerfield, J.F. Jaffe and G.S. Roberts,. Corporate Finance, McGraw-Hill Ryerson, 6th Ed., 2011.

REFERENCE BOOKS:

R1. Paresh Shah; "Financial Management", Biztantra, 2nd Ed., New Delhi, 2012

R2. Prasanna Chandra; "Financial Management Theory and Practice", TMH, 8th Ed., 2011

R3. R P Rustagi; "Financial Management: Theory, Concepts & Problem", Taxmann, 2010

R4. Lawrence Gitman "Principles of Managerial Finance", Pearson, 2010

R5. Pandey, I. M.; "Financial Management" Vikas Publishing House Pvt. Ltd, 8th Ed., New Delhi, 2010

R6. Gupta, S. P.; "Financial Management", Sahitya Bhawan Publication, 2nd revised Ed., Agra, 2009

R7. Van Horne & Wachowicz; "Fundamentals of Financial Management", Pearson, 2009

Weston Besley & Brigham, "Essentials of Managerial Finance ", W B Saunders, 1996

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Understanding** the concept of maximization of shareholders wealth by **applying** techniques of financial techniques. Understanding and **analyzing** the real-life situations in the corporate world and public sector	2,3,4 Understand, Apply, Analyze
CLO2	**Understanding** the concept of Investment **Decision** and Cost of capital for optimum allocation of funds. **Application** of evaluation criteria like Pay-back period, NPV, IRR, PI etc in decision making.	2,5,6 Understand Evaluate, Create
CLO3	Developing **understandin**g about various sources of finance and financial assets such as shares, debenture etc. **Analyzin**g risk return characteristics of different alternative capital structure through leverage and EBIT-EPS Analysis.	2, 4,5 Understand, Analyze, Evaluate
CLO4	**Evaluation** and **selection** of Dividend **decision** that maximizes shareholders wealth. **Understanding** concept of Working Capital Management. **Examine** and **formulate** trade off between Liquidity and profitability for optimum utilization of fixed assets.	2,4,5,6 Understand, Analyze, Evaluate, Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H			M	M					H				M	L
CLO2	H		H		M					H				H	
CLO3	H		H		M					H				H	
CLO4	H		M	H	L					H				H	

H: High M: Medium L: Low

MACRO ECONOMICS
BEM3001

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):

CO 1) To understand the functioning of economy at the macro level. And they can apply these concepts to their lives and to the world in which they live.

CO 2) Economic theory is useful and interesting only if it can be applied to understanding actual events in energy sector and policies. Therefore, this course gives greater understanding about economic news and issues of energy around the world.

CO 3) It helps in decision making in order to achieve desired economic goals. It enhances the capability of participants to understand the prevailing economic and business policy in totality and its impact on the energy sector.

CO 4) It improves the ability of the students to apply economic concepts to complex business realities as well as support them to forecast in the energy business.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO 1) Explain GDP by income, value added, and expenditure approach and the basic concept of budget deficit and source of financing. Evaluate economic variables used in economic context. . Analyze GDP, inflation, and unemployment, unemployment rate, consumer price index, inflation rate using basic methods.

CLO 2) Explain the sources of economic growth in long-run including government policies to raise living standard. Analyze the income determination through classical and Keynesian economics.

CLO 3) Illustrate and Discuss the basic concepts of consumption, saving, investment in closed and open economy which affects to the international finance and balance of payment. Communicate the results by data collection and synthesis.

CLO 4) Examine the role of financial market in economy. Assess the effects of policies and economic issues on domestic and foreign economy to make decision; and the use of economic policies on business cycle.

UNIT – I: (10 Hours)

Concepts of Macroeconomics

- Macroeconomics – Scope and Concepts, Nature, Importance, Limitations
- Difference between Micro and Macro Economics.
- National Income Accounting - Concepts and Measurement of GDP, GNP, NNP& NI
- Circular flow of income – Real and Nominal GDP

UNIT – II: (10 Hours)

Macro Market Analysis

- Theory of full employment and income Classical, Modern (Keynesian) approach.
- Consumption function.
- Relationship between Saving and consumption
- Savings and Investment function, Concept of Marginal efficiency of Capital and marginal efficiency of investment
- Concept of Multipliers.

UNIT – III: (10 Hours)

Money and Inflation

- Meaning and Functions of Money, Advantage and Disadvantage of Money
- Concept of demand for and supply of money
- Quantity theory of money and Keynesian theory of Demand for money
- Inflation, Deflation & Stagflation

UNIT – IV: (10 Hours)

Banking and Balance of Payments

- Balance of Payments: Concept, Balance of Trade, Difference between Balance of Payment and Balance of Trade
- Composition of Balance of Payments
- Banking-Definition and Functions of Banks, Methods of Credit Creation, Typesof Banks,
- Central Banking- Role and Functions in Developing Economy, RBI.

TEXT BOOKS:

T1. Samuelson, Nordhaus , Economics ,Tata McGraw Hill, New Delhi 2007

T2. D. N. Dwivedi, Macro Economics, Tata McGrew Hill, New Delhi

REFERENCE BOOKS:

R1. Deepshree; "Macro Economics", ANE Books Pvt. Ltd., New Delhi

R2. Branson, William H.; "Macro Economics- Theory and Policy", Harper Collins Indian Pvt. Ltd.

R3. Dornbusch, Fischer & Startz, Macroeconomics, TMH

R4. Ackley G. ,Macro Economics: Theory and Policy, Macmillan Publishing Company, New York

R5. Ahuja H.L., Macro Economics: Theory and Policy, S. Chand & Co. Ltd. New Delhi

R6. Shapiro, E., Macro Economic Analysis, Galgotia Publications, New Delhi

R7.MCVaish; Macro Economics Theory, Vikas Publishing House,2003.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Explain** GDP by income, value added, and expenditure approach and the basic concept of budget deficit and source of financing. **Evaluate** economic variables used in economic context. . **Analyz**e GDP, inflation, and unemployment, unemployment rate, consumer price index, inflation rate using basic methods.	2,4,5 Understand, Analyze , Evaluate
CLO2	**Explain** the sources of economic growth in long-run including government policies to raise living standard .**analyze** the income determination through classical and Keynesian economics.	2,4 Understand, analyze
CLO3	**Illustrate** and **Discuss** the basic concepts of consumption, saving, investment in closed and open economy which affects to the international finance and balance of payment. Communicate the results by data collection and synthesis	2,6 Understand , Create
CLO4	**Examine** the role of financial market in economy. **Assess** the effects of policies and economic issues on domestic and foreign economy to make decision; and the use of economic policies on business cycle.	4,5 Analyze, Evaluate

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H		H	H						L	H			H	
CLO2	H		M	H	H		L			L	H	M		H	
CLO3	H		M	H	H		L			L	H	M		H	
CLO4	H		H	H	H		L			L	H			H	

H: High M: Medium L: Low

OPERATIONS MANAGEMENT
BMG3005

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):

CO1) To Explain an understanding of how the operations, have strategic importance and can provide a competitive advantage in the workplace and techniques of location and facility planning.

CO2) To provide students with the basic concepts related to the Work Study, Method Study and Work Measurement.

CO3) To Illustrate the Materials Management function starting from Demand Management through Inventory Management.

CO4) To explain the concept and core values of Quality Management (QM).To Determine the voice of the customer and the impact of quality on economic performance and long-term business success of an organization.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1) To identify the elements of operations management and various transformation processes to enhance productivity and competitiveness. Explain the techniques of location and facility planning.

CLO2) To Analyze and Make use of various methods of work study, method study and work measurement.

CLO3) To define and examine the materials management function starting from demand management through Inventory Management.

CLO4) Apply various Statistical Quality Control tools including the analysis of various Quality costs and quality circles. Explain the concept of TQM.

UNIT-I (12 Hours)

Operation Management/ Location facilities

Introduction, Nature & Scope of operation management, Functions of operation, Major long terms and short terms decisions, Difference between product and services (from OM view point), Relationship of production / operations with the other functional area. Meaning and type of production system, Production to order and production to stock, Plant location, Factors affecting locations and evaluating different location, Plant layout: Meaning, objectives, Characteristics and types.

UNIT- II **(10 Hours)**

Work study

Importance of work study, Work study procedures, Introduction to method study, Objectives of method study, Steps involved in method study, Work measurement: Objectives of work measurement, Techniques of work measurement, Computation of standard time – Allowance, computation of various techniques.

UNIT – III **(8 Hours)**

Materials Management

Meaning of inventory management, Basic function of Inventory, Economic order quantity, Classification of materials – ABC analysis, VED analysis.

UNIT –IV **(10 Hours)**

Quality and Productivity

Quality – Definition, Quality control and quality assurance – the methods, TQM, Productivity: Definition, measurement and methods of improvement, Relationship between quality and productivity.

TEXT BOOK:

T1. Telsang Martand,(2011),"Industrial Engineering and Production Management", S Chand.

REFERENCE BOOKS:

R1. Russell, R.S & Bernard W. Taylor III ,(2011), "Operations Management", Wiley India.
R2. Heizer Jay, Render Barry, Rajashekhar J, (2008), "Operations Management", Pearson
R3: Norman Gaither & Greg Frazier, "Operations Management," 9th edition, Thomson-South Western
R4. Barnes, D., "Operations management: an international perspective", London: Thomson. 2008. Ebook
R5. Heizer, J. and RENDER, B., "Principles of operations management". 8th Ed. Harlow: 2011. Pearson Education
R6. Naylor, J., "Introduction to operations management".2nd Ed. 2002.Harlow: Financial Times Press
R7. Slack, N., Chambers, S. and Johnston, R. "Operations management." 6th Ed. Harlow : 2010, Financial Times Prentice Hal. ebook

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	To **Identify** the elements of operations management and various transformation processes to enhance productivity and competitiveness. **Explain** the techniques of location and facility planning.	2,3 Understand, Apply
CLO2	To **Analyze** and **Make use of** various methods of work study, method study and work measurement.	3, 4 Apply, Analyze
CLO3	To **Define** and **examine** the materials management function starting from demand management through Inventory Management.	1, 4 Remember, Analyze
CLO4	**Apply** various Statistical Quality Control tools including the analysis of various Quality costs and quality circles. **Explain** the concept of TQM.	2, 3 Understand, Apply

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1					H				H		H	H		M	M
CLO2	H		H	H	M				M				H	H	H
CLO3			M		H					H		H	L	M	M
CLO4	H		M											M	H
CLO5	M			H								H	M	M	H

H: High M: Medium L: Low

FUNDAMENTALS OF INSURANCE
BCM 3004

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives (CO):

CO 1) To understand the meaning of risk and concept of insurance

CO 2) To assess the basic mechanism behind insurance and its application in the industry.

CO 3) To provide a framework for reinsurance and other non-life insurance.

CO 4) To gain knowledge about changes in the insurance industry in pre and post liberalization era.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO 1) Understand the concept of risk and illustrate its application in the insurance industry.

CLO 2) Analyze the Process of life insurance and interpret various aspects of the settlement mechanism

CLO 3) Assess the Concept of reinsurance and non-life insurance by compiling

CLO 4) Elaborate on the Regulatory framework and provide insights into the pre and post liberalization changes which the insurance industry has adapted.

UNIT- I

(10 Hours)

Risk: concept and management.
Meaning and functions of Insurance. Classification of Insurance.
Principles of Insurance. Features of Insurance Contracts.
Types of intermediaries in the Insurance business.

UNIT- II

(10 Hours)

Basics of Life insurance.
Types of Life insurance policies.
Procedures in Life Insurance.
Settlement of Life insurance Claims.

(10 Hours)

UNIT- III

Basic features of fire, motor and marine insurance.
Procedures in Non-Life insurance.
Settlement of Life Insurance, Claims.
Concept of Reinsurance.

UNIT- IV

(10 Hours)

Evolution of the Insurance industry.
Insurance industry in India: pre and post liberalization.
Regulatory framework of Insurance industry in India.
Contemporary issues in Insurance. Ethics in Insurance.

TEXT BOOKS:

T1. Principles of risk management and insurance, Rejda, 2011, Pearson.

REFERENCE BOOKS:

R1. Principles of Insurance Management, Neelam C. Gulati, 2007, Excel Books.

R2. InsuranceManagement: Principles and Practice, Karam Pal, Bodla and Garg, 2007, Deep & Deep Publishers.

R3. Risk Management and Insurance: James. S. Trieschmann, 2000, South-Western College Pub.

R4. Corporate Risk Management: Tony Merna, 2008, Wiley Pub.

R5. Introduction to Risk Management and Insurance: Mark S. Dorfman, 9th Edition,Prentice Hall

R6. Fundamentals of Risk and Insuranc:, Vaughan & Vaughan, 10th Edition, Wiley Pub.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Understand** the concept of risk and **illustrate** its **application** in the insurance industry.	2, 3 Understand, Apply
CLO2	**Analyze** the Process of life insurance and **Interpret** various aspects of the settlement mechanism	4,5 Analyze, Evaluate
CLO3	**Assess** the Concept of reinsurance and non-life insurance by compiling	5 Evaluate
CLO4	**Elaborate** on the Regulatory framework and provide insights into the pre and post liberalization changes, which the insurance industry has adapted.	6 Create

Mapping of CLO with PLOs and PSOs

COURSE LEARN--ING OUT-COMES	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H														
CLO2	H									H				H	
CLO3	H			H						H				H	
CLO4				H						H		H		H	

H: High M: Medium L: Low

ASSIGNMENT ON BUSINESS PROBLEM FRAMING
BMG3501

L	T	P	C
0	0	2	1

Assignment on Business Problem Framing serves as an important element in the application and integration of the topics included in this course, coverage includes material and concepts that are not directly associated with the business plan. This course provides advanced analysis and decision-making concepts, tools, and techniques to be applied in a real business setting. The effective use of communication and other electronic technology is integrated throughout the course and is an important aspect of the assignment. Assignments also emphasize written and oral communication to a large extent.

Course Learning Objectives (CO) :

CO 1) To develop skills necessary for advanced analysis and understanding of decision-making concepts, tools, and techniques to be applied in a real business setting.

CO 2) To inculcate communication, presentation and leadership skills among students.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO 1) Understand and remember the various elements of decision-making concept, tools and techniques to be applied in business problems.

CLO 2) Identify and improving the writing, critical thinking, communication and presentation skills needed for explaining business problems.

CLO 3) Demonstrate and develop an insight about the business problems and apply those for their probable solutions.

List of Experiments: After the successful completion of the course, students will be able to:

Improving writing/revision skills
Improving critical thinking skills
Improving risk analysis skills
Improving research skills
Improving presentation and communication skills
Improving ability to think globally

Guidelines: This assignment is a semester-long project that will require immediate and continuous work throughout the entire 13 weeks of the semester. To help keep students on track for successful completion of the course, there will be many assignments due throughout the semester.

Course Learning Outcomes (CLOs) : On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Understand** and **remember** the various elements of decision making concept, tools and techniques to be applied in business problems.	1, 2 Remember, Understand
CLO2	**Identify** and **improving** the writing, critical thinking, communication and presentation skills needed for **explaining** business problems.	2, 3, 6 Remember Understand, Create
CLO3	**Demonstrate** and **develop** an insight about the business problems and **apply** those for their probable **solutions.**	2, 3, 6 Understand, Apply , Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M		M								M		H		
CLO2	M		L								L		M		
CLO3	M		M								H		H		

H: High M: Medium L: Low

INTRODUCTION TO SPSS
BMG3503

L	T	P	C
0	0	4	2

Course Learning Objective (CO):

CO 1) The course is designed to provide students with transferable skills

CO 2) To understand the uses of SPSS, as a tool to summarize and aid in the interpretation of research findings.

CO 3) To introduce students to the basic practice of statistics by using SPSS Statistics, a statistical software program used for data management and data analysis

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1) Remember and explain the SPSS as a data analysis tool

CLO2) Understand and apply how to work with SPSS

CLO3) Develop and demonstrate the use of SPSS to understand and interpret chart

CLO4) Understand, Examine and Formulate how to enter and reorganize information within SPSS

List of Experiments

Basics of SPSS-I

Basics of SPSS-II

Creation of Variable and entry of data in SPSS

Looking at Frequency Distributions

Analyzing Descriptive Statistics

Presenting Data in Graphic Form-Simple and 2DGraph

Presenting Data in Graphic Form-3D Graph

- Measuring the Simple Relationship between Two Variables
- Measuring the association between Two Variables
- Testing Research Hypotheses about one or more populations

REFERENCE BOOKS:

R1. George & Mallery, “SPSS for Windows step by step 17.0”, Pearson

R2. Ready, Set, GO! A Student Guide to SPSS, Thomas Pavkov, Kent Pierce, TMH.

R3. Data Analysis with SPSS, Carver and Nash, Cengage.

Course Learning Outcomes (CLOs) : On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Remember** and **explain** the SPSS as a data analysis tool	1, 2 Remember Understand
CLO2	**Understand a**nd **apply** how to work with SPSS	2, 3 Understand, Apply
CLO3	**Develop** and **demonstrate** the use of SPSS to **understand** and **interpret** chart.	**2, 5,** 6 Understand Evaluate, Create
CLO4	U**nderstand, Examine** and **Formulate** how to enter and reorganize information within SPSS	2, 4, 6 Understand, Analyze, Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H		M							M	L			M	
CLO2	H	M	M							M				H	M
CLO3	H	H	H							H	L			H	M
CLO4	M	H	M	M						M				M	L

H: High M: Medium L: Low

BBA
SEMESTER IV

BUSINESS LAW

BMG 4013

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives:

1. To understand the basic concept of business legislations
2. To analyze the different legal issues of business and to know the legal remedies to solve the problem.
3. To encourage and develop legal thinking for smooth establishment of business concern.
4. To understand the problems of consumers and to get knowledge to solve the issues related with the particular product.

Course Learning Outcomes (CLO):

1. Understand and apply the concepts of Indian Contract Act in business dealings.
2. Understand the rule of partnership as per the Partnership Act, analyze the problems of partnership firm and evaluate the method for registration of a partnership firm.
3. Understand the need of sale of goods act, apply its laws for conduction of smooth business and analyze the legal issues to solve disputes.
4. Understand the basic principles of laws related with the IT sector and analyze the issues for dispute solving machinery.

UNIT - I (12 Hours)

Indian Contract Act, 1872 (Fundamental Knowledge): Overview: Essentials of Valid Contract- Offer and acceptance, consideration, contractual capacity, free consent, legality of objects, Discharge of Contract, Remedies for Breach of Contract;
Contracts of Indemnity, Guarantee, Bailment, Pledge and Agency.

UNIT - II (10 Hours)

Sale of Goods Act 1930: Contract of sale, meaning and difference between sale and agreement to sell, Conditions and Warranties, Performance of contract of sale, difference between sale and gift, Unpaid seller – meaning and rights of an unpaid seller against the goods and the buyer, Rights of Buyer.

- **The Law of Partnership-** Meaning and essential elements of Partnership,Partnership Deed.
- **The Limited Liability Partnership Act, 2008 -** Statement of Objects and Reasons, Salient Features of LLP Act

UNIT - III (10 Hours)

- **The Negotiable Instruments Act 1881** – Meaning and Characteristics of Negotiable Instruments, Presumptions, Types of Negotiable Instruments, Promissory Notes, Bills of Exchange, Acceptance, Cheque, Crossing of a cheque, Bouncing or dishonor of cheques.

UNIT - IV (08 Hours)

- **Information Technology Act, 2000-** Definitions, Digital signature, Electronic governance, Attribution, acknowledgement and dispatch of electronic records, Regulation of certifying authorities, Digital signatures certificates, Penalties and adjudication, Appellate Tribunal, Offences. Cyber offence and its remedies.

TEXT BOOKS:

T1. Kuchhal, M. C., (2006), -Business Law|, Vikas Publishing House, New Delhi.
T2. Singh, Avtar, -Business Law|, Eastern Book Co. Lucknow, 9th Edition , Delhi.

REFERENCE BOOKS:

R1. Pathak, Akhileshwar, (2009), -Legal Aspects of Business|, 4th Edition, McGraw Hill Education.
R2. PC Tulsian, -Business Law|, Tata McGraw Hill-2nd Edition
R3. Gulshan SS, Kapoor GK, -Business Law Including Company Law|, New Age International Publication, 15 Edition.
R4. Bagrial, Ashok, (2008), -Company Law|, Vikas Publishing House.
R5. Kapoor, N. D., (2006), -Elements of Mercantile Law|, Sultan Chand & Sons, New Delhi.
R6. A.Ramaiyya, -Guide to the Companies| Act, 16th edition, Lexis NexisButterworths

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand and apply the concepts of Indian Contract Act in business dealings.	2,3 Understanding Applying
CLO2	Understand the rule of partnership as per the Partnership Act, analyze the problems of partnership firm and evaluate the method for registration of a partnership firm.	2,4,5 Understand Analyze Evaluate
CLO3	Understand the need of sale of goods act, apply its laws for conduction of smooth business and analyze the legal issues to solve disputes.	2,3,4 Understand, Apply, Analyze
CLO4	Understand the basic principles of laws related with the IT sector and analyze the issues for dispute solving machinery.	2,5 Understand Analyze

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H	M		H			M			H		L			
CLO2	H	M		M						H		M			
CLO3	H	M		H		L	L		L	M		M			
CLO4	H	M		H		H	L		H	M		M			

H: High M: Medium L: Low

BEHAVIORAL SCIENCES
BMG 4012

L T P C
3 1 0 4
(40Hours)

Course Learning Objectives:

CO1: To understanding of self and the process of self-exploration
CO2: To learn strategies for development of a healthy self esteem
CO3: To understand the importance of attitude and its effect on personality building and emotional competence.

Course Learning Outcomes: On completion of the course students will be able to:
CLO1: Understand and Apply basic knowledge about behavioral
CLO2: develop critical thinking with logical reasoning related behavioral aspects.
CLO3: Evaluate and Learn the importance of attitude
CLO4: Develop and Analyze the importance of emotions.

UNIT - I **(12 Hours)**

Individual Core Competency : Understanding Individual Behavior, Factors affecting Individual Behavior, Ways to increase self-confidence, Meaning of Personality, Personality Traits, Types of Personality, Factors affecting Personality, Concept of perception.

UNIT - II **(08 Hours)**

Techniques of self-awareness : Exploration through Johari Window, Concept of Transactional Analysis, Ego stages, SWOT analysis, Meaning of Interpersonal Behavior, Developing Interpersonal skills.

UNIT - III **(10 Hours)**

Self-esteem and building positive attitude : Meaning and importance of self-esteem, high and low self-esteem, building positive attitude , meaning and nature of attitude , components and types of attitude, relevance and importance of attitude.

UNIT - IV **(10 Hours)**

Building emotional competence and Group dynamics: Meaning, component and relevance of Emotional intelligence, positive and negative emotions, importance and need for group formation, types of groups, team building and development.

TEXT BOOK:

- Robbins Stephen P. –"Organizational Behavior" (Pearson Education, 13th edition)

REFERENCE BOOKS:

R1. Singh, Dalip, "Emotional Intelligence at work", Response books, Sage Publication ,Delhi
Chakroborty S.K. , Management by values, Oxford university press, 1991

R2. Luthans ,Fred, "Organization behavior" ,Tata McGraw Hill, New Delhi
Dressler David and Cans, Donald , "The study of Human interaction" ,U.S.

R3. Lindzey G. and Borgatta E, Sociometric measurement in the handbook of social psychology, Addison Welsey ,U.S.

R4. Preffer& company, "Theories and models in applied behavioral sciences" ,Vol -2 (1996)

R5. Fodem, Board review series or high yield behavioral sciences.

R6. Mitra, " Personality & Soft Skills development". Oxford University press, 2008.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand and Apply basic knowledge about behavioral	2 Understand , Apply
CLO2	Develop critical thinking with logical reasoning related behavioral aspects.	4 Develop
CLO3	Evaluate and Learn the importance of attitude	4, 6 Evaluate and Learn
CLO4	Develop and Analyze the importance of emotions.	2,4 Develop and Analyze

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H	M		L			H			H					
CLO2		L					M				L			M	
CLO3				H			L			H	M			L	
CLO4				L						M					

H: High M: Medium L: Low

Marketing of Services
BMG 4014

L	T	P	C
3	0	0	3

(40 Hours)

Course Objective:

CO1: To understand the theory and concepts pertaining to Services marketing.
CO2: To define the role of Services marketing and discuss its core concepts and explain the relationship among customer value, satisfaction, productivity and quality.
CO3: To enhance the ability to develop effective service marketing strategies that emphasizes the value exchange between suppliers and their customers.
CO4: To develop an understanding of the special context and techniques of the marketing of services that services play in the economy and its future.

Course Learning Outcomes: On completion of the subject, students will be able:
CLO1: Define concepts of service marketing and classify the service quality gaps.
CLO2: Describe and differentiate the service product planning, service design and services distribution framework.
CLO3: Illustrate and investigate people, physical evidence and process used in marketing of services.
CLO4: Compare and contrast the various types of services being operated in global context.

UNIT-I (12 Hours)

- Reasons for growth of service in economy. Service challenges.
- Concept, Characteristics and importance of services, Good vs. Service Categorization
- Classificationofservices.Threestagemodelofserviceconsumption.,ServiceMarketing mix-Elements of service marketing mix.(seven p's)
- Segmentation, Targeting and positioning of Services
-

UNIT-II (10 Hours)

- Service quality: measurement and improvement. Service quality Gap and Model
- Managing and designing service offerings ,Levels of Service Product, New Service Development
- Role of pricing, Steps involved in pricing, Method of pricing,

UNIT –III (10Hours)

- Designing Distribution Mix: Physical and electronic channels of distribution, Role of Marketing Communications
- DesigningServicepromotion:RoleofMarketingcommunications,Challengesofservice communications, Marketing Communication Mix
- Design of service processes, Service blueprint, uses of service blueprint, Process layout.

UNIT –IV (08 Hours)

- Managing people for service : Service Encounter, Front Line services, Service Failure and Recovery, Managing Relationships in Services
- Role of Customer in Service, SelfService
- Roleof Service Environment: Importanceand Typesof Physical Evidence in Services: Servicescape, Signage, Dimensions and role of Service Environment

TEXTBOOKS:

T1. Christopher Lovelock, Jochen Wirtz, Jayanta Chatterjee, Services Marketing, 7th ed., Pearson.

T2. Valarie A Zeithml, Bitner, Gremler, Ajay pandit, Services Marketing,4th ed.

REFERENCE BOOKS:

R1. K Rama Mohan Rao, Services marketing**,** Pearson, 2011.

R2. Customer Relationship Management- Strategic Approach, Lakshman Jha, Global India publication

Course Learning Outcomes (CLO):On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO 1	Define concepts of service marketing and classify the service quality gaps.	1 Remember
CLO 2	Describe and differentiate the service product planning, service design and services distribution framework	2,3 Understand, Analyze
CLO 3	Illustrate and investigate people, physical evidence and process used in marketing of services	3, 4 Apply, Analyze
CLO 4	Compare and contrast the various types of services being operated in global context	5 Evaluate

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)			
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3	PSO4
CLO1	L	M	M	H	H					H				H	H	
CLO2	L	M	M	H	H					H				H	H	
CLO3	L		M	H	H					H				H	H	
CLO4	L		M	H	H				H	H	M			H	H	

H:High M: Medium L: Low

ENTREPRENEURSHIP DEVELOPMENT

BMG 4015

L	T	P	C
3	0	0	3

Course Learning Objectives:

1. Understand and develop various skills required for organizing and carrying out entrepreneurial activities.
2. Develop the ability to understand and analyze various business situations.
3. Develop the ability to analyze various risks in the market and apply the coping strategies
4. Develop the ability of converting an idea into a business proposition.

Course Learning Outcomes (CLO):

1. Describe the basics of entrepreneur, its importance and entrepreneurship process. Understand and apply traits of successful entrepreneurs in doing projects.
2. Understand the kinds of feasibility analysis and evaluating business plans with respect to real life case studies. Creating business models with real life examples.
3. Understand and analyze the ethical and legal issues in entrepreneurship, employ people for the new venture, marketing challenges faced by the new venture and intellectual property rights.
4. Understanding the evolution, features, role, limitations, and types of venture capital. Analyze process of venture capital.

UNIT-I: Introduction To Entrepreneurship (05 Hours)

- Entrepreneurship and the Entrepreneurial mindset.
- Corporate Entrepreneurship.
- Generating and exploiting New Entry Opportunities.
- Role of Entrepreneurship in the economic development of a country.

UNIT –II: From Idea to Opportunity (05 Hours)

- Creativity and Innovation - development of Business Idea.
- Identifying and Analyzing Domestic and International Opportunities.
- Protecting the idea – Intellectual Property
- Deciding the legal form of Business

UNIT-III: From Opportunity to Business Plan (05 Hours)

- The Business Plan: Creating and Starting the Venture.

- The Marketing Plan.
- The Organizational Plan.
- The Financial Plan.

UNIT-IV: From Business Plan To Funding The Venture (05 Hours)

- Sources of Capital.
- Informal Risk Capital.
- Venture Capital and Going Public.
- Exploring government schemes for Entrepreneurship Promotion.

TEXT BOOKS:

T1. David H. Holt- Entrepreneurship- New Venture Creation- PHI
T2. Mathew J. Manimala, Michael P. Peters & Dean A. Shepherd Robert D. Hisrich Entrepreneurship McGraw Hill India 2014

REFERENCE BOOKS:

R1. Hisrich, Peters & Shepherd- Entrepreneurship- 6th Edition
R2. Barringer, Entrepreneurship: Successfully launching new ventures, Pearson 3rd Edition
R3. Charantimath, Entrepreneurship: Development and Small Business Enterprise, Pearson 1st Edition.
R4. PareekUdai,&VenkateshwaraRao- Developing Entrepreneurship- A Handbook on Learning Systems, Learning Systems.
R5. Clifton &Bharadwaj, Entrepreneurial Strength Finder,1st,Gallup Press,2014
R6. Siddhartha Sharma, The Millionaire Entrepreneur- Like a Boss,1st,Learners of Life Publication,2013
R7. PuneetSrivastava, Accidental Entrepreneur,1st, Rupa& Co.,2012

Course Learning Outcomes (CLO) :On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the basics of entrepreneur, its importance and entrepreneurship process. Understand and apply traits of successful entrepreneurs in doing projects.	1,2,3 Remember, Understand, Apply,
CLO2	Understand the kinds of feasibility analysis and evaluating business plans with respect to real life case studies. Creating business models with real life examples.	2,5,6 Understand, Evaluate, Create
CLO3	Understand and analyze the ethical and legal issues in entrepreneurship, employ people for the new venture, marketing challenges faced by the new venture and intellectual property rights.	2,4 Understand, Analyze
CLO4	Understanding the evolution, features, role, limitations, and types of venture capital. Analyze process of venture capital.	2,4 Understand, Analyze

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	L			L	H	L	M								
CLO2	M			M	H	M	L								
CLO3	L			L	M		L								
CLO4	L			L	M										

E Commerce
BMG 4006

L T P C

3 1 0 4

(40 Hours)

CO1. Gain an understanding of basic concepts, theories, and business models underlying e-commerce.

CO2. Apply e-commerce theory and concepts to what e-marketers are doing in "the real world."

CO3. Improve familiarity with current challenges and issues in e-commerce.

CO4. Identify advantages and disadvantages of technology choices such as merchant server software and electronic payment options.

CO5. Discuss the issues facing businesses that are considering worldwide marketing of their products and services.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Outline and Determine the processes to be executed for starting a business and the advantages of using the internet to widen reach and appeal of the organization.

CLO2. Illustrate various disciplines of Commerce, Taxation, Finance, Management and Accounts, and implement in real life business situations.

CLO3. Organize and Analyze the technical and managerial requirements of various e-commerce activities, as well as the interaction between computing and human being in the global context.

CLO4. Distinguish various technologies and Examine complex business problems to solve problems in various e- commerce activities like sales, payment, marketing, auction, etc.

UNIT- I **(10 Hours)**

The nature and importance of Entrepreneurs, The Entrepreneurial and Entrepreneurial mindset. Creating and starting a new venture- Source of new ideas, methods of generating ideas, Creative problem solving,

opportunity recognition, product planning and Development process. Legal issues for the Entrepreneur.

UNIT- II **(10 Hours)**

Electronic Commerce- Architectural Framework and network infrastructure.- Local Area Networks, Ethernet, Wide Area Networks, Internet, TCP/IP, Domain Name System, Internet Industry Structure.

UNIT- III **(8 Hours)**

Electronic Commerce- Information Distribution and Messaging- File Transfer Protocol, Electronic Mail, World Wide Web Server, HTTP. Electronic Commerce and Securing the Business on Internet- Security policies, procedures and practices. Electronic Commerce Payment Systems.

UNIT IV **(12 Hours)**

Electronic Commerce & Influence on Marketing- Product, physical distribution, price, promotion marketing communication, common e Marketing Tools. Internet Advertising- models, Banner advertising, sponsoring content, screen savers and push broadcasting, corporate website, Interstitials, Superstitious, Weakness in Internet advertising. Mobile Commerce- Introduction, Framework and Models.

TEXT BOOKS:

T1. Entreperneurship- Hirsh, Peters & Shepherd- PHI 6TH Edition

T2. Bharat Bhaskar- Electronic Commerce- Framework, Technologies & Applications- McGraw Hill, 6th Edition

REFERENCE BOOKS:

R1. Peter Cunningham, Friedrich Fröschl, Electronic Business Revolution, Springer.

R2. Dayl M. Smith, The E-business Book, Bloomberg Press.

R3. Bharat Bhaskar- Electronic Commerce- Framework, Technologies & Applications- McGraw Hill, 6th Edition

R4. Daniel Amor , The E-Business Revolution, Hewlett-Packard Professional Book

R5. F.Gerard Adams, The E-Business Revolution & The New Economy: Publishedby South-Western Educational Pub, 2004

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Outline and Determine the processes to be executed for starting a business and the advantages of using the internet to widen reach and appeal of the organization.	3, 5 Understand and Evaluate
CLO2	Illustrate various disciplines of Commerce, Taxation Finance, Management and Accounts, and implement in real life business situations.	2 Understand
CLO3	Organize and Analyze the technical and managerial requirements of various e-commerce activities, as well as the interaction between computing and human being in the global context.	3,4 Apply and Analyze
CLO4	Distinguish various technologies and Examine complex business problems to solve problems in various e- commerce activities like sales, payment marketing, auction, etc.	4 Analyze

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1					H									L	
CLO2		L											M	L	
CLO3			H								M			L	M
CLO4			H							M				M	

H: High M: Medium L: Low

Banking Operations
BMG 4016

L	T	P	C
3	1	0	4

(40 Hours)

Course Learning Objectives:

1. To acquaint students with the rationale for banking law.
2. To give them an understanding of key statutory provisions and case law.
3. To provide practical understanding of banking law and policy.

Course Learning Outcomes:

1. Remember and understand Practices and Precautions regarding opening and conduction of bank accounts and various types of relationships between a banker and customer.
2. Understand and apply knowledge of Negotiable Instruments and its uses.
3. Analysis of Banker‘s role for payment methods in case of International trade.
4. Apply and do analysis of Banker‘s secured and unsecured loans and advances.

UNIT-I (8 Hours)

The Ordinary, practice of bankers with regard to the opening and conduct of banking accounts, closing of accounts. Banker and customer – General and special relations.

UNIT –II (10 Hours)

Law relating to cheques, bill of exchange and other negotiable instruments. Discounting of Bill of Exchange, the practice relating to cheques bills of exchange and other negotiableinstruments.

UNIT –III (12 Hours)

Banker‘s credit, advance and overdrafts, Traveller cheque, letter of credit, confirmed bankers credit, unconfirmed bankers credit, acceptance credits and documentary credit.

UNIT –IV (10 Hours)

Revolving credit, banker‘s advance against marketable securities, goods & produce, debentures and life insurance policies. Unsecured advances – guarantees, precautions/ duties of Banker.

REFERENCE BOOKS:

R1. Sheldom – Practice of Banking
R2. Tannan – Law & Practice of Indian Banking
R3. Guru Datt – Trends in Indian Banking

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Remember and understand Practices and Precautions regarding opening and conduction of bank accounts and various types of relationships between a banker and customer.	1,2 Remember, Understand
CLO2	Understand and apply knowledge of Negotiable Instruments and its uses.	2,3 Understand Apply,
CLO3	Analysis of Banker's role for payment methods in case of International trade.	3, 4 Apply ,Analyze
CLO4	Apply and do analysis of Banker's secured and unsecured loans and advances.	3, 4 Apply ,Analyze

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M			H	L					M					
CLO2	H			M	L					M	H			H	
CLO3	M			M	L						M			H	
CLO4	H				L				H	M					

APTITUDE & REASONING and ONLINE TEST

BAP 4501

L	T	P	C
0	0	2	1

Course Learning Objective:

1. To enable the students to refine their mathematical, logical and analytical skills.
2. To enhance their employability skills.
3. To prepare the students for competition.
4. To give them practice sessions to increase their speed and confidence.

Course Learning Outcomes:

1. Identify their weakness for various competitive exams their quantitative and reasoning skills.
2. Examine their employability skills
3. Develop their Competitive skill.
4. Improve their quantitative and reasoning skills.

UNIT 1

LOGICAL REASONING 1 **(3 hours)**

Cube, Cuboid, Dice and Figure Problem, Venn diagram, Syllogism, Set Theory

UNIT 2

LOGICAL REASONING 2 **(3 hours)**

Puzzle Test, Matrix, Sitting Arrangement, Statement, Binary Logic

UNIT 3

QUANTITATIVE APTITUDE 1 **(6 hours)**

Mixture and Allegation, Ratio and Proportion, Problems on Ages, Time Speed and Distance, Problems on Boats and Trains, Geometry

UNIT 4

QUANTITATIVE APTITUDE 2 **(6 hours)**

Trigonometry, mensuration, algebra and linear and quadratic equations, simple and compound interest

UNIT 5

QUANTITATIVE APTITUDE 3 **(6 hours)**

Permutation and Combination, Probability, Data Interpretation

REFERENCE BOOKS:

R.S. Agarwal –Quantitative aptitude

R.S. Agarwal –A modern approach to logical reasoning

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify their weakness for various competitive exams their quantitative and reasoning skills.	3 Applying
CLO2	Examine their employability skills	4 Analyzing
CLO3	Develop their Competitive skills	6 Creating
CLO4	Improve their quantitative and reasoning skills.	6Creating

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1						H	M		L	H			M	H	H
CLO2						H	M		L	H			M	H	H
CLO3						H	M		L	H			M	H	H
CLO4						H	M		L	H			M	H	H

H: High M: Medium L: Low

INDUSTRIAL VISITII

BMG 4505

L	T	P	C
0	0	0	1

Course Learning Objectives:
CO1: To know about the business activities and challenges that organizations come across on a routine basis.
CO2: To understand how the organizations interpret the challenges and try and find solutions to them.
CO3: To gain insights about on-ground issues and how they are dealt with inside the organization.

Course Learning Outcomes: On completion of the course students will be able to:
CLO1: Identify and describe the various business activities and challenges of modern World

CLO2: Illustrate and criticize the various probable solutions of the business challenges

CLO3: Examine the business activities/issues for the better decision making

CLO4: Develop and improve their critical thinking and communication skills

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify and describe the various business activities and challenges of modern World.	1, 2 Remember, Understand
CLO2	Illustrate and criticize the various probable solutions of the business challenges.	3, 4 Apply, Analyze
CLO3	Examine the business activities/issues for the better decision making.	5 Evaluate
CLO4	Develop and improve their critical thinking and communication skills.	6 Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)			
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3	PSO4
CLO1	H									L			M			
CLO2	H	M				M				M			H			
CLO3	H	M	L	L		M	L			M			H			
CLO4	H	M	L	L			M			M			H			

H: High M: Medium L: Low

SOFT SKILLS
BSS 4501

L T P C
0 0 2 1

Course Objective (CO):

CO1) To help students do Self Analysis.

CO2) To help them strengthen their Written Communication Skills.

CO3) To teach them Professionals Skills .

CO4) Teach them Interview Skills to become job ready

Course Learning Outcome (CLOs): On completion of this course, the students will be able to

CLO1) Discuss the Importance of SWOT Examine the technique of goal setting. Compare SMART goal and SWOT Analysis

CLO2) Explain Resume and CV format. Illustrate the importance of Career Objective, Examine relevant competencies.

CLO3) Illustrate Email writing and application writing, Demonstrate Email etiquette, Evaluate practice of written application & Email.

CLO4) Explain interview skills. Demonstrate the importance and types interview, GD Skills & presentation skills, Evaluate types of interview Construct the tips for how to be creative, Compare Telephonic interview & skype interview.

UNIT I **(01 Hour)**

INTRODUCTION

Goal setting & SWOT: Technique of goal setting, SMART goals & SWOT analysis.

UNIT II

RESUME WRITING

(02 Hours)

Resume Writing: CV Format & Guidelines, Careers Objective: Framing the career Objective, finding relevant competencies – skills, aptitude and qualities, achievements, projects, internship, extracurricular activities

UNIT III **(02 Hours)**

REVISION OF WRITTEN COMMUNICATION SKILLS
Revision of application writing & e-mail Writing: Email format, Application Format, E-mail etiquette and practice of writing application & E-mails.

UNIT-IV **(09 Hour)**

PROFESSIONAL SKILLS
Personal Branding: Definition & Concept of Personal Branding, Steps to Personal Branding.
EQ & IQ: What is EQ, Difference between EQ and IQ, Major components of EQ & IQ, How to raise your EQ, relation between EQ & Success

Management Styles: Concept of Management, Level of management & the skills needed, Functions of Manager, Management styles, Leadership vs Management GD

Persuasive Skills & selling Skills: What is Persuation, Importance of Persuation in selling.

Selling Tips, Activity
Group Discussion (Abstract, Current Affairs Based, Management Related, Case Based GD): Practice of GD

UNIT-V **(10 hours)**
INTERVIEW SKILLS & CAMPUS TO CORPORATE
Interview Skills: Interview Question & Answers – Types & structuring of answers, giving relevant examples handling situational questions.
Telephonic Interview/Skype Interview Tips: Reasons for telephonic/Skype interview, rules to be observed & practice.
Mock Interview – (HR, Technical, Behavioural & Situation Based): Panel interview practice Qualities in the New Millenium Professional: Qualities needed in the New Millenium Professional Creativity: What is Creativity, How to be creative, and Importance of creativity. Creativity Developing a Business Plan.

/Biz – Quiz: Quiz on Basic Information about various companies related to their field.

TEXT BOOKS:
T1. The SWOT Analysis – Lawrence G Fine Goal setting: How to create an action plan and achieve your goals – M.S. Dobson
T2. Business Communicationth writing Improvemnt Exercises – Phyllis Davis Hemphill, Donald W. McCormick, Prentice Hall Publications
T3. Group Discussions and Interview skills – Priyadarshi Patnaik,
T4. Foundation Books the Definitive Book of Body language : Barbara & Allan Pease Bantam Publications From Campus to Corporate – Ramchandran & Karthik, Pearson Publications

REFERENCE BOOKS:

R1. Personality Development by Rajiv Mishra-2014 Edition
R2. Facing the corporate Interviews By S. Hundiwala Arihant Publications

Course Learning Objective (CLOs): On completion of this course the students will be able to

CLO	Description	Bloom's Taxonomy Level
CLO1	**Discuss** the Importance of SWOT **Examine** the techniqu e of goal setting. **Compare** SMART goal and SWOT Analysis.	Creating
CLO2	**Explain** Resume and CV format. **Illustrate** the importance of Career Objective, **Examine** relevant competencies..	2, 3, 4 Explain, Illustrate, Evaluate .
CLO3	**Illustrate** Email writing and application writing, **Demonstrate** Email etiquette, Evaluate practice of written application & Email.	2, 3, 6,6 Illustrate, Demonstrate, Evaluate,
CLO4	**Explain** interview skills. **Demonstrate** the importance and types interview, GD Skills & presentation skills**, Evaluate** types of interview **Construct** the tips for how to be creative, **Compare** Telephonic interview & skype interview.	2,3,6,6, Explain, Demonstrate, Evaluate, Debate, Compare, Construct

Mapping of CLOs with PLOs and PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)			
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CLO1		H					L				M				M	
CLO2		H					L				M				M	
CLO3		H					L				M				M	
CLO4		H					L				M				M	
CLO5		H					L				M				M	

H: High M: Medium L: Low

COMPREHENSIVE VIVA

BMG4505

L	T	P	C
0	0	0	1

Course Learning Objectives (CO):

CO1. To prepare comprehensively about the concept and overall knowledge of all courses.
CO2. To gain confidence and develop interpersonal skills in the relevant field.
C**O3.** To acquaint the students with the overall framework of management concepts in business administration.
CO4. To build professional conduct within any team activities.

.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. The students will be able to understand the concept of management principles and various dimensions.

CLO2. The students will be able to Develop problem solving skills by gathering and assessing appropriate management information.
CLO3. The students will be able to Assess management concepts, plans and decision in business administration.
CLO4. The students will be able to Analyze and build professional conduct within any team activities.

Methodology:

The confidence level, presentation and communication skills, decision-making ability and a comprehensive understanding will be assessed.

The viva voce is of 100 marks and is to be conducted by the external examiners appointed by the University. A weightage of 2 credits has been given to this to highlight its importance.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	The students will be able to understand the concept of management principles and various dimensions.	2 Understand
CLO2	The students will be able to Develop problem solving skills by gathering and assessing appropriate management information.	3 Apply
CLO3	The students will be able to **Assess** management concepts, plans and decision in business administration.	4 Evaluate
CLO4	The students will be able to **Analyze** and **build** professional conduct within any team activities.	4,6 Analyze, Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H	M	M	M	M	H	M	H	M	H	M	M	H	H	M
CLO2	H	M	M	M	M	M	H	M	M	M	M	H	M	M	H
CLO3	H	H	M	H	H	M	H	M	M	M	M	M	M	M	M
CLO4	H	H	M	H	H	H	H	H	M	H	M	M	L	M	M

H: High M: Medium L: Low

BBA
SEMESTER V

CORPORATE GOVERNANCE AND BUSINESS ETHICS
BMG 5001

L	T	P	C
3	0	0	3

Course Learning Objectives (CO): **(40 Hours)**

CO1: To inculcate in the student the ability to discern between ethical and unethical conduct.
CO2: To teach them the application of ethics to different functional areas of business.
CO3: To imbibe in them the awareness and importance of social responsibility for business.
CO4: Enlighten them about the concept and relevance of Corporate Governance in India.

Course learning outcomes (CLOs): On completion of this course, the students will be able to:

CLO1: Remember and understand concept of ethics and globalization, Business ethics: concept, scope and importance. Codes of conduct in business. Analyse the common unethical practices and ethical dilemmas

CLO2: Remember and understand the Ethics and functional areas: marketing, finance, production and operations, HRM and Information technology. Understand and evaluate work ethics, professional ethics and human values. Remember and understand the concept of corporate social responsibility

CLO3: Remember and understand the Organizational culture and ethics, Social audits, Whistle blowing, Apply ethics in business decision-making: determinants and tests. Remember and understand Environmental ethics

CLO4: Remember and understand Corporate governance: concept, importance and principles. Analyzing Corporate governance in India

UNIT I **(12 Hours)**

Concept of ethics. Ethics and globalization.

Business ethics: concept, scope and importance. Codes of conduct in business. Common unethical practices. Ethical dilemmas.

UNIT II **(10 Hours)**

Ethics and functional areas: marketing, finance, production and operations, HRM and Information technology.

Work ethics, professional ethics and human values. Corporate social responsibility-an overview

UNIT III **(8 Hours)**

Organizational culture and ethics. Social audits.
Whistle blowing.

Ethics and business decision-making: determinants and tests. Environmental ethics.

UNIT IV **(10 Hours)**

Corporate governance problems , Principle agent problem and corporate governance in India

TEXT BOOK :

T1. B N Ghosh, Business Ethics and Corporate Governance ,1st ed. TMH

REFERENCES BOOKS:

R1. Mishra and Francis, Business Ethics : An Indian Perspective, 1st Edition, TMH2009. **R2.** Business ethics and Coporate Governaence by A. C Fernando, Pearson Educati**on**

Course learning outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Remember and understand concept of ethics and globalization, Business ethics: concept, scope and importance. Codes of conduct in business. Analyze the common unethical practices and ethical dilemmas.	1,2,4 Remember, Understand, Analyze
CLO2	Remember and understand the Ethics and functional areas: marketing, finance, production and operations, HRM and Information technology Understand and evaluate work ethics, professional ethics and human values Remember and understand the concept of corporate social responsibility	1,2,5, Remember, Understand, Evaluate
CLO3	Remember and understand the Organizational culture and ethics, Social audits, Whistle blowing, Apply ethics in business decision-making: determinants and tests. Remember and understand Environmental ethics .	1,2,3,4 Remember, Understand, Apply, Analyze
CLO4	Remember and understand Corporate governance: concept, importance and principles Analyzing Corporate governance in India	1,2,4 Remember, Understand, Analyze

Mapping of CLOs with PLOs & PSOs:

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	L			M		H	L	H	H				L	L	
CLO2	H			L				H		M			L	M	M
CLO3	L			L				H		M			L		
CLO4	H			M				L					L		L

H: High M: Medium L: Low

INTERNATIONAL BUSINESS
BMG5012

L	T	P	C
3	0	0	3

(40 Hours)

Course Learning Objective (CO):

CO1: To Create an environment of learning the basic concepts of International Business. **CO2:** To Apply the knowledge gained in studying the Organizational Structure for Global business,
CO3: To Understand the Indian export documentation Process.
CO4: To Analyze the implications of global trade for India.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1: Understand the basic concepts of International Business. **Apply** the trends of global business and its impact on different economies. **Analyze** the impact of government policies in relation to the other developed economies of the world.

CLO2: Remember the trends of business around the world, **Understand** the role of international organizations in impacting the growth of business. **Analyze** the trade figures and to Evaluate the future expectations.

CLO3:Evaluate and Contrast between domestic and international markets. **Apply** the advantage of gaining knowledge of international markets to grow the national markets. **Analyze** the different types of international market intermediaries around the world

CLO4: Understand the role of international financial organization. **Evaluate** the concept of different marketing concept., **Analyze** the role of government and the basic structure of international business along with its organization to boost the business from the country.

UNIT-I **(10 Hours)**

Introduction and concept of International business, International Business v/s Domestic Business, Factors and variables involved in International Business, terms of trade, Modes of International Business: Joint venture, Turnkey Projects, FDI, Exporting, Franchise, Outsourcing.

UNIT-II **(10 Hours)**

functions and role in the current international business scenario.

UNIT-III **(8 Hours)**

International Marketing- Comparison and Contrast between domestic and International marketing, Advantage of International Marketing, Various types of international Market Intermediaries and cross-culture implication on the host and guest countries.

UNIT-IV **(12 Hours)**

International Financial Institutions- structure, roleandfunctionsof World Bank, IMF, UNTCAD, Export documentation and financial support available in India-APEDA,EPZs, SEZs, Concept of BPO, FDIandtheir effectsonthefutureof International business, MNCs: concept, merits anddemerits, NTCAD.

TEXT BOOK:

T1 P.SubhaRao, International Business Environment, Himalaya Publishing House

REFERENCE BOOKS:

R1. Rakesh Mohan Joshi, International Business, Oxford University Press
R2. Justin Paul, **International** Business, PHI Learning Pvt. Ltd
R3. Pradip Kumar Sinha, SanchariSinha, **International** Business Management, Excel Books India,
R4. Francis Cherunilam, **International** Business: Text And Cases, Phi Learning Pvt. Ltd.
R5. Hill C.W. - International Business (TMH, 5th Ed.)
R6. Daniels - International Business (Pearson, 1st Ed.)

Course Learning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Understand** and **Apply** the trends of global business and its impact on different economies. **Analyze** the impact of government policies in relation to the other developed economies of the world.	2, 3, 4 Understand, Apply, Analyze
CLO2	**Remember** the trends of business around the world, **Understand** the role of international organizations in impacting the growth of business. **Analyze** the trade figures and to Evaluate the future expectations.	1, 2, 4 Remember, Understand, Analyze
CLO3	**Evaluate** and Contrast between domestic and international markets. **Apply** the advantage of gaining knowledge of international markets to grow the national markets. **Analyze** the different types of international market intermediaries around the world	5, 3, 4 Evaluate, Apply, Analyze
CLO4	**Understand** the role of international financial organization. **Evaluate** the concept of different marketing concept., **Analyze** the role of government and the basic structure of international business along with its organization to boost the business from the country.	2, 5, 4 Understand, Evaluate, Analyze

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H	M	M	M	H	M	H	M	H	H	M	M	H	M	M
CLO2	H	M	M	M	H	M	H	M	H	H	M	M	H	M	M
CLO3	H	M	M	M	H	M	H	M	H	H	M	M	H	M	M
CLO4	H	M	M	M	H	M	H	M	H	H	M	M	H	M	M

H: High M: Medium L: Low

DIRECT AND INDIRECT TAXES
BCM 5007

L	T	P	C
3	0	0	3

(40 Hours)

Course Learning Objectives (CO):

CO1: To understand the framework of taxation in India.
CO2: To understand the various concepts of direct taxes and their application relating to direct tax laws with a view to integrating the relevance of these laws with financial planning and management decisions
CO3: To understand the laws and practices of indirect taxes viz. central excise duty, services tax, custom duty and central sales tax in all aspects including tax planning and management
CO4: To make assessment of individual tax and understand the procedure of return filling under Income Tax Act-1961 and GST Act 2017

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1: Understand the basic concepts of International Business. **Apply** the trends of global business and its impact on different economies. **Analyze** the impact of government policies in relation to the other developed economies of the world.

CLO2: Remember the trends of business around the world, **Understand** the role of international organizations in impacting the growth of business. **Analyze** the trade figures and to Evaluate the future expectations.

CLO3:Evaluate and Contrast between domestic and international markets. **Apply** the advantage of gaining knowledge of international markets to grow the national markets. **Analyze** the different types of international market intermediaries around the world

CLO4: Understand the role of international financial organization. **Evaluate** the concept of different marketing concept., **Analyze** the role of government and the basic structure of international business along with its organization to

boost the business from the country.

UNIT-I **(10 Hours)**

Income Tax Law an overview. Income under the head Salaries, computation of Pension, Gratuity, House Rent Allowances and provident funds their tax implication & deductions. Income from House Property, Annual Value, Its Computations and deduction.

UNIT-II **(10 Hours)**

Profits & Gains from business or profession- scope- basis of charge, Computation of Taxable Profits of Business or Profession. Computation of Income under Capital Gains: Capital Assets, Types of Capital Assets and Capital Gains Computation of Long Terms & Short Term Capital Gains. Income from other sources- basis of charge, scope, and deductions.

UNIT-III **(12 Hours)**

Concept of GST in India, Difference between Direct and Indirect taxes, Features, objectives, merits and limitation of indirect taxes, Classifications, Objectives, Merits & Demerits of GST. Registration under GST, Composition scheme, Levy and collection of Tax (under CGST, SGST, IGST, UGST), Inputtaxcredit, Tax Invoice, Creditand Debitnotes, Returns, Payment of Tax, Audit under GST,

UNIT-IV **(8 Hours)** Customs Duty: Features, importance, demerits of customs duty, Types of customs duty and valuation for customs duty.

TEXT BOOK:

T1. Prasad, Bhagwati: Income Tax Law &Practice ; Wiley Publication, New Delhi.
T2. V.S. Datey, GST: Law and Practice, Taxmann Publication, New Delhi.

REFERENCE BOOKS:

R1. Singhanai V.K: Students' Guide to Income Tax; Taxmann, Delhi.
R2. Mehrotra H.C: Income Tax Law &Accounts ;SahityaBhawan, Agra.
R3. Dr. H.C. Mehrotra, Prof. V.C. Agarwal, Indirect Taxes, ,SahityaBawan Publications **R4.** Mohd. Rafi (CA), with a Foreword by G.N.Venkataraman, INDIRECT TAXES (GST Act, Customs)

Course Learning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Remember and understand the concept, need and types of Income under direct and Indirect Taxes. Describe and Illustrate the concept of various heads of Income Tax.	2, 3, 4 Remembering, Understanding, Applying
CLO2	Understand, organize categories and evaluate various sources of Income on individual and company level.	2, 3, 4, 5 Understanding, Applying, Analyze, Evaluating
CLO3	Develop an idea about procedure of registration, Composition scheme, Levy and collection of Tax (under CGST, SGST, IGST, and UGST), Concept of Input tax credit, Credit and Debit notes.	2,4,5 Understanding, Analyzing, Evaluating
CLO4	Understand and analyze the role of customs duty, Evaluate the procedure, valuation and computation of customs duty.	2,4,5 Understanding, Analyze Evaluate

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H		M		H			M		H			H		
CLO2				M		M				H		M		M	
CLO3		H					H			H					
CLO4			M				H			H			H		

H: High M: Medium L: Low

CUSTOMER RELATIONSHIP MANAGEMENT BMG5001-MK

L T P C
3 1 0 4
(40 Hours)

Course Learning Objectives (CO):

CO 1: To develop understanding about customer relationship management concepts and frameworks, and how these are applied to form relationships with customers and other internal and external stakeholders.

CO 2: To develop skills to analyze and synthesize information and issues, related to customer relationship management, from several perspectives like customer satisfaction, loyalty and service quality dimensions.

CO 3: To disseminate knowledge regarding the concept of e-CRM and e-CRM technologies.

CO 4: To enable the students understand the technological and human issues relating to implementation of Customer Relationship Management in the organizations.

Course Learning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO1: Define and discuss the basic concepts of Customer relationship management. **CLO2:** Apply and analyze the various dimension of customer relationship management to formulate the marketing strategy.

CLO3: Demonstrate the information technology used in application of e- CRM. **CLO4:** Evaluate CRM implementation strategies and formulate and assess strategic, operational and tactical CRM decisions.

UNIT I **(9 Hours)**

Fundamentals of CRM: CRM Definitions, Emergence of CRM practice:, CRM Fundamental Theories, Evolution, Purpose of relationship marketing, Significance of CRM, CRM cycle, Stakeholders in CRM, Stages of relationship and their types , Issues , Approach towards marketing: A paradigm shift, , Types of CRM, CRM Implementation

UNIT II **(9 Hours)**

Dimensions of CRM: Customer Satisfaction: Meaning, Definition, Significance of Customer Satisfaction, Customer Satisfaction Models, Measuring Customer Satisfaction Customer Loyalty: Concept, Ladder and Principles, Service Quality: Types, Dimensions & Gap

UNIT III **(11 Hours)**

Information Technology Dynamics in CRM: Customer Relationship Management: Technology Dimensions - E- CRM in Business, Features of e-CRM, Advantages of e-CRM, Technologies of eCRM, Voice Portals, Web Phones, Virtual Customer Representative, Customer Relationship Portals, Call centers, Sales force automation

UNIT IV **(11 Hours)** Information Technology Implementation in CRM: Functional Components of CRM, Database Management: Database Construction, Data Warehousing, architecture, Data Mining, Data Mining tools and techniques, CRM Strategies: Acquisition, Retention & Win Back, CRM Practices in Indian Business Services, Future scope and challenges in CRM

TEXT BOOKS:

T1. Rojer J,Baren, Customer Relationship Management, Special Indian Edition. T2. Alok Kumar Rai, Customer Relationship Management: Concepts and Cases (SecondEdition)-PHI Learning

T3. Govinda.K, Bhat, Customer Relation Management, Himalaya

REFERENCE BOOKS :

R1. Customer Relationship Management – Peelen, Ed. Pearson

R2. Sheth J N, Parvatiyar A. and Shainesh G-,Customer relationship management: , Emerging Concepts, Tools, & Applications, Tata McGraw-Hill Education

R3. CRM, A strategic Imperative in the World of eBusiness – Brown, Stanley

R4. CRM (Emerging Concepts, Tools & Applications) – Sheth, Jagdish N. R5. Marketing Research – Harper Boyd & Ralph Westfall

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Define** and **discuss** the basic concepts of Customer relationship management.	1, 2 Remember, Understand
CLO2	**Apply** and **analyze** the various dimension of customer relationship management to formulate the marketing strategy.	3,4 Apply, Analyze
CLO3	**Demonstrate** the information technology used in **application** of e- CRM.	2, 3 Understand, Apply
CLO4	**Evaluate** CRM implementation strategies and **formulate** and **assess** strategic, operational and tactical CRM decisions.	5 , 6 Evaluate, Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)													Program Specific Outcomes(PSOs)	
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H		M						L	H					
CLO2	H		M						L	H					
CLO3	H		M						L	H					
CLO4	H		H						L	H					

H: High M: Medium L: Low

SECURITYANALYSIS ANDPORTFOLIO

MANAGEMENT

BCM 5001-FM

L T P C
3 1 0 4
(40 Hours)

Course Learning Objectives (CO):

CO1: To examine various alternative investment techniques, theory behind the science of investments, techniques of securities valuation, and kinds of financial markets.
CO2: To illustrate the various portfolio management strategies available to the investment manager.

Course Learning Outcomes(CLOs): On completion of this course, the students will be able to:
CLO1: Remember and Understand the concept of portfolio management and techniques and application of techniques in real life experience.
CLO2: Critically evaluate portfolio management techniques and adapt them to specific portfolio problems.
CLO3: Assess and infer recommendations for portfolio construction, based on the requirements of a client.
CLO4: Examine the knowledge across business disciplines.

UNIT-I (10Hours)

Introduction: The Investment Environment, Financial Markets, Investment Alternatives, Trading Procedure, Investment Approaches, Structure of Securities Market, Participants in Security Market, Regulatory Mechanism: SEBI and its Guidelines; Investor Protection. Concept and Measurement of Risk & Return. Market Efficiency, Empirical Evidence on Security Returns. EMH & its implications for investment decision. Adaptive Markets Hypothesis (AMH) as an Alternative to the Efficient Market Hypothesis (EMH)

UNIT-II (10 Hours)

Valuation of Equity: Nature of equity instruments, Equity Valuation Models. Approaches to equity valuation: Technical Approach: Overview of Concept & Tools Used Fundamental Approach: Economy, Industry and Company Analysis. Fixed Income Securities: Nature of Bonds, Bond Prices and Yields, Term Structure of Interest Rates, Managing Bond Portfolio, Bond Theorem.

UNIT-III (10 Hours)

Portfolio Theory & Equilibrium in Capital Markets: Portfolio Return & Risk, Efficient Frontier, Optimal Portfolio, Risk-less Lending & Borrowing, Optimal Risky Portfolio, Capital Asset Pricing Model, Single-Index and Multifactor, Models, Arbitrage Pricing Theory

UNIT-IV (10 Hours)

Portfolio Management: Portfolio Management Process, Approaches to Portfolio Construction,

Determinants of Objectives, Choice of Asset Mix, Formulation of strategy, Portfolio Execution, Portfolio Evaluation and Portfolio Revision. Portfolio Management and Performance Evaluation: Performance Evaluation of Existing Portfolio: Sharpe, Treynor, Jenson, Fama Measures.

TEXT BOOKS:

T1. Investment Analysis and Portfolio Management – Prasanna Chandra, 4/e, TMH, 2012.

REFERENCE BOOKS:

R1. Security Analysis & Portfolio Management- Kevin S, 10/e, PHI, 2011.
R2. Investments – ZviBodie, Kane, Marcus &Mohanty, 8/e, TMH, 2010. R3. Investment Science- Luenberger, 1st Edition, OUP, 2012

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Remember** and **Understand** the concept of portfolio management, techniques and application of techniques in real life experience	1,2 Remember, Understand
CLO2	Critically **evaluate** portfolio management techniques and implement them to specific portfolio problems.	5 Evaluate
CLO3	**Assess** and **infer** recommendations for portfolio construction, based on the requirements of a client.	4,5 Analyze Evaluate
CLO4	**Examine** the knowledge across business disciplines	5 Evaluate

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H								H	H	H	M		H	M
CLO2	M			H	M	L			H	H	H	H		H	H
CLO3	M			M	H	L			H	H	H	M		L	M
CLO4	M			H	H	H			M	M	H	H		M	H

H: High M: Medium L: Low

BASICS OF LABOUR
LAWS BMG 5001-HR

L T P C
3 1 0 4
(40 Hours)

Course Learning Objectives (CO):

CO1: Understand the labor laws, policies and programs and develop the skills required to enrich an organization's human capital.
CO2: Analyze the nature of effective employees and understand their importance in business operations & society.
CO3: Understand the laws made for the welfare of workers and employees and the dispute settlement bodies for grievances

Course Learning Outcomes(CLOs): On completion of this course, the students will be able to:
CLO 1: Explain the basic concept of Labour Laws
CLO 2: Examine the application and effect of statutory rules covering termination of employment, wages and working hours in relation to collective rights.
CLO 3: Assess the impact of the legal rules, which affect the parties involved in the industrial relations system in the India.
CLO 4: Illustrate and interpret with the basic guidelines of distribution of bonus including to know the labor legislations for minimizing the disputes with labors and to develop a dispute solving mechanism in the factory

UNIT I **(8 Hours)**

Introduction : Principles involved in labour legislation in India, Impact of Industrial Revolution on Labour Problems, Origin and growth of Labour legislation in India. UNIT II (10 Hours) Wages: Payment of wages Act – 1936 Minimum Wages Act – 1948 Payment of Bonus Act – 1965

UNIT III **(10Hours)**

Conditions of work. Industrial Employment (Standing Orders) 1946. Factories Act. 1948

UNIT IV **(12Hours)**

Social Security, Employees state Insurance Act 1948, Maternity Benefits Act 1961, Employees, Provident Fund Act 1952, Workman's Compensations Act 1923. Industrial Disputes Act 1947, Trade Union Act 1926.

TEXT BOOKS:

T1. Prasad,Tandon: Labour Legislations ; Wiley Publication, New Delhi.

REFERENCE BOOKS:

R1. Singhal K.K: Students' Guide to Labour Laws; Indu PublicationsDelhi.
R2. Mehrotra,Saxena H.C: An Introduction of Labour Laws ;SahityaBhawan,Agra.
R3. DinkerPagare: Labour Laws ; Sultan Chand & Sons, New Delhi.
R4. Rohit and Ravi Gupta: Labour Legislations;SahityaBhawan Publications, New Delhi.
R5. K. Mahesh and Shukla D.C.: Labour LawsPragati Publications, New Delhi.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Explain** the basic concept of Labour Laws	2 Understand
CLO2	**Examine** the **application** and effect of statutory rules covering termination of employment, wages and working hours in relation to collective rights.	3,4 Analze, Apply
CLO3	**Assess** the impact of the legal rules, which affect the parties involved in the industrial relations system in the India.	5 Evaluate
CLO4	**Illustrate** and **interpret** with the basic guidelines of distribution of bonus including to know the labor legislations for minimizing the disputes with labors and to develop a dispute **solving** mechanism in the factory	2,3 Understand, Apply

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M	H						L	L	H		H		H	H
CLO2	M		L		H			M		H		H	L	H	H
CLO3	M				H			M		H		H	H	H	H
CLO4	H			M	M					H		H		M	

H: High M: Medium L: Low

EXPORT IMPORT PROCEDURE AND DOCUMENTATION

BMG5001-IB

L T P C
3 1 0 4
(40 Hours)

Course Learning Objectives (CO):

CO1: Understand the process of selecting a product for export and judging its commercial feasibility.

CO 2: Understand the crucial aspects related to export distribution channels and an Export Sales Contract

CO 3: Analyze the intricacies of export finance and pricing in the Indian context

CO 4: Understand the steps involved in preparing appropriate export documents

Course Learning outcomes (CLOs): On completion of this course, the students will be able to:

CLO1: Understand the issues in selecting a product for export and analyze the challenges in selecting export market

CLO2: Evaluate various export distribution channels and understand the nature and process of making an Export Sales Contract

CLO3: Understand the organizational support for pre and post shipment finance and analyze the crucial aspects of export pricing

CLO4: Understand the various forms of ownership along with the procedural formalities and documentation required for export

UNIT- I **(12 Hours)**

Selecting a product for export: □ Choosing a Product & Methods of Identifying Export Winners □ Suitability of a Product for A company □ Selecting Products for Manufacturing and Export □ Selection of Export Markets, Criteria for Grouping Countries

UNIT- II **(8 Hours)**

Identifying Export Distribution Channels and Making the Export Sales Contract: Concept of Distribution Channels, International Channels Distribution Agents in Exporting, Methods of Locating and Selecting an Agent Signing the agreement, Nature of Exports Sales Contract, Incoterms Settlement of Disputes, Terms of Payment in Export.

UNIT- III **(8 Hours)**

Export Finance and Pricing Pre-shipment Finance, Post-shipment Finance, Special Financial Facilities Organizational support for export- Export Import Bank of India, E.C.G.C. Export Pricing, Mechanism of Price Fixation Benefits to India Exports.

UNIT- IV **(12 Hours)**

Formalities of registration and Export Documentation Intricacies of Naming the Enterprise Forms of Ownership Opening a Bank Account, General Registrations, Registrations with RBI, Registration with Licensing Authorities, Registration with Appropriate EPC' /CB's Defining Export Documentation, Main Commercial Documents, Additional Commercial Documents, and Statutory Documents for Export's Country, Statutory Documents for Imports Country and Documents for Claiming Export Benefits.

TEXTBOOKS:

T1. Cherunilam, F - International Trade and Export Management (Himalaya, 2007)

REFERENCR BOOKS:

R1. Monika Kothari, Export Promotion measures in India, Deep & Deep Publications

R2. Varshney R.L, Bhattacharya B-International Marketing Management (Sultan Chand & Sons, 9th Ed.)

R3. Govt. of India - Hand Book of Export Import Policy 2002-2007 (Ministry of Commerce, India)

R4. Keegan J Warren – Global Marketing Management (Pearson, 7th Ed.)

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	**Understand** the issues in selecting a product for export and **analyze** the challenges in selecting export market	2, 4 Understand, analyze
CLO2	**Evaluate** various export distribution channels and **understand** the nature and process of making an Export Sales Contract	5, 2 Evaluate, Understand
CLO3	**Understand** the organizational support for pre and post shipment finance and **analyze** the crucial aspects of export pricing	2, 4 Understand, Analyze
CLO4	**Understand** the various forms of ownership along with the procedural formalities and documentation required for export	2 Understand

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M			L	L				M	H	M				H
CLO2	M			L	L				M	H	L				H
CLO3	M			L	L				M	H	L				H
CLO4	M				L				M	H		M			H

H: High M: Medium L: Low

BUSINESS ANALYSIS AND DEVELOPMENT PLANNING
BMG5001-FB

L T P C

3 1 0 4

Course Learning Objectives (CO): **(40Hours)**

CO1: To understand the concept and importance of Business Plans for success **CO2:** To comprehend the various components of planning and thrust areas.
CO3: To develop confidence in drafting a business plan.
CO4: To critically evaluate business plans and implement in business practices.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1: Describe the concept of Business Plans and their pervasive nature encompassing all facets of operations

CLO2: Differentiate between plans and strategy and understanding their role in facing competition and developing the route ahead

CLO3: Apply the concepts learnt for framing of Executive summary for Business Planning

CLO4: Explain the relevance of industry and competitor analysis and development of a strategic plan.

CLO5: Formulate the Business Plan and related activities of data collection, analysis and compilation for objective achievement.

CLO6: Evaluate the business plan from the Investor's Perspective

Unit 1- **(10 Hours)**

Introduction to Business Plan: Business Plan – Concept, need, use. Business planning overview - Business planning as a change agent - Idea brainstorming session - Understanding motivations for preparing a plan - Raising money, Clarifying the company‘s future, launching a new venture, Searching for partners, Plotting against the competition, Recruiting.

Unit 2- **(10 Hours)**

Key elements of a Business Plan: Executive summary - Business description - Industry analysis and trends - Competitive analysis - Target market - strategic position – risk

assessment - Market strategies - Design and development plan - Technology plan - management and organization - Financial factors - Financial features - sales, profits, cash flows and return on investment - Financial requirements - loan, equity source of collateral - Current business position- Relevant information about the company, its legal form ofoperation, when it was formed, the principal owners and key personnel - Major achievements - developments within the company that are essential to the success of the business.

Unit 3- (10 Hours)

Writing a Business plan: Objective of writing the business plan - Research other business plans - Collect Information - press releases, related articles, Trade and industries associations - industry journals, Internet, government sources and statistics - offline research resources - library - historical financials, important web sites. Evaluating data- benefits of market study - coverage of market study. Put it down on paper - brainstorming – Preparation of rough draft, Compilation of information, research to support the claims and writing the final draft.

Unit 4- (10 Hours)

Evaluating the Business Plan from the Investor's Perspective:

Opportunity identification/ uniqueness quotient, classification of the idea / industry, assessment of the target market, Customer evaluation, compensation mapping, time appropriateness and speed of implementation. Risk Assessment: Possible uncertainties and their management.

Text Books:

T1. Jerome Katz , Richard P. Green, 4th Edition, Entrepreneurial Small Business, McGraw-Hill Education

T2. J. Mullins and R. Komisar, (2009), Getting to Plan B, Harvard Business Press, Boston, Massachusetts

Reference Books:

R1. David Butler, Thompson, (2008), Business Planning: A guide to Business Start-up, Butterworth-Heinemann, MA.

R2.Rhonda Abrams, John Doe, Fifth Edition (2010), The Successful business Plan Secret Strategies,

Course Learning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the concept of Business Plans and their pervasive nature encompassing all facets of operations	2 Understand
CLO2	Differentiate between plans and strategy and understanding their role in facing competition and developing the route ahead	2,4 Understand, Analyze
CLO3	Apply the concepts learnt for framing of Executive summary for Business Planning	3 Apply
CLO4	Explain the relevance of industry and competitor analysis and development of a strategic plan.	3,4 Apply, Analyze
CLO5	Formulate the Business Plan and related activities of data collection, analysis and compilation for objective achievement.	3,5 Apply
CLO6	Evaluate the business plan from the Investor's Perspective	5 Evaluate

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H			H	H		H		M	L	H		H		H
CLO2	H			H	H		M		M	M	H	M	H	M	H
CLO3	H			H	H		H		M	M	M		M		M
CLO4	M			H	H		M		L	H	M		M		M
CLO5	H			H	H		M		M	L	M		M		M
CLO6	H			H	H		M		M	M	H		H		H

H: High M: Medium L: Low

SUMMER TRAINING
BMG5501

L T P C
0 0 2 2

An internship is a large part of a student's formula for acquire the skill for the job. Students who have good internship experience can be hired faster and earn more than students who do not. More and more employers are seeking students who have relevant experience and are familiar with the work environment. After a student completes an internship, it improves his/her employability chances, the advantage here is that these students are already familiar with an organization's culture and work style.

Course Learning Objective (CO):

CO1: To provide Student Interns a platform to take up on-the-job Training and develop a network which will be useful in enhancing their career prospects.
CO2: To enhance skills
CO3: To work in a team
CO4: To get sensitized with rigors of corporate world.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1: Identify and Understand the complexities of the business words.

CLO2: Interpret and demonstrate the skills needed to be successful in the business world.

CLO3: Analyze and explain the business problems and find out it's probable solution.

CLO4: Develop, Plan and convert a business idea into reality.

Expected Outcomes: After completion of the summer training, students will be equipped with the following traits:

- **Personal Growth-** The value of an internship often extends beyond career exploration; a good experience can have a significant impact on your personal growth by developing your intellectual, interpersonal, and leadership qualities.
- **Experience and skills and enhance your resume with career-related experience-** Employers' number one criteria when interviewing potential candidates for employment is related work experience.
- **Improve employment opportunities-** The high demand for skilled employees have

convinced employers of the prudence of sponsoring internship programs to identify, test, groom and recruit candidates.

- **Gain valuable contacts and references-** Networking is an essential part of the job search process and who better to ask for a reference or contact than someone who knows your work style and habits. Getting to know people working in the career field you're interested in is easier when you're working side-by-side with them.

Course Learning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify and Understand the complexities of the business world.	2, 3 Understand, Apply
CLO2	Interpret and demonstrate the skills needed to be successful in the business world.	3, 4 Apply. Analyze
CLO3	Analyze and explain the business problems and find out it's probable solution.	4, 5 Analyze, Evaluate
CLO4	Develop, Plan and convert a business idea into reality.	6 Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M			M						M			M		
CLO2	H			M						M			M		
CLO3	H	L		H	M			L		H	L	L	H	L	
CLO4	H	L		H	M			L		H	L	L	H	L	

H: High M: Medium L: Low

APTITUDE & REASONING AND ON-LINE TEST
BAP 5501

L T P C
0 0 2 1

(24 hours)

Course Learning Objective (CO):

CO1: To enable the students to refine their mathematical, logical and analytical skills.
CO2: To enhance their employability skills.
CO3: To prepare the students for competition.
CO4: To give them practice sessions to increase their speed and confidence.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:
CLO1: Examine their employability skills.
CLO2: Identify their weakness for various competitive exams.
CLO3: Develop their Competitive skills
CLO4: Improve their quantitative and reasoning skills.

UNIT- I **(5 Hours)**

NUMBER SYSTEM

Number System

LCM, HCF

Decimal

UNIT- II **(4 Hours)**

Simplification of number system

Square, Cubes, surds

Inequality

Words problems on number system

UNIT- III **(5 Hours)**

ARITHMETIC

Percentage Profit

& loss

Discounting Simple Interest

Compound Interest

UNIT- IV **(5 Hours)**

ARITHMETIC

Average Problems

on ages

Ratio & proportion

Mixture and allegation

UNIT- V **(5 Hours)**

ARITHMETIC

Partnership Time

and Work Pipe

and cistern

REFERENCE BOOKS:

R1. R.S Aggrawal, M Tyra Quicker Maths
R2. Paramount Publication: Reasoning
R3.Arihant Publication: Bs Sijwal

Course Learning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify their weakness for various competitive exams their quantitative and reasoning skills.	3 Applying
CLO2	Examine their employability skills	4 Analyzing
CLO3	Develop their Competitive skills	6 Creating
CLO4	Improve their quantitative and reasoning skills.	6 Creating

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1				H		H	M		L				M	H	H
CLO2				H		H	M		L				M	H	H
CLO3				H		H	M		L				M	H	H
CLO4				H		H	M		L				M	H	H

H:High, M:Medium L:Low

SOFT SKILL

BSS 5501

L T P C
0 0 2 1

(24 hours)

Course Learning Objective (CO):

CO1: To make students understand the relevance of soft skills.
CO2: To help students develop their verbal and non-verbal communication skills. **CO3:** To help students learn and apply personal and professional skills.
CO4: To introduce, demonstrate and help students use correct etiquettes in formal and informal settings.
CO5: To train the students to be suitable for employment.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1: Discuss the Importance of Soft Skills Examine the skills required to be updated. Compare the behavior and attitude of the students.

CLO2: Explain the Verbal Comprehension & listening skills. Illustrate the role and importance of Verbal Comprehension, listening skills, HAM/JAM, public speaking , body language, Examine the importance of listening skills, HAM/JAM, public speaking , body language. Evaluate on the basis Question & answers based on read out passage. Compare the improvement in listening skills, body language.

CLO3: Describe the importance of email writing, application writing, role play Demonstrate the format of email and application. Evaluate through practice of writing applications, emails and evaluate role plays through practice. Compare the actual knowledge from previous knowledge of the students.

CLO4: Explain grooming & etiquette. Experiment business etiquette, meeting Etiquette, social etiquette. Debate, Conclude and Compare Do‘s &Don‘t of business etiquette. Construct their own opinion about the grooming & etiquette.

CLO5: Explain professional skills, leadership & teamwork, GD Skills & Presentation skills. Demonstrate the importance of leadership and teamwork, GD Skills & presentation skills, Evaluate qualities of a good leader, qualities of a good team player, difference between leader & a

manager Debate, Conclude and Compare Importance, purpose, types, do‘s & don’ts, difference between GD & Debate. Construct the tips for making effective presentation

UNIT 1: Ice breaking [01]

Introduction to soft skills, expectations from the course: Importance of soft skills, expectations from the course, skills that need to be updated.

UNIT 2: Verbal Communication Skills [06]

Verbal Comprehension and Listening: Question and answers based on the read out passage, importance of listening in comprehending, tips to improve listening skills HAM/JAM: Tips to speak on HAM/JAM, practice of HAM/JAMPublic Speaking and Body Language: Do‘s and Don‘ts of public speaking, role of body language in public speaking

UNIT 3: Non Verbal Skills [07]

Application & E-mail writing: Email format, application format, e-mail etiquette and practice of writing applications and emails. Written Comprehension: Question and answers based on written passage, tips of answering questions from written comprehension practice. Role plays on various situations: Role play practice.

UNIT 4: Personal Skills [01]

Grooming & Etiquette (Business etiquette, social etiquette): Dos & Don‘ts of business etiquette, meeting etiquette and social etiquette

UNIT 5: Professional Skills [09]

Positive Attitude & Confidence: Importance of positive attitude in a person‘s life. How to have a positive attitude? Leadership & Team work: Importance of leadership & team work in personal & professional life. Qualities of a good team player. Difference between a leader & a manager. GD Skills: What is a GD? Purpose of a GD, what is observed in a GD, how to initiate in a GD, types of GD,

do‘s and don‘t of a GD.GD Practice: GD practice Presentation skills: Tips on how to make an effective PPT

TEXT BOOKS:

T1. The Ace of Soft Skills- G Ramesh, Mhadevan Ramesh-2013 Edition

T2. Communication Skills for Engineers & Scientists- Sangeeta Sharma, Binod Mishra-2013 Edition

REFERENCE BOOKS:

R1. Personality Development by Rajiv Mishra-2014 Edition

Course Learning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Discuss the Importance of Soft Skills Examine the skills required to be updated. Compare the behavior and attitude of the students.	2,4,6 Understanding, Analyzing, Creating.
CLO2	Explain the Verbal Comprehension & listening skills. Illustrate the role and importance of Verbal Comprehension, listening skills, HAM/JAM, public speaking , body language, Examine the importance of listening skills, HAM/JAM, public speaking , body language. Evaluate on the basis Question & answers based on read out passage. Compare the improvement in listening skills, body language.	2, 3, 4, 6 Understanding, Applying Analyzing, Creating.
CLO3	Describe the importance of email writing, application writing, role play Demonstrate the format of email and application. Evaluate through practice of writing applications, emails and evaluate role plays through practice. Compare the actual knowledge from previous knowledge of the students.	2, 3, 6 Understanding, Applying, Creating
CLO4	Explain grooming & etiquette. Experiment business etiquette, meeting Etiquette, social etiquette. Debate, Conclude and Compare Do's &Don't of business etiquette. Construct their own opinion about the grooming & etiquette.	2,4,5, 6 Understanding, Analyzing, Evaluating, Creating
CLO5	Explain professional skills, leadership & teamwork, GD Skills & Presentation skills. Demonstrate the importance of leadership and teamwork, GD Skills & presentation skills, Evaluate qualities of a good leader, qualities of a good team player, difference	2,3, 6 Understanding, Applying, Creating

	between leader & a manager Debate, Conclude and Compare Importance, purpose, types, do‘s & don’ts, difference between GD & Debate. Construct the tips for making effective presentation	

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1		H					L				M				
CLO2		H					L				M				
CLO3		H					L				M				
CLO4		H					L				M				

H: High M: Medium L: Low

BBA
SEMESTER VI

INTRODUCTION TO STRATEGIC MANAGEMENT

BMG6017

L T P C
3 0 0 3

(40Hours)

Course Learning Objectives (CO):

CO1: To understand & analyze the various Levels of Strategy and the Firm's Environment.
CO2: To understand & evaluate the Competitive Advantage and the various Functional Level Strategies.
CO3: To analyze & apply the various Business Level Strategies and their relationship with Industry Environment.
CO4: To understand & analyze the various Corporate Level Strategies and Strategy Implementation.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Understand & analyze the practical and integrative model of strategic management process that defines basic activities in strategic management, Evaluate the real life company's environmental factors.
CLO2. Understand the essence of formulating strategies and strategic plans. Estimate & Integrate various Business strategies employed in concurrent Market.
CLO3. Analyze & apply the competitive situation and strategic dilemma in dealing withdynamic global business environment in terms of rapidly changing market trends and technological advancement.
CLO4. Comprehend and evaluate the challenges faced by managers in implementing and applying strategies based on the nature of business, industry, and cultural differences.

UNIT -I **(10hours)**

- Meaning of Strategy; Strategic process; Levels of Strategy;
- Concept of firm's environment; Internal and External Analysis; SWOT Analysis; Environment Analysis;
- Porter's Five Forces Model; Strategic Groups; Industry Life-Cycle.

UNIT -II **(10 hours)**

- Meaning of Competitive Advantage; The Value Chain;
- Functional Level Strategy; Efficiency, Quality, Innovation, Responsiveness to Customer.

UNIT -III **(12 hours)**

- Business Level Strategy; Generic Business Level Strategies;
- Positioning, Cost leadership, Differentiation;

- Relationship of Business Level Strategy with Industry environment;
- Strategy in the global environment.

UNIT-IV **(08hours)**

- Over view of Corporate Level Strategy; Horizontal and Vertical Integration; Strategic Outsourcing; Diversification; Concept
- Ethics and Strategy; Strategy implementation; strategic control systems.

TEXT BOOK/REFERENCE BOOK:

T1. CWL Hill and G Jones, Strategic Management: An integrated Approach, 2009, Biztantra

REFERENCE BOOKS:

R1. Johnson, G., Exploring Corporate Strategy: Text & Cases, 7/E, Pearson Education India
R2. H.Igor, Ansoff: Implanting Strategic Management, Prentice Hall, New Jersey.
R3. Michael, E Porter: The Competitive Advantage of Nations, Macmillan, New Delhi.
R4. Mintzberg, Henry and James Brian Quinn: The Strategy Process, Prentice Hall, New Jersey.

Course Learning Outcomes (CLO):On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand & Analyze the practical and integrative model of strategic management process that defines basic activities in strategic management, Evaluate the real life company's environmental factors.	2, 4, 5 Understanding, Analyzing, Evaluating
CLO2	Understand the essence of formulating strategies and strategic plans. Estimate & Integrate various Business strategies employed in concurrent Market.	2, 5, 6 Understanding, Evaluating, Create
CLO3	Analyze & Apply the competitive situation and strategic dilemma in dealing with dynamic global business environment in terms of rapidly changing market trends and technological advancement.	3, 4 Applying, Analyzing
CLO4	Comprehend and Evaluate the challenges faced by managers in implementing and applying strategies based on the nature of business, industry, and cultural differences.	2,3,5 Understanding, Analyzing, Evaluating

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H		M	L	M		M				M		L	M	L
CLO2	H		M		M	H	H	M		M		L	H	M	L
CLO3	L		H		H	H			M			L	H	H	L
CLO4			M				M			L	M	L	H	M	L

H: High M: Medium L: Low

MARKETING COMMUNICATION AND ADVERTISING

BMG6018

L T P C
3 0 0 3

(40 Hours)

Course Learning Objectives (CO):

CO1: To provide an in-depth understanding of integrated marketing communication concepts.
CO2: To explore and evaluate an organization's marketing and promotional situation in order to develop an effective communication strategies.
CO3: To understand the industry and the players.
CO4: To enable students to develop a promotional plan adapted to a specific organization.

Course Learning Outcomes (CLOs): On completion of this course, the **students will be able to:**

CLO1: Determine the role of marketing communications within the context of marketing strategies and would be able to analyze different tools of Promotion Mix.
CLO2: Analyze & Apply theories to the development of marketing communications.
CLO3: Critically evaluate traditional marketing communication strategies vis-à- vis modern communication. Articulate specialised knowledge in both oral and written contexts reflective of target audience.
CLO4: Compare and contrast the stages involved in developing effective marketing communications. Evaluate the impact of emerging technologies and globalisation on the nature of marketing communications inclusive of social and cultural influences.

Unit I: Introduction to Integrated Marketing Communications [10 Hours]

Marketing Process, An Introduction to IMC, The Role of IMC in the Marketing Process , Organizing for Advertising and Promotion, Role of Ad Agencies and Other Marketing Communication Organizations

Unit II: Analysing Communication Process & Consumer Behaviour [10 Hours]

The Communication Process, Source, Message, and Channel Factors, Organizing for Advertising and Promotion- Perspectives on Consumer Behaviour

Unit III: Creative Strategy [10 Hours]

Establishing Objectives and Budgeting for the Promotional Program, Creative Strategy: Planning and Development, Implementation and Evaluation, Media Planning and types, Evaluating the Social, Ethical, and Economic Aspects of Advertising and Promotion

Unit IV: Advertising & Measuring Effectiveness [10 Hours]

Communication model with reference to Advertising, AIDA, Hierarchy of Effects, Innovation and Adoption, Promotion Tools-Sales Promotion, Direct Marketing, Public Relation, Personal Selling, Publicity and Corporate Advertising, Measuring the Effectiveness of the Advertising &Promotional Program.

TEXT BOOK/REFERENCE BOOK:

T1. Belch and Belch, Advertising and Promotion, 2006 ISBN 9781428804951

R1. Advertising: Principles and Practice; By William .D. Wells, John Burnett, Sandra Moriarty. Prentice Hall, 2005 ISBN 9780131465602.

R2. Julian Cummins, Sales Promotion, How to Create, Implement and Integrate Campaigns That Really Work, Kogan Page Limited, London, 2008 ISBN 9780749450212.

R3. Marketing Communications and Advertising-Himalaya Publishing House

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Determine the role of marketing communications within the context of marketing strategies and would be able to analyze different tools of Promotion Mix.	2, 4, 5 Understanding, Analyzing, Evaluating
CLO2	Analyze & Apply theories to the development of marketing communications.	3, 4 Analyzing, Application
CLO3	Critically evaluate traditional marketing communication strategies vis-à-vis modern communication. Articulate specialised knowledge in both oral and written contexts reflective of target audience.	5,6 Evaluating, Synthesize
CLO4	Compare and contrast the stages involved in developing effective marketing communications. Evaluate the impact of emerging technologies and globalisation on the nature of marketing communications inclusive of social and cultural influences.	4, 5 Analyzing, Evaluating

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M					L	M			M			L	L	M
CLO2				L			H			M			H	M	L
CLO3	H	M				L		L		M			M	L;	H
CLO4		M	H						H				H	L	L

H: High M: Medium L: Low

RETAILING

BMG6001-MK

L T P C

40 hours

Course Learning Objectives

CO1.To remember the retailing concept and its relevance in Indian retail market.

CO2. To **explain** the retail business environment and elements of retail- mix.

CO3. To **analyze** the retail location choices and their effectiveness in Indian context.

CO4. To **evaluate** the retail strategies for effective retail business management in the competitive retail industry.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Understand the comprehensive view of retailing, retail industry and its evolution and remember the concepts, theories and principles of retailing.

CLO2. Identify the factors of retail business environment and their impact on retail mix.

CLO3. Evaluate the types of retail locations and effective category management.

CLO4. Demonstrate the understanding on retail customer buying behavior, decision process and customer satisfaction.

CLO5. Analyze the situations and apply the fundamentals in real- world retailing issues and cases.

UNIT-I (10Hours)

Concept of retailing, Importance of retail industry and its evolution in India;
Functions of Retailing,
Trends in retail in India: Current trends prevalent in India & Factors affecting trends
Formats of Retailing: Definition of Organized & unorganized retailing,
Challenge faced by unorganized retailing from organized retailing, types of Organized and Unorganized retailing .Ethical issues in retailing

UNIT-II (12Hours)

Retail Marketing Environment: Introduction- Definition of retail business environment, relevance of business environment in retailing

Types of retailers: Discount Stores, Department store, Warehouse store, Variety store, Hypermarket, Supermarket &Mall.
Retail Marketing Mix: Shift from 4P's to 4 M's, Managing merchandise, monitoring & Pricing Strategy.

UNIT-III **(8Hours)**

Retail location and site evaluation, Types of Retail location and process of site selection
Store: functions, external and internal store; display and atmospherics.
Category management, product category life cycles and category mix.

UNIT-IV **(10Hours)**

Customer Buying Decision Process: Types of Buys, Types of Customers, Customer Satisfaction
Issues in retail branding, pricing, promotion and services.
Role of Internet and IT in retailing.

TEXTBOOK/REFERENCE BOOKS:

T1.Gupta and Randhawa, Retail Management, 2008, AtlanticPub.

T2.Swapna Pradhan, Retail Management: Text & Cases,McGraw Hill(2012)4th Edition.

R1. Neelesh Jain, Retail Management: a realistic approach; 2008; Global India Pub.

Pvt. Ltd. **R2**. Harvinder Singh & S R Srinivasan, Mall Management: Operating in

Indian retail Space, 2012,

CourseLearning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the comprehensive view of retailing, retail industry and its evolution and Remember the concepts, theories and principles of retailing.	1,2 Remember Understand
CLO2	Identify the factors of retail business environment and their impact on retail mix.	1, 4 Remember
CLO3	Evaluate the types of retail locations and effective category management.	5 Evaluate
CLO4	Demonstrate the understanding on retail customer buying behavior, decision process and customer satisfaction.	2, 3, Understand Applying,
CLO5	Analyze the situations and apply the fundamentals in real-world retailing issues and cases.	4,3 Analyze, Apply

Mapping of CLOs with PLOs & PSOs

Course	Program Learning Outcomes(PLOs)												Program Specific Outcomes (PSOs)		
Learning Outcomes	**PLO1**	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	H			L						L	L			L	
CLO2	M			M						L	L			L	
CLO3	L									L				L	
CLO4	M			L						L				L	
CLO5				M						H	L			H	

H: High M: Medium L: Low

SALES AND DISTRIBUTION MANAGEMENT

BMG6002-MK

L T PC
3 1 04
(40 Hours)

Course Learning Objectives(CO):

CO1. To understand the basic concept of sales management with comprehension of the contemporary role of professional selling and the role of management.
CO2. To understand the concept of Integrated Marketing Communication and managing sales professional people through modern approach.
CO3. To understand importance of training of the sales professional and applied sales promotion strategies.
CO4. To analyze the best distribution channel in the organization.

CourseLearningOutcomes(CLOs):

On completion of this course, the students will be able to:

CLO1. Understand the basic concept of sales management with comprehension of the contemporary role of professional selling.

CLO2. Understand the concept of Integrated Marketing Communication and managing sales professional people through modern approach.

CLO3. Understand importance of training of the sales professional and applied sales promotion strategies.

CLO4. Analyze the best distribution channel in the organization.

UNIT-I **(10Hours)**

Introduction

Sales management: nature, importance and evolution;
Sales managers: types, roles and skills;
Objectives of sales management; emerging trends.
Sales Management strategy
The buying decision & the sales process.
Personal selling
Recruitment &Selection

UNIT-II **(8 Hours)**

Strategic issues

Sales planning
Forecasting sales
Integrated marketing communications.
Developing sales budgets; procedure for designing sales territories; sales quotas.
Relationship Marketing

UNIT-III **(12Hours)**

The Sales Force

- Types of sales force organization;

Size of the sales force
Staffing the sales force & the sales training process
Motivation and Compensation issues- sales force expenses
Performance evaluation; ethical and legal issues.
Sales promotion strategies
Types &Technique of sales promotion

UNIT-IV **(10Hours)**

Distribution and channels

Concept of distribution System
Kinds of distribution channels
Selection of channels
Role & function of channels of Distribution
The process of channel design; channel conflict and its management.
Retail selling

TEXT BOOK/REFERENCE BOOKS::

T1. Tapan Panda ,Sales & Distribution Management,Oxford

T2. Dr. S.L.Gupta,Sales & Distribution Management, Excel Books

R1. Pingali Venugopal, Sales and Distribution Management: An Indian perspective,2008, Response

R2. Johson & Mershell, Sales Force Management Tata Mc. Graw Hill 8th Edition

R3. Spiro, Sales Force Management by Tata Mc.Graw Hill 11th Edition

R4. Jobber David and Lancaster Geoff - Selling and Sales Management,

PearsonEducation

CourseLearning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom' Taxonomy Level
CLO1	Understand the basic concept of sales management with comprehension of the contemporary role of professional selling	2 Understand
CLO2	Understand the concept of Integrated Marketing Communication and managing sales professional people through modern approach.	2, 5, Understand, Evaluate
CLO3	Understand importance of training of the sales professional and applied sales promotion strategies	2, 4 Understand, Analyzing
CLO4	Analyze the best distribution channel in the organization.	4 Analyze

Mapping of CLOs with PLOs & PSOs

Course Learning Outcome	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1			M							H			H		
CLO2		H							L		M			H	
CLO3			H		M		L								L
CLO4				H						L				H	

H: High M: Medium L: Low

INDIAN FINANCIAL SYSTEM

BCM 6001-FM

L T PC
3 1 04
(40 Hours)

Course Learning Objectives (CO):

CO1. Demonstrate knowledge and understanding of the Indian Financial System.
CO2. Develop an understanding of the meaning and characteristics of money market.
CO3. Gain knowledge of the Capital market and the secondary market.
CO4. Evaluate the relevance of various banking institutions and define different regulatory

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Demonstrate knowledge and understanding of the Indian Financial System.

CLO2. Develop an understanding of the meaning and characteristics of money market.

CLO3. Gain knowledge of the Capital market and the secondary market.

CLO4. Evaluate the relevance of various banking institutions and define different regulatory bodies.

UNITI **(12 hours)**

The financial system

Introduction, The financial system and economy, Reforms in financial system, Savings and financial intermediation, Global financial system, Indian financial system and Weaknesses of Indian financial system and measures to improve

UNITII **(12hours)**

Money market

Meaning, Objectives and Importance, Call money market, Commercial paper market, Certificate of deposits market, Treasury bills market, Money market derivatives and Government or gilt edged securities market

UNIT III **(9 hours)**

Capital market

History of Indian capital market, capital market scams, Reforms in capital market, Capital market instruments, Primary market, Intermediaries and organization, Secondary market: Indian Stock Exchange and online trading, over the counter exchange of India

UNITIV **(7 hours)**

New instruments & financial regulation

New financial instruments and their implications, SEBI and regulation of primary and secondary markets, Regulation of securities market, Regulation of financial market by RBI

TEXT BOOK/REFERENCEBOOKS:

T1. Pathak, V. Bharti; "The Indian Financial System: Markets, Institutions and Services", Pearson

R1. Dr. Gurusamy S,; "Indian Financial System",TMH

R2. Machiraju, H R; "Indian Financial System", VikasPublications

R3. Khan Y M,; "Indian Financial System",TMH

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO	Description	Blooms Taxonomy Level
CO1:	**Demonstrate** knowledge and **understanding** of the Indian Financial System.	2, 3 Understanding, Applying
CO2:	**Develop** an **understanding** of the meaning and characteristics of money market.	2,6 Understanding Creating
CO3:	**Gain knowledge** of the Capital market and the secondary market.	4 Analyzing
CO4:	**Evaluate the** relevance of various banking institutions and **define** different regulatory bodies.	1, 5 Remembering Evaluating

Mapping of CLOs with PLOS and PSOs:

Course Learning Outcomes (CLO):	**Programme Learning Outcomes (PLOs)**												**Programme Specific Outcomes (PSOs)**		
	PLO 1	PLO2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO11	PLO12	PSO1	PSO2	PSO 3
CO 1	H	M	L	M	H		M	L	H	H	L			H	H
CO 2	H		M	M	L		L	M		H	M		L	H	H
CO 3	H		H	M	H			M	H	H	M		H	H	H
CO 4	H	M	L	L			L	H	M	H		H	L	M	H

H: High, M: Medium, L: Low

COST AND MANAGEMENT ACCOUNTING
BCM6002-FM

L T PC
3 1 04

(40Hours)

Course Learning Objectives (CO):

CO1: To understand the conceptual framework of cost accounting and its application.
CO2: To the importance of variance analysis in controlling material expenses.
CO3: To understand the implication of Job, batch and contract costing
CO4: To learn the basic of process costing and its uses.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to

CLO 1: Understand the concept cost accounting, examine its usefulness in controlling cost

CLO 2: Understand the basic of Material and labour analysis and evaluate its control procedures.
CLO 3: Analyze various overheads, wage payments issues and measure its impact on labour efficiency.
CLO 4: Understand and examine in detail the usefulness and practical usage of job, batch and process costing.

UNIT- I **(08 Hours)**

Meaning, Nature and significance of cost accounting
Nature and significance of cost accounting
Difference between cost, management and financial accounting
Analysis and classification of cost
Elements of cost : Material, labour & overheads
Cost sheet: definition, characteristics, objectives and preparation
Reconciliation of cost and financial accounts: Objectives and how reconciliation is done
Cost Audit

UNIT-II **(12 Hours)**

Accounting for Material:
Material Control Techniques
Pricing of Material issues
Accounting for Labour- I:
Labour Cost Control, Procedure
Labour turnover, idle time and overtime.

UNIT-III **(10 Hours)**

Accounting for Labour- II:

Methods of Wage Payment- Time and Piece Rates,

Incentive Schemes

Accounting for overheads:

Classification and Departmentalization,

Absorption of Overheads,

Determination of overhead rates, under and Over Absorption and its treatment,

UNIT-IV **(10 Hours)**

Job, Batch and Contract Costing

Job costing: procedure of job costing, recording of material, labour & overheads. Batch costing: determination of Economic Batch Quantity

Contract costing: Definition, difference between job and contract costing, preparation of contract account.

Process costing

Introduction, characteristics, application of process costing, process accounts and recording of costs Joint products &By products: meaning, definition, distinction between joint and by Product and its recording.

TEXT BOOK/REFERENCE BOOKS::

T1.Tulsian P.C – Cost Accounting – Tata McGraw Hills

R1. Jain &Narang : Principles and Practice of Cost Accounting, Kalyani Publishers, Ludhiana.

R2. M.Y. Khan & P.K. Jain : Cost and Management Accounting, Tata McGraw Hill Publishing House, New Delhi

R3.Charles Horngren, SrikantDatar, MadhavRajan, Cost Accounting: Global Edition OLP 14th Edition, Pearson

R4. Terence Lucey: Costing, Cengage Learning EMEA, 2002

R5.J. K Mitra: Advanced Cost Accounting, New Age International, 2009

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the concept cost accounting, examine its usefulness in controlling cost.	2,4 Understanding, Analyzing
CLO2	Understand the basic of Material and labour analysis and evaluate its control procedures.	2,5 Understanding, Evaluating
CLO3	Analyze various overheads, wage payments issues and measure its impact on labour efficiency.	4,5 Analyzing, Evaluating
CLO4	Understand and examine in detail the usefulness and practical usage of job, batch and process costing.	2,4 Understanding, Analyzing

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H		H			L		L		H		H			
CLO2	H	H	H	M	L					H		H			
CLO3	M		H	M	L				L						
CLO4	M	M	H						L						

H: High M: Medium L: Low

Performance appraisal and Compensation
BMG6001- HR

L T PC
3 1 04
(40 Hours)

Course Learning Objectives (CO):

CO1. To apprise the students about the intricacies of Performance and Talent Management.

CO2. To enhance capabilities and decision-making skills in handling compensation management.

CO3. To be aware about their judgmental errors and able to suggest solution to performance appraisal issues.

CO4. To motivate them to move on career path through right career moves and competencies.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. The students will be able to understand the concept performance appraisal and problems and issues related to appraisal process.

CLO2. The students will be able to analyze their Competency framework and define the HR functions in the organization.

CLO3. The students will be able to Design Strategic pay plans, Establishing pay plans and measure the competency based Pay and Compensation Trends.

CLO4. The students will learn to Apply and Execute Incentive programs and Insurance benefits.

UNIT-I **(12Hours)**

Performance Management

Understanding Performance Management, Elements of the Performance Management , Performance Planning: Setting Objectives, Performance Evaluation Methods ,Potential Problems in Performance Evaluations, Performance Review, Reward & Recognition.

UNIT-II **(12Hours)**

Competency Management & Human Resource Management Practices in India

Introduction to Competency Management, Competency Model, Competency Framework, Competency- Based HR Processes, Career Planning & Succession Planning Process, Assessment & Development Centers, Understanding, HRM Practices in India, Audit of HR Functions.

UNIT-III **(09Hours)**

Compensation Management:

Meaning and need; types of compensation; micro and macro theories of compensation management, Job analysis, job description and job evaluation: concept, methods, process, importance and limitations

UNIT-IV **(07Hours)**

Wage differentials: rationale and types.
Wage fixation by collective bargaining; statutory wage fixation. Design of pay structure; pay structure in India.

Executive compensation: components and issues;

TEXT BOOK/REFERENCEBOOKS:

T1. Human Resource Management: Sharon Pandey & Swapnalekha Basak,Pearson Publication , ISBN – 978-81-317-6121-2

R1. **"**Performance Management " ,Herman Aguinis ,2nd Edition ,Prentice HallPublication.

R2. Performance Management," Robert becal"Mc .Graw-Hill Publisher ,1stEdition,-ISBN -00707

CourseLearning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	The students will be able to understand the concept performance appraisal and problems and issues related to appraisal process.	2 Understand
CLO2	. The students will be able to Analyze their Competency framework and Define the HR functions in the organization.	4, 1 Analyzing, Remembering
CLO3	The students will be able to Design Strategic pay plans, establishing pay plans and measure the competency based Pay and Compensation Trends.	6,5 Create, Evaluate
CLO4	The students will learn to Apply and Execute Incentive programs and Insurance benefits.	3 Apply

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)											Program Specific Outcomes (PSOs)		
	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11		PSO1	PSO2	PSO3
CLO1	H	H	H	L				M	L	H	H	H		
CLO2	M	M	L	M		M			M			M		M
CLO3	L	M	M	M			L			L	M		L	H
CLO4	M	L										H		

H: High M: Medium L: Low

TEAM BUILDING & LEADERSHIP

BMG 6002-HR

L T PC
3 1 0 4
(40 Hours)

Course Learning Objectives (CO):

CO1. The main objective of this course is to develop a thorough understanding of the concepts, theoriesand models of leadership and to understand its essence at various levels of the organization

CO2. To understand group behavior and dynamics for effective control

CO3. To recognize the role of leadership in achieving organizational excellence

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Describe the concepts of Leadership and Team Building and their relevance for organizational development

CLO2. Understand his/her predisposition for Leadership and comprehension of group dynamics for team building. Apply the concepts to specific situations/organizations for effective leadership and control

CLO3. Explain the dynamics of group behavior and harnessing it for organizational success

CLO4. Formulate high performance teams for achievement of organizational objectives

CLO5. Evaluate and integrate the concepts of Leadership, Group Dynamics and Team Building for harnessing individual skills to create organizational synergies

UNITI **(10Hours)**

Leadership – Meaning, Concepts and Myths about Leadership, Components of Leadership- Leader, Followers and situation.
Assessing Leadership & Measuring Its effects.

UNITII **(10Hours)**

Focus on the Leader – Power and Influence; Leadership and Values.
Leadership Traits; Leadership Behavior; Contingency Theories of Leadership; Leadership and Change.

UNIT III **(11Hours)**

Groups, Teams and Their Leadership.

Groups – Nature, Group Size, Stages of Group Development, Group Roles, Group Norms, Group Cohesion. Teams – Effective Team Characteristics and Team Building, Ginnetts Team Effectiveness Leadership Model.

UNITIV **(09Hours)**

Leadership Skills – Basic Leadership Skills, Building Technical Competency, Advanced Leadership Skills, Team Building for Work Teams, Building High Performance Teams.

TEXT BOOKS/REFERENCEBOOKS:

T1. Team Building & Leadership: T.N. Chhabra (Sun India, First Edition) / R.K. Chopra / H. Sharma.
T2. Leadership and Team Building by Uday Kumar Haldar, Oxford University Press

R1. Hughes, Ginnett, Curphy - Leadership, Enhancing The Lessons of Experience (Tata McGraw Hill, 5thEd.)
R2. Yukl G - Leadership in Organisations (Pearson, 6thEd.) **R3.**
West Michael - Effective Team Work (Excel Books,1stEd.)
R4. Sadler Philip – Leadership(Crest PublishingHouse)

R5. Team Work: Natalie Gold – Palgrane Macmillan, First Edition.

CourseLearning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the concepts of Leadership and Team Building and their relevance for organizational development	1,2 Remembering, Understanding
CLO2	Understandhis/her predispositionfor Leadership and comprehension of group dynamics for teambuilding	2, 4 Understanding, Analyzing
CLO3	Apply the concepts to specific situations/organizations for effective leadership and control	2, 3 Understanding, Applying
CLO4	Explain the dynamics of group behavior and harnessing it for organizational success	3, 4 Applying, Analyzing
CLO5	Formulate high performance teams for achievement of organizational objectives	3,5 Applying Evaluating
CLO6	Evaluate and integrate the concepts of Leadership, Group Dynamics and Team Building for harnessing individual skills to create organizational synergies	4, 5 Analyzing , Evaluating

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M	H	M	M	M		H	M	L	H	M	L	M	H	H
CLO2	H	H		M	L	L	H	L	L	M	H	M	H	M	H
CLO3	H	M		M	M	H	H	M	M	M	M	L	H	H	H
CLO4	H	M		M	M	M	L	H	L	L	M	L	H	H	H
CLO5	H	M		H	H	L	H	L	M	H	M	L	M	H	H
CLO6	H	H		H	H	L	H	M	M	H	M	L	H	H	H

H: High M: Medium L: Low

INTERNATIONAL LOGISTICS MANAGEMENT
BMG6001-IB

L T P C
3 1 0 4
(40 Hours)

Course Learning Objectives (CO):

CO1: To identify market segment and the official formalities and documentation required for export.

CO2: To explain documentation, logistics, and transportation of export management. Prepare appropriate export documents and responses to requests for quotation. Apply export processes and procedures to public, customer and employee relationships.

CO3: To apply export processes and procedures to such functional areas as finance and accounting.

Course Learning Outcomes: On completion of this course, the students will be able to:

CLO1: Remember and understand the general concepts of logistics information to better analysis of distribution channels, starting from producers to customers.

CLO2: Define and explain the concepts of supply chain management form raw materials supply to finished good delivery to the end users; to learn the re-engineering of existing logistics networks.

CLO3: Analyze and apply the knowledge of logistics in designing suitable marketing channel for international trade and to suitably design a packaging.

CLO4: Develop and use a suitable logistics by considering global trends in logistics information such as the information systems application is provided.

Unit I (10 Hours)

Logistics & Marketing

Logistics: Definition, Evolution, Concept, Components, Importance, Objectives; Logistic Subsystem; The work of Logistics; Integrated Logistics; Barrier to Internal Integration.

Marketing and Logistics

Customer Focused Marketing; Basis for International Trade, Process, Importance; International Marketing Channel: Role of Clearing Agent, Various Modes of Transport, Choice and Issues for Each Mode, Transport Cost Characteristics.

Unit II **(12 Hours)**

Inventory Management and Packaging

Inventory Management: Introduction, Characteristics, Functionality, Components, Planning; Packaging and Packing: Labels, Functions of Packaging, Designs, Kinds of Packaging; Packing for Transportation and Marking: Types of Boxes, Container, Procedure, Cost, Types of Marking, Features of Marking

Containerization: Genesis, Concept, Classification, Benefits and Constraints;

Chartering: Kinds of Charter, Charter Party, and Arbitration

Unit III **(10 Hours)**

Supply Chain Management

Supply Chain definition –Objectives, Types, Drivers, Need for SCM, SCM as a profession, SCM decisions and skills, Strategy formulation in SCM, Value in Supply Chain, Tradeoffs, CRM **Strategy relationship matrix:** Strategic Sourcing, Source evaluation, collaborative perspective, **Buyer-** Supplier Relationship, Partner Selection, develop of Partnership

Unit IV **(08 Hours)**

Supply Chain Management and profitability, quality management, mass customization and globalization, ethical Supply Chains, e-business and SCM, Balanced Score Card, Benchmarking, Performance measurement, SCM software packages

TEXT BOOKS/REFERENCEBOOKS:

T1.Mohanty R.P, S.G Deshmuki -Supply Chain Management‖ Biztantra, New Delhi

T2. Donald J .Bowerson; ― Logistic and Supply Chain Management‖Prentice Hall of India

R1.MultiahKrishnaveni; -Logistic Management and World Sea Borne Trade, Himalaya Publication

R2. Bowersox, Closs, Cooper; ―Supply Chain Logistics Management‖, McGraw Hill.

R3. Burt, Dobbler, Starling; ― World Class Supply Management‖, TMH.

R4. Donald J Bowersox, David J Closs; ― Logistical Management‖, TMH

R5. Pierre David,
-International Logistics‖, Biztantra.

R6.Sunil Chopra, Peter Meindl; -Supply Chain Management‖ ,Pearson Education, India.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Remember and Understand the general concepts of logistics information to better analysis of distribution channels, starting from producers to customers.	1, 2 Remember, Understand
CLO2	Define and explain the concepts of supply chain management form raw materials supply to finished good delivery to the end users; to learn the re- engineering of existing logistics networks.	1, 2 Remember, Understand
CLO3	Analyze and Apply the knowledge of logistics in designing suitable marketing channel for international trade and to suitably design a packaging.	3, 4 Apply, Analyze
CLO4	Develop and use a suitable logistics by considering global trends in logistics information such as the information systems application is provided.	3, 6 Apply, Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)			
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO1	PLO1	PLO1	PSO1	PSO2	PSO3	PSO4
CLO1	H								L	M				M	L	
CLO2	H								L	M				M	L	
CLO3	H		M	L				L	M	H	M	L		H	M	
CLO4	H		M	L				L	M	H	M	L		H	M	

H: High M: Medium L: Low

INTERNATIONAL FINANCE
BMG6002-IB

L T P C
3 1 0 4
(40 Hours)

Course Learning Objectives (CO):

CO1: To make the students understand financial management in global context.

CO2: To explain the foreign exchange market-major players, basic concepts, international monetary system and contemporary practices.

CO3: To develop an insight into the meaning and increasing role of derivatives in the international financial market and help students to make the short term and long term financial decisions in the global market.

Course Learning Outcomes: On completion of the course students will be able to

CLO1: Identify and discuss the impact of globalization and the connection of national economies and the world economy as a whole.

CLO2: Understand the international financial system and the various issues in overseas funding. CLO3: Analysis of foreign exchange market operations and the risk involved in it.

CLO4: Explain and Compare Global financial scene and funding alternatives.
CLO5: Examine International Bond Market.

UNIT- I **(10 Hours)**

Nature&ScopeofInternational Finance: Role of information technology and financial integration in the process of globalization. International Financial Institutions: International Monetary Fund, World Bank. International credit rating agencies and rating criteria, International financing decision.

Issues in Overseas Funding: Choices, Economic Circumstances and overall funding choices, funding and risk management aspects. Parity conditions in International Finance: Purchasing power parity, Covered Interest Parity, Real Interest Parity and Managerial Implications.

UNIT- II **(10 Hours)**

Foreign Exchange Markets: Forecasting Exchange Rates, Fundamental Factors affecting Exchange Rates, Time Series Forecasting Models. Functions of Foreign exchange market, Role of participants in foreign

exchange market. Foreign Exchange Management Act 1999, Role of Reserve Bank of India in Management of foreign exchange. Exchange Rates; Spot rate, Forward rate, Cross Rates, Types of exchange rate regimes.

Parity relations, Purchasing power parity, Interest parity, Exchange risk, Types of exchange risk, Management of exchange risk. Hedging; Internal & External techniques of heading. Currency futures and options, Currency swaps. Speculation in foreign exchange market. Currency arbitrage. Covered interest arbitrage. Convertibility of Indian Rupee. Exchange Rate Behaviour, efficiency and forecasting.

UNIT III **(10 Hours)**

Global Capital Markets, Historical perspective and development, participants, issues, investors, intermediaries. Foreign Bonds & Euro Bonds. Foreign equity and Euro equity. Depository Receipts (A.D.Rs and G. D.Rs) Disintermediation, Deregulation, Securitization, Globalization.

Methods of raising resources by borrowers in international markets – domestic foreign currency loans out of foreign currency resources like FCNR (B), EEFC, etc. International portfolio investment, International liquidity, Foreign Exchange Market Mechanism, Foreign Tradezone.

UNITIV **(10 Hours)**

International Bond Markets, Development, Types of Bonds, Floating Rate Notes (FRNs), Deep Discount Bonds, Zero Coupon Bonds, Dual Currency Bonds, and Equity related Bonds. Procedure for Bonds Issues.

Syndicated loans, Multicurrency options, Syndication process in practice, Offer documents and mandate, Loan agreements. Rights and duties of managing and agents banks.

TEXT BOOKS/REFERENCE BOOKS:

T1. ApteP.G., _Multinational Financial Management‘, Tata -McGraw Hill, New Delhi

R1. International Financial Management by VyuptakeshSharan

R2. International Financial Management by S.P. Sriniwasan

R3. International Finance by Mauric Levi, Keith P. (2013 Edition)

R4. Foreign Exchange, International Finance, Risk Management by A.V. Rajwade

R5. Currency Exposures and Derivatives by A.VRajwade

Course Learning Outcomes(CLO): On completion of this course, the students will be able to

CLO	Description	Bloom's Taxonomy Level
CLO1	Identify and Discuss the impact of globalization and the connection of national economies and the world economy as a whole.	1,2 Remember ,Understand
CLO2	Understand the international financial system and the various issues in overseas funding.	2 Understand
CLO3	Analysis of foreign exchange market operations and the risk involved in it.	4,6 Analyze, Apply
CLO4	Explain and Compare Global financial scene and funding alternatives.	2, 4 Understand , Analyze

Mapping of CLOs with PLOs&PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)			
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3	PSO4
CLO1	H					M			H	H	H	L		H	M	
CLO2	M	M			M	H			H	H	H	H		H	H	
CLO3	M	L			H				H	H	H	M		L	M	
CLO4	M				H	H				M	H	H		M	H	
CLO5	H				H					M	H	H		H	L	

H: High M: Medium L: Low

MANAGEMENT OF FUNDS FOR SMALL BUSINESS
BMG6001-FB

L T P C
3 1 0 4

(40 Hours)

Course Objectives (CO):

CO1: To expose student to needs of Family business / small business Accounting and Finance.

CO2: To prepare student to maintain books of accounts.

CO3: To teach them about inventory management and operations control.

CO4: To provide overview of inventory and asset management and operations.

Course Learning Outcomes (CLOs): On completion of the course the students will be able to :

CLO1: Describe the basic accounting concepts and have an overview of business operations

CLO2: Differentiate between various costs and their relative relevance to budgeting

CLO3: Apply the concepts of money management by controlling cash flows using forecasts and preventive cash flow techniques.

CLO4: Explain the relevance of equity, debt and gifts in small business finance.

CLO5: Formulate financial management for different types of ventures and various stages of operation.

CLO6: Evaluating and framing of inventory and operations management procedures and internalizing the intricacies of capital budgeting

Unit I **(10 Hours)**

Small business accounting: Overview of basic accounting concepts. Analysis of Business operations, The business plan and budget process, Planning/Budgeting, Completing a master budget, Sales budget, Purchase budget, Cost of goods sold, Labor budget, Selling, general, and administrative expense budget, Overhead budget, Budgeted income statement, Completing a comprehensive budget, Controlling, Preparing a Master Budget, Decision Making.

Unit II **(10 Hours)**

Cash: Lifeblood of the business: The importance of money management, Money in/ Money Out , Money as a key idea, Cash and cash equivalents, Managing

cash flow, Company and bank cash balances, Reconciling bank balances with company book balances, Planning cash needs, Sales budget: forecasting sales receipts, Cash receipts budget, Forecasting cash disbursements, A comprehensive budget, Preventive cash flow problems, Techniques to increase cash inflow, Techniques to decrease
cash outflows, Controlling Cash shortages.

Unit III **(10 Hours)**

Small business finance: Using equity, debt, and gifts: Focus on small business: Sources of financing for small businesses, Financing with equity, Determining personal net worth, Getting equity investment for your business, Obtaining your credit report, Gift financing, Finding grants, selecting the sources of finance for the business. Financial management for the life of the business, Tools for financial management, Financial Management for start-up, Financial Management for growth, Financial Management for operations, Financial Management for business exit.

Unit IV **(10 Hours)**

Assets: Inventoryandoperationsmanagement: Managing short-term assets, Accounts receivable, The pros and cons of offering credit to customers, Managing account receivables, accounts receivable as a source of financing, Using receivables to raise immediate cash, Managing inventory, Determining the appropriate level of inventory, Scheduling ordering and receipt of inventory, Just-in-time inventory systems, Other approaches to inventory control, Determining the value of Inventory. Understanding whole of life costs for capital budgeting, The capital budgeting decisions, Payback period, Rate of return on investment. **Practical in small business.**

TEXT BOOKS/REFERENCE BOOKS:

T1. Jerome Katz, Richard Green, Second Edition (2011), Entrepreneurial small business, Tata McGraw- Hill
T2. Khan and Jain, Sixth Edition (2012), Financial Management- Text and Problems, Tata McGraw Hill

R1. Prasanna Chandra, Eight Edition (2011), Financial Management Theory and Practice‖, TMH
R2. R P Rustagi, (2010), Financial Management: Theory, Concepts & Problem, Taxmann, **R3.**I.M. Pandey, Eighth Edition (2010), Financial Management, Vikas Publishing House Pvt. Ltd, New Delhi
R4.S.P. Gupta, Second Edition (2009), Financial Management, SahityaBhawan Publication, Agra

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the basic accounting concepts and have an overview of business operations	1,2 Remember, Understand
CLO2	Differentiate between various costs and their relative relevance to budgeting	2, 4 Understand, Analyze
CLO3	Apply the concepts of money management by controlling cash flows using forecasts and preventive cash flow techniques.	2, 3 Understand, Apply
CLO4	Explain the relevance of equity, debt and gifts in small business finance.	2, 3, 4 Understand, Apply, Analyze
CLO5	Formulate financial management for different types of ventures and various stages of operation.	3,5 Apply Evaluate
CLO6	Evaluating and framing of inventory and operations management procedures and internalizing the intricacies of capital budgeting	2, 4, 6 Understand, Analyze, Evaluate

Mapping of CLOs with PLOs&PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H			M	H		H		L	M	H	M		H	M
CLO2	H			M	H		H		M	M	L	M		H	M
CLO3	H			M	H		H		L	H	M	M		M	M
CLO4	H			M	H		H		M	H	M	H		M	M
CLO5	H			M	H		H		L	M	M	M		M	H
CLO6	H			H	H		H		M	M	M	H		M	H

H: High M: Medium L: Low

Managing, Growing and Exiting the New Venture
BMG6002-FB

L T P C
3 1 0 4

(40 Hours)

Course Objectives (CO):

CO1: To identify stages of venture and entrepreneurial conduct

CO2: To prepare student with the understanding of resources and external sources

CO3: To describe separation and exit strategies

Course Learning Outcome (CLOs): On completion of the course students will be able to:

CLO1: Describe the concept generating and exploiting new entry opportunities

CLO2: Differentiate opportunity on the basis of risk, uncertainty and potential and the advantages of being a first mover.

CLO3: Understand the concepts to understand various strategies of growth and their implication on financial, human resource and entrepreneurial resources.

CLO4: Explain the relevance of using external parties to grow a business- franchising, joint ventures, mergers etc.

CLO5: Formulate the strategy for negotiating for resources and assessing the impact of Going Public

Unit I (10 Hours)

Entrepreneurial Strategy: Generating and Exploiting New Entries:

New Entry, Generation of a New Entry Opportunity - Resources as a Source of Competitive Advantage, Creating a Resource Bundle. Assessing the Attractiveness of a New Entry Opportunity - Information of New Entry, Comfort with Making a Decision under Uncertainty, Decision to Exploit or Not to Exploit the New Entry. Entry Strategy for New Entry Exploitation - Environmental Instability and First Mover Advantages/ disadvantages, Customer Uncertainty and First Mover Advantages/disadvantages, Lead Time and First Mover Advantages/disadvantages. Risk Reduction Strategies for New Entry Exploitation- Market Scope Strategy, Imitation Strategies, Managing Newness.

Unit II (10 Hours)

Strategies For Growth And Managing The Implications of Growth:

Growth Strategies: Growth Opportunities- Penetration Strategies, Market Development Strategies, Product Development Strategies, Diversification Strategies, Example of Growth Strategies. Economic Implications of Growth. Implications of Growth for the Firm - Pressures on Existing Financial Resources , Pressures on Human Resources, Pressures on Management of Employees , Pressures on Entrepreneur‘s Time. Overcoming the Pressures.

Unit III (10 Hours)

Accessing Resources For Growth From External Sources: Using External Parties to Help Grow a Business, Franchising - Advantages of Franchising- to the Franchisee, Advantages of Franchising- to the Franchiser, Disadvantages of Franchising, Types of Franchising, Investing in Franchising.Joint Ventures- Types of Joint Ventures, Factors in Joint Ventures.Acquisition- Advantages of Acquisition, Disadvantages of Acquisition, Synergy, Structuring the Deal, Locating Acquisition Candidates.Mergers, Leveraged Buyouts, Overcoming Constraints by Negotiating for More Resources.Going Public: Advantages and Disadvantages of Going Public.

Unit IV (10 Hours)

Ending the Venture: Bankruptcy- An overview, Reorganization- Surviving Bankruptcy, Prepackaged Bankruptcy, Extended Time Payment Plans, Liquidation, Strategy during Reorganization, Keeping the Venture Going, Warning Signs of Bankruptcy, Starting Over, The Reality of Failure, Business Turnarounds, Exit Strategy. Succession of Business- Transfer to Family Members, Transfer to Non- Family Members.Harvesting Strategy- Direct Sale, Employee Stock Option Plan, Management Buyout.

TEXT BOOKS/REFERENCE BOOKS:

T1. Robert D Hisrich, Michel P Peters, Dean A Shepherd, Sixth Edition, Entrepreneurship, Tata Mcgraw Hill

R1. James Collins, William C. Lazier, Beyond Entrepreneurship: Turning Your Business into an Enduring Great Company, Prentice Hall

Course Learning Outcomes(CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Describe the concept generating and exploiting new entry opportunities	1 Remember,
CLO2	Differentiate opportunity on the basis of risk, uncertainty and potential and the advantages of being a first mover.	4 Analyze
CLO3	Understand the concepts to understand various strategies of growth and their implication on financial, human resource and entrepreneurial resources.	2 Understand
CLO4	Explain the relevance of using external parties to grow a business- franchising, joint ventures, mergers etc.	2 Understand,
CLO5	Formulate the strategy for negotiating for resources and assessing the impact of Going Public	3,5 Apply Evaluate

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSO s)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H			M	H		M	M	M	H	H	M		H	H
CLO2	H			M	H		H	M	M	M	M	M		H	H
CLO3	H			H	H		H	H	M	H	M	L		H	H
CLO4	H			H	H		H	H	M	H	H	H		M	M
CLO5	H			H	H		H	M	M	M	M	M		M	H

H: High M: Medium L: Low

Project- Preparation of a Business Plan
BMG6501

L	T	P	C
0	0	2	2

With a unique blend of Marketing and Finance, this course takes students through the entire process of conceiving and planning a business start-up. The semester-long business planning project serves as the framework around which all of the instruction is based. The final business plan encompasses all of the necessary components to launch a successful and financially viable business.
While the Assignment on Business Problem Framing serves as an important element in the application and integration of the topics included in this course, coverage includes material and concepts that are not directly associated with the business plan.
This course provides advanced analysis and decision-making concepts, tools, and techniques to be applied in a real business setting. Topics include marketing and financial analysis, competitive strategy and pricing, sales and growth forecasting, distribution of goods and services, cash budgeting and forecasting, short and long-term financial planning, and traditional and venture capital. The effective use of communication and other electronic technology is integrated throughout the course and is an important aspect of the business plan project. Assignments and the business plan project also emphasize written and oral communication to a large extent.

Course Learning Objectives:
The business problem framing assignment will form the centerpiece and unifying theme for the course. Students, along with their group members, will conceive a new business venture and plan for its marketing and financial strategies as well as all other aspects of the business. The assignment will involve research, data gathering, analysis, and preparation of a professional-quality business plan at the end of the semester. Graded assignments associated with this project will include computer and written work as well as the final presentation. Students will work in team of four for this project.

Course Learning Outcomes:

The business problem framing assignments intended to foster the following learning objectives and outcomes:

- Gain extensive experience in business planning. Challenge your resourcefulness
- Exercise your powers of innovation and creativity. Gain an understanding of what "professional-quality output" means.
- Improving writing/revision skills. Improving critical thinking skills. Improving risk analysis skills. Improving research skills. Improving presentation and communication skills. Improving ability to think globally.

Progressive Creation and Expected Outcome:
This assignment is a semester-long project that will require immediate and continuous work throughout the entire 13 weeks of the semester. To help keep you on track for successful completion of the project, there will be many assignments due throughout the semester. These assignments and their deadlines will be noted on the schedule page, but in general will include the following:

- Create and submit a description of your group structure, roles and responsibilities.

- Conceive and select two business ideas with mission statements and general descriptions of the product/service to be offered and a reasonable discussion of how each business will meet all of the required criteria for the project.
- Based on feedback received from the instructor, select one of the two businesses to form the basis for your business plan.
- Submit an industry analysis
- Submit a market analysis, plan, and sales forecast
- Submit a cash budget

Guidelines:
The idea behind the business plan is to familiarize students more extensively with the problems related to the business issues and also to allow them to deal with examples of the practical problems that always are ahead while starting a business plan. This assignment is a semester-long project that will require immediate and continuous work throughout the entire 13 weeks of the semester. To help keep students on track for successful completion of the course, there will be many assignments due throughout the semester.

Course Learning Outcomes (CLO) On completion of this course, the students will be able to:

CLO	**Description**	**Blooms Taxonomy Level**
CLO1	Gain extensive experience in business planning. Challenge your resourcefulness	2 , 5 Understanding Evaluating
CLO2	Exercise your powers of innovation and creativity. Gain an understanding of what "professional-quality output" means	1, 2,6 Remembering Understanding Creating
CLO3	Improving writing/revision skills. Improving critical thinking skills. Improving risk analysis skills. Improving research skills. Improving presentation and communication skills. Improving ability to think globally	3, 4, 6 Applying Analyzing Creating

Mapping of CLOs with PLOS and PSOs:

Course Learning Outcomes (CLO):	**Program Learning Outcomes (PLOs)**												**Program Specific Outcomes (PSOs)**		
	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CLO 1	H	M	L	H	H	L	M	L	L	M	L	M	L		
CLO 2	H	L		H	H		L	M	L	L	M		L	L	
CLO 3	H	H		H	H	L	H		H	H	M	M	L		

H: High, M: Medium, L: Low

COMPREHENSIVE VIVA III

BMG6505

L	T	P	C
0	0	0	1

Course Learning Objectives (CO):

CO1. To prepare comprehensively about the concept and overall knowledge of all courses.
CO2. To gain confidence and develop interpersonal skills in the relevant field.
CO3. To acquaint the students with the overall framework of management concepts in business administration.
CO4. To build professional conduct within any team activities.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. The students will be able to understand the concept of management principles and various dimensions.
CLO2. The students will be able to Develop problem solving skills by gathering and assessing appropriate management information.
CLO3. The students will be able to Assess management concepts, plans and decision in business administration.
CLO4. The students will be able to Analyze and build professional conduct within any team activities.

Methodology:

The confidence level, presentation and communication skills, decision-making ability and a comprehensive understanding will be assessed.

The viva voce is of 100 marks and is to be conducted by the external examiners appointed by the University. A weightage of 2 credits has been given to this to highlight its importance.

CourseLearning Outcomes(CLOs): On completion of this course, the students will be able to:

CLO	Descriptio n	Bloom's Taxonom y Level
CLO1	The students will be able to understand the concept ofmanagementprinciplesandvarious dimensions.	2 Understand
CLO2	The students will be able to Develop problem solving skills by gathering and assessing appropriate management information.	3 Apply
CLO3	The students will be able to **Assess** management concepts, plans and decision in business administration.	4 Evaluate
CLO4	The students will be able to **Analyze** and **build** professional conduct within any team activities.	4,6 Analyze , Create

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)			
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	M	M	M	H	M	H	M	H	M	M	H	H	M	
CLO2	H	M	M	M	M	M	H	M	M	M	M	H	M	M	H	
CLO3	H	H	M	H	H	M	H	M	M	M	M	M	M	M	M	
CLO4	H	H	M	H	H	H	H	H	M	H	M	M	L	M	M	

H: High M: Medium L: Low

RAFFLES UNIVERSITY

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ALAB.COMR SCHOOL OF MANAGEMENT
RAFFLES UNIVERSITY, NEEEMRANA

Bachelor of Business Administration (B.COM 3 Years)

Programme Objectives (PO)

The objectives of B.COM Programme are:

PO1: To remember the conceptual knowledge with an integrated approach to various functionsof management.
PO2: To develop leadership and communication skills to become successful business leadersand managers.
PO3: To encourage and develop critical thinking, analysis and initiative ability skills.
PO4: To develop problem-solving skills through experiential learning and innovative pedagogy to ensure utilization of knowledge in professional careers.
PO5: To apply the various concepts, theories and models in the area of HR, Marketing, Finance.
PO6: To develop a positive attitude and life skills to become a multi facet personality with a sense of environmental consciousness and ethical values.

Programme Learning Outcomes (PLO)

The expected outcomes after completing the program would be:

PLO1: Management knowledge: Acquire adequate knowledge through principles, theory and models of business management, Accounting, Marketing, Finance, IT, Operations and Human Resource.

PLO2: Communication: Demonstrate proficiency for Business Communication for effective and professional business management.
PLO3: Technical Knowledge: Acquire employability skills through practical exposure of IT and its usage in management.

PLO4: Investigation of Business Problems: Analyze and comprehend the applicability of management principles in solving complex business issues.
PLO5: Entrepreneurial Perspective: Develop entrepreneurial skills to become an entrepreneur.

PLO6: Environment and Sustainability: To build perspective about global environment including cultural, social and sustainability issues.

PLO7: Leadership Skills: Ability to develop group behavior and lead a team to achieve the individual, group and organizational goals.

PLO8: Ethics: Understand importance of ethics in business decision-making and inculcate the spirit of social responsibility.

PLO9: Global Perspective: Comprehend the applicability of management principles in the situations pertaining to global business world.

PLO10: Area Specific Expertise: Apply various concepts, theories and models in the functional areas of business like Marketing, HR and Finance in the Organizations.
PLO11: C**ross-Disciplinary Integration and Strategic Perspective**: Acquire and apply knowledge of economics, mathematics, statistics and production and operation management and its integration relevant to business decisions.

PLO12: Legal Knowledge: Obtain legal knowledge of various business operations for effective decision-making.

Program Specific Outcomes (PSO)

PSO1 Acquire Practical learning through summer internship, industrial visit and Business Plan etc.
PSO2 Demonstrate analytical and problem-solving skills through core elective area of specialization in Finance, Human Recourse, and Marketing to solve the business issues.
PSO3 Understand and develop the new dimensions of knowledge through open electives to cater the need of the industry.

B.COM

I Year: I Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	COM -103	Management Process	4	0	0	60	40	100	4
2.	COM -104	Business Organization and Environment	4	0	0	60	40	100	4
3.	COM -105	Principles of Accounting	4	0	0	60	40	100	4
4.	COM -106	Business Mathematics	4	0	0	60	40	100	4
AECC									
5.	COM -101	English Language-I	2	0	0	30	20	50	2
SEC									
6.	COM -102	Constitution of India and Human Rights	4	0	0	60	40	100	4
GE									
7.	COM -107	Fundamentals Computer and IT	3	0	1	60	40	100	4
		Total	**25**	**0**	**1**	**390**	**260**	**650**	**26**

B.COM

[Effective from the Session 2019-20]

I Year: II Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	COM -203	Business statistics	4	0	0	60	40	100	4
2.	COM -204	Cost Accounting	4	0	0	60	40	100	4
3.	COM -205	Organization Behavior	4	0	0	60	40	100	4
AECC									
4.	COM -201	English Language-II	3	0	0	30	20	50	2
SEC									
5.	COM -202	Environmental Studies	4	0	0	60	40	100	4
		Total	**19**	**0**	**0**	**270**	**180**	**450**	**18**

B.COM

Year: III Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	COM- 302	Business Economics	4	0	0	60	40	100	4
2.	COM- 303	Corporate Accounting	4	0	0	60	40	100	4
3.	COM- 304	Human Resource Management	4	0	0	60	40	100	4
4.	COM- 305	Rural Management	4	0	0	60	40	100	4
5.	COM- 306	Comprehensive Viva Voce	0	0	0			100	4
SEC									
6.	COM -301	Cyber Phenomenon & Law	3	0	0	60	40	100	4
		Total	**19**	**0**	**0**	**300**	**200**	**600**	**24**

B.COM

Year: IV Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	COM-402	Financial Management	3	0	0	60	40	100	4
2.	COM- 403	Direct Tax	4	0	0	60	40	100	4
3.	COM- 404	Management Accounting	4	0	0	60	40	100	4
4.	COM- 405	E- Business	4	0	0	60	40	100	4
5.	COM- 406	Business Research Methods	4	0	0	60	40	100	4
SEC									
6.	COM -401	Business Communication	4	0	0	60	40	100	4
		Total	**23**	**0**	**0**	**360**	**240**	**600**	**24**

B.COM

Year: V Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
CORE									
1.	COM -501	Marketing Management	3	0	0	60	40	100	4
2.	COM -502	Human Resource Planning and Development	4	0	0	60	40	100	4
3.	COM -505	Summer Internship & Project	4	0	0			100	4
DSE(Choose any one**)**									
4.	COM -503	Investment Management Entrepreneurial c. Management Advertising	4	0	0	60	40	100	4
5.	COM -504	International Finance Accounting Information System c. Labour Law	**4**	**0**	**0**	60	40	100	4
		Total	**22**	**0**	**0**	**240**	**160**	**500**	**20**

B.COM
III Year: VI Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	COM- 603	International Business	4	0	0	60	40	100	4
2.	COM- 604	Operation Management	4	0	0	60	40	100	4
3.	COM- 605	Research Project Report	4	0	0			100	6
DSE(Choose any one**)**									
4.	COM- 601	a. Business Ethics b. Financial Market Institutions, and Services c.Industrial Relation	4	0	0	60	40	100	4
5.	COM- 602	Performance Management Goods and Services Tax Consumer Affairs and Customer care	4	0	0	60	40	100	4
		Total	**20**	**0**	**0**	**240**	**160**	**500**	**22**

B.COM

Syllabus
B.COM
I Semester

ENGLISH LANGUAGE

COM-101

L T P C

2 0 0 2

B.COM: Semester-I

Course Objective

Teaching English to students of Management is to prepare them with an adequate knowledge of communication in English in the periphery of business world. Students should feel comfortable and easy to communicate in English with others. They have learnt some basic grammatical usage and in this upcoming semester they will learn to communicate to each other with role play conversation. The course contents will, bring a lot of changes in their soft skills and personal development which are very essential for each of them. This syllabus is only for the second semester which will help them to communicate comfortably to others with general English in business field. The following contents are enlisted for the students of B.COM/B.Com in the second semester.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: To make effective and impressive communication.
CO2: To make communication in ethical manner.
CO3: Capable to make persuasive digital communication.
CO4: Capable to make abstract & summaries of proposals.
CO5: Better presentation and communication using proper body language.

Course Contents

Unit I: Introduction to Communication

Meaning and Definition - Process - Functions - Objectives - Importance - Essentials of good communication - Communication barriers - Overcoming communication barriers

Unit II: Reported Speech

What is reported speech, where to use, how to report the speech of second person to others, words used for reported speech, etc.

Unit III: Oral Communication

Meaning, nature and scope - Principles of effective oral communication - Techniques of effective speech - Media of oral communication (Face-to-face conversation - Teleconferences - Press Conference – Meetings - Rumour -
Demonstration and Dramatization - Public address system - Group Discussion - Oral report - Closed circuit TV). The art of listening - Principles of good listening.
Jam sessions – Debates etc.

Unit IV: Business Letters

Need and functions of business letters - Planning & layout of business letter - Kinds of business letters - Essentials of effective correspondence
Drafting of business letters, Enquiries and replies - Placing and fulfilling orders - Complaints and follow-up - Sales letters -Circular letters - Application for employment and resume - Report

writing - Notices, Agenda and Minutes of the Meetings – Memos – cover letters – resume/ cv drafting.

Unit V: Basic Grammar

Aids to correct writing- Tenses, Modals, Subject-verb agreement, common errors.

Suggested Readings:

Bovee, and Thill, Business Communication Essentials, Pearson Education

Shirley Taylor, Communication for Business, Pearson Education

Locker and Kaczmarek, Business Communication: Building Critical Skills, McGraw Hill Education

Herta A Murphy, Herbert W Hildebrandt, Jane P. Thomas, Effective Business Communication (SIE), McGraw Hill Education

Dona Young, Foundations of Business Communication: An Integrative Approach, McGraw Hill Education

Raymond V. Lesikar, Marie E. Flatley, Kathryn Rentz, Paula Lentz, and Neerja Pande, Business Communication: Connecting in a Digital World (SIE), McGraw Hill Education

Course Learning Outcomes	Program Learning Outcomes(PLOs) COM-101												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	L	H		M	L		H	L		L		L	H	M	
CLO2	M	L		L			M			L	L	H	M	M	
CLO3	M			M			L			M			M	L	L
CLO4	L			M									L	L	

Mapping of CLOs with PLOs and PSOs

H: High -3

M:Medium -2

L:Low-1

MANAGEMENT PROCESS
COM-103
L T P C
4 0 0 4
40 HOURS

Course Objective

CO1) To introduce students to the core concepts and principles of management.
CO2) To provide a foundational understanding of the role and importance of management in organizations.
CO3) To teach students how to develop and implement effective planning processes and to enable students to make informed and strategic decisions by applying various decision-making techniques.
CO4) To introduce the principles of staffing, including recruitment, selection, training, and performance appraisal and to understand the importance of human resource management in achieving organizational goals.
CO5) To analyze current trends and challenges in management, such as globalization, technology, sustainability, and diversity and to encourage critical thinking and adaptability in a rapidly changing business environment.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Evaluate the global context for taking managerial actions of planning, organizing and controlling
CO2: Assess global situation, including opportunities and threats that will impact management of an organization
CO3: Integrate management principles into management practices.
CO4: Assess managerial practices and choices relative to ethical principles and standards.
CO5: Specify how the managerial tasks of planning, organizing, and controlling can be executed in a variety of circumstances.
CO6: Determine the most effective action to take in specific situations.
CO7: Evaluate approaches to addressing issues of diversity.

Course Contents

Unit I: Introduction to Management(8 HOURS)

Nature of Management- Meaning, Definition, it's nature purpose, importance & Functions. Evolution of Management Thoughts- Contribution of F.W.Taylor, Henri Fayol ,Elton Mayo , Chester Barnard & Peter Drucker to the management thought. Various approaches to management (i.e. Schools of management thought)Indian Management Thought.

Unit II: Planning and Decision Making (8 HOURS)

Planning - Meaning - Need & Importance, types levels - advantages & limitations.
Forecasting - Need & Techniques
Decision making - Types - Process of rational decision making & techniques of decision making.

Unit III: Organizing and Directing(8 HOURS)

Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation – Decentralization.
Directing- Introduction, Principles and Elements of Direction; Supervision, Traditional vs. Development Supervision.

Unit IV: Controlling and Coordination (8 HOURS)

Controlling- Concept, Importance, Process & Types of Controlling, Contemporary Issues in Control, Entrepreneurs and Control. Operations Management- Importance, Service and Manufacturing Firms, Project Management Tools & Techniques.
Coordination- Coordination- Definition, Characteristics, Objectives, Techniques.

Unit V: Contemporary Management Issues (8 HOURS)

Management in the International Area.
Change and Organizational Development.
Ethics, Corporate Governance and Social Responsibilities.

Recommended book

L. M. Prasad: Principles and Practice of Management, (2016): Sultan Chand & Sons Publications,. New Delhi
V.S.P. RAO: Principles of Management text and cases

Reference books

Robbins, De Cenzo, Bhattacharya and Agarwal, (2009): Fundamentals of Management- Essential Concepts & Applications 6e, India, Pearson
Hellriegel, Jackson and Sloceum, (2008): Management- A Competency Based Approach 10e, India, South- Western Cengage Learning.
Stoner, Freeman, Gilbert, Jr., (2006), Management 6e, India, Prentice- Hall

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	**Program Learning Outcomes(PLOs) COM-103**												**Program Specific Outcomes (PSOs)**		
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	M		L							M				L	
CLO2	H		M							H				L	
CLO3	H		H	L	L					H		L		H	
CLO4	H		H	L	L					H		L		H	

H: High M: Medium L: Low

Business Organization And Environment
COM-104
L T P C
4 0 0 4
40 HOURS

Course Objective

CO10 This module provides students with an elaborative understanding of organizational behavior, its key principles, concepts & theories.
CO2) The range of concepts & theories that students will be introduced includes foundation of individual behavior, groups & group dynamics, motivation, leadership, organization design, organization structure, work stress, organization culture, organization change.
CO3) By the end of the module, students will be fully equipped with the knowledge and skills required to understand & deal human behavior in the organization as individual, group member & organization as a whole.

Course Learning Outcomes

After completing this course, the students will be able to:
Identify and evaluate social, cultural, legal and technical factors in business environment.
Describe the various economic system and sectors.
Discuss economic planning and policies of Indian economy.
Apply ethical values and social responsibilities in business.
Explain International economic grouping and organisations.

Course Contents

Unit I: Foundations of Individual Behavior (8 Hours)

Introduction and Conceptual framework of OB- Nature & Scope of Organizational Behavior.
The organization and the individual.
Personality: Determinants and Attributes, Big Five Model
Major Personality Attributes: Locus of Control, Machiavellianism, Self Esteem, Self-Monitoring, Type A & B personality, Risk taking ability.
Learning and Learning Theories: Concept, Law of Effect, Classical Conditioning, Operant Conditioning, Social Learning Theory. Reinforcement Theory and OB Modification Process and its Advantages.
Attitudes: Concept, its components and various job related attitudes, Job satisfaction and its impact on OB.
Values: Concept, types of values, Robbin's Dominant Work Values today, Hofstede's Values Across Cultures, Javidan & House's The G.L.O.B.E. Findings.
Perception: Definition, factors affecting individual perception, Perceptual Selectivity.

Unit II: Motivation and Leadership(8 Hours)

Motivation: Definition and concept, different types of motives.
Theories of motivation: Maslow's Hierarchy of Needs, Herzberg's Two Factor theory, ERG theory, Vroom's Expectancy theory, Equity theory, Reinforcement theory and Behavior Modification.

Leadership: Nature and Significance of leadership, Trait theory of leadership.
Behavioral theories of leadership- Ohio State Studies, Michigan Studies, and Managerial Grid.
Contingency theories - Fiedler's model, Hersey and Blanchard's situational theory, leader-member exchange theory, path goal theory, Charismatic leadership.

Unit III: Foundations of Group Behavior(8 Hours)
Group: Definition, Classification of Groups, stages of group development, Group Structure, Group Processes, Strength and weakness of group over individuals.
Team: Concept of team, Group v/s Team, Team Effectiveness, Different types of teams, how to convert an individual into team player.
Conflict and Collaboration: Transitions in Conflict Thought, Functional versus Dysfunctional Conflict, Conflict Process.
Conflict Management: Techniques, Negotiation process, Bargaining strategies, Global implications.

Unit IV: Structural & Cultural Dimensions of OB(8 Hours)
Organization Structure: Definition, Elements of Organization Structure, Common Organization Designs: simple Structure, Bureaucratic Structure, Matrix Structure.
New Designs Option: Team Structure, Virtual Structure, Boundaryless Organization Structure; Factors affecting choice of different organization designs.
Organization Culture: Meaning of Organizational Culture, Creating and Sustaining Culture, Countries and Culture, Employee Acculturation Process.
Organizational Climate: Concept and How to build a more positive and employee centered climate.

Unit V: Organizational Change and Stress Management(8 Hours)
Organizational Change: Change Concept, Forms of Change, Sources of Resistance to Change, Tactics to deal with resistance.
Approaches/ Models to Managing Change: Lewin's Change Model and Nadler's Organizational Model, Action Research: Steps in action Research and Change agents.
Stress Management: Work Stress, types of stress, stages of stress, causes of stress: extra-organizational, organizational, group and individual; Strategies to cope with stress: individual strategies and organizational strategies.

Recommended Book
Robbins, Judge & Sanghi, (2009): Organizational Behavior 13e, India, Pearson, Prentice Hall

Reference Book
L. M. Prasad, (2011): Organizational Behavior, India, Sultan Chand & Sons
Hersey, Blanchard & Johnson, (2009), India, Pearson/ Prentice Hall
Keith Davis: Organizational Behavior: Human Behavior at Work, McGraw Hill Book Co

Course Learning Outcomes (CLOs): On completion of this course, the students willbe able to:

Course Learning Outcomes	Program Learning Outcomes(PLOs) COM-104												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M		L			L				M				L	
CLO2	H		M				L			H				L	
CLO3	H		H	L	L		M			H		L		H	
CLO4	H		H	L	L		M			H		L		H	

Mapping of CLOs with PLOs & PSOs

H: High M: Medium L: Low

Principles of Accounting
COM-105
L T P C
4 0 0 4
40 HOURS

Course Objective

This course provides conceptual knowledge of financial accounting and the techniques for preparing accounts in different types of business organisations.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: understand the theoretical framework of accounting and to prepare financial statements
CO2: explain and determine depreciation and value of inventory
CO3: learn accounting for hire purchase transactions, leases, branches and departments
CO4: understand the concepts of partnership firm and prepare accounts for dissolution of a partnership firm
CO5: develop the skill of preparation of trading and profit and loss account and balance sheet using computerized accounting.

Course Contents

Unit-1: Introduction(8 HOURS)

Conceptual Framework: Accounting principle, Concepts and Conventions Introduction to Accounting Standards and Indian Accounting Standards (AS & Ind AS), Accounting Process: Journal, ledger, Trial Balance, Financial Statements (overview) Capital Expenditure (and Receipts), Revenue Expenditure (and Receipts) and Deferred Revenue Expenditure. Preparation of Financial Statements of a profit making sole proprietorship trading firm with additional information, Preparation of Financial Statements of a not for profit organisations.

Unit-2: Depreciation Accounting and Inventory Valuation(8 HOURS)

Accounting for Plant Property and Equipment & Depreciation: Meaning of Depreciation, Depletion and amortization, Objective and Methods of depreciation (Straight line, Diminishing Balance), Change of Method, Inventory Valuation: Meaning, Significance of Inventory Valuation, Inventory Record System-Periodic and Perpetual, Methods of Inventory Valuation-FIFO, LIFO and Weighted Average
(Relevant accounting Standards as applicable)

Unit-3: Special types of Accounting(8 HOURS)

Hire Purchase Accounting: Calculation of Interest, Partial and Full Repossession, profit Computation (Stock & Debtors System only)**,** Accounting for Leases: Concept, Classification of leases (Simple practical problems)**,** Accounting for Branches (excluding foreign branches): Dependent branches (‘Debtors system’ and ‘Stock & debtors System’) and overview of

Independent branches. Departmental Accounting: Concept, Type of departments, Basis of allocation of departmental expenses, Methods of departmental accounting (excluding memorandum stock and memorandum mark-up account method)
(Relevant accounting Standards as applicable)

Unit-4: Accounting for Partnership Firm(8 HOURS)

Partnership accounts: Fundamentals, Admission, Retirement and Death of a partner (only an overview)**,** Accounting for Dissolution of Partnership Firm: Dissolution of Partnership Firm including Insolvency of partners (excluding sale to a limited company), Gradual realization of assets and piecemeal payment of liabilities

Unit-5: Computerized Accounting System(8 HOURS)

Computerized Accounting System: Computerized accounts by using any popular accounting software: Creating a company; Configure and Features settings; Creating Accounting Ledgers and Groups, Creating Stock Items and Groups; Vouchers Entry; Generating Reports – Cash Book, Ledger Accounts, Trail Balance, Profit and Loss Account, Balance Sheet, Funds Flow Statement, Cash Flow Statement, Selecting and Shutting a Company; Backup and Restore of Data of a Company
Note: Latest Accounting Standards to be followed

References

Goyal, Bhushan Kumar and H.N. Tiwari, Financial Accounting , Taxmann
Kumar, Alok. Financial Accounting, Singhal Publication.
Lt Bhupinder. Financial Accounting – Concepts and Applications, Cengage
Monga, J R. Financial Accounting: concept and Applications. Mayur paper Backs, New Delhi
Sehgal, Ashok & Deepak Sehgal. Fundamentals of Financial Accounting, Taxmann
Tulsian, P C. Financial Accounting, Tata McGraw Hill New Delhi
Lal, Jawahar, Seema Srivastava & Abrol, Shivani. Financial Accounting Text and problems, Himalaya Publishing House, New Delhi.

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	M			H		L		M	L	M	H		L	H	L
CLO2	M	L	L	H	H	L		M	L		H		L	H	L
CLO3		L	L	H	H	L		M		M	H		L	H	L
CLO4				H	H	L		M			H		L	H	L

Matching of PLOs and CLOs:

H: High M: Medium L: Low

Business Mathematics
COM-106
L T P C
4 0 0 4
40 HOURS

Course Objective

Business mathematics is used by commercial enterprises to record and manage business operations. Commercial organizations use mathematics in accounting, inventory management, marketing, sales forecasting, and financial analysis. Mathematics typically used in commerce includes elementary arithmetic, elementary algebra, statistics and probability. Business management can be made more effective in some cases by use of more advanced mathematics such as calculus, matrix algebra and linear programming.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: comprehend the concept of systematic processing and interpreting the information in quantitative terms to arrive at an optimum solution to business problems.
CO2: develop proficiency in using different mathematical tools (matrices, calculus, linear programming, and mathematics of finance) in solving daily life problems.
CO3: acquire competence to use computer for mathematical computations, especially with Big data.
CO4: obtain critical thinking and problem-solving aptitude.
CO5: evaluate the role played by mathematics in the world of business and economy.

Course Contents

UNIT I : Basics of Business Mathematics(8 HOURS)
Ratio and proportion
Indices
Logarithms

UNIT II : Equations (8 HOURS)
Linear – simultaneous linear equations up to three variables,
Quadratic and cubic equations in one variable,
Equations of a straight line,
Intersection of straight lines,
Graphical solution to linear equations.

Inequalities
Graphs of inequalities in two variables
Feasible & Infeasible solutions

UNIT III(8 HOURS)

Simple and Compound Interest including annuity – Applications
Basic concepts of Permutations and Combinations

UNIT IV(8 HOURS)
Sequence and Series – Arithmetic and geometric progressions
Sets, Functions and Relations

UNIT V(8 HOURS)
Limits and Continuity – Intuitive Approach
Basic concepts of Differential and Integral Calculus (excluding trigonometric functions)

Recommended book:

R S Agarwal, Quantitative Aptitude, S. Chand Publishing, 17th Edition, 2012

Reference books:

Abhijit Guha, Quantitative Aptitude, Tata McGraw - Hill Education, 4th Edition, 2010
P.Gupta, Quantitative Aptitude, Unique Publisher
Zameerudin, Qazi, V.K. Khanna & S.K. Bhambri, Business Mathematics, Vikas Publishing House Pvt. Ltd, New Delhi.

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	**Program Learning Outcomes(PLOs)**												**Program Specific Outcomes (PSOs)**		
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	L									M			L		
CLO2		M								M				M	
CLO3			H							M					M
CLO4	L									M	H				L

H:High M: Medium L: Low

Fundamentals of computers
COM-107
L T P C
3 0 1 4
40 HOURS

Course Objective

Computers have become an integral part of work life of every individual. Today's pace of corporate functioning cannot even be thought of without computers. Keeping into mind such a necessity, this paper is introduced to help the students learn the basic skills of operating a computer and office automation.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Understand the concept of input and output devices of Computers and how it works.
CO2: Understand the concepts, structure, types and design of operating Systems.
CO3: Understand the concept of Data Communication, its Modes, its Forms and Data Communication Channels
CO4: Understand evolution of internet, its application and its basic services.
CO5: Recognize when to use each of the Microsoft Office programs to create professional and academic documents
CO6: Create and design a word document for general office use.
CO7: Students will have a working knowledge of paragraph formatting, macro and mail-merge in MS-Word.

Course Contents

Unit I: Introduction to Computers(8 Hours)
Computer defined, Classification of computers, Basic computer organization, Input devices, Output devices, Primary Memory (ROM, RAM), Secondary Memory, Binary digit system, Bits, Bytes, Other units of memory, Software (Application software, Operating Software).

Unit II: Microsoft Word(8 Hours)
Introduction to Toolbars, Menus, Ribbons, Text formatting, Finding and replacing text, Inserting illustrations (picture, clipart, shapes, Smartart, Chart), Headers, Footers, Text box, Word art, Symbols, Page setup, Watermark, Page border, Paragraph formatting, grouping, ungrouping, Mail merge, Spell check, Word count, Zoom, Save, Save as, Printing documents, Print preview

Unit III: Microsoft Excel(8 Hours)
Introduction to components of Excel window interface, Toolbars, Worksheet concept, Cell address, Formatting, Cell alignment, Conditional formatting, Inserting, Deleting and formatting cell, Autosum, Sorting & Filtering, Inserting illustrations (picture, clipart, Shapes, Smartart),

Inserting and formatting charts, Text box, Header & Footer WordArt, Object, Symbol, page layout, Basic formulas (sum, multiplication, average, maximum, minimum, percentage), Spellcheck, Inserting & editing comment, Save, Save as, Printing, Print preview, Page break view.

Unit IV: Microsoft PowerPoint(8 Hours)
Introduction to components of PowerPoint window interface, Toolbars, Slide layout, design, Slide formatting, arranging and ordering, Inserting tables, Illustrations (Picture, Clipart, Shapes, Smartart, Chart, Text box, Header & Footer, WordArt, Movie, Sound, Slide animation, Slide transition, Slide show basics, Slides handout, Slides sorter, Printing handouts, Print preview.

Unit V: Networking and Internet(8 Hours)
Computer networking basics, Network topology (Star, Ring, Bus, Hybrid, LAN, WAN, MAN, Internet surfing, Internet browsers (Mozilla, Internet explorer, Chrome, Opera), Opening & operating email accounts, Dropbox, Instant messaging, Search engines

Recommended Readings
Sinha, P.K. and Sinha, Priti, Computer fundamentals, BPB Publications, New Delhi, Sixth Edition, 2011.
Peter Norton, Introduction to Computers, Tata McGraw Hill, Sixth Edition, 2009.
Behrouz Forouzan, Data Communication and networking, TMH

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	**Program Learning Outcomes (PLO's)**														
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1		M		M		M	M		M	M			M	M	
CLO2		H		M		M	H	M	M	M		H	M	M	
CLO3	M	H		H		M	H	M	M	M		H	M	M	
CLO4	H	M		M		M	H	M	M	M		H	M	M	

H: High M: Medium L: Low

Constitution of India and Human Rights
COM-102
L T P C
4 0 0 4
40 HOURS

Course Objective

To bring about aware among students about our constitution and human rights

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Understand the emergence and evolution of Indian Constitution.
CO2: Understand the structure and composition of Indian Constitution
CO3: Understand and analyse federalism in the Indian context.
CO4: Analyse Panchayathi Raj institutions as a medium of decentralization.
CO5: Evaluate the Indian Political scenario amidst the emerging challenges.
CO6: Evaluate Indian foreign relations under cold war and post-cold war era.

Course Contents

Unit I: Indian Constitutional Philosophy (10 HOURS)
a) Features of the Constitution and Preamble
b) Fundamental Rights and Fundamental Duties
c) Directive Principles of State Policy

Unit II Union and State Executive, Legislature and Judiciary (10HOURS)
a) Union Parliament and State Legislature: Powers and Functions
b) President, Prime Minister and Council of Ministers
c) State Governor, Chief Minister and Council of Ministers
d) The Supreme Court and High Court: Powers and Functions

Unit III: Concept and Development of Human Rights (10HOURS)
a) Meaning Scope and Development of Human Rights
b) United Nations and Human Rights – UNHCR
c) UDHR 1948, ICCPR 1996 and ICESCR 1966

Unit IV: Human Rights in India (10 HOURS)
a) Protection of Human Rights Act, 1993 (NHRC and SHRC)
b) First, Second and Third Generation Human Rights
c) Judicial Activism and Human Rights

Suggested Readings:

Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd..

New Delhi
SubashKashyap, Indian Constitution, National Book TrustJ.A. Siwach, Dynamics of Indian Government & Politics
D.C. Gupta, Indian Government and Politics , Vikas Publishing House Pvt Ltd (1 July 1973)
H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	**Program Learning Outcomes (PLO's)**														
	PLO 1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	L	H	M	H	H	H	M	H	H	H	M	M	H	M	M
CLO2	L	H	M	H	H	M	M	H	M	H	M	M	H	M	M
CLO3	L	H	M	H	H	M	H	H	H	H	M	M	H	M	H
CLO4	M	H	L	H	H	H	H	H	H	H	M	M	H	M	H
CLO5	M	L	H	M	H	H	H	M	M	H	H	M	H	M	M

H: High M: Medium L: Low

B.COM Semester: II

Business Statistics
COM-203

L T P C
4 0 0 4
40 HOURS

Objective

The objective of this course is to familiarize students with the basic statistical tools used to summarize and analyze quantitative information for decision making.

Curriculum

Unit I (8 HOURS)

Probability: introduction, basic terminology, Types of probability, Probability rules, posterior probability.

Unit II(8 HOURS)

Probability distribution: Introduction, random variables, use of expected value in decision making, normal distribution, binomial distribution.

Unit III (8 HOURS)

Sampling and Sampling distribution: introduction, random sampling, sampling distribution, relationship between sample size and standard error.

Unit IV (8 HOURS)

Estimation: introduction, point estimate, interval estimate, confidence interval, sample size in estimation.

Unit V (8 HOURS)

Testing Hypothesis: introduction, basic concept, testing procedure, testing hypothesis, measuring the power of hypothesis test. Testing of proportion.

Reference books:

Vohra, N.D., (2009) Quantitative Techniques in Management, 4th edition, McGraw Hill Education.
Vishwanathan, P.K., (2008) Business Statistics and Applied Orientation, 1st edition, Pearson Education.
Rajagopalan, S. and Sattanathan, R., (2009) Business Statistics & Operations Research, 2nd Edition, McGraw Hill Education.
Sharma, J.K., (2009) Operations Research: Problems & Solutions, 2nd edition, Macmillan India Ltd.

Taha, Hamdy, (2008) Operations Research: An Introduction, 8th edition, Pearson Education.
Render, Barry, Stair, R.M., Hanna, M.E., and Badri, (2009) Quantitative Analysis for Management, 10th edition, Pearson Education
Richard l. Levin and Devid S. Rubin, Statics for management, Pearson

Mapping of CLOs with PLOs & PSOs

COURSE LEARN--ING OUT-COMES	**Program Learning Outcomes (PLOs)**												**Program Specific Outcomes (PSOs)**		
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	M			H									H		
CLO2		L		H							H			H	
CLO3											H			H	
CLO4	M			H						H				H	H

H: High M: Medium L: Low

COST ACCOUNTING
COM-204

L	T	P	C
4	0	0	4

(40 Hours)

Objective

The subject of Management Accounting is basicaliiy Designed to equip the Student with tools for analysing financial and non financial information which will help them in decision-making planing and control.

Aim: To acquaint the students with basic concepts used in cost accounting and various methods involved in cost ascertainment systems.

Curriculum

Unit I: Introduction(8 HOURS)

Meaning, objectives and advantages of cost accounting, Difference between cost accounting and financial accounting. Cost concepts and classifications, Elements of cost. Installation of a costing system. Role of a cost accountant in an organization.

Unit II: Cost concept(8 HOURS)

Types of cost, Cost Accumulations, cost objects , cost classifications, cost applications, cost behavior,Techniques of Costing.

Unit III: Overhead(8 HOURS)

Classification, allocation, apportionment and absorption of overhead.Under- and over-absorption. Capacity costs. Treatments of certain items in costing, like interest on capital, packing expenses, debts, research and development expenses, Bad Activity – based cost allocation.

Unit IV Methods of Costing(8 HOURS)

Unit costing, Job costing. Contract Costing. Process costing (process losses, valuation of work in progress, joint and by-products) Service costing (only transport).

Unit V:Cost -Volume -Profit Analysis(8 HOURS)

The Reletionship of cost and profit with volume, use of CVP Analysis, Marginal Costing and Absorption costing, Breakeven point, contribution marginal Approach, Use of Break even analysis.

Recommended Book

Lal, Jawahar. Cost Accounting. Tata McGraw Hill Publishing Co., New Delhi

Reference Book

Nigam, B.M. Lall and I.C. Jain. Cost Accounting: Principles and Practice. Prentice Hall of India, New Delhi.
Mittal, D.K. and Luv Mittal. Cost Accounting. Galgotia Publishing Co., New Delhi.
Arora, M.N.Cost Accounting–Principles and Practice. Vikas Publishing House, New Delhi.
Shukla, M.C., T.S. Grewal and M.P. Gupta. Cost Accounting: Text and Problems.

S. Chand & Co. Ltd., New Delhi.

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H									M				M	L
CLO2	H									M				M	L
CLO3	H			L						M				M	L
CLO4	H			L						M				M	L

Mapping of CLO with PLOs and PSOs

-H igh, M-Medium, L-Low

ORGANIZATIONAL BEHAVIOR

COM-205
L T P C
4 0 0 4
40 HOURS

Course Objective

CO1.) This module provides students with an elaborative understanding of organizational behavior, its key principles, concepts & theories.
CO2.) The range of concepts & theories that students will be introduced includes foundation of individual behavior, groups & group dynamics, motivation, leadership, organization design, organization structure, work stress, organization culture, organization change.
CO3.) By the end of the module, students will be fully equipped with the knowledge and skills required to understand & deal human behavior in the organization as individual, group member & organization.

Course Learning Outcomes:

CLO1) Students will demonstrate an understanding of the factors that influence individual behavior in organizational settings, including personality, motivation, perception, and attitudes.
CLO2) They will demonstrate the ability to work effectively in teams, manage conflicts, and contribute positively to group decision-making processes.

CLO3) They will be able to assess and apply effective leadership and management practices to improve organizational performance and employee satisfaction.

CLO4) Students will analyze the concept of organizational culture and its impact on employee behavior and organizational success.

Curriculum

Unit I: Foundations of Individual Behavior (8 HOURS)

Introduction and Conceptual framework of OB- Nature & Scope of Organizational Behavior. The organization and the individual.
Personality: Determinants and Attributes, Big Five Model
Major Personality Attributes: Locus of Control, Machiavellianism, Self Esteem, Self Monitoring, Type A & B personality, Risk taking ability.
Learning and Learning Theories: Concept, Law of Effect, Classical Conditioning, Operant Conditioning, Social Learning Theory. Reinforcement Theory and OB Modification Process and its Advantages.
Attitudes: Concept, its components and various job related attitudes, Job satisfaction and its impact on OB.
Values: Concept, types of values, Robbin's Dominant Work Values today, Hofstede's Values Across Cultures, Javidan & House's The G.L.O.B.E. Findings.
Perception: Definition, factors affecting individual perception, Perceptual Selectivity.

Unit II: Motivation and Leadership(8 HOURS)

Motivation: Definition and concept, different types of motives.
Theories of motivation: Maslow's Hierarchy of Needs, Herzberg's Two Factor theory, ERG theory, Vroom's Expectancy theory, Equity theory, Reinforcement theory and Behavior

Modification.
Leadership: Nature and Significance of leadership, Trait theory of leadership.
Behavioral theories of leadership- Ohio State Studies, Michigan Studies, and Managerial Grid.
Contingency theories - Fiedler's model, Hersey and Blanchard's situational theory, leader-member exchange theory, path goal theory, Charismatic leadership.

Unit III: Foundations of Group Behavior(8 HOURS)
Group: Definition, Classification of Groups, stages of group development, Group Structure, Group Processes, Strength and weakness of group over individuals.
Team: Concept of team, Group v/s Team, Team Effectiveness, Different types of teams, how to convert an individual into team player.
Conflict and Collaboration: Transitions in Conflict Thought, Functional versus Dysfunctional Conflict, Conflict Process.
Conflict Management: Techniques, Negotiation process, Bargaining strategies, Global implications.

Unit IV: Structural & Cultural Dimensions of OB(8 HOURS)
Organization Structure: Definition, Elements of Organization Structure, Common Organization Designs: simple Structure, Bureaucratic Structure, Matrix Structure.
New Designs Option: Team Structure, Virtual Structure, Boundaryless Organization Structure; Factors affecting choice of different organization designs.
Organization Culture: Meaning of Organizational Culture, Creating and Sustaining Culture, Countries and Culture, Employee Acculturation Process.
Organizational Climate: Concept and How to build a more positive and employee centered climate.

Unit V: Organizational Change and Stress Management (8 HOURS)
Organizational Change: Change Concept, Forms of Change, Sources of Resistance to Change, Tactics to deal with resistance.
Approaches/ Models to Managing Change: Lewin's Change Model and Nadler's Organizational Model, Action Research: Steps in action Research and Change agents.
Stress Management: Work Stress, types of stress, stages of stress, causes of stress: extra-organizational, organizational, group and individual; Strategies to cope with stress: individual strategies and organizational strategies.

Recommended Book
Robbins, Judge & Sanghi, (2009): Organizational Behavior 13e, India, Pearson, Prentice Hall

Reference Book
L. M. Prasad, (2011): Organizational Behavior, India, Sultan Chand & Sons
Hersey, Blanchard & Johnson, (2009), India, Pearson/ Prentice Hall
Keith Davis: Organizational Behavior
Fred Luthans: Organizational Behavior

Course Learning Outcomes	Program LearningOutcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H	H		H			M		H	M	H		L	H	
CLO2	H	H	M	H	H		M		H	M	H	M	L	H	
CLO3	H	H	M	H	H		M		H	M	H	M	L	H	
CLO4	H		M	H	H		M		H	M	H		L	H	

Mapping of CLOs with PLOs & PSOs

: High M: Medium L: Low

ENVIRONMENT STUDIES
COM-202

L	T	P	C
4	0	0	4

(40 Hours)

Objective
To bring awareness about our environment in management students

Unit I: The multidisciplinary nature of environmental studies
Definition,
Scope and importance
Need for public awareness

Unit II: Natural Resources:
Renewable and non-renewable resources:
Natural resources and associated problems.
Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
Role of an individual in conservation of natural resources.
Equitable use of resources for sustainable lifestyles.

Unit III: Ecosystems
Concept of an ecosystem
Structure and function of an ecosystem
Producers, consumers and decomposers
Energy flow in the ecosystem
Ecological succession
Food chains, food webs and ecological pyramids
Introduction, types, characteristic features, structure and function of the following ecosystem:
Forest ecosystem
Grassland ecosystem
Desert ecosystem
Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit IV: Biodiversity and its conservation
Introduction – Definition: genetic, species and ecosystem diversity
Biogeographical classification of India

Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values
Biodiversity at global, national and local levels
India as a mega-diversity nation
Hot-spots of biodiversity
Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
Endangered and endemic species of India
Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

Unit V: Environmental Pollution
Definition
Causes, effects and control measures of:
Air pollution
Water pollution
Soil pollution
Marine pollution
Noise pollution
Thermal pollution
Nuclear pollution
Solid waste management: Causes, effects and control measures of urban and industrial wastes.
Role of an individual in prevention of pollution
Pollution case studies
Disaster management: floods, earthquake, cyclone and landslides
Matching of PLOs and CLOs:

Course Specific Outcomes(CLO)	**Programme Learning Outcomes (PLO)**												**Programme Specific Outcomes (PSO)**		
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**		**PLO8 PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	M	M	H	M	L	M	H	M	-	M	-	M	M	-	-
CLO2	M	H	H	M	L	M	H	L	H	M	M	-	-	H	M
CLO3	M	M	H	-	-	H	M	L	M	H	M	M	M	H	M
CLO4	-	-	L	H	H	-	H	-	M	H	M	M	-	-	H

H:High; M:Medium; L:Low

B.COM Semester: III

CYBER PHENOMENON LAW
Paper COM-301

L T P C
3 0 0 4

(40 HOURS)

Course Objectives:
In recent times the Cyber law has emerged as medium for growth with immense potentials for solving many new and interesting challenges. Both the personal and professional worlds are extremely dependent today on the Cyber World. The world is increasingly dependent on networked information and communication technologies (ICT). However, with growing dependency, new threats to network and information security have emerged and there is ever-growing vulnerability to Cyber Crime. Thus, an effort to spread awareness of Cyber Security is the need of the hour and particularly among the law fraternity as these are the persons who must handle the cases of cybercrime.

Course Learning Outcomes
After completing the course, the student shall be able to:
CO1: Describe cyber organized crime and criminal groups that engage in cyber organized crime
CO2: Identify and discuss the structures and characteristics of organized criminal groups that engage in cyber organized crime
CO3: Identify different types of cyber organized crime
CO4: Explain and analyse the ways in which information and communication technology is used to commit cyber organized crime
CO5: Critically evaluate the measures used to counter cyber organized crime

CO5: understand the fundamentals of E-commerce and silent features of the same.

Course Contents

Unit I (8 HOURS)
Introduction to Cyber space, Need for Cyber Law. Cyber Jurisprudence at International and Indian Level. Cyber Law - International Perspectives-UN & International Telecommunication Union (ITU) Initiatives, Council of Europe - Budapest Convention on Cybercrime, Asia-Pacific Economic Cooperation (APEC), Organization for Economic Co-operation and Development (OECD), World Bank, Commonwealth of Nations

Unit II: (8 HOURS)
Constitutional & Human Rights Issues in Cyberspace-Freedom of Speech and Expression in Cyberspace. Right to Access Cyberspace – Access to Internet. Right to Privacy. Right to Data Protection

Unit III: (8 HOURS)

Cyber Crimes & Legal Framework-Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act, 2000.

Unit IV: (8 HOURS)

Cyber Torts-Cyber Defamation, Different Types of Civil Wrongs under the IT Act, 2000. Intellectual Property Issues in Cyber Space. Interface with Copyright Law. Interface with Patent Law. Trademarks & Domain Names Related issues

Unit V: (8 HOURS)

E Commerce-Concept, E-commerce-Salient Features, Online approaches like B2B, B2C & C2C.Online contracts, Click Wrap Contracts, Applicability of Indian Contract Act, 1872. Dispute Resolution in Cyberspace-Concept of Jurisdiction, Indian Context of Jurisdiction and IT Act, 2000. International Law and Jurisdictional Issues in Cyberspace. Dispute Resolutions

Textbook

Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012).
Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)

References

Jonthan Rosenoer, Cyber Law, Springer, New York, (1997).
Sudhir Naib, The Information Technology Act, 2005: A Handbook, OUP, New York, (2011)
S. R. Bhansali, Information Technology Act, 2000, University Book House Pvt. Ltd., Jaipur (2003).
Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi, (2003).

Note: Latest edition of readings may be used

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes(PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H	M		H			M			H		L			
CLO2	H	M		M						H		M			

CLO3	H	M		H		L	L		L	M		M			
CLO4	H	M		H		H	L		H	M		M			

H: High M: Medium L: Low

BUSINESS ECONOMICS
Paper COM-302

L T P C
4 0 0 4

(40 Hours)

Course Objective

Economics is the study of how individuals and societies make rational choices when confronted with scarce resources and an uncertain environment. Economic theory aims at the construction of models which describe the economic behavior of individual units (Consumers, Firms, and Government Agencies). Microeconomics studies the economic phenomenon at the micro level i.e. at the individual level. Microeconomics studies how consumers and producers make their choices; how their decisions and choices affect the demand and supply conditions and how consumers and producers interact to settle the prices of goods and services in the market.

Course Learning Outcomes

Upon successful completion of the course a student will be able to

CO1: Understand how households (demand) and businesses (supply) interact in various market structures to determine price and quantity of a good produced.
CO2: Understand the links between household behavior and the economic models of demand.
CO3: Represent demand, in graphical form, including the downward slope of the demand curve and what shifts the demand curve.
CO3: Understand the links between production costs and the economic models of supply.
CO4: Apply the concept of opportunity cost
CO5: Analyze operations of markets under varying competitive conditions

Course Contents

Unit I (8 Hours)

Introduction to Economics:

Nature, Scope, Definition of Managerial Economics, Difference between Managerial Economics & Economics, Micro and Macro Economics Opportunity cost.

Demand and supply: Demand & supply curves, Measurement of elasticity of demand, factors

affecting elasticity of demand, income elasticity of demand, cross elasticity of demand, advertising elasticity of demand.
Demand forecasting: need, objective & methods (in brief)

Unit II (8 Hours)

Consumer Behavior: Cardinal Utility Approach: Diminishing Marginal Utility, Law of Equi-Marginal Utility. Ordinal Utility Approach.
Indifference Curves, Marginal Rate of Substitution, Budget Line and Consumer Equilibrium.

Unit III (8 Hours)

Theories of Production: Meaning & concept of Production, Factors of Production, Production functions, Iso-quants, Fixed & Variable factors of production. Law of variable proportions (Short run production analysis), Law of returns to a scale (long run production analysis).

Unit IV (8 Hours)

Cost analysis & Price output decision in different market: Concept of Cost, Cost Function, Short Run Cost, Long Run Cost, Economics and Diseconomies of Scale. Explicit Cost and Implicit Cost, Profit maximization, equality of marginal cost and marginal revenue.

Unit V (8 Hours)

Pricing Under Perfect Competition, Pricing Under Monopoly, Control of Monopoly, Price Discrimination, Pricing Under Monopolistic Competition, Pricing Under Oligopoly.

REFERENCES

1. Samuelson, P & Nordhaus, W. (2009) Economics, 18th Edition, McGraw Hill Education.
2. Dwivedi, D.N.(2008) Managerial Economics, 7th edition, Vikas Publishing House.
3 Salvatore, D. ((2006)) Managerial Economics in a Global Economy, 6th edition, Oxford UniversityPress.
4. Kreps, D.(2009). MicroEconomics for Managers, 1st edition, Viva Books Pvt. Ltd.
5. Peterson, L. and Jain ((2006)) Managerial Economics, 4th edition, Pearson Education.
6. Colander, D, C (2008) Economics, McGraw Hill Education.
7. Managerial Economics: H.L Ahuja, Sultan Chand & Sons
Note: Latest edition of readings may be used

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	**Program Learning Outcomes (PLOs)**	**Program Specific Outcomes (PSOs)**

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H		H	H						L	H			H	
CLO2	H		M	H	H		L			L	H	M		H	
CLO3	H		M	H	H		L			L	H	M		H	
CLO4	H		H	H	H		L			L	H			H	

Mapping of CLOs with PLOs & PSOs

H: High M: Medium L: Low

CORPORATE ACCOUNTING
Paper COM-303

L T P C
4 0 0 4

(8 Hours)

Course Objective

To acquire the conceptual knowledge of corporate accounting and to understand the various techniques of preparing accounting and financial statements

Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: develop an understanding of accounting for share capital and debentures
CO2: prepare financial statements of a company

CO3: understand the accounting for amalgamation
CO4: prepare consolidated balance sheet for Holding company
CO5: develop an understanding of cash flow statements

Course Contents

Unit 1. Accounting for Share Capital & Debentures
Issue, forfeiture and reissue of forfeited shares: concept & process of book building; Issue of rights and bonus shares; Buy back of shares; Redemption of preference shares; Issue and Redemption of Debentures

Unit 2. Final Accounts
Preparation of profit and loss account and balance sheet of corporate entities, excluding calculation of managerial remuneration, Disposal of company profits. Valuation of Goodwill and Valuation of Shares--Concepts and calculation: simple problem only

Unit 3. Amalgamation of Companies
Concepts and accounting treatment as per Accounting Standard: 14 (ICAI) (excluding intercompany holdings). Internal reconstruction: concepts and accounting treatment excluding scheme of reconstruction.

Unit 4. Accounts of Holding Companies/Parent Companies
Preparation of consolidated balance sheet with one subsidiary company; Relevant provisions of Accounting Standard: 21 (ICAI).

Unit 5. Accounting for Cash Flow Statement
Cash Flow Statement-Concept of funds, Preparation of cash flow statement as per Indian Accounting Standard (Ind-AS3 revised):
Note:
1. The relevant Indian Accounting Standards in line with the IFRS for all the above topics should be covered.
2. Any revision of relevant Indian Accounting Standard would become applicable immediately.

References:
1. J.R. Monga, *Fudamentals of Corporate Accounting*. Mayur Paper Backs, New Delhi.
2. M.C. Shukla, T.S. Grewal, and S.C. Gupta. *Advanced Accounts*. Vol.-II. S. Chand & Co., New Delhi.
3. S.N. Maheshwari, and S. K. Maheshwari. *Corporate Accounting*. Vikas Publishing House, New Delhi.
4. Ashok Sehgal, Fundamentals of *Corporate Accounting*. Taxman Publication, New Delhi.
5. V.K. Goyal and Ruchi Goyal**,**. *Corporate Accounting*. PHI Learning.
6. Jain, S.P. and K.L. Narang. *Corporate Accounting*. Kalyani Publishers, New Delhi.
7. Bhushan Kumar Goyal, *Fundamentals of Corporate Accounting*, International Book House
8. P. C. Tulsian and Bharat Tulsian, Corporate Accounting, S.Chand
9. Compendium of Statements and Standards of Accounting. The Institute of Chartered

Accountants of India, New Delhi.
Note: Latest edition of readings may be used

Teaching Learning Process

Theory/ numerical with examples

Assessment Methods

Class participation, Presentation, Viva/ test, End Semester Exam

Keywords
Shares, Financial Statements, Cash Flow, Amalgamation, Liquidation, Purchase Consideration, Holding Company

Course Learning Outcomes	**Program Learning Outcomes (PLOs)**												**Program Specific Outcomes (PSOs)**		
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	H		H			L		L		H		H			
CLO2	H	H	H	M	L					H		H			
CLO3	M		H	M	L				L						
CLO4	M	M	H						L						

HUMAN RESOURCE MANAGEMENT
Paper COM-304

LTPC
4 0 0 4

(40 HOURS)
Course Objective

This module introduces the students with the key concepts, theories, tools & techniques of human resource management. The range of concepts that students will be introduced to include philosophy of HRM, human resource planning, job analysis, recruitment & selection, training & development, compensation & labor relation. By the end of the module, students will be fully equipped with the skills & techniques required to plan & manage the human resource in the organization.

Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: understand basic nature and importance of human resource management.
CO2: analyze the current theory and practice of recruitment and selection.
CO3: realize the importance of performance management system in enhancing employee performance.
CO4: recommend actions based on results of the compensation analysis and design compensation schemes that are cost effective, that increase productivity of the workforce, and comply with the legal framework.
CO5: understand role of modern HRM in meeting challenges of changing business environment.

Course Contents

Unit I: (8 HOURS)
Introduction to Human Resource Management

Definition and concept of HRM and personnel Management, Importance of HRM, Activities and functions of HRM, Organization of H.R.M. department, Role of HRM Department, Limitations of HRM, Challenges before HRM.

Unit II: (8 HOURS)
Human Resource Planning (HRP)

Definition and objectives of Human Resource Planning, Process of Human Resource Planning, Factors influencing estimation of Human Resources. Concept of Recruitment, Recruitment policy, Sources of Recruitment, Selection and its procedure.

Unit III: (8 HOURS)
Performance Appraisal

Concept and objectives of Performance Appraisal, Process of Performance Appraisal, Methods of Performance Appraisal, Uses and limitations of Performance Appraisal.

Unit IV: (8 HOURS)
Training & Development

Meaning and Definition of Training; need, objectives and importance of Training, Training Methods, Evaluation of Training Programme. Concept of Management Development, Management
Development Process and methods, Evaluation of Management Development Programme.

Unit V: (8 HOURS)
Wage and Salary Administration
Methods of wage payments, Employee Remuneration, factors determining the level of remuneration, Profit sharing, Fringe Benefits and Employee services, Wages & Salary Administration

Recommended book:
K. Aswathappa, (2009): Human Resource Management- Text & Cases 5e, India, McGraw Hill.

Reference books:
Dessler & Varkkey, (2010): Human Resource Management 11th ed., Prentice Hall of India.
Decenzo & Robbins, (2006): Fundamentals of Human Resource Management, Wiley.
Dipak Kr. Bhattacharyya, (2010): Human Resource Management 2e, India, Excel Books.
Bernardin, (2007): Human Resource Management- An Experimental Approach, India, TATA McGraw Hill.
Snell & Bohlander, (2008): Human Resource Management, India, South- Western Cengage Learning
Latest editions of the books may be used.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	M		M	M	M		H	M	H
CO2	M	M	H	M	M	H	H	H	H	H	H	M
CO3	H	M	H	L	H	M	M		M	M	M	M
CO4	M			H	H	L	H	H	H	M	M	M
CO5		H	M	M	L	M		M	H	L		

Rural Management
Paper COM-305

LTPC
4 0 0 4

(40 HOURS)

Course Objective

To help the students develop a general understanding of the various aspects of rural management.

Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: join in NGOs, CBOs, Projects of Funding Agencies (UNDP, World Bank, JICA, DFID,CARE,CRY,USAID,Action Aid),CSR Units of Corporate/Business houses.
CO2: join in Rural Development Organizations / Institutions as Social Worker, Community Mobilizer.
CO3: set up Small Scale Industry in rural areas supported by State govt. institutions like ORMAS, DDUGKY (Aajeebika), Indian Red Cross Society, District Rural Development Agency (DRDA) or District Industry Centre (DIC) of any district.
CO4: join in State /National Livelihoods Mission under Panchayati Raj Dept / Rural Development Dept. of the State / Nation as Manager or Programme Coordinator.
CO5: start a Non- Governmental Organisation or Voluntary agency to serve for the welfare of the rural poor. Currently NGOs play a very crucial role in rural development, by organizing poor people in villages. The funds for running of such NGOs will be available from both Central and State governments on the basis of the projects and requirements of theNGOs.

Course Contents

Unit I: Introduction (8 HOURS)
Definition of Rural Area, Meaning and concept of rural development, nature and scope of rural development in India. Demographic structure of rural India; Trends in population growth, composition of rural work force.
Unit II: Rural development(8 HOURS)

Concepts, Principles and Approaches: of rural management. Indicators of development; Conceptual framework, Strategies; Rural development in India:
Unit III: Policies and Programs: (8 HOURS)

A retrospective; Policies, Programs: Techniques of planning: Detail steps in district and block level planning: Area Development Planning: Definition, purpose, Area development plans.
Unit IV: Rural Administration: (8 HOURS)

Panchayati Raj & Rural Administration, Natural Resources Development & Management,

Unit V: Rural Marketing(8 HOURS)

Rural Marketing: Rural production and products: agricultural and non-agricultural products; types of rural production and products; Market functionaries: Concept of supply chain management and Value Addition; Problems of marketing; Role of co-operative agencies in marketing of agricultural and non-agricultural product.

References:

1. Rural Management by KB Gupta, Faizia Sidiqui, and Iftikhar Alam; CBS Publication
2. Rural marketing: Challenges and opportunities. by Dinesh Kumar and Punam Gupta; SAGE text
3. Rural Development: Principles, Policies and Management by Katar Singh; SAGE text
4. Rural Marketing by Pradeep Kashyap; Pearson Publication

Note: Latest edition of readings may be used

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Comprehensive Viva-voce
Paper COM-306

LTPC
0 0 0 4

Course Objective

A viva-voce of all the subjects of semester-III shall be conducted in front of a constituted committee of academicians/experts (internal and external)

Course Learning Objectives (CO):

CO1. To prepare comprehensively about the concept and overall knowledge of all courses.CO2. To gain confidence and develop interpersonal skills in the relevant field.
CO3. To acquaint the students with the overall framework of management concepts in business administration.CO4. To build professional conduct within any team activities.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. The students will be able to understand the concept of management principles and various dimensions.
CLO2. The students will be able to Develop problem solving skills by gathering and assessing

appropriate managementinformation.
CLO3. The students will be able to Assess management concepts, plans and decision in business administration.CLO4. The students will be able to Analyze and build professional conduct within any team activities.

Methodology:

The confidence level, presentation and communication skills, decision-making ability and a comprehensiveunderstanding will be assessed.

The viva voce is of 100 marks and is to be conducted by the external examiners appointed by theUniversity. A weightage of 4 credits has been given to this to highlight its importance.

Course Learning Outcom Es	Program Learning Outcom es (PLOs)												Program Specific Outcom es (PSOs)			
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	M	M	M	H	M	H	M	H	M	M	H	H	M	
CLO2	H	M	M	M	M	M	H	M	M	M	M	H	M	M	H	
CLO3	H	H	M	H	H	M	H	M	M	M	M	M	M	M	M	
CLO4	H	H	M	H	H	H	H	H	M	H	M	M	L	M	M	

B.COM-SEMESTER-IV

BUSINESS COMMUNICATION
Paper COM-401

LTPC
4 0 0 4

(40 HOURS)
Course Objective

To develop the skills of the professional undergraduate students for proper self-expression, social communication, spoken English, correct pronunciation, voice modulation and business etiquettes.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Understand the basic concepts of communication and help them to transform their communicationabilities.
CLO2. To develop the students to acquire necessary skills of Business Etiquettes for handling day-to-day managerial responsibilities and evaluate the facilitators of business Communication. **CLO3. To** choose their body language more correctly and impressively in accordance with anorganizational requirement and international standards
CLO4. To analyze the forms of Communication and make the students to understand the verbaland non-verbal Communication and to design impressive documents.
CLO5. The students will illustrate the correct practices of the strategies of Effective business writing

Curriculum

Unit I (8 HOURS)
Essentials of Business communication: Introduction, Basic Patterns of Business Messages: Writing process, Directness and Indirectness in new s and messages of all types, sales Massages, Persuasion.

Unit-II (8 HOURS)

Writing a Project Report: Basics, writing Reports on Field Work visits to Industries/Business Concerns etc.; Business-Negotiations.

Unit-III (8 HOURS)

E-Correspondence

Unit-IV (8 HOURS)

Spoken English for Business-communication: Presentation of Plans, Objectives; speech: Preparation, Mode of delivery presentation; Addressing the Audience. Oral Talking. Strategies to overcome Barriers in Address, speech.

Unit-V (8 HOURS)

Business Etiquettes and Public Speaking:
Business Manners. Body Language Gestures, Email and Net Etiquettes, Etiquette of the Written Word, Etiquettes on the Telephone, Handling Business Meetings; Introducing Characteristic, Model Speeches, Role Play on Selected Topics with Case Analysis and Real Life Experiences.

Reference books:

- Dr.Preeti Shukla, Business Communications, Shree Mahavir Book depot., Nai Sarak, New Delhi.
- A.Kumar, Effective Business Communications, Khanna Book Publishing Co..P, Ltd.
- John.M.Penrose, Robert W. Rosberry, Robert J. Myers, Advanced Business Communications, Thomsan South Western.
- Urmila Rai, S.M.Rai – Business Communication – Himalya Publishing House. 1. Boove, C.L., 5. Thill, J.V., and Chaturvedi, M., (2009) Business Communication Today, Pearson Education.

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes(PLOs)												Program Specific Outcomes (PSOs)		
	PLO	PLO	PLO	PLO	PLO	PLO	PLO	PLO	PLO	PLO1	PLO1	PLO1	PSO	PSO	PSO 3
CLO1	M	M	L				M						L		
CLO2		M	M		M		L		M	L	L				
CLO3		L	L	M	M		M	M		L			L	M	
CLO4					L				L	L					
CLO5	L	M						L	L	M	M				

H: High M: Medium L: Low

FINANCIAL MANAGEMENT

Paper COM-402

L T P C
3 0 0 4

(40 HOURS)

Course Objective

The focus in this paper would be on issues related to financial management in the Indian Corporate Sector. The contents are related to the practices observed in Indian Corporate Sector. The objective is to enable and equip the future managers with basic tools for applying financial analysis.

Course Learning Outcomes

CO1: Define the concepts, vital tools and techniques applicable forfinancial decision making by a business firm.

CO2: Explain the functions of Finance in organization and methods inmanaging funds for business

CO3: Apply the concepts of budgeting, working capital, cost of capitalincluding the choice of source of funds.

CO4: Analyse the practical problems relating to the financing of fundsincluding pricing and dividend theories.

CO5: Select the methods and techniques for analysing the data forfinancial decision making.

Curriculum

Unit I: Introduction to Financial Management (8 hours)

Meaning, objectives and scope, conflicts in profit versus wealth or value maximization principle, Time value of money.

Unit II: Investment Decisions (8 hours)

Capital budgeting techniques-Net Present Value Method, Internal Rate of Return Method. Cost of Capital-equity and debt.

Unit III: Financing Decisions (8 hours)

Leverage- operating, financial and composite leverage, Capital structure- theory and policy, Dividend policy, Asset based financing- lease and hire purchase.

Unit IV: Short term financing (8 hours)

Management of Working Capital, Cash management, Inventory Management, Receivables Management, working capital leverage.

Unit V: Risk and Return (8 hours)

Calculating risk and return for individual securities, Beta estimation, overview of capital market theory.

Recommended book:

- I. M. Pandey, (2010): Financial Management, Vikas Publishing House

Reference books:

- M Y Khan & P K Jain, Financial Management- Text, problems and cases, Tata McGraw Hills
- Dr. R. P. Rustagi (2011): Financial Management- Theory, concept and problems, Taxman Publications

Mapping of CO'S and PO'S

11003001	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	2	2			3	3
CO2	2	2	2	2	3		2	2	3	3	2	3
CO3	1		2	2	3	3	3		2		2	3
CO4			2	2	3	2		2			2	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

DIRECT TAX

Paper COM-403

LTPC

4004

(40 hours)

Objective

To provide basic knowledge and equip students with application of principles and provisions Income-tax Act, 1961.

Expected learning outcome: Students will gain a working knowledge regarding computation of taxable income and tax liability pertaining to individuals/firms.

Course Learning Outcomes

CO1: What are the fundamental provisions of the concept of Direct tax planning and to equip with a reasonable knowledge of tax planning devices?

CO2: Understand the intricacies relating to the filling of various forms and returns & to understand the relevance of GST in present Indian TaxScenario.

CO3: Applying the concepts of taxation to the corporate tax planning.

CO4: Analysing the skill of independent thinking and creativity in the field of direct tax law & evaluate the impact of laws on companies and on individuals & also, to make capable to understand amendments made from time to time in Acts related to the Tax.

CO5: Measure the tax liability of an individual or organisation.

Curriculum

Unit I (8 hours)

Basic concept: Income, agricultural income, person, assessee, assessment year, previous year, gross total income,

total income, maximum marginal rate of tax.

Unit II (8 hours)

Residential status Scope of total income on the basis of residential status Exempted income under section .

Unit III (8 hours)

Salaries.

Unit IV (8 hours)

Income from house property and Profits and gains of business or profession.

Unit V (8 hours)

Capital gains and Income from other sources.

Recommended Book:

- Singhania, Vinod K. and Monica Singhania. Students‟ Guide to Income Tax.Taxmann Publications Pvt. Ltd., New Delhi.

Reference Books:

- Ahuja, Girish and Ravi Gupta. Systematic Approach to Income Tax. Bharat Law House, Delhi.
- Chandra, Mahesh., S.P. Goyal and D.C. Shukla. Income Tax Law and Practice.Pragati Prakashan, Delhi.
- Pagare, Dinkar. Law and Practice of Income Tax. Sultan Chand and Sons, New Delhi.
- Mehrotra, H.C. Income Tax Law. Sahitya Bhawan, Agra.
- Lal, B.B. Income Tax Law and Practice. Konark Publications, New Delhi.
- Singhania, Vinod K. and Kapil Singhania. Tax Computation on CD. Taxmann Publications Pvt. Ltd., New Delhi.

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	L	-	H	L	H	H	H	L	L	H
CO2	-	-	H	M	L	H	M	M	M	-	H	H
CO3	H	M	H	M	-	L	L	M	-	H	M	H
CO4	M	M	-	H	H	M	H	M	1	M	M	H
CO5	H	H	H	H	M	H	M	H	M	H	H	H

MANAGEMENT ACCOUNTING

Paper COM-404

LTPC

4004

(40 hours)

Objective

The subject of Management Accounting is basically Designed to equip the Student with tools for analyzing financial and non-financial information which will help them in decision-making planning and control.
Aim: To acquaint the students with basic concepts used in cost accounting and various methods involved in cost ascertainment systems.

Course Learning Outcomes

CLO1) Develop the ability to analyze financial data and use it for making informed decisions related to budgeting, cost control, pricing, and resource allocation within an organization.

CLO2) Acquire skills to identify and analyze different types of costs (e.g., variable, fixed, direct, indirect) and implement strategies to control and reduce these costs effectively.

CLO3) Gain proficiency in designing and using performance measurement tools and key performance indicators (KPIs) to assess an organization's financial performance and track progress towards its goals.

CLO4) Learn to create budgets, financial forecasts, and perform variance analysis, enabling effective planning, resource allocation, and adaptation to changing business conditions.

CLO5) Develop the ability to integrate management accounting information into the strategic decision-making process, including evaluating investment opportunities, assessing project financial viability, and aligning financial strategies with the organization's goals.

Curriculum

Unit I: Introduction (8 HOURS)

Meaning, objectives and advantages of cost accounting, Difference between cost accounting and financial accounting. Cost concepts and classifications, Elements of cost. Installation of a costing system. Role of a cost accountant in an organization.

Unit II: Cost concept (8 HOURS)

Types of cost, Cost Accumulations, cost objects, cost classifications, cost applications, cost behavior, Techniques of Costing.

Unit III: Overhead (8 HOURS)

Classification, allocation, apportionment and absorption of overhead. Under- and over-absorption. Capacity costs. Treatments of certain items in costing, like interest on capital, packing expenses, debts, research and development expenses, Bad Activity – based cost allocation.

Unit IV Methods of Costing (8 HOURS)

Unit costing, Job costing. Contract Costing. Process costing (process losses, valuation of work in progress, joint and by-products) Service costing (only transport).

Unit V: Cost -Volume -Profit Analysis (8 HOURS)

The Relationship of cost and profit with volume, use of CVP Analysis, Marginal Costing and Absorption costing,

Breakeven point, contribution marginal Approach, Use of Breakeven analysis.

Recommended Book

- Lal, Jawahar. Cost Accounting. Tata McGraw Hill Publishing Co., New Delhi

Reference Book

- Nigam, B.M. Lall and I.C. Jain. Cost Accounting: Principles and Practice. Prentice Hall of India, New Delhi.
- Mittal, D.K. and Luv Mittal. Cost Accounting. Galgotia Publishing Co., New Delhi.
- Arora, M.N. Cost Accounting – Principles and Practice. Vikas Publishing House,
- New Delhi.
- Shukla, M.C., T.S. Grewal and M.P. Gupta. Cost Accounting: Text and Problems.
- S. Chand & Co. Ltd., New Delhi.
- Maheshwari, S.N. and S.N. Mittal. Cost Accounting: Theory and Problems. Shri
- Mahabir Book Depot, New Delhi.
- Jain , S.P. and K.L. Narang. Cost Accounting: Principles and Methods. Kalyani
- Publishers, Jalandhar.

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	H	M	M	L	M	M	-	M	M
CO2	M	M	M	-	M	H	M	M	M	-	M	H
CO3	M	M	H	H	H	M	M	-	-	-	M	M
CO4	H	H	L	M	L	M	M	-	-	M	M	H
CO5	H	H	M	H	H	M	H	M	H	-	M	H

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E-BUSINESS

Paper COM-405

LTPC
4004

Objective

To enable the student to become familiar with the mechanism for conducting business transactions through electronic means

Course Learning Outcomes

CLO1) Demonstrate proficiency in online marketing strategies and tactics, including search engine optimization (SEO), social media marketing, email marketing, and pay-per-click advertising, to effectively promote products and services in the digital marketplace.

CLO2) Analyze and interpret data from web analytics tools to make informed decisions about website and online store performance, user behavior, and customer preferences, leading to optimization of the online customer experience.

CLO3) Apply principles of e-commerce security and privacy to protect sensitive customer data and ensure secure transactions, safeguarding the integrity and reputation of the e-business.

Develop and implement an effective e-business strategy, incorporating aspects such as market CLO4) research, competitive analysis, and business model innovation, to gain a competitive edge and maximize online profitability.

CLO5) Collaborate with cross-functional teams, including web developers, designers, and IT professionals, to effectively manage the technical aspects of e-business operations, ensuring a seamless and user-friendly online presence for customers

Contents

Unit 1: Introduction:

Meaning, nature, concepts, advantages, disadvantages and reasons for transacting online, types of E-Commerce, e-commerce business models (introduction, key elements of a business model and categorizing major E-commerce business models), forces behind e-commerce.

Technology used in E-commerce: The dynamics of world wide web and internet (meaning, evolution and features); Designing, building and launching e-commerce website (A systematic approach involving decisions regarding selection of hardware, software, outsourcing vs. in-house development of a website)

Unit 2: Security and Encryption:

Need and concepts, the e-commerce security environment: (dimension, definition and scope of e security), security threats in the E-commerce environment (security intrusions and breaches, attacking methods like hacking, sniffing, cyber-vandalism etc.), technology solutions (Encryption, security channels of communication, protecting networks and protecting servers and clients),

Unit 3: IT Act 2000 and Cyber Crimes

IT Act 2000: Definitions, Digital signature, Electronic governance, Attribution, acknowledgement and dispatch of electronic records, Regulation of certifying authorities, Digital signatures certificates, Duties of subscribers, Penalties and adjudication, Appellate Tribunal, Offences and Cyber-crimes

Unit 4: E-payment System:

Models and methods of e–payments (Debit Card, Credit Card, Smart Cards, e-money), digital signatures (procedure, working and legal position), payment gateways, online banking (meaning, concepts, importance, electronic fund transfer, automated clearing house, automated ledger posting), risks involved in e-payments.

Unit 5: On-line Business Transactions:

Meaning, purpose, advantages and disadvantages of transacting online, E commerce applications in various industries like {banking, insurance, payment of utility bills, online marketing, e-tailing (popularity, benefits, problems and features), online services (financial, travel and career), auctions, online portal, online learning, publishing and entertainment} Online shopping (Amazon, Snapdeal, Alibaba, Flipkart, etc.)

Reference books:

1. Kenneth C. Laudon and Carlo Guercio Traver, *E-Commerce*, Pearson Education.
2. David Whiteley, *E-commerce: Strategy, Technology and Applications*, McGraw Hill Education
3. Bharat Bhaskar, *Electronic Commerce: Framework, Technology and Application, 4th Ed.*, McGraw Hill Education
4. PT Joseph, *E-Commerce: An Indian Perspective*, PHI Learning
5. KK Bajaj and Debjani Nag, *E-commerce,* McGraw Hill Education
6. TN Chhabra, *E-Commerce,* Dhanpat Rai & Co.
7. TN Chhabra, Hem Chand Jain, and Aruna Jain, *An Introduction to HTML*, Dhanpat Rai & Co.

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	L	L	L	L	L	L	L	L	L	L
CO2	L	L	L	M	L	L	L	L	L	L	L	L
CO3	L	L	L	L	L	L	L	H	L	L	L	H
CO4	M	L	L	H	M	L	L	L	M	L	M	L
CO5	M	L	M	L	H	L	H	L	L	M	L	L

BUSINESS RESEARCH METHODS

Paper COM-406

LTPC
4 0 0 4

(40 HOURS)

Objective

Any body of knowledge cannot develop without the underlying research. This module introduces the fundamentals of research, its process and the way in which findings of a research initiative is presented and reported. It exposes the students to the various statistical tools being used to analyze data and draw inferences.

Course Learning Outcomes

CO1: Define & Show Critical Thinking in their working.

CO2: Interpret the primary data & relate the research articles with theirresearch.

CO3: Interview respondents for data collection & organize discussions and chatshows.

CO4: Analyse the primary & secondary data and will be able to prepare ameaningful interpretation

CO5: Explain critical thinking process and decide the right course of action.

Curriculum

Unit I: (8 HOURS)

Introduction to Research

Research: Meaning, types & process. Research methods versus methodology, Research problem & Research design. Basic concepts of research- variables, hypothesis & its types, sample & population, parameter & statistic, type-I & type-II errors, one tailed and two tailed testing of hypothesis.

Unit II: (8 HOURS)

Sampling and Data Collection

Sampling: Meaning, types and techniques of sampling. Types of data: Primary & secondary data.
Methods of data collection: Interview-structured and unstructured, questionnaire & interview schedule, observation-participative and non-participative, Delphi method, focus group, depth interview and survey method.

Unit III: (8 HOURS)

Descriptive Statistics & Hypothesis Testing

Measures of central tendency- mean, median & mode, Measures of Variability- Average Deviation, Standard Deviation & Quartile Deviation, Skewness & Kurtosis. Testing of Hypothesis-I: One tailed and Two tailed Parametric Test- z-test and t-test

Unit IV: (8 HOURS)

Non-Parametric Tests

Testing of Hypothesis-II: Non Parametric Tests- Sign Test, Median Test, Chi-Square Test, Mann-Whitney U Test, Run Test for Randomness. Analysis of Variance- One Way and Two Way

Unit V: (8 HOURS)

Report writing

Steps of writing research report, Report Layout: Preliminary pages, Main text, End matter, Mechanics of writing research report, Bibliography and references format, Precautions in writing research report.

Recommended Books:

- C. R. Kothari, Research Methodology Methods and Technique

Reference Books:

R. Panneerselvam, Research methodology, PHI

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	-	H	-	H	-	H	M	H	M	-	H
CO2	-	H	-	H	M	H	H	H	-	H	H	H
CO3	M	H	H	H	-	H	-	H	H	-	H	H
CO4	H	M	H	M	H	M	H	-	M	H	H	H
CO5	M	H	M	M	M	M	-	M	M	M	M	H

B.COM-SEMESTER-V

MARKETING MANAGEMENT
Paper COM-501

LTPC
3 0 0 4

(40 HOURS)
Course Objective

The objective of this course is to provide basic knowledge of concepts, principles, tools and techniques of marketing.

Course Learning Outcomes

After completing the course, the student shall be able to:
CO1: learn the basic concepts and principles of marketing and to develop their conceptual skill to be able to manage marketing operations of a business firm.
CO2: understand the complexities involved in various targeting and positioning decisions.
CO3: take effective decisions for launching new products and to understand the implications of different pricing strategies.
C04: develop the skills to design the promotion-mix strategies
C05: familiarize about the current trends in marketing to take proactive measures while taking marketing decisions

Course Contents

Unit I: Introduction (8 Hours)

Marketing: Meaning, Nature, Scope and Importance; Marketing Philosophies; Marketing Mix; Marketing Environment- Concept and need for studying marketing environment; Micro environmental factors- company, suppliers, marketing intermediaries, customers, competitors, publics; Macro environmental factors– demographic, economic, natural, technological, politico-legal and socio-cultural.

Unit II: **Consumer behaviour and Market Selection (8 Hours)**

Need for studying consumer behaviour; Stages in Consumer buying decision process; Factors influencing consumer buying decisions. Market Segmentation- concept, importance, levels and bases of segmenting consumer markets. Market Targeting- concept and factors affecting the choices for market targeting. Product Positioning– concept and bases. Product differentiation- concept and bases.

Unit III: Product and Pricing Decisions (8 Hours)

Concept and classification; Levels of Product; Product-mix dimensions; Branding- concept,

functions and qualities of good brand name; Packaging and Labeling- concept and functions; Product support services; New product development process. Concept and objectives of pricing decisions; Factors affecting price of a product; Pricing methods; Pricing strategies.

Unit IV: Distribution and promotion Decisions (8 Hours)

Channels of distribution- meaning and importance; types of distribution channels and their functions; Factors affecting choice of distribution channel; Distribution logistics– concept, importance and major logistics decisions. Wholesaling and retailing. Nature and Importance of Promotion; Promotion mix concept and distinctive characteristics of advertising, personal selling, sales promotion, public relations, publicity and direct marketing; Factors influencing promotion mix decisions.

Unit V: Developments in Marketing (8 Hours)

Relationship Marketing; Sustainable Marketing; Rural marketing; Social marketing; Digital marketing; Legal Issues in marketing- The Consumer Protection Act, 1986; Ethical issues in marketing.

References

1. Kotler, P., Armstrong, G. and Agnihotri, P. (2018). *Principles of Marketing (17th edition)* Pearson Education. Indian edition.
2. Sharma, K., & Swati Aggarwal. (2018). Principles of Marketing. Taxmann's.
3. The Consumer Protection Act,1986.

Additional Resources

1. Etzel, M. J., Walker, B. J., Stanton, W. J., & Pandit, A. (2010). *Marketing (14th ed.).* Mc Graw Hill.
2. Grewal, D. & Levy, M. (2017). *Marketing (5th ed.).* McGraw-Hill Education.

Note: Latest editions of the books may be used.

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	-	H	-	H	-	H	M	H	M	-	H
CO2	-	H	-	H	M	H	H	H	-	H	H	H
CO3	M	H	H	H	-	H	-	H	H	-	H	H
CO4	H	M	H	M	H	M	H	-	M	H	H	H

CO5	M	H	M	M	M	M	-	M	M	M	M	H

HUMAN RESOURCE PLANNING AND DEVELOPMENT
Paper COM-502

LTPC
4 0 0 4

(40 HOURS)

Course Objective

This paper has been designed keeping in mind the current need of organizations. Human resource planning has become a bigger challenge for organization due to growing globalization and emerging new trends specially because of changing environment. This paper addresses all those challenges and suggests ways to handle them efficiently. The objective of this paper is to develop a conceptual as well as a practical understanding of Human Resource Planning in organizations.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: understand basic nature and importance of human resource management.

CO2: analyze the current theory and practice of recruitment and selection.

CO3: realize the importance of performance management system in enhancing employee performance.

CO4: recommend actions based on results of the compensation analysis and design compensation schemes that are cost effective, that increase productivity of the workforce, and comply with the legal framework.

CO5: understand role of modern HRM in meeting challenges of changing business environment.

Course Contents

Unit I

HR Planning: Conceptual framework, Definitions, Historical evolution, HR Planning levels,

Unit II

HR planning at Enterprise level, Need for systematic planning, Planning process, **Variables to be accounted for in planning process,** Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supply forecasting. Retention-Redeployment and Exit strategies

Unit III

Linkages with other HR business processes- Recruitment, Performance/ Productivity, Training and Development. Re-Engineering/ Organization Development etc

Unit IV

Study of HR Planning process Practices in select businesses, Ramp-up and scale down practices and tools, Research in HR Planning area, Career Planning and Succession Planning,

Unit V

Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level.

Recommended Book

1. Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia
2. John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A Reader, SAGE Publications, 1998

Reference Books

1. Aloke K. Sen, Human Resource Development- Development Planing and Deployment- Asian Books
2. Christopher Mabey, Rosemary Thomson (2011): Developing Human Resources, Routledge, Taylor and francis group, New York, USA.
3. Dessler & Varkkey, (2010): Human Resource Management 11e, India, Prentice Hall
4. Richard D. Johnson, Michael J. Kavanagh, Mohan Thite (2011): Human Resource Information System 2e, SAGE Publications, 2011.

Latest editions of the books may be used.

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	L	M	L	L	L	L	L	M	L	L
CO2	M	L	L	M	L	L	L	L	L	M	L	L
CO3	M	L	L	M	L	L	L	L	L	M	L	L
CO4	H	L	L	H	L	L	L	L	L	H	L	L
CO5	M	L	L	H	L	L	L	L	L	H	L	L

INVESTMENT MANAGEMENT
Paper COM-503

LTPC
4 0 0 4

(40 Hours)

Course Objective

The focus of this paper would be on the intricacies of security markets, construction of optimal portfolios and analysis of different investment options.
The basic objective of this course is to acquaint the student with the investment decisions related to financial assets, risks and returns involved, functioning of securities market and principles of security analysis along with the theories and concepts associated with portfolio management in order to be able to judge the competitive position of firms in capital market and review the related business decisions.

Curriculum

UNIT I: Introduction To Investment And Securities Market (8 Hours)

- Concept of investment-investment objectives and constraints-security and non security forms of investment, investment process. Securities markets: markets and their functions- development of stock market in India, regulation of securities market (SEBI).

UNIT II: Risk and Return (8 Hours)

- Types of risk-systematic and unsystematic, security returns-ex post and ex ante returns, portfolio return, concept of Beta-risk of individual security, portfolio risk.

UNIT III: Introduction To Portfolio Management(8 Hours)

- Diversification, construction of optimum portfolio- Markowitz risk return optimization, performance evaluation and revision- Sharpe's Ratio, Treynor's Ratio, Jenson's Alpha.

UNIT IV: Capital Market Theory (8 Hours)

- Capital Asset Pricing Model (CAPM), application of Capital Market Line and Security Market Line, Arbitrage Pricing Theory (APT).

UNIT V: Security Analysis (8 Hours)

- Fundamental analysis-economy, industry and company analysis, Technical Analysis- Efficient Market Hypothesis.

Recommended Books:

- Pandian, P., Security Analysis & Portfolio Management, Vikas Publishing House.

Reference Books:

- Fischer, E.D. & Jordan, R.J., Security Analysis & Portfolio Management, Pearson Education

- Khan & Jain, Financial Management, Tata McGraw Hills, 2008

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	-	H	-	H	-	H	M	H	M	-	H
CO2	-	H	-	H	M	H	H	H	-	H	H	H
CO3	M	H	H	H	-	H	-	H	H	-	H	H
CO4	H	M	H	M	H	M	H	-	M	H	H	H
CO5	M	H	M	M	M	M	-	M	M	M	M	H

Entrepreneurial Management
Paper COM-503

LTPC
4 0 0 4

(40 Hours)

Course Objective

The purpose of this paper is to prepare a ground where the students view Entrepreneurship as a desirable and feasible career option. The paper seeks to build the necessary competencies and motivation for a career in Entrepreneurship. After studying this course, the students would be able to build on personal as well as external resources with a view to successfully launching and subsequently managing their enterprises. They would have not only a definite idea as to which support/ developmental agency to look up and for what purpose, but also the necessary know-how and wherewithal for accessing their help. They would have basic skills in operations, finance, and marketing and human resource management.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: understand the concept of entrepreneurship in the context of Indian economic scenario.
CO2: link the individual's capability and strength as a guiding factor towards entrepreneurial orientation.
CO3: understand social support system for gaining strength towards entrepreneurial preferences.
CO4: understand entrepreneurial process for initiating new venture creation.
CO5: understand various dimensions of managing a business enterprise once it is formed.

Course Content

Unit I: **Entrepreneurship (8 Hours)**

Theories of Entrepreneurship

Role and Importance of Entrepreneur in Economic Growth.

Unit II: Entrepreneurial Behaviours

Entrepreneurial Motivation, Need for Achievement Theory

Risk Taking Behavior

Innovation and Entrepreneur

Unit III: Entrepreneurial Traint

Definitions, Characteristics of Entrepreneurial Types

Functions of Entrepreneur.

Unit IV: Entrepreneurial Development in India

History, Objectives, Stages of Growth

Target Group, Programmes

Govt. Policy towards SSI's

Unit V: Project Feasibility Analysis

Business Ideas – Sources, processing; Input requirements, Sources of Financing, Technical Assistance, Marketing Assistance

Preparation of Feasibility Reports, Legal Formalities and Documentation.

Recommended books:

1. McClelland, D.C. & Winter, W.G. : Motivating Economic Achievement, Free Press.
2. Pareek, U & Venkateswara Rao, T : Developing Entrepreneurship – A Handbook on Learning Systems, Learning Systems, New Delhi.
3. Desai, A.N. : Entrepreneur and Environment, Ashish, New Delhi.
4. Druckar, Peter : Innovation and Entrepreneurship, Heinemann.
5. Chakraborty, Tridib : Introducing Entrepreneurship Development, Modern Book Agency
6. Manimala, M.J. : Entrepreneurial Policies and Strategies,TMH

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Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	-	H	-	H	-	H	M	H	M	-	H
CO2	-	H	-	H	M	H	H	H	-	H	H	H
CO3	M	H	H	H	-	H	-	H	H	-	H	H

CO4	H	M	H	M	H	M	H	-	M	H	H	H
CO5	M	H	M	M	M	M	-	M	M	M	M	H

ADVERTISING
Paper COM-503

LTPC
4 0 0 4

(40 Hours)

Course Objective:

Advertisements are a vital component of the promotion mix, which enhance the awareness of a company and its products. It helps a company build image and position a product on its target segment. This course introduces the conceptual framework and functional aspects of the field of advertising management.

The core objective of the course is to help the students understand the concepts of advertising, its types and the different functional areas of advertising management.

Course Learning Outcomes

1. Understand the fundamental principles of advertising, including its history, evolution, and its role in modern marketing strategies.

2. Develop the ability to analyze target audiences, consumer behavior, and market trends to create effective advertising campaigns.

3. Acquire proficiency in various advertising mediums and channels, such as print, digital, social media, and broadcast, and demonstrate the ability to choose the most appropriate ones for specific campaigns.

4. Learn how to craft compelling advertising messages and visuals, taking into consideration branding, storytelling, and the use of persuasive techniques.

5. Demonstrate the capability to evaluate the success of advertising campaigns through key performance indicators (KPIs) and metrics, and make data-driven decisions for optimizing future advertising efforts.

Curriculum

Unit I: Introduction to Advertising & its management

- Advertising defined, Major Indian advertising & media agencies, Integrated Marketing Communication concepts, Merits & Demerits of advertising, Advertising agencies: Roles & Functions, 5-M model of advertising management, Career options in Advertising field.

Unit II: Classification of advertisements & campaign planning

- Types of advertising
- Advertising campaign planning
- Advertising budget

Unit III: Advertising message

- AIDA model
- Message design & Development
- Print Advertisement layout
- Advertisement appeals

Unit IV: Advertising Media

- Types of advertising media: Print media, Electronic media, Internet, Outdoor and transit media, Cinema
- Media selection, Planning, Scheduling and strategy

Unit V: Advertisement effectiveness & ethical issues

- Measuring advertisement effectiveness(pre-launch methods, post launch methods)
- Ethical issues of advertising

Recommended book:

- Chunawalla, S.A. and Sethia, K.C., *Foundations of Advertising Theory and Practice*, Himalaya Publishing House, Mumbai, 2009.

Reference books:

- Batra, Myers, Aaker, *Advertising Management*, Prentice Hall of India, New Delhi
- Mishra, M. N., *Sales Promotion and Advertising Management*, Himalaya Publishing House, Mumbai

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	M	L	L	L	L	L	L	L	L
CO2	L	H	L	H	L	L	M	L	L	L	L	L
CO3	L	L	H	L	L	L	L	L	L	L	L	L
CO4	L	L	L	M	L	L	L	L	L	L	L	L
CO5	L	L	L	L	H	L	L	L	L	L	L	L

INTERNATIONAL FINANCE
Paper COM-504

LTPC
4 0 0 4

Course Objective

Liberalization and Globalization of Economies in the Recent years has increased the Prominence of International Finance and Trade, which Prompted the Finance Managers to concentrate on the International Perspective as well, and it is Vital for a Student learning Finance to know the Intricacies of the Foreign Exchange Market and the Methods to Combat the Forex Risk.

Aim of this Subject is to Develop a Body of Knowledge and Skills and Make it Available to the Students to make them Successful Managers in the New Era of liberalization and Globalization.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Demonstrate knowledge of basic theorems of exchange rate determination, interest rates and inflation and the role of arbitrage in keeping the foreign exchange market efficient.
CO2: Apply knowledge of foreign exchange hedging to identify and manage the foreign exchange risks faced by globally active firms.
CO3: Demonstrate the ability to select global financing strategies and propose solutions that will take advantage of opportunities in the global financial markets to the benefit of relevant stakeholders.
CO4: Demonstrate the ability to deliver an effective oral presentation with appropriate visuals.
CO5: Demonstrate the ability to produce a clear and concise written report that demonstrates higher order understanding of key concepts in international finance.

Curriculum

Unit I: Introduction to International Finance and Theory of International Trade:

Increasing interdependence in the global economy, trends in international trade and cross-border financial flow, recent developments in global financial markets, liberalization, Integration and Innovation, Challenges of International Financial Management, Theory of Absolute Advantage, Theory of Comparative advantage, Heckscher-Ohlin Model, Imitation - Gap Theory.

Unit II Balance of Payments

Concept of Economic transactions, Resident, General Government institution, principles of accounting, Components of the BOP Account, factor affecting the components of the Bop account, balance of payments compilation, BoP- The Indian Perspective, Importance and limitations of BoP Statistics.

Unit III Foreign Exchange Market and Exchange rate determination.

Structure and the Participants, Types of Transactions, Mechanics of Currency dealing, exchange rate quotations, arbitrage, forward rates evolution of Exchange control and the foreign exchange market in india, relation between forex and money market, covered interest arbitrage, covered parity theorem, option forwards, cancelation of forward contracts, purchasing power parity, interest rate parity.

Unit IV: Short Term Financial Management:

Short Term Funding and Investment, Centralized vs. Decentralized Cash Management, Netting, Pooling, Exposure Management, Offshore Invoicing Centers.

Unit V: Introduction to Trade block, WTO, GATT, EXIM POLICY:

Formation of Trade Blocks, OPEC, its Objective, Function of European Community(EC), Function and Structure of WTO Agreements, trade related Aspects of Intellectual Property Rights (TRIPS), trade related aspects of Investment Measures (TRIMS), General Agreement on Trade in Services (GATS), Trade Negotiations under GATT, EXIM Policy Historical Perspective, Objective.

Reference Books:

1. International Financial Management: P G APTE : The Mcgrow Hill Companies.
2. International Economics: Francis Cherunilam: The Mc Graw Hill Companies.
3. International Corporate Finance: JEFF MADURA:CENGAGE Learning.
4. International money and Finance: Michael Melvin: Pearson Education.

Note: Latest edition of readings may be used

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		L						H			
CO2	M								H	L		
CO3	H								H		M	
CO4		H					H					
CO5		H		H							M	

LABOUR LAW
Paper COM-504

LTPC
4 0 0 4

Course Objective

Understanding of the legal framework is important for the efficient decision-making relating to management and employees relations. The course aims to provide an understanding, application and interpretation of the various labour laws and their implications for industrial relations and labour issues.

Course Learning Outcomes

CLO1) Understand the foundational principles and concepts of labor law, including the rights and obligations of both employers and employees.
CLO2) Analyze and apply relevant labor legislation and regulations to real-world workplace situations.
CLO3) Evaluate the impact of labor laws on employment relationships, collective bargaining, and labor disputes.
CLO4) Develop effective strategies for resolving labor disputes and conflicts in compliance with labor laws.
CLO5) Demonstrate knowledge of international labor standards and their relevance to domestic labor laws and practices.

Curriculum

Unit I: Labour Legislations in a Changing Context

- The Classification of Labour Laws
- The Factories Act, 1948
- The Shop and Establishments Act, 1953
- The Contract Labour (Regulation and Abolition) Act, 1970

Unit II: Social-Security Legislations

- Major Legislations
- The Employees' State Insurance Act, 1948
- Maternity Benefit Act, 1961
- The Workmen's Compensation Act, 1923
- The Payment of Gratuity Act, 1972
- Employees' provident Funds and Miscellaneous Provisions Act, 1952

Unit III: Wage Legislations

- The History of Wage legislations
- The Payment of Wages Act, 1936
- The Minimum Wages Act, 1948
- The Payment of Bonus Act, 1965

Unit IV: Other Recent Significant Legislations in India

Recommended Book

- P. N. Singh, Neeraj Kumar, Employee Relations Management, Pearson.
- P.L. Malik, Handbook of Labour and Industrial Law, 5e, Eastern Book Company.

Reference Books

- H.K. Saharay, . Industrial and Labour laws of India, Universal Law Publishing.
- S. P. Jain, Industrial & labour laws.
- Arun Monappa, Industrial Relations, Tata Mc Graw Hill.

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	-	-	-	-	-	-	-	L	-	-	H
CO2	-	-	-	-	-	-	-	-	-	M	M	H
CO3	-	-	-	-	-		M	M	-	-	-	H
CO4	-	-	-	M	-	-	M	-	-	-	-	H
CO5	M	-	-	-	-	-	-	-	H	-	M	-

SUMMER INTERNSHIP &PROJECT
COM-505

LTPC
4 0 0 4

COURSE LEARNING OUTCOME

CO1: Understand the real-time working of organizations.

CO2: Demonstrate professional knowledge, skills and attitude along withthe experience needed to constitute a successful career.

CO3: Analyse career opportunities in their areas of interest.

CO4: Build aptitude for gaining supervised professional experiences.

CO5: Create a clear understanding of industry trends and advancements

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	H	H	M	H	H	H	M	M	M	M
CO2	-	H	H	M	L	-	L	M	L	-	M	-
CO3	L	L	M	H	H	-	M	-	-	M	H	L
CO4	L	L	M	L	-	M	H	H	M	L	L	L
CO5	M	M	H	L	-	M	H	H	M	L	M	L

B.COM

Semester-

VI

BUSINESS ETHICS

Paper COM-601

LTPC

4 0 0 4

(40 HOURS)

Objectives

The basic objective of this paper is to make the students realize the importance of values and ethics in business. This course endeavors to provide a background to ethics as a prelude to learn the skills of ethical decision-making and, then, to apply those skills to the real and current challenges of the information professions.

Curriculum

Unit I: Ethics (8 Hours)

Management Process and Ethics, Ethical Decision Making, Ethical Issues, Ethos of Vadanta in Management, Relevance of Ethics and Values in Business

Unit II: Knowledge and Wisdom (8 Hours)

Meaning of Knowledge and Wisdom, Difference between Knowledge and Wisdom, Knowledge Worker versus Wisdom Worker, Concept of Knowledge Management and Wisdom management, Wisdom Based Management.
Stress Management: Meaning, Sources and Consequences of Stress, Stress Management and Detached Involvement.

Unit III: Understanding Progress, and Success - Results & Managing Transformation: (8 Hours)

Progress and Results Definition, Functions of Progress, Transformation, Need for Transformation, Process & Challenges of Transformation.
Understanding Success: Definitions of Success, Principles for Competitive Success, Prerequisites to Create Blue Print for Success. Successful Stories of Business Gurus.

Unit IV: Corporate Social Responsibility & Corporate Governance: (8 Hours)

Corporate Responsibility of Business: Employees, Consumers and Community, Corporate Governance, Code of Corporate Governance, Consumer Protection Act, Unethical issues in Business

Unit V (8 Hours)

Cases of corruption, corporate Scandals, Whistle Blowing, Insider Trading, Discrimination, Advertising, Consumer Rights etc.

Reference books:

- Fernando, A.C., (2009), Business Ethics, 1st edition, Pearson education.
- Hartman,Laura and Chatterjee, Abha, (2006), Perspectives in Business Ethics, 3rd Edition, McGraw Hill Education.
- Dr.F.C.Sharma, Business Values & Ethics – Shree Mahavir Book Depot, Nai Sarak, New Delhi.
- C.S.V Murthy – Business Ethics, Himalya Publishing House.
- Shina Parkashan – Managerial Ethics – Rajat Publications.
- C.L.Dave – Social Accounting – Renuka Publishers, Jodhpur

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	L		M	M					
CO2		M	M						H	M	M	M
CO3		M	M	M	H	M	M	H				
CO4					1		M	M	M	M		M
CO5	H	H	H	H	H	H	H	H	H	H	H	H

FINANCIAL MARKETS AND SERVICES

Paper COM-601

LTPC

4 0 0 4

(40 Hours)

Objectives

The focus in this paper would be on issues related to the financial markets & instruments along with different financial services and current scenario of Indian financial system & markets. This paper provides an introduction to the financial markets products and services, markets and market participants. The objective of this course is to familiarize the student with the operations of Indian financial markets and basic concepts of different financial services along with the banking system.

Course Learning Outcomes

CLO1) Analyze various financial instruments and their characteristics, including stocks, bonds, derivatives, and commodities, to make informed investment decisions.
CLO2) Evaluate the impact of economic indicators, central bank policies, and geopolitical events on financial markets and their implications for portfolio management.
CLO3) Develop a comprehensive understanding of risk management techniques and strategies to protect and optimize investment portfolios in volatile markets.
CLO4) Demonstrate proficiency in financial analysis tools and techniques to assess the financial health and performance of corporations and investment opportunities.
CLO5) Examine the regulatory framework governing financial markets and services, including the role of government agencies, and assess their impact on market stability and investor protection.

Content

Unit I: Introduction to the Financial System (8 HOURS)

Nature and role of financial system, financial system and financial markets, government intervention in the financial system, informal and formal financial system, components of formal financial system- institutions, intermediaries, markets and services, functions and weaknesses of Indian Financial System.

Unit II: Introduction to Financial Markets (8 HOURS)

Money market and Capital market, money market instruments- T Bills, CPs & CDs. Capital Market-primary and secondary, methods of raising capital, Derivative concepts, Role of SEBI.

Unit III: Introduction to Financial services (8 HOURS)

Fund based and Fee based service. Conceptual aspect of factoring, forfeiting, credit rating, bill discounting, leasing, securitization and consumer finance. Evaluation of strategic decisions regarding factoring, leasing and merger & acquisitions.

Unit IV: Insurance and Mutual funds (8 HOURS)

Basic concepts of insurance and mutual funds, role of IRDA and AMFI

Unit V: Introduction to Banking (8 HOURS)

An overview of the different activities performed by a bank. Retail Banking: Concepts, forms and products of retail banking. Corporate Banking: meaning, nature, functions and products.

Recommended books:

- "Financial Markets and Services" E. Gordon & K. Natarajan, Himalaya Publishing House

Reference books:

- "Financial Markets, Institutions and Financial Services" Clifford Gomez, Prentice Hall of India
- "Financial Markets and Institutions-An Introduction to the Risk Management Approach" A. Saunders & M. M. Cornett. Tata McGraw Hills Publication
- "Indian Financial System" Bharti Pathak, Pearson Education.
- "Financial Institutions and Markets- structure, growth and innovations" L. M. Bhole & Jitendra Mahakud. Tata McGraw Hills Publication

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	L	L	L	L	L	L	L	H	M	L
CO2	M	L	L	L	L	L	L	L	L	M	M	L
CO3	L	L	L	L	L	L	L	L	L	L	L	L
CO4	M	L	L	L	L	L	L	L	L	M	L	L
CO5	L	L	L	L	L	L	L	L	L	L	L	L

INDUSTRIAL RELATIONS

Paper COM-601

LTPC

4 0 0 4

(40 Hours)

Objective:

To acquaint the student to develop an understanding of the industrial relations and the legal framework of industrial and labor laws. The objective of this course is to impart the students with the knowledge of laws and how law affects the industry and labor.

Course Learning Outcomes

CLO1) Analyze the historical development and evolution of industrial relations, tracing the key milestones and shifts in labor-management dynamics.
CLO2) Evaluate the impact of labor laws and regulations on workplace relations, including the ability to interpret and apply relevant legal frameworks.
CLO3) Demonstrate proficiency in negotiation and conflict resolution techniques within the context of labor disputes, fostering effective communication and problem-solving skills.
CLO4) Assess the role of labor unions and employer organizations in shaping industrial relations, including their functions, structures, and strategies.
CLO5) Examine contemporary issues in industrial relations, such as globalization, technological advancements, and diversity, and their effects on workforce dynamics and service delivery.

Curriculum

Unit I (8 Hours)

- Industrial Relations- Definition, importance and scope.
- ILO, Ministry of Labor, Commissions, National Conferences.

Unit II (8 Hours)

- Workers Participation in Management- Concept, forms of participation, benefits, of WPM.
- Trade Union Act.

Unit III (8 Hours)

- Service Conditions
- The Factories Act, 1948.
- Work Discipline, Standing Order Act.

Unit IV (8 Hours)

- Industrial Disputes- Nature, Causes, Types of conflict Resolution, Collective Bargaining.
- Industrial Dispute Act, 1946

- Strike & lockout, Lay-off and Retrenchment
- Grievance Redressal Machinery

Unit V (8 Hours)

- The Contract Labor (Regulation & Abolition Act, 1970.
- Payment of Wages Act.

Recommended Book:

- P. N. Singh, Neeraj Kumar, Employee Relations Management, Pearson.
- P.L. Malik, Handbook of Labour and Industrial Law, 5e, Eastern Book Company.

Reference Books:

- S. P. Jain, Industrial & labour laws.
- Kochan T.A. & Katz Henry 2nd, Collective Bargaining.
- P.C.Shejwalkar,S.B.Malegaonkar, Personnel Management & Industrial Relations.
- P. C. Tripathi, Industrial Relations and Personnel Management.

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	L	L	L	L	L	L	L	L	L	H
CO2	L	M	L	L	L	L	L	L	L	L	L	H
CO3	L	H	L	M	L	L	M	L	L	L	L	L
CO4	L	L	L	L	L	L	L	L	L	L	L	L
CO5	L	L	L	L	L	L	L	L	L	L	L	L

PERFORMANCE MANAGEMENT
Paper COM-602

LTPC
4 0 0 4

(40 HOURS)

Objective

To acquaint the student to develop an understanding of the performance management of employees and its implications. Study of performance management that aid in motivation, employee development and productivity improvement to meet organization goals.

Course Learning Outcomes

CLO1) Demonstrate an understanding of performance management principles and frameworks, including key concepts such as goal setting, feedback, and performance appraisal.
CLO2) Analyze and evaluate various performance management systems and tools used in organizations to measure employee performance and provide recommendations for improvement.
CLO3) Develop effective communication and feedback skills to facilitate productive performance discussions and address performance issues constructively.
CLO4) Identify and apply strategies for aligning individual and team goals with organizational objectives, fostering a culture of performance excellence.
CLO5) Create and implement performance improvement plans to enhance individual and team performance, utilizing data-driven decision-making and performance metrics.

Curriculum

Unit I

Introduction to Performance Management, Definition, nature, scope, importance, Business and sub functional Performance Management, Performance Management as a management Tool, Performance objectives and standards, Standards of Performance. Performance Domains and dimensions.

Unit II

Performance Planning Process, Contents of Performance Plan, 8 Step Model, Individual and Group Performance Planning, Role clarity and Job description.
Meaning of Performance appraisal, methods and approaches to performance appraisal, Obstacles in appraisal, Designing appraisal for better results, Performance Appraisal Interview, Potential Appraisal.

Unit III

Introduction, Definition, Purpose and Role of appraisal in Performance Management, Methods and Steps in Performance Appraisal. Why Appraisal Fail, Types of Appraisal, Approaches and Design, MBO, 360*, Potential Appraisal, Performance Review, Performance counseling/ Mentoring. Team Performance Appraisal.

Unit IV

Introduction to PMS, Importance, Features, Process of Building PMS, PMS Dimensions, Conceptual Framework. 4 pillars of PMS, PMS Prism, Strategic Performance Management, Performance and Strategy linkage, Components of SPM, SPM- Balanced Score Card, SPM

and Metrix, SPM Environment teatre and Risks.

Unit V

Competency Based Performance Management System, Performance Measurement, Performance Measurement through BSC, Performance and Succession Plan/ Career Development, International Performance Management, Performance Audit, Human Resource Valuation accounting and Audit.

Recommended Book:

- D. K. Bhattacharya, Performance Management Systems and Strategies- Text book, Pearson.

Reference Books:

- Aquinis, Performance Management, Pearson.
- Chadha, Performance Management, Macmillan.
- Armstrong, Michael, Baron, Jaico, Performance Management.
- Cardy, Performance Management, PHI.
- Kohli, Deb, Performance Management, Oxford.
- D Sharma, Performance Management, HPH.
- R.K. Sahu, Performance Management System, EB.
- TV Rao, Performance Management and Appraisal, Sage.

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	L	H	L	M	L	L	L	H	M
CO2	M	L	L	H	H	L	L	H	H	M	H	M
CO3	M	H	L	L	H	L	H	L	H	M	H	M
CO4	H	M	L	M	H	L	L	L	L	L	H	L
CO5	M	L	L	L	H	L	L	L	L	L	H	L

GOODS AND SERVICES TAX (GST)
Paper COM-602

LTPC
4 0 0 4

Course Objective

To provide basic knowledge and equip students with application of principles and provisions of GST, Central Excise, and Customs Laws. Expected learning outcome: Students will gain a working knowledge regarding computation of tax liability pertaining to these laws.

Course Learning Outcomes

CLO1) Demonstrate a comprehensive understanding of the GST framework, its principles, and its significance in the context of taxation and economic policies.
CLO2) Analyze the various components of GST, including Input Tax Credit (ITC), tax rates, exemptions, and threshold limits, and apply this knowledge to calculate GST liabilities and refunds accurately.
CLO3) Evaluate the impact of GST on businesses and consumers, assessing its implications on pricing, supply chains, and compliance requirements.
CLO4) Interpret and navigate the GST legal and regulatory framework, including the GST Act, rules, and procedures, to ensure compliance and minimize the risk of penalties.
CLO5) Develop effective strategies for GST compliance and optimization, enabling businesses to streamline their operations, minimize tax liabilities, and enhance their competitive advantage in the marketplace.

Curriculum

Unit I: Introduction of Indirect Tax

- Historical background of Indirect Tax in India.
- Introduction of GST Act in India,
- Commodities not falling under GST in India and Provision of tax on the same.
- Computation of tax on such commodities.

Unit II: GST

- Recognize the applicability of SGST, CGST and IGST,
- Define the concept of supply, Differentiate between taxable and nontaxable supply, Define the taxable event with respect to supply of goods,
- Identify the place of supply so as to decide the applicability of the tax, Define what is meant by the location of supplier of goods.

Unit III: GST

- List down the registration process for single or separate business, Goods and Services Tax (GST) Accounts Assistant, Note down the details to be furnished during the registration, Differentiate between taxable person verses registered person,
- Understand the benefits of registration, Register an Assessee under GST Independently.

- Identify instances for eligibility of input credit, Identify set-offs under GST wherever applicable.
- Identify in detail carry over credit, capital goods credit, embedded credits etc, Differentiate between consideration and valuation.

Unit IV: Customs laws

- Maintain the different types of ledgers, Prepare different types of periodic returns to be filed, File Returns Online, List the different types of payment, due dates, modes of payment with rules and collection of tax, penalties etc.,
- Differentiate on TDS versus, Calculate the amount of tax payable, Make the payment online.
- Basic concepts of customs law, Territorial waters, high seas
- Types of custom duties
- Basic, Countervailing & Anti- Dumping Duty, Safeguard Duty,
- Valuation of Custom Duty.

Unit V: Customs Procedures

- Import and Export Procedures, Baggage, Exemptions
- Provision related to Prohibited goods, Notified goods, Special goods, illegal importation/exportation of goods .
- Search, Seizer, and Arrest; Offences; Penalties; Confiscation and Prosecution.

Reference books:

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- GST Law Manual 4th Edition (November 18, 2017) Paperback – 2017 by R. K. Jain
- GST Tariff (Set of 2 Volumes) with GST Rate Reckoner Paperback – 2017 by Taxmann (Author)
- GST Acts with Rules & Forms(Incorporating Notifications Issued till 17-11-2017) (Bare Act) Paperback – 2017 by Taxmann (Author)
- V.S. Datey. Indirect Tax Law and practice, Taxmann Publications Pvt. Ltd., Delhi, Latest edition
- S. S. Gupta. Service Tax -How to meet your obligation Taxmann Publications Pvt. Ltd., Delhi, Latest edition.

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	L	L	H	L	M	L	H	H	H	M
CO2	M	L	L	H	H	L	L	H	H	H	H	M
CO3	H	H	L	L	H	L	H	L	H	M	H	M
CO4	H	M	L	M	H	L	L	L	L	L	H	L
CO5	H	H	H	H	H	H	H	H	H	H	H	H

CONSUMER AFFAIRS AND CUSTOMER CARE

Paper COM-602

LTPC

4 0 0 4

Course Objective:

This paper seeks to familarise the students with Basics of consumer affairs and behaviours their rights as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights. The firm needs to know who buys their product. How they buy? When and where they buy? Why they buy? How they respond to marketing stimuli. What is Consumer Behavior about? How, why, where and when consumers make purchase decisions? Considers who influences the decisions? What is Consumer Behavior about?

It also provides an understanding of the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards.
All these are important questions, which are to be known to the students and companies so that they can design, and implement marketing strategies to satisfy the customers.

Course Learning Outcomes

CLO1) Students will demonstrate an understanding of consumer rights and responsibilities in various industries and legal frameworks.
CLO2) Learners will develop effective communication and interpersonal skills to engage with customers professionally and empathetically.
CLO3) Participants will analyze case studies and real-world scenarios to identify common consumer issues and implement appropriate resolution strategies.
CLO4) Students will explore the impact of technology on consumer interactions, including online reviews, social media, and e-commerce platforms.
CLO5) Learners will gain knowledge of ethical considerations and best practices in customer service, promoting customer satisfaction and loyalty.

Unit 1: Conceptual Framework: Consumer affairs and Behaviour
Consumer and Markets: Concept of Consumer, Nature of markets, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP) and Local Taxes, Fair Price, labeling and packaging Experiencing and Voicing Dissatisfaction: Consumer Satisfaction/dissatisfaction-Grievances complaint, Consumer Behavior and its Application, Development of the Marketing Concept'. A Model of Consumer Decision Making.
STP Process and strategies, A Simple Frame work of CB, Consumer Behavior Roles.
Unit 2: Consumer Decision:
Dynamic Process of CB, Pre- purchase, purchase and post-purchase issues of Consumers and challenges to marketers.
Individual Decision Making, Buying and Disposing, Organizational and Household Decision Making

Unit 3: Factors Influencing Consumer Behavior:
Family Influence on CB, Family Life Cycle, Cultural and social influence on Consumer decision making process, Reference Groups and Social Influences.
Unit 4: The Consumer Protection Act, 1986 (CPA) & Grievance Redress Mechanism under the Consumer Protection Act, 1986:
Objectives and Basic Concepts: Consumer, goods, service, defect in goods, deficiency in service, spurious goods and services, unfair trade practice, restrictive trade practice.
Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy to be be provided; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties.
Unit 5: Industry Regulators and Consumer Complaint Redress Mechanism

i. Banking: RBI and Banking Ombudsman
ii. ii. Insurance: IRDA and Insurance Ombudsman
iii. iii. Telecommunication: TRAI
iv. iv. Food Products: FSSAI (an overview)
v. v. Electricity Supply: Electricity Regulatory Commission
vi. vi. Advertising: ASCI
vii. Consumer Protection in India

Reference Books:

1. Hawkins, Best, Coney, Consumer Behavior, (Latest Edition) Tata McGraw Hill
2. David L Loudon and Albert J Della Bitta, Consumer Behaviour (Latest Edition), Tata McGraw Hill.
3. Roger D. Black Well et al, Consumer Behaviour, Thomson, (Latest Edition)

Suggested Readings:
1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. Consumer Affairs" (2007) Delhi University Publication. 334 pp.
2. Aggarwal, V. K. (2003). Consumer Protection: Law and Practice. 5th ed. Bharat Law House, Delhi, or latest edition.
3. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
4. Nader, Ralph (1973). The Consumer and Corporate Accountability. USA, Harcourt Brace

Jovanovich, Inc.
5. Sharma, Deepa (2011).Consumer Protection and Grievance-Redress in India: A Study of Insurance Industry (LAP LAMBERT Academic Publishing GmbH & Co.KG, Saarbrucken, Germany. 263 pp.
6. Empowering Consumers e-book, www.consumeraffairs.nic.in
7. ebook, www.bis.org 8. The Consumer Protection Act, 1986

Articles

1. Verma, D. P. S. (2002). Developments in Consumer Protection in India. Journal of Consumer Policy. Vol. 25. No. pp 107 –123.
2. Verma, D.P.S. (2002). Regulating Misleading Advertisements, Legal Provisions and Institutional Framework. Vikalpa. Vol. 26. No. 2. pp. 51-57.
3. Ralph L. Day and Laird E. Landon, Jr. (1997). Towards a Theory of Consumer Complaining Behaviour. Ag Woodside, et al. (eds.). Consumer and Industrial Buying Behaviour. New York; North Holland pp. 425-37.
4. George, S. Day and A. Aaker (1970). A Guide to consumerism. Journal of Marketing. Vol. 34. pp 12-19.
5. Sharma, Deepa (2003).New measures for Consumer Protection in India. The Indian Journal of Commerce. Vol.56. No.4. pp. 96-106
6. Sharma, Deepa (2011).Consumer Grievance Redress by Insurance Ombudsman. BIMAQUEST.Vol.11. pp.29-47.

Mapping of CO'S and PO'S

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	L	H	H	L	M	L	L	H	H	M
CO2	M	H	L	H	H	L	L	H	L	H	H	M
CO3	H	H	L	H	H	L	H	L	M	M	H	M
CO4	H	H	L	H	H	L	L	L	L	L	H	L
CO5	H	H	H	H	H	H	H	H	H	H	H	H

INTERNATIONAL BUSINESS

Paper COM-603

LTPC

4 0 0 4

(40 Hours)

Course Learning Objective (CO):

CO1: To Create an environment of learning the basic concepts of International Business.

CO2: To Apply the knowledge gained in studying the Organizational Structure for Global business,

CO3: To Understand the Indian export documentation Process.
CO4: To Analyze the implications of global trade for India.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1: Understand the basic concepts of International Business. **Apply** the trends of global business and its impact on different economies. **Analyze** the impact of government policies in relation to the other developed economies of the world.

CLO2: Remember the trends of business around the world, **Understand** the role of international organizations in impacting the growth of business. **Analyze** the trade figures and to Evaluate the future expectations.

CLO3:Evaluate and Contrast between domestic and international markets. **Apply** the advantage of gaining knowledge of international markets to grow the national markets. **Analyze** the different types of international market intermediaries around the world

CLO4: Understand the role of international financial organization. **Evaluate** the concept of different marketing concept., **Analyze** the role of government and the basic structure of international business along with its organization to boost the business from the country.

Unit I (8 Hours)

Introduction to International Business: Globalization and its growing importance in world economy; Impact of globalization; International business contrasted with domestic business - complexities of international business; Modes of entry into international business. International Business Environment: National and foreign environments and their components - economic, cultural and political-legal environments; Global trading environment - recent trends in world trade in goods and services; Trends in India‟s foreign trade.

Unit II (8 Hours)

Theories of International Trade – an overview; Commercial Policy, Instruments - tariff and non-tariff measures; Balance of payment account and its components .International Organizations and Arrangements: WTO – Its objectives, principles, organizational structure and functioning; An overview of other organizations – UNCTAD, World Bank and IMF; Commodity and other trading agreements.

Unit III (8 Hours)

Regional Economic Co-operation: Forms of regional groupings; Integration efforts among countries in Europe, North America and Asia. International Financial Environment: International financial system and institutions; Foreign exchange markets and risk management; Foreign investments - types and flows; Foreign investment in Indian perspective.

Unit IV (8 Hours)

Organizational structure for international business operations; Key issues involved in making international production, finance, marketing and human resource decisions; International business negotiations. Developments and Issues in International Business: Outsourcing and its potentials for India; Strategic alliances, mergers and acquisitions; Role of IT in international business; International business and ecological considerations.

Unit V (8 Hours)

Foreign Trade promotion measures and organizations in India; Special economic zones (SEZs) and 100% export-oriented units (EOUs); Measures for promoting foreign investments into and from India; Indian joint ventures and acquisitions abroad. Financing of foreign trade and payment terms.

Recommended Books:

- Charles, W.L. Hill and Jain, Kumar, Arun. International Business. New Delhi: Tata McGraw-Hill.

Reference Books:

- Johnson, Derbe., and Colin Turner. International Business - Themes & Issues in the Modern Global Economy. London: Roultedge.
- Cherunilam, Francis. International Business: Text and Cases. Prentice Hall of India Ltd.
- Daniels John, D. Lee H. Radenbaugh and David P. Sullivan. International Business. Pearson Education (Singapore) Pvt. Ltd.
- Justin, Paul. International Business. Prentice Hall of India Ltd.
- Michael R. Czinkota. et al. International Business. Fortforth: The Dryden Press.
- RBI. Report on Currency & Finance, various issues.
- Griffin, Ricky W. and Michael W. Pustay. International Business - A Managerial Perspective. Prentice Hall.

- Bennett, Roger. International Business. Delhi: Pearson.
- UNCTAD Reports.
- WTO, Annual Report, various issues.

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	H	M	M	M	H	M	H	M	H	H	M	M	H	M	M
CLO2	H	M	M	M	H	M	H	M	H	H	M	M	H	M	M
CLO3	H	M	M	M	H	M	H	M	H	H	M	M	H	M	M
CLO4	H	M	M	M	H	M	H	M	H	H	M	M	H	M	M

H: High M: Medium L: Low

OPERATION MANAGEMENT
Paper COM-604

Course Obectives

CO1) To Explain an understanding of how the operations, have strategic importance and can provide a competitive advantage in the workplace and techniques of location and facility planning.

CO2) To provide students with the basic concepts related to the Work Study, Method Study and Work Measurement.

CO3) To Illustrate the Materials Management function starting from Demand Managementthrough Inventory Management.

CO4) To explain the concept and core values of Quality Management (QM).To Determine the voice of the customer and the impact of quality on economic performance and long-term businesssuccess of an organization.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1) To identify the elements of operations management and various transformation processesto enhance productivity and competitiveness. Explain the techniques of location and facility planning.

CLO2) To Analyze and Make use of various methods of work study, method study and work measurement.

CLO3) To define and examine the materials management function starting from demand management through Inventory Management.

CLO4) Apply various Statistical Quality Control tools including the analysis of various Quality costs and quality circles. Explain the concept of TQM.

Unit-I:

Operations management - meaning, definitions, scope and objectives- interaction of operations management with other areas - manufacturing and non-manufacturing operations and
their characteristics.

Unit-II:

Facilities planning - plant location - factors determining plant location - plant layout— process layout and product layout - materials handling – MRP - Principle equipment's.

Unit-III:

Capacity planning - estimation of capital requirements - maintenance management— types of maintenance -work study - time and method study - work measurement, meaning, scope
and importance.

Unit-IV:

Operations planning and control - Objectives of Operations planning— planning procedure - Operations planning categories.

Unit-V:

Operations control - Meaning, Importance and objectives - Techniques of operations control.

References:

1. Russell, Roberta S, and Bernard W.Taylor, Operations Management, Pearson Education, New

Delhi 2004.
2. Chase :Operations Management for Competitive Advantage, Tata McGraw Hill, New Delhi.
3. Buffa, E.S., 'Modern Production Management', New York, John Wiley, 1987.
4. Adam, E.E. and Ebert, R.J., 'Production and Operations Management' Prentice Hall of India, New Delhi 1995.
5. Chary, S .N., Production and Operations Management', Tata McGraw Hill, New Delhi 1989

Mapping of CLOs with PLOs & PSOs

Course Learning Outcomes	Program Learning Outcomes (PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1					H				H		H	H		M	M
CLO2	H		H	H	M				M				H	H	H
CLO3			M		H					H		H	L	M	M
CLO4	H		M											M	H
CLO5	M			H								H	M	M	H

H: High M: Medium L: Low

RESEARCH PROJECT REPORT

Paper COM-605

LTPC

0 0 0 6

Objective

Student has to undergo a practical training of minimum forty five days after second semester. B.COM being professional course it is essential for each student to practically apply or

understand theoretical concepts what he/she learn during the course. During the training programme student is expected to collect vital information through internal and external source so as to reach concrete conclusions on the given subject. Student has to prepare the project report under the guidance of internal teacher. Director/Principal of the institution/college will decide the last date of submission of final copy. Student should submit two typed copies to the Institute. One copy for the institute and another copy for his/her personal record. Students may prepare additional copies for the organization, guide etc.

A viva-voce examination will be conducted before the Semester IV examination. A viva-voce committee of minimum two members will be appointed by the university.

Guidelines for the project report

Declaration from the student that the research work is not copied from any other existing reports. Certificate of the guide.- Guide should certify that the research work is original and completed satisfactorily under his guidance.

The Chapter scheme for the project report will be as follows-.

CHAPTER NO-I – Introduction to the study.

1.1 Introduction
1.2 Objectives and importance of the study
1.3 Scope and limitations of study
1.4 Research Methodology

CHAPTER NO.II – Introduction to the organisation

2.1 Introduction to the industry
2.2 Brief History of organisation
2.3 Subsidiaries, Associates of the company
2.4 Departments / Manufacturing process
2.5 Important statistical information
2.6 Future prospect
2.7 Organisation Structure

CHAPTER – III - Theoretical Background

Basic concepts
Necessary theoretical inputs may be added to support the research work.

CHAPTER –IV – Data Analysis and Interpretation

Data should be analyzed with help of various tools studied in the Subject "Application of Research Methods in Management".

CHAPTER-V Findings / Observations

CHAPTER VI- Suggestions / Conclusion

Appendix

Questionnaire / Charts / Data / Diagrams / Tables / etc.

Bibliography

The above guidelines are not the prescription on writing the project report but can be used as milestones while writing the Project Report. The guide has the every discretion to change the chapter scheme as per the requirement

Note

1. There should be proper linkage between objectives, data analysis and interpretation, findings and suggestions.
2. Student should not use logos and name of company on the project report pages. Header and Footer shall consist of university name and institute name respectively. No other information should be included in the Header and Footer.
3. Use of colors in text matter should be avoided.

School of Law, Raffles University

Bachelor of Laws

B.A.LL.B/B.B.A.LL.B

PROGRAM OUTCOMES

1. **PO1. Legal Knowledge:** To acquire & apply legal knowledge to complex Socio-legal problems.
2. **PO2. Professional Practice:** to make students eligible to practice as legal practitioners in Courts, Industries, and Companies.
3. **PO3. Professional Skills:** To possess professional skills required for legal practice such as Argument, Pleading, drafting, conveyancing etc.
4. **PO4. Professional Ethics:** To understand and apply principles of professional ethics of the legal profession.
5. **PO5. Legal Research & Legal Reasoning:** to develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PO6. Leadership Skills:** To develop leadership qualities amongst students.

PROGRAM EDUCATIONAL OBJECTIVES

1. **PEO1**: To acquire & apply legal knowledge to multifaceted Socio-legal problems.
2. **PEO2:** To make students eligible to practice as legal experts in Courts, Industries, and Companies.
3. **PEO3**: To possess the expertise necessary for practicing law, such as argument, pleading, drafting, conveyancing, etc.
4. **PEO4**: Understanding and applying legal professional ethics in legal principles.
5. **PEO5**: To develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PEO6**: To create a foundation for independent employment by acquiring professional legal skills.
7. **PEO7**: To strengthen clinical skills and raise understanding of constitutional legislation and societal transformation.
8. **PEO8**: Each law graduate will acquire expertise in legal research, written and spoken communication, teamwork, advocacy, and problem-solving.

PROGRAM SPECIFIC OBJECTIVES

1. **PSO1**. Students should be able to demonstrate an understanding of substantive and procedural law sufficient to enter the legal profession and professions in which legal knowledge is an advantage.
2. **PSO2**. Should be able to associate the learning from the courses related to Law and Management.
3. **PSO3**. Should have the capability to understand the laws at national and global levels and to solve the client's problem.
4. **PSO4**. Should possess the skills to communicate in both oral and written forms and the ability to formulate legal problems and use appropriate concepts and methods to solve them.
5. **PSO5** should use skills in specific areas (e.g. Criminal, industrial-organizational, clinical, counselling, social, and community).
6. **PSO6** should be analyzing social problems and understanding social dynamics.

COURSE OUTCOMES (COs)

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER 1	
Legal Methods (BAL/BBL 101)	**CO1** Understand the foundations of law. **CO2** Analyze the application of the components of the Indian Legal System. **CO3** Write research reports, using proper research tools. **CO4** Draft plaints & written statements as a part of the clinical Legal Education.
Law of Torts, Consumer Protection and MV. Act (BAL/BBL 102)	**CO1** Identify the various conceptual aspects of the Law of Torts. **CO2** Apply various defences under tortuous liability and specific kinds of torts. **CO3** Enumerate the remedies available for specific torts. **CO4** Know the relation of torts with various other laws.
General English-I (BAL/BBL 103)	**CO1** Describe the importance of General English and Legal Language. **CO2** Identify the correct usage of grammar in legal drafting during the draft of any document.

	CO3 Draft documents for legal correspondence to use in the legal drafting. **CO4** Analyse characters of literary texts and apply skills of interpreting poetry.
Political Science-I (BAL 104)	**CO1** Enumerate the concepts associated with Political Theory in Political Science. **CO2** Correlate the knowledge of Political Science with Legal knowledge. **CO3** Conceptualize the associated concepts of Political Science **CO4** Know the relation of political science with law.
Sociology-I (BAL 105)	**CO1** Understand the basic and associated concepts of sociology in India. **CO2** Know the concept and essence of kingship in different societies under the current scenario. **CO3** Analyze the relevance of the sociological aspect with the present legal system. **CO4** Apply the knowledge of sociology with legal knowledge.
Principles of Management (BBL 104)	**CO1.** Understand the basic concept and fundamental principles of Management. **CO2**. Discuss the evolution of Management Thought **CO3**. Enumerate the functions of Management. **CO4** Appraise Management Practices in the specified domain.
Financial Accounting (BBL 105)	**CO1.** Develop an understanding of basic aspects of Financial Accounting **CO2**. Know all the components of the financial statement and how it relates to the law. **CO3**. Analyze and interpret Financial Statements and use them during legal proceedings. **CO4**. Understand the accounting process under financial accounting.
Economics-I (BAL/BBL 106)	**CO1** Conceptualize the various components of Micro and macroeconomics. **CO2** Enumerate functioning of markets. **CO3** Discuss the impact of a laissez-faire state in the Indian Economy. **CO4** Able to understand the business cycle and the concept of inflation.

Course	Course Outcomes: After Completion of these courses the students should be able to learn
SEMESTER II	
LEGAL & CONSTITUTIONAL HISTORY (BAL 201)	**CO1** Understand the basic concept of constitutional history. **CO2** Know the development of legal and constitutional history. **CO3** Apply the various provisions of GOI act with constitution. **CO4** Analyse the A Codification of Indian Laws and the Law Commissions Reports
LAW OF CONTRACT – I (BAL 202)	**CO1** Have an elementary understanding of the debates around the nature of law. **CO2** Distinguish between the major kinds of law, legal systems and institutions. **CO3** Knows the structure of the legal institutions and the hierarchy of courts in India. **CO4** Apply critically the various provisions of contract practically in the court of law .
GENERAL ENGLISH-II (BAL 203)	**CO1** Understand the general concept of legal language. **CO2** Summarize information and reconstruct arguments in a coherent presentation. **CO3** Produce organized and coherent communications and essays with clear paragraphs and appropriate methods for introducing and concluding. **CO4** Produce well-supported communications and essays using different patterns of development taking into consideration purpose and audience.
POLITICAL SCIENCE-II (BAL 204)	**CO1** Understand key field-specific theories and concepts, as well as their importance in the development of political science knowledge. **CO2** Summarise conceptual arguments or theoretical methods, apply them to field-relevant situations, and back up your claims with evidence.

	CO3 Compare and contrast the merits of various policies, theories, or concepts from various disciplinary perspectives. **CO4** Know the theories of Management and Administrative Reform.
SOCIOLOGY-II (BAL 205)	**CO1** Understand the functional similarities and differences in the institutions of Indian Society. **CO2** Make students aware of the micro and macro world of Indian Society **CO3** Know the various caste system in India. **CO4** Analyse how the sociological approach applies in society and is beneficial to them.
Business Environment (BBL 204)	**CO1.** Identify and evaluate social, cultural, legal and technical factors in the business environment. **CO2**. Describe the various economic systems and sectors. **CO3.** Discuss economic planning and policies of the Indian economy. **CO4.** Apply ethical values and social responsibilities in business.
Human Resource Management (BBL 205)	**CO1.** Understand the concept of the changing environment of HRM and the role of HR managers. **CO2.** Know the recruitment & selection process and application of Information Technology. **CO3.** Apply the critical knowledge for training and development during practical. **CO4.** Recognize the pay plans, performance appraisal and compensation and administer the wage and salary of employees and employee services.
ECONOMICS-II (BAL 206) (BAL/BBL 106)	**CO1** Identify and explain economic concepts and theories concerning economic agents' behaviour, markets, industry and corporate structures, legal institutions, social standards, and government policies. **CO2** Know the combine theoretical knowledge with quantitative and qualitative information to explain previous economic events and forecast future ones.

	CO3 Evaluate the consequences of economic activities and institutions for individual and social welfare. **CO4 U**nderstand about the basic concepts of Monetary Economics.
Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER III	
CONSTITUTIONAL LAW – I (BAL 301)	**CO1** Identify the various dimensions of the constitutional law. **CO2** Understand the process of Executive, legislative and judicial mechanisms under the constitution. **CO3** Enumerate the constitutional remedies available. **CO4** Apply the real spirit of distribution of power between centre and state government.
LAW OF CONTRACT – II (BAL 302)	**CO1** Understand the list and define the specific contracts. **CO2** Know the explanation of why specific contracts are important to our legal and economic system. **CO3** Analyse how sale transactions of moveable property take place. **CO4** They will find out how partnership firms are formed, and the duties and liabilities of the partners in a partnership firm.
LAW OF CRIMES-I (BAL 303)	**CO1** Understand the conceptual analysis of the law of crimes. **CO2** Analyse the spirit of legal provisions of crimes and apply it before the court of law. **CO3** Apply the practical aspects of the law of crime in the different types of courts in India. **CO4** Assess the real approach to the law of crime in the present context of Indian Society.
POLITICAL SCIENCE – III (BAL 304)	**CO1** Understand the basic and general concept of the political system in India. **CO2** Assess the relations of the Indian political system with the international political system. **CO3** Analyse the powers and limitations of the states in the context of international political scenarios. **CO4** Apply the Critical approach of the political system to the legal system in India

SOCIOLOGY-III (BAL 305)	**CO1** Understand the various theories of sociology and apply it into society. **CO2** Know and apply the social ideology of the various thinkers in the practical and real world. **CO3.** Analyse the role of media in the prevention of crime from the ground level in India. **CO4.** Express the views of various thinkers and sociologists in future for the betterment of society.
Organizational Behaviour (BBL 304)	**CO1.** Understand the conceptual framework of the discipline of Organizational Behaviour and its practical applications. **CO2.** Analyze the role of individuals, groups, and structures in achieving organizational goals effectively and efficiently. **CO3.** Critically evaluate the various theories and models of contribute to the overall understanding of the discipline. **CO4.** Develop innovative ideas that could positively shape the organizations from different cultural and diverse backgrounds in the workplace.
Business Strategy (BBL 305)	**CO1.** Study the concepts of strategic management and various business policies. **CO2.** Discuss the strategic operations governing business management. **CO3.** Implement the strategies suitable for various organizational structures. **CO4.** Understand the basic concept of business strategy.
ECONOMICS-III (BAL/BBL 306)	**CO1** Understand the fundamental principles of monetary economics and financial markets. **CO2** Analyse the financial system of markets and the tools of Monetary Policy used in the market system. **CO3** Know the banking and standards of banking, functions, quantitative & qualitative credit control methods, Limitations and role of RBI.

	CO4 Apply public finance in various sectors of economics and change the character of public finance through international financial instruments.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER IV	
CONSTITUTIONAL LAW - II (BAL 401)	**CO1** Understand the Concept of 'State' in reference to fundamental rights. **CO2** Fundamental rights and the method for ensuring conformity with fundamental rights, as well as Writ jurisdiction of the supreme court and high court under Articles 32 and 226. **CO3** The state's duty and relationship with the interdependence of fundamental rights and directive principles. **CO4** Know the provisions regarding fundamental rights under the national and international legal system.
LAW OF CRIMES-II (LCRL-II)	**CO1** Understand how society views crime against women, the human body and property. **CO2** Demonstrate a thorough understanding of aspects of criminal justice or law, as well as their relevance to larger social issues. **CO3** Identify and apply the principles of criminal law covered in the whole course. **CO4** Know the provisions of the various offences under criminal law and apply them in a court of law.
CODE CRIMINAL PROCEDURE (BAL 403)	**CO1** Understand the criminal procedure in India includes the following information: who prosecutes; process to compel production of things; right to a quick trial; and process to compel the appearance of persons. **CO2** Know the Criminal Procedure Act's legal guidelines for arrest and bail, the rights of those who have been detained, and how to apply these laws in a real-world situation.

	CO3 Describe the rules that govern the right to legal representation in criminal proceedings in India and demonstrate how to use them in a real-world situation. **CO4** Apply the various provisions of criminal procedure code in the different courts.
LAW OF EVIDENCE (BAL 404)	**CO1** Identify and enumerate the various categories of evidence, their general characteristics, and the relevant legal processes. **CO2** Examine the rule governing the admissibility of evidence in court and its importance. **CO3** Analyse the regulations governing dying declarations and their admissibility. **CO4** Understand the whole concept of the law of evidence and correlate it with other laws.
ADMINISTRATIVE LAW (BAL 405)	**CO1** State the need for the development of Administrative Law. **CO2** Express the concept of delegated legislation and its control mechanisms. **CO3** Demonstrate natural justice and its exceptions and examine the recent innovations in administrative Law. **CO4** Appraise the judicial control of administrative action.
ECONOMICS-IV (BAL 406)	**CO1** Understand the general concept of international economics. **CO2** Know the various theories of international trade and role of international trade in economic development. **CO3** States the importance of the terms of trade and commercial policy. **CO4** Analyse the international financial institutions and trade agreements and its functions.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER V	
FAMILY LAW – I (BAL 501)	**CO1** Understand the general concept and provisions of Hindu law. **CO2** Basic ideas including marriage, divorce, parental custody, domestic abuse, and children's rights are taught to students of family law.

	CO3 Family law investigates how historical and social settings have impacted how families are defined and governed in the present. **CO4** Students will learn to think critically, analyse information, and communicate ideas orally and in writing.
JURISPRUDENCE (BAL 502)	**CO1** Understand the basic principles of learning of law and sources of law. **CO2** Perform that you have a thorough understanding of the political, social, historical, philosophical, and economic framework of law. **CO3** Identify, articulate, and critically assess legal theory, as well as its consequences for policy. **CO4** Critically evaluate and explore intricate legal and theoretical issues and select the best course of action among available options.
CORPORATE LAW-I (BAL 503)	**CO1** Apply the practical aspect of company law in the global system of economics. **CO2** Understand multinational companies in the legal system. **CO3** Frame the legal requirement for registration for companies. **CO4** Contest the cases pertaining to corporate law.
INTELLECTUAL PROPERTY LAW (BAL 504)	**CO1** Understand the international origin of IPR. **CO2** Think over the Indian IPR law in relation to the International legal system. **CO3** Critically analyses the IPR law for protecting the intellectual property. **CO4** Apply critically the principles of IPR laws for the protection of creative activities.
PUBLIC INTERNATIONAL LAW (BAL 505)	**CO1** Understand the basic concept and sources of international law. **CO2** Demonstrate knowledge and understanding of the international rights framework, its origins and justifying theories **CO3** Establish the capacity to assess how specific human rights may be asserted, enforced or violated. **CO4** Critically evaluate the relationship between international and domestic law.
CIVIL PROCEDURE CODE-I (BAL 506)	**CO1** Know the detailed procedure for the redressal of civil rights.

	CO2 Where the suit is to be filed? The essential forms and procedures for the institution of the suit, the documents in support and against, evidence taking and trial, dimensions of an interim order, the peculiar nature of the suits, the complexities of executing a decree and provisions for appeal and revision are all matters which a lawyer for any side is to be familiar with. **CO3** Recognize and address issues that arise in Civil Procedure that implicate relevant ethical, moral, and religious principles. **CO4** Understand the basic concept of the civil procedure code.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER VI	
FAMILY LAW-II (BAL 601)	**CO1** Analyse Muslim law, its sources, Schools, the concept of marriage, and the various matrimonial remedies **CO2** Understand the legal or statutory provisions relating to maintenance, Dower Guardianship they will be able to solve disputes of property by reading the above course. **CO3** Know the legal solutions to some very sensitive disputes relating to Waqf, Will, Inheritance and Guardianship etc. **CO4** The Students recognize the recent development under Muslim Law through the judiciary.
TRANSFER OF PROPERTY (BAL 602)	**CO1** Understand and explain the basic principles of transfer of property with real-life examples. **CO2** Demonstrate the various kinds of transfer of properties with practical examples. **CO3** Know the draft of various deeds relating to the transfer of property. **CO4** Recognize the easementary rights in India.
COMPETITION LAW (BAL 603)	**CO1** Understand the basic principles of fair competition and constitutional perspectives. **CO2** Analyse the international perspectives of competition law.

	CO3 Recognise the role of the Competition Act, 2002 in regulating anti-competitive practices and promoting fair competition and enforcement procedures. **CO4** Identify and able to conduct research on emerging trends in competition law.
ARBITRATION & MEDIATION (BAL 604)	**CO1** Recognise the fundamentals and guiding principles of arbitration. **CO2** Interpreting and applying pertinent domestic and international arbitration and mediation laws and regulations. **CO3** Identify the advantages and limitations of arbitration and mediation. **CO4** Case analysis and legal research in arbitration and mediation.
PRIVATE INTERNATIONAL LAW (BAL 605)	**CO1** Analyse the fundamental principles of private international law and conduct legal research and assess legal data. **CO2** Apply private international law principles to difficult challenges and difficulties and assess how they work theoretically. **CO3** Examine the effects of private international law from a comparative and global viewpoint, taking social and cultural diversity into consideration. Build and maintain clear, convincing writing for a legal and professional audience.
CIVIL PROCEDURE CODE-I (BAL 606)	**CO1** Demonstrate the knowledge and understanding of substantive law, procedural law, and Constitutional Law. **CO2** Develop the ability to perform legal analysis and reasoning, legal research, problem-solving, and written and oral communication in the legal context and apply it in legal practice and real-life situations. **CO3** Demonstrate the professional skills of pleading, argument, drafting and conveyancing, collaboration, counselling, and negotiation required for legal practice. **CO4** Develop the ability to analyse the law in relation to contemporary developments at the national level.

Course	Course Outcomes: After Completion of these courses the students should be able to learn
SEMESTER VII	
INFORMATION TECHNOLOGY LAW (BAL 701)	**CO1** Clarify and apply the key legal principles of information technology law presented in the course. **CO2** Choose and use a variety of written and spoken communication techniques, as well as the critical thinking skills necessary to find answers to challenging legal issues in the field of information technology law. **CO3** Demonstrate knowledge of the various ways that the law can be affected by and changed by quickly developing technology in a way that can help clients with their planning or lawmakers with their recommendations. **CO4** Apply the provisions of law relating to Information Technology in the judicial proceedings.
PRINCIPLES OF TAXATION (BAL 702)	**CO1** Apply the principles of taxation laws to complex legal problems. **CO2** Understand the technical aspects of taxation laws. **CO3** To file and contest cases writ pertaining to taxation laws before the competent authorities. **CO4** Supervise and guide the persons whose matters are related to taxation laws.
HUMAN RIGHTS LAW & PRACTICE (BAL 703)	**CO1** Understand the meaning and historical development of human rights. **CO2** Classify relevant documents on human rights. **CO3** Interpret legal provisions on human rights under Indian laws. **CO4** Examine the effective implementation of human rights of vulnerable groups.
INTERPRETATION OF STATUTES (BAL 704)	**CO1** Understand the real thing of interpretation. **CO2** Apply the principles of interpretation in the courts. **CO3** Understanding the capacity of the students will increase for the real application of the law. **CO4** Practically understands the construction of various statutes.
INDIAN FEDERALISM (BALA 705)	**CO1** Understand the concept and definition of federalism. **CO2** Know the provisions regarding federalism in different countries.

	CO3 Analise the confederation and cooperative federalism. **CO4** Critically applies and compares the federal and unitary systems of government.
LOCAL SELF-GOVERNMENT (BALA 706)	**CO1** Understand the development of Local Self Government in India. **CO2** Critically analyse the working of self-governing institutions in India. **CO3** Explore the recent trends in Local Self Government in India. **CO4** Recognize the provisions under the constitution regarding local government.
CRIMINOLOGY PENOLOGY & VICTIMOLOGY (BALB 705)	**CO1** Understand the relationship between theories of punishment and historical context. **CO2** Analyze and evaluate the relevance of theories of punishment to current penal policy. **CO3** Become familiar with basic criminal laws and criminal justice processes in the country. **CO4** Evaluate the reasons behind the crime and the significance of Penology in the present society and theories of the punishments and its application in the criminal justice system.
CYBER CRIME SECURITY & SOVEREIGNTY (BALB 706)	**CO1** Defend and safeguard computer systems and networks from cybersecurity threats. **CO2** Analyse and investigate cybersecurity incidents or crimes involving digital evidence and computer systems. **CO3** Address information security issues through effective communication in a professional setting. **CO4** Identify present and potential assaults on a company's computer systems and networks, use critical thinking and problem-solving techniques.
CORPORATE GOVERNANCE (BALC 705)	**CO1** Understanding of Corporate Governance from a managerial as well as legal point of view. **CO2** Learn the importance of good governance which is an important tool to achieve shareholder democracy. **CO3** Enumerate the importance of the responsibilities of a corporation towards society.

	CO4 Critically applies the knowledge of corporate law in the court proceedings.
LAW OF CORPORATE FINANCE (BALC 706)	**CO1** Understand the basic concept and scope of corporate finance. **CO2** Know the provisions related to corporate finance under constitutional law. **CO3** Analyse the key concept of Share Capital and non-opting equity shares. **CO4** Apply critically the provision of company law and constitutional law in the proceedings before the court of law.
COPYRIGHTS AND TRADITIONAL CULTURAL EXPRESSION (BALD 705)	**CO1** Understand the concept of copyrights and folklore. **CO2** Analyse the authorship and ownership under copyrights. **CO3** Develops procedural knowledge to Legal System and solving the problem relating to copyrights. **CO4** Skill to understand the concept of Traditional Cultural Expressions (TCEs) or Expressions of Folklore.
LAW OF TRADEMARKS AND GEOGRAPHICAL INDICATIONS (BALD 706)	**CO1** Obtain a fair and sound knowledge of the ideas behind international and Indian trademark law. **CO2** Demonstrate a thorough understanding of trademark law in the applicant's chosen field of study or employment. **CO3** Employ fundamental research techniques, data analysis, and interpretation around trademark law. **CO4** Examine various approaches to problem-solving, build science-based solutions, and identify the main points of disagreement in both international and domestic trademark law.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER VIII	
Environmental Law (BAL 801)	**CO1**: Analyze a complex body of information in environmental law with an advanced and integrated understanding. **CO2**: Gain the ability to recognized new law and apply old law in the quickly changing environmental law landscape. **CO3**: Understanding of the specialized area of environmental law and related disciplinary topics.

	CO4: Know the different provisions related to Environmental Law in different legislations.
Banking Insurance and Negotiable Instrument (BAL 802)	**CO1**. Understand and gain practical knowledge of the insurance and banking industries. **CO2**. Professionals can find profitable employment in retail, investment, merchant, treasury, banking, and insurance. **CO3**. Students will have first-hand experience of the practice relevant to banking and insurance. **CO4**. The rapidly expanding industry of financial and investment services is also drawing numerous reputable firms and individual legal consultants.
Land & Agricultural Laws (BAL 803)	**CO1**. Identify and characterize the revenue board courts, as well as their role in appeal revision and review in case of any dispute. **CO2**. Demonstrate knowledge of the legal and regulatory framework for tribunals, as well as the regulatory requirements. **CO3**. Provide that you are aware of the professional abilities required by urbanization, particularly analytical abilities. **CO4**. Understand the basic concept of Land and Agricultural Laws.
Labour & Industrial Laws – I (BAL 804)	**CO1**. Know the development and the judicial setup of Labour Laws. **CO2**. Understand the 4 new codes of labour laws and knowledge of Labour Law in General HRD Practice. **CO3**. Learned about the rules governing labour relations and working conditions as well as the inquiry process and industrial discipline. **CO4**. Identify the new provisions and amendments under the labour laws.
Law Relating to Elections (BALA 805)	**CO1**. Understand and identify the basic concept and importance of election law in a democratic country. **CO2**. Analyze the lacuna of the law relating to elections and available remedies. **CO3**. Know the main reform in present election law and the procedure of elections. **CO4**. Identify the provisions of law relating to elections under the constitution of India.

Law Governing Service (BALA 806)	**CO1**. Understand the Basic concept of service laws in different countries. **CO2**. Know the legal provisions related to various service matters in different laws. **CO3**. Identify the procedure regarding service matters under public sectors. **CO4**. Critically apply the legal provisions relating to service matters during the proceedings.
Corporate & White-Collar Crimes (BALB 805)	**CO1**. Know that white-collar crime exists and is committed as a phenomenon in a globalized society. **CO2**. Develop a grasp of other principles that could be used to define white-collar crimes, such as organizational or corporate crimes, and acquire some knowledge of the many categories of white-collar crime. **CO3**. Explain the foundations or explanation for the committing of white-collar crimes in India. **CO4**. Through class discussions, students' writing and critical thinking abilities on the subject of white-collar crime will be improved.
Police Law & Administration (BALB 806)	**CO-1**-Knowledge of the Structure of the Police force under the India administrative system. **CO-2** Powers, functions, and Problems of the Police Force in all Forms under India's legal system. **CO-3** Understand different forums of Justice administration under the Indian legal system. **CO-4** Identify the nature and scope of police and administration under Indian legal.
Competition Law (BALC 805)	**CO1** Understand the Deep knowledge of fair competition and constitutional perspectives. **CO2** Analyse the national and international perspectives of competition law in different countries.

	CO3 Recognise the role of the Competition Act, 2002 in regulating anti-competitive practices and promoting fair competition and enforcement procedures. **CO4** Identify and able to conduct research on emerging and growing trends in competition law.
International Trade Law (BALC 806)	**CO1.** Understand the basic concept of trade law as various theories like free trade theory and the attacks that have been made on free trade theory. **CO2**. Identify the origin and development in the last century of international institutions governing trade. **CO3.** Knowing the laws and policies of the World Trade Organization. **CO4**. Critically analyse the relationship between trade, development, environment, and human rights.
Patent Drafting & Specification Writing (BALD 805)	**CO1.** Analyse the rights and responsibilities of the Patent holder, Copyright and Trademark Design etc. **CO2.** Identify the procedure to protect different forms of IPRs at the national and international levels. **CO3.** Develop key skills in making searches using modern tools and techniques in patent drafting. **CO4.** Understand the basics of IPR and patent drafting.
Law Relating to Design & Geographical Indication (BALD 806)	**CO1**. Develop a proper understanding of the basic concept of law relating to the design and layout of integrated circuits. **CO2**. Know the international and national treaties and laws dealing with law relating to design. **CO3**. Obtain a critical understanding of the subject matter regarding the design in different geographical areas. **CO4**. Identify the infringement that takes place in relation to the design and what are remedies available in case of infringement.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER IX	

Labour & Industrial Laws- II (BAL 901)	**CO1**. Understand the basic concept of the different Labour Codes. **CO2**. Resolve the Labour welfare problems and Students will learn the laws relating to Industrial Relations. **CO3**. Know the Social Security, private sector wages problems etc. **CO4**. Identify the working conditions and also learn the enquiry procedural and industrial discipline.
Insolvency and Bankruptcy Law (BAL 902)	**CO1**. Develop a conceptual understanding of the basic principles of Insolvency and Bankruptcy Laws in different Countries. **CO2**. Apply the different principles of insolvency and Bankruptcy to the real-life situations and relate theory with practical knowledge. **CO3**. Understand the concepts and apply them to a wide range of problems related to the Banking Sector. **CO4**. Know the linkages between insolvency, Banking and the Insurance sector and the related Law.
Clinical & Practical-I (Drafting, Pleading & Conveyance) (BAL 903)	**CO1.** Understand the basics of pleadings and conveyancing. **CO2.** Apply the practical law in drafting the various kinds of deeds. **CO3.** Know the law pertaining to the rules of pleading. **CO4.** Analyse affirmative actions in practice.
Clinical & Practical-II (Alternative Dispute Resolution) (BAL 904)	**CO1.** Understand the fundamental principles of equity, justice, and good conscience. **CO2.** Know the real spirit of the equity which was prevailing in Great Britain. The application of these principles will analyse for providing real justice in India. **CO3.** Apply the provisions of equity with reference to constitutional law in India. **CO4.** Analyse the principles and maxims of equity for the application of the spirit of justice.
Affirmative Action & Discriminative Justice (BALA 905)	**CO1.** Understand the applications of real justice in the development of society. **CO2.** Know the principles of protective discrimination for the upliftment of the privileged class. **CO3.** Apply the principles of affirmative action and principles of equity.

	CO4. Examine the reservation policy as existing in the global legal framework.
Gender Justice & Feminist Jurisprudence (BALA 906)	**CO1.** Understand the basic concept and law related to the gender justice system. **CO2.** Know the controversial issues, theories and texts with a critical lens and an open mind. **CO3.** Develop the ability to research and write substantive analytical research papers. **CO4.** Apply the professional activities in the national and international law in the Indian legal system.
International Criminal Law (BALB 905)	**CO1.** Understand the principles of International Criminal law for its application. **CO2.** Know the legal provisions of the International Criminal courts. **CO3.** Examine the procedure and practice of remedial forums related to International Criminal law. **CO4.** Analyse the contemporary issues on the International Criminal law regime.
Comparative Criminal Law (BALB 906)	**CO1.** Understand the comparative legal provisions of crime. **CO2.** Know about the trial procedure under the legal regime of various criminal systems. **CO3.** Analyse and assess the legal mechanism related to the remedy available under the comparative criminal system. **CO4.** Examine the reformative legal techniques under criminal law.
Laws of Mergers & Acquisitions (BALC 905)	**CO1.** Understand legal obligations in terms of mergers and acquisitions. **CO2.** Know the Corporate Restructuring and implication for society and economy. **CO3.** Appreciate the importance of mergers and acquisitions (M&A) in the present corporate world. **CO4.** Analyse the process of M&A, essentialities of valuation and various methods thereof in case of Mergers and Acquisitions.
Corporate & White-Collar Crimes (BALC 906)	**CO1**. Know that white-collar crime exists and is committed as a phenomenon in a globalized society.

	CO2. Develop a grasp of other principles that could be used to define white-collar crimes, such as organizational or corporate crimes, and acquire some knowledge of the many categories of white-collar crime. **CO3**. Explain the foundations or explanation for the committing of white-collar crimes in India. **CO4**. Through class discussions, students' writing, and critical thinking abilities about white-collar crime will be improved.
Patent and Patentability of Biotechnological Invention (BALD 905)	**CO1.** Understand the basics of intellectual property law. **CO2.** Analyse the Legal System and solve the problem relating to intellectual property rights. **CO3.** Know the registration process of patents, copyright trademarks etc. **CO4.** Context the cases relating to the IPR before the appropriate forum.
Intellectual Property Rights & Pharma Industry (BALD 906)	**CO1.** Understand the basic concept of the pharmaceutical industry in India. **CO2.** Know the domestic and International legal regime in relation to IPR. **CO3.** Critically analyse the role of IPR law in pharmaceutical development in India. **CO4.** Analyse the role of IPR and the right to health in particular access.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER X	
Clinical & practical-III (Professional Ethics) (BAL 1002)	**CO1**. Develop critical thinking skills to evaluate and analyze ethical issues from multiple perspectives and recognize the complexities involved in ethical decision-making. **CO2**. Learn the process of ethical decision-making, which includes identifying ethical issues, considering alternatives, and making well-reasoned ethical choices.

	CO3. Understanding of various ethical theories, such as deontology, utilitarianism, virtue ethics, and consequentialism, and be able to apply these theories to ethical dilemmas. **CO4**. Recognize personal and professional ethical responsibilities and obligations, including duties to clients, colleagues, employers, and society as a whole.
Clinical & Practical-IV (Moot Court & Art of Persuading Judges) (BAL 1003)	**CO1**. Develop proficiency in legal research techniques, including using databases, libraries, and online resources to find relevant case law, statutes, regulations, and legal precedents. **CO2**. Enhance the ability to analyze legal cases, statutes, and regulations in depth, focusing on relevant legal issues and precedents. **CO3**. Improve oral advocacy skills by participating in mock appellate court arguments, including developing persuasive arguments. **CO4**. Understand the procedural rules and protocols specific to appellate courts, including the rules for filing briefs, presenting oral arguments, and interacting with judges.
Seminar Paper (BAL 1004)	**CO1**. Learn how to choose a relevant and well-defined research topic or question that aligns with the course's objectives or the student's academic interests. **CO2**. Conduct a comprehensive literature review to identify existing research on the chosen topic, summarize key findings, and identify gaps in the literature. **CO3**. Improve academic writing skills, including clarity, conciseness, and precision in writing, as well as proper grammar and style. **CO4**. Practice critical analysis of research findings and their implications, drawing conclusions based on evidence and analysis.
Media and the Law (BALA 1005)	1. **CO1.** Identify the various media laws and legislation, and media trials in accordance with the Constitution under different countries. 2. **CO2.** Understand the legal remedies provided by different courts. 3. **CO3.** Enumerate the convergence and media in accordance with the broadcasting sector.

	4. **CO4.** Apply the real spirit of social media to become a strong democratic country.
Comparative Constitutional Law (BALA 1006)	1. **CO1.** Understand the similarities and differences between leading legal traditions in key areas. 2. **CO2.** Know the comparative study on Judicial systems and judicial review. 3. **CO3.** Apply the comparative methodology of principles of Natural Justice as well as law relating to trade commerce and intercourse. 4. **CO4.** Examine the comparative legal provisions of developed countries with the provisions of the Indian Constitution.
Organized Crimes and Law (BALA 1005)	**CO1.** Understand the different tactics to defining the organized crime in India. **CO2.** Know the basic concept of organized criminal groups under the Organized Crime in different Legislation and Convention. **CO3.** Apply a types of organized crime activity to specific organized crimes in India. **CO4.** Distinguish the different ways organized criminal groups can be assessed.
Forensic Science (BALB 1006)	**CO1**. Describe the fundamental principles of forensic sciences and functions and their significance to human society. **CO 2**. Illustrate the divisions in a forensic science laboratory which is useful for the investigation of any cases. **CO 3**. Understand the workings of forensic establishments in India and internationally. **CO4**. Know the basics of the forensic sciences and the law.
International Commercial Arbitration (BALC 1005)	**CO1.** Understanding the Arbitration Process including its principles, procedures, and rules such as those established by institutions like the International Chamber of Commerce (ICC) or the International Centre for Dispute Resolution (ICDR) **CO2.** Familiarize oneself with the relevant international and national laws governing international commercial arbitration. **CO3.** Develop skills in negotiation, mediation, and conflict resolution, as these are often integral to the arbitration process. **CO4.** Explore the unique challenges and considerations associated with cross-border disputes.
Laws of Infrastructure Development (BALC 1006)	**CO1**. Understand the various stages of an infrastructure project's lifecycle, from planning and feasibility studies to financing, construction, operation, and maintenance.

	CO2. Develop skills in identifying and assessing legal and financial risks associated with infrastructure projects, including political, regulatory, and financial risks. **CO3**. Explore contract law principles as they relate to infrastructure development, including contract drafting, negotiation, and dispute resolution. **CO4**. Learn about the legal framework for public procurement in infrastructure projects, including competitive bidding processes, contract award, and procurement regulations.
Protection of Plant Varieties & Traditional Knowledge (BALD 1005)	**CO1**. Gain a comprehensive understanding of plant varieties, genetic resources, and traditional knowledge associated with plants. **CO2**. Learn about the concept of plant breeders' rights, including the criteria for granting rights, duration, and the rights and obligations of breeders. **CO3**. Explore strategies for the management, conservation, and sustainable use of plant genetic resources, including gene banks and ex-situ conservation. **CO4**. Examine the ethical and cultural dimensions of traditional knowledge and plant genetic resources, including the rights and interests of indigenous and local communities.
IPR Management & Litigation (BALD 1006)	**CO1**. Develop a solid understanding of the key intellectual property laws, including patents, trademarks, copyrights, and trade secrets. **CO2**. Gain knowledge of patent law, including the requirements for patentability, patent prosecution, and the legal protection of inventions. **CO3**. Understand trademark law, including the registration process, trademark enforcement, and the protection of brand identities. **CO4**. Analyze real-world IP litigation cases to gain practical insights into the strategies and tactics employed by parties involved in disputes.

School of Law, Raffles University

Bachelor of Laws (LL.B)

PROGRAM OUTCOMES

1. **PO1. Legal Knowledge:** To acquire & apply legal knowledge to complex Socio-legal problems.
2. **PO2. Professional Practice:** to make students eligible to practice as legal practitioners in Courts, Industries, and Companies.
3. **PO3. Professional Skills:** To possess professional skills required for legal practice such as Argument, Pleading, drafting, conveyancing etc.
4. **PO4. Professional Ethics:** To understand and apply principles of professional ethics of the legal profession.
5. **PO5. Legal Research & Legal Reasoning:** to develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PO6. Leadership Skills:** To develop leadership qualities amongst students.

PROGRAM EDUCATIONAL OBJECTIVES

1. **PEO1**: To acquire & apply legal knowledge to multifaceted Socio-legal problems.
2. **PEO2:** To make students eligible to practice as legal experts in Courts, Industries, and Companies.
3. **PEO3**: To possess the expertise necessary for practising law, such as argument, pleading, drafting, conveyancing, etc.
4. **PEO4**: Understanding and applying legal professional ethics in legal principles.
5. **PEO5**: To develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PEO6**: To create a foundation for independent employment by acquiring professional legal skills.
7. **PEO7**: To strengthen clinical skills and raise understanding of constitutional legislation and societal transformation.
8. **PEO8**: Each law graduate will acquire expertise in legal research, written and spoken communication, teamwork, advocacy, and problem-solving.

PROGRAM SPECIFIC OBJECTIVES

1. **PSO1**. Students should be able to demonstrate an understanding of substantive and procedural law sufficient to enter the legal profession and professions in which legal knowledge is an advantage.
2. **PSO2**. Should be able to associate the learning from the courses related to Law and Management.
3. **PSO3**. Should have the capability to understand the laws at national and global levels and to solve the client's problem.
4. **PSO4**. Should possess the skills to communicate in both oral and written forms and the ability to formulate legal problems and use appropriate concepts and methods to solve them.
5. **PSO5** should use skills in specific areas (e.g. Criminal, industrial-organizational, clinical, counselling, social, and community).
6. **PSO6** should be analyzing social problems and understanding social dynamics.

COURSE OUTCOMES (COs)

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER 1	
Constitutional Law-I (LLB 101)	**CO1** Identify the various dimensions of constitutional law. **CO2** Understand the process of Executive, legislative and judicial mechanisms under the constitution. **CO3** Enumerate the constitutional remedies available. **CO4** Apply the real spirit of distribution of power between centre and state government.
Law of Contract-I (LLB 102)	**CO1** Understand the list and define the specific contracts. **CO2** Know the explanation of why specific contracts are important to our legal and economic system. **CO3** Analyse how sale transactions of moveable property take place. **CO4** They will find out how partnership firms are formed, and the duties and liabilities of the partners in a partnership firm.
Family Law-I (LLB 103)	**CO1** Understand the general concept and provisions of Hindu law.

	CO2 Basic ideas including marriage, divorce, parental custody, domestic abuse, and children's rights are taught to students of family law. **CO3** Family law investigates how historical and social settings have impacted how families are defined and governed in the present. **CO4** Students will learn to think critically, analyse information, and communicate ideas orally and in writing.
Law of Torts, Consumer Protection and MV. Act (LLB 104)	**CO1** Identify the various conceptual aspects of the Law of Torts. **CO2** Apply various defences under tortuous liability and specific kinds of torts. **CO3** Enumerate the remedies available for specific torts. **CO4** Know the relation of torts with various other laws.
General English-I (LLB 105)	**CO1** Describe the importance of General English and Legal Language. **CO2** Identify the correct usage of grammar in legal drafting during the draft of any document. **CO3** Draft documents for legal correspondence to use in the legal drafting. **CO4** Analyse characters of literary texts and apply skills of interpreting poetry.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER II	
CONSTITUTIONAL LAW - II (LLB 201)	**CO1** Understand the Concept of 'State' in reference to fundamental rights. **CO2** Fundamental rights and the method for ensuring conformity with fundamental rights, as well as Writ jurisdiction of the supreme court and high court under Articles 32 and 226. **CO3** The state's duty and relationship with the interdependence of fundamental rights and directive principles. **CO4** Know the provisions regarding fundamental rights under the national and international legal system.
LAW OF CRIMES-II (LLB 202)	**CO1** Understand how society views crime against women, the human body and property.

	CO2 Demonstrate a thorough understanding of aspects of criminal justice or law, as well as their relevance to larger social issues. **CO3** Identify and apply the principles of criminal law covered in the whole course. **CO4** Know the provisions of the various offences under criminal law and apply them in a court of law.
FAMILY LAW-II (LLB 203)	**CO1** Analyse Muslim law, its sources, Schools, the concept of marriage, and the various matrimonial remedies **CO2** Understand the legal or statutory provisions relating to maintenance, Dower Guardianship they will be able to solve disputes of property by reading the above course. **CO3** Know the legal solutions to some very sensitive disputes relating to Waqf, Will, Inheritance and Guardianship etc. **CO4** The Students recognize the recent development under Muslim Law through the judiciary.
INDIAN PENAL CODE (LLB 204)	**CO1** Understand the conceptual analysis of the law of crimes. **CO2** Analyse the spirit of legal provisions of crimes and apply it before the court of law. **CO3** Apply the practical aspects of the law of crime in the different types of courts in India. **CO4** Assess the real approach to the law of crime in the present context of Indian Society.
ADMINISTRATIVE LAW (LLB 205)	**CO1** State the need for the development of Administrative Law. **CO2** Express the concept of delegated legislation and its control mechanisms. **CO3** Demonstrate natural justice and its exceptions and examine the recent innovations in administrative Law. **CO4** Appraise the judicial control of administrative action.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER III	
JURISPRUDENCE (LLB 301)	**CO1** Understand the basic principles of learning of law and sources of law.

	CO2 Perform that you have a thorough understanding of the political, social, historical, philosophical, and economic framework of law. **CO3** Identify, articulate, and critically assess legal theory, as well as its consequences for policy. **CO4** Critically evaluate and explore intricate legal and theoretical issues and select the best course of action among available options.
PUBLIC INTERNATIONAL LAW (LLB 302)	**CO1** Understand the basic concept and sources of international law. **CO2** Demonstrate knowledge and understanding of the international rights framework, its origins and justifying theories. **CO3** Establish the capacity to assess how specific human rights may be asserted, enforced or violated. **CO4** Critically evaluate the relationship between international and domestic law.
CORPORATE LAW (LLB 303)	**CO1** Apply the practical aspect of company law in the global system of economics. **CO2** Understand multinational companies in the legal system. **CO3** Frame the legal requirement for registration for companies. **CO4** Contest the cases pertaining to corporate law.
INTELLECTUAL PROPERTY LAW (LLB 304)	**CO1** Understand the international origin of IPR. **CO2** Think over the Indian IPR law in relation to the International legal system. **CO3** Critically analyses the IPR law for protecting the intellectual property. **CO4** Apply critically the principles of IPR laws for the protection of creative activities.
CODE CRIMINAL PROCEDURE (LLB 305)	**CO1** Understand the criminal procedure in India includes the following information: who prosecutes; process to compel production of things; right to a quick trial; and process to compel the appearance of persons. **CO2** Know the Criminal Procedure Act's legal guidelines for arrest and bail, the rights of those who have been detained, and how to apply these laws in a real-world situation.

	CO3 Describe the rules that govern the right to legal representation in criminal proceedings in India and demonstrate how to use them in a real-world situation. **CO4** Apply the various provisions of the criminal procedure code in the different courts.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER V	
CIVIL PROCEDURE CODE (LLB 401)	**CO1** Demonstrate the knowledge and understanding of substantive law, procedural law, and Constitutional Law. **CO2** Develop the ability to perform legal analysis and reasoning, legal research, problem-solving, and written and oral communication in the legal context and apply it in legal practice and real-life situations. **CO3** Demonstrate the professional skills of pleading, argument, drafting and conveyancing, collaboration, counselling, and negotiation required for legal practice. **CO4** Develop the ability to analyse the law in relation to contemporary developments at the national level.
PROPERTY LAW (LLB 402)	**CO1** Understand and explain the basic principles of transfer of property with real-life examples. **CO2** Demonstrate the various kinds of transfer of properties with practical examples. **CO3** Know the draft of various deeds relating to the transfer of property. **CO4** Recognize the elementary rights in India.
PRIVATE INTERNATIONAL LAW (LLB 403)	**CO1** Analyse the fundamental principles of private international law and conduct legal research and assess legal data. **CO2** Apply private international law principles to difficult challenges and difficulties and assess how they work theoretically. **CO3** Examine the effects of private international law from a comparative and global viewpoint, taking social and cultural diversity into consideration.

	Build and maintain clear, convincing writing for a legal and professional audience.
CYBER LAW (LLB 404)	**CO1** Clarify and apply the key legal principles of information technology law presented in the course. **CO2** Choose and use a variety of written and spoken communication techniques, as well as the critical thinking skills necessary to find answers to challenging legal issues in the field of information technology law. **CO3** Demonstrate knowledge of the various ways that the law can be affected by and changed by quickly developing technology in a way that can help clients with their planning or lawmakers with their recommendations. **CO4** Apply the provisions of law relating to Information Technology in the judicial proceedings.
ENVIRONMENTAL LAW (LLB 405)	**CO1**: Analyze a complex body of information in environmental law with an advanced and integrated understanding. **CO2**: Gain the ability to recognized new law and apply old law in the quickly changing environmental law landscape. **CO3**: Understanding of the specialized area of environmental law and related disciplinary topics. **CO4**: Know the different provisions related to Environmental Law in different legislations.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
	SEMESTER V
LAW OF EVIDENCE (LLB 501)	**CO1** Identify and enumerate the various categories of evidence, their general characteristics, and the relevant legal processes. **CO2** Examine the rule governing the admissibility of evidence in court and its importance. **CO3** Analyse the regulations governing dying declarations and their admissibility. **CO4** Understand the whole concept of the law of evidence and correlate it with other laws.

INTERPRETATION OF STATUTES (LLB 502)	**CO1** Understand the real thing of interpretation. **CO2** Apply the principles of interpretation in the courts. **CO3** Understanding the capacity of the students will increase for the real application of the law. **CO4** Practically understands the construction of various statutes.
LABOUR LAWS (LLB 503)	**CO1**. Know the development and the judicial setup of Labour Laws. **CO2**. Understand the 4 new codes of labour laws and knowledge of Labour Law in General HRD Practice. **CO3**. Learned about the rules governing labour relations and working conditions as well as the inquiry process and industrial discipline. **CO4**. Identify the new provisions and amendments under the labour laws.
PRINCIPLES OF TAXATION (LLB 504)	**CO1** Apply the principles of taxation laws to complex legal problems. **CO2** Understand the technical aspects of taxation laws. **CO3** To file and contest cases writ pertaining to taxation laws before the competent authorities. **CO4** Supervise and guide the persons whose matters are related to taxation laws.
Alternative Dispute Resolution (LLB 505)	**CO1.** Understand the fundamental principles of equity, justice, and good conscience. **CO2.** Know the real spirit of the equity which was prevailing in Great Britain. The application of these principles will analyse for providing real justice in India. **CO3.** Apply the provisions of equity with reference to constitutional law in India. **CO4.** Analyse the principles and maxims of equity for the application of the spirit of justice.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER VI	
HUMAN RIGHTS (LLB 601)	**CO1** Understand the meaning and historical development of human rights. **CO2** Classify relevant documents on human rights.

	CO3 Interpret legal provisions on human rights under Indian laws. **CO4** Examine the effective implementation of human rights of vulnerable groups.
Land Laws (LLB 602)	**CO1**. Identify and characterize the revenue board courts, as well as their role in appeal revision and review in case of any dispute. **CO2**. Demonstrate knowledge of the legal and regulatory framework for tribunals, as well as the regulatory requirements. **CO3**. Provide that you are aware of the professional abilities required by urbanization, particularly analytical abilities. **CO4**. Understand the basic concept of Land and Agricultural Laws.
PROFESSIONAL ETHICS (LLB 603)	**CO1**. Develop critical thinking skills to evaluate and analyze ethical issues from multiple perspectives and recognize the complexities involved in ethical decision-making. **CO2**. Learn the process of ethical decision-making, which includes identifying ethical issues, considering alternatives, and making well-reasoned ethical choices. **CO3**. Understanding of various ethical theories, such as deontology, utilitarianism, virtue ethics, and consequentialism, and be able to apply these theories to ethical dilemmas. **CO4**. Recognize personal and professional ethical responsibilities and obligations, including duties to clients, colleagues, employers, and society as a whole.
ALTERNATIVE DISPUTE RESOLUTION (LLB 604)	**CO1.** Understand the fundamental principles of equity, justice, and good conscience. **CO2.** Know the real spirit of the equity which was prevailing in Great Britain. The application of these principles will be analysed for providing real justice in India. **CO3.** Apply the provisions of equity with reference to constitutional law in India. **CO4.** Analyse the principles and maxims of equity for the application of the spirit of justice.

MOOT COURT & INTERNSHIP (LLB 605)	**CO1**. Develop proficiency in legal research techniques, including using databases, libraries, and online resources to find relevant case law, statutes, regulations, and legal precedents. **CO2**. Enhance the ability to analyze legal cases, statutes, and regulations in depth, focusing on relevant legal issues and precedents. **CO3**. Improve oral advocacy skills by participating in mock appellate court arguments, including developing persuasive arguments. **CO4**. Understand the procedural rules and protocols specific to appellate courts, including the rules for filing briefs, presenting oral arguments, and interacting with judges.

LL.M (One Year Programme)

Programme Educational Objectives, Programme Specific Outcomes,and Programme Outcomes

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

The School of law, Raffles University faculty members have formulated the **Programme Educational Objectives** (PEOs). The PEOs are **broad statements** that describe the career and professional accomplishments that the program is preparing its graduates to achieve in a few yearsafter receiving the degree. The PEOs of the Master of Laws (LL.M.) program are as follows:

- **PEO 1:** RU LL.M. post-graduates will be able to demonstrate critical thinking in their chosen area of specialization leading to a successful career.
- **PEO 2:** RU LL.M. postgraduates will be able to develop their research skills and progress towards pursuing Doctoral studies.
- **PEO 3:** RU LL.M. postgraduates will be active members ready to serve society through their teaching skills.
- **PEO 4:** RU LL.M. postgraduates will be equipped with enhanced legal insights that will lend them a cutting edge over ordinary law graduates in the judicial profession.
- **PEO 5:** RU LL.M. post-graduates will have leadership skills with a high level of integrity and have the ability to function professionally with ethical responsibility as an individual as well as in a multidisciplinary team with a positive attitude.

PROGRAM-SPECIFIC OUTCOMES (PSOS)

(CONSTITUTIONAL LAW GROUP)

- **PSOS 1:** LLM in Constitutional Law allows students to specialise in all laws related to the Constitution and the operation of the judicial system to protect people's rights.
- **PSOS 2:** An LLM in Constitutional Law enables students to concentrate on legal topics in-depth and better prepare them to handle disputes involving government agencies and regulatory bodies.
- **PSOS 3:** It aims to provide students with specialised knowledge about legislation as well as extensive exposure to the many branches of government, both locally and globally.

- **PSOS 4:** In addition to having access to extensive national and international databases, the students also gain experience with writing seminar papers, research, legal writing, and internships.
- **PSOS 5:** The program focuses on going over the law in great depth, assisting participants in developing into better legal professionals with a thorough understanding of the law.

(CORPORATE LAW GROUP)

- **PSOS 1:** LLM in Corporate Law offers students the chance to focus on all legislation pertaining to the corporate sector.
- **PSOS 2:** An LLM in corporate law enables students to concentrate on legal topics in detail, better preparing them for a career in the corporate sector.
- **PSOS 3:** The program aims to provide students with specialised knowledge of the laws governing corporate finance, securities law, banking, and insurance. Law, M&A, and other legal issues Laws relating to insolvency and international trade.
- **PSOS 4:** Students are also exposed to seminar paper writing, research, legal writing, and internship opportunities, as well as access to enormous databases, both national and worldwide.
- **PSOS 5:** The program focuses on covering the law in more depth, assisting them in becoming stronger legal professionals with a broad understanding of the law.

(CRIMINAL LAW GROUP)

- **PSOS 1:** Students will gain a comprehensive understanding of criminal law principles, theories, and doctrines. They will study the elements of different criminal offences, defences, and the principles of criminal liability.

- **PSOS 2:** The program aims to develop student's analytical and critical thinking abilities, allowing them to analyze complex criminal law issues and apply legal reasoning to arrive at sound conclusions.

- **PSOS 3:** Students will be familiarized with the criminal justice system, including the investigation, prosecution, and defence processes. They will learn about the roles of various stakeholders, such as judges, prosecutors, defence attorneys, and law enforcement agencies.

- **PSOS 4:** Students may explore criminal law from a comparative perspective, examining the similarities and differences between criminal justice systems in different countries and jurisdictions.

- **PSOS 5:** LL.M. candidates are often required to conduct in-depth legal research and produce scholarly papers or a thesis on criminal law topics, which improves their legal research and writing skills.

(MARITIME LAW GROUP)

- **PSOS 1:** Students will have a thorough understanding of the concepts, laws, and conventions that govern maritime law, including maritime law, international maritime law, and domestic maritime law.
- **PSOS 2:** A focus on admiralty and maritime litigation could be a part of the curriculum, educating students to manage legal disputes involving shipping, marine insurance, salvage, collisions, and other maritime disasters.
- **PSOS 3:** Students will study marine insurance contracts, policies, and the principles guiding marine risk management to safeguard shipowners, cargo owners, and other stakeholders' interests.
- **PSOS 4:** The programme may address legal aspects of seaborne cargo transportation, such as bills of lading, charter parties, and other contracts for cargo transportation.
- **PSOS 5:** Students will learn about admiralty jurisdiction, which refers to the court's authority to hear maritime matters, maritime liens, and maritime arrests.

PROGRAM OUTCOMES (POS)

Program Outcomes (POs) are **attributes of the graduates** of the program that are indicative of the graduate's ability and competence to work as a legal professional upon graduation. Program Outcomes are statements that describe what students are expected to know or be able to do by the time of graduation. They must relate to the knowledge and skills that the students acquire from the program. The achievement of all outcomes indicates that the student is well prepared to achieve the program's educational objectives down the road. The following 10 POs have been chosen by the School the Law of Raffles University. The curriculum of LL.M. at RU has been designed to fully meet all the 10 Programme Outcomes:

- **PO 1:** Conduct independent research on diverse legal topics and questions using knowledgeof primary as well as secondary data. (*Legal Knowledge*)
- **PO 2:** Develop and demonstrate analytical skills to interpret various judgments of domesticand international courts of law and different provisions of law and re-interpret the opinionsand submissions of learned jurists and academicians. (*Analytical Skills*)
- **PO 3:** Demonstrate an understanding of substantive and/or procedural aspects of their chosen area of specialization, and offer solutions based on such understanding. (*Problem Solving*)
- **PO 4:** Independently write research articles and undertake research studies on different topics.

(*Research Skills*)

- **PO 5:** Develop a sense of social responsibility and commitment, and work on various socio-legal issues. (*Social Responsibility*)
- **PO 6:** Establish as a competent professional in a highly competitive world with cutting-edge legal education tools. (*Competitive Skills*)
- **PO 7:** Apply diverse knowledge to prepare for a higher research degree with clarity of purpose (*Higher Education*).
- **PO 8:** Ability to translate ideas into words, and words into practical solutions, which is reflective of their critical thinking (*Critical Thinking*).
- **PO 9:** Apply ethical principles and commit to professional ethics and responsibilities and norms of legal practice (*Ethics*).
- **PO 10:** Communicate effectively on complex legal activities with the legal community andwith the society at large; thus, giving and imparting clear instructions (*Communication*).

COURSE OUTCOMES

1. RESEARCH METHODOLOGY AND LEGAL WRITING

1. **CO1**: Students will be able to learn various research methods in the legal discipline.
2. **CO2**: Students will be able to develop the craft of legal writing.
3. **CO3**: To enable students to use different data collection methods and sampling design techniques in their research.

2. COMPARATIVE PUBLIC LAW

1. **CO1**: Students will be able to understand the similarities and differences between leading legal traditions in key areas like separation of powers, protection of rights, and the role of the judiciary.
2. **CO2**: Students will be able to understand the methodology of comparative public law.
3. **CO3**: Students will be able to use comparative methodology in public law analysis.

3. LAW AND JUSTICE IN A GLOBALISING WORLD

1. **CO1**: Students will be able to understand the role of law and justice in a rapidly globalizing world.
2. **CO2**: Students will be able to appreciate and comprehend finer aspects related to the subject.
3. **CO3**: Students will be able to recognize the significance of law and justice vis-à-vis the concept of globalization.

4. COMPARATIVE ADMINISTRATIVE LAW

1. **CO1**: Students will be able to understand the concepts associated with the subject.
2. **CO2**: Students will be able to critically evaluate the role of different organizations and establishments involved in administrative law.

3. **CO3**: The students will be able to recognize the relationship between constitutional law and administrative law of other countries.

4. MEDIA & INFORMATION LAWS

1. **CO1**: The students will be sensitized towards various legislations related to the subject.
2. **CO2**: Students will be able to understand constitutional provisions governing mass media.
3. **CO3**: Students will recognize the significance of media and information in a global world.

5. FEDERALISM AND LOCAL SELF GOVERNANCE

1. **CO1**: Students will be able to develop research skills in exploring the advantages and disadvantages associated with local self-government.
2. **CO2**: Students will learn about the specific legislation related to the subject.
3. **CO3**: Students will be able to recognize the importance of local self-government and its role in national growth.

6. SERVICE LAW

1. **CO1**: Students will be acquainted with various kinds of rules applicable to government employees.
2. **CO2**: Students will be able to analyze the role played by the Constitution in the protection of public servants.
3. **CO3**: Students will be able to apply legal provisions for the protection of employees.

7. HEALTH LAW

1. **CO1**: Students will be able to acquire the basic knowledge of health laws in the contemporary world.
2. **CO2**: Students will be able to analyze the role played by the judiciary in enhancing the scope of the medical profession.
3. **CO3**: Students will be able to evaluate the working of various special enactments on health in India.

8. ELECTION LAWS

1. **CO1**: Students will be able to develop research skills in exploring the various election laws in India.
2. **CO2**: Students will learn about the specific legislation related to the subject.
3. **CO3**: The students will be able to understand the provisions of the Representation of the People Act, 1951 as applicable to the elections in India.

9. BANKING AND INSURANCE LAW

1. **CO1**: Students will be able to understand that the scope of the banking and insurance sector is getting wider than the conventional role.
2. **CO2**: Students will be well acquainted with the conceptual as well as practical aspects of Banking and Insurance Laws as per the changing scenario.

3. **CO3**: Students will evaluate the concepts of Banking and Insurance with ordinary and cardinal approaches and cover different types of insurance laws.

10. LAWS OF SECURITIES AND FINANCIAL MARKETS

1. **CO1**: Students will be able to learn the securities markets and understand the different laws and rules related to the securities market in India.
2. **CO2**: Students will be able to learn the significance of FDI in the corporate market.
3. **CO3**: The students will be able to recognize the difference between capital and venture capital.

11. INTERNATIONAL COMMERCIAL ARBITRATION

1. **CO1**: Students will be able to learn the basic rules that guide the arbitration process from start to finish.
2. **CO2**: Students will be able to learn about the growth of international arbitration law as well as critically evaluate its functioning in India and abroad.
3. **CO3**: To enable the students to recognize the difference between arbitration and other law.

12. COMPETITION LAW

1. **CO1**: Students will be able to demonstrate the knowledge of Competition law in the present commercially competitive world.
2. **CO2**: Students will be well acquainted with the different anti-competition practices and the measures to curb them.
3. **CO3**: Students will be able to evaluate the working of various competition authorities in India.

13. CORPORATE GOVERNANCE

1. **CO1**: Students will be imparted complete understanding and knowledge about the concept of corporate governance, its history, emergence, objectives, and principles of good governance.
2. **CO2**: Students will understand the nature, system, and compliance requirements of corporate governance.
3. **CO3**: Students will understand the insights into the workings of companies around the world.

14. INTERNATIONAL TRADE LAW

1. **CO1**: Students will be able to understand the international aspects of trade law.
2. **CO2**: Students will have a comparative comprehension of international legislation/conventions/treaties, etc. related to the subject.
3. **CO3**: Students will be able to understand the evolution, role, and working of international institutions working for international trade.

15. CRIMINAL AND SECURITY LAW

1. **CO1**: The students will be able to understand the concept and historical background of criminal

law and would be able to critically review the application of general principles of criminal law.

2. **CO2**: The students will be able to differentiate between kinds of criminal liability and will be able to recognize the inchoate crimes under the Indian penal code.
3. **CO3**: The students will be able to critically evaluate the defenses and classify the theories and types of Punishment under the Indian Criminal justice system.

16. CRIMINOLOGY, PENOLOGY & VICTIMOLOGY

1. **CO1**: The students are able to recognize the basic concepts of Criminology, Penology, and Victimology.
2. **CO2**: The students are able to understand the nature and ideological thinking of criminological studies.
3. **CO3**: The students are able to outline logical thinking about specific penological and other measures available for dealing with criminals and how far these measures are appropriate in protecting the rights of the victims.

17. COMPARATIVE CRIMINAL PROCEDURE LAW

1. **CO1**: Students will be imparted complete understanding and knowledge about the procedure for arrest, trial, and execution of sentences in criminal cases.
2. **CO2**: Students will be imparted knowledge about the concept of bailable, non-bailable, cognizable, and non-cognizable cases, inquiry, investigation, F.I.R.etc.
3. **CO3**: Students to be well acquainted with complete knowledge of Trial procedures and Fair trials in different countries.

18. CRIMINAL AND SECURITY LAW

1. **CO1**: Students will have in-depth knowledge of cybercrimes.
2. **CO2**: The students will be able to develop a critical approach toward the law related to cybercrimes.
3. **CO3**: The students will be able to understand cyber investigation procedures and evidence collection.

19. INTERNATIONAL CRIMINAL LAW

1. **CO1**: The students are able to recognize the evolutionary aspect of International criminal law.
2. **CO2**: The students are able to classify the national and international persecution of crimes.
3. **CO3**: The students are able to categorize and compare different kinds of crimes under International Criminal Law.

20. ORGANIZED CRIME & TERRORISM

1. **CO1**: Students will be able to understand the concept of organized crime.
2. **CO2**: Students will be able to understand the international perspective towards organized crimes.
3. **CO3**: Students will be able to analyze the legislative provisions of India towards organized crimes.

SCHOOL OF ENGINEERING & TECHNOLOGY (SOET)

RAFFELSUNIVERSITY

NEEMRANA

Department of Mechanical Engineering

B.Tech (4 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

RAFFLES
UNIVERSITY

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Vision

To be a centre of excellence by producing high caliber, competent and self-reliant computer Science engineers, who possess scientific temperament and would engage in activities relevant to industries with ethical values and flair to research.

Mission

- To provide efficient engineers for global requirements by imparting quality education.
- To explore, create and develop innovations in various aspects of engineering through industries and institutions.
- To emphasize on practical skills and socially relevant technology

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
RAFFLES UNIVERSITY, NEEMRANA
Department of Mechanical Engineering
B.Tech (4 Years Degree Program)

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.
PO 2	Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO 5	Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make

	effective presentations and give and receive clear instructions.
PO 11	Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO 12	Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change

Program Education Objectives

PEO 1	To impart deep knowledge of mechanical engineering and interdisciplinary subjects.
PEO 2	To use modern tools in academic to enhance the technical skills of the students for implementation of the scientific concepts.
PEO 3	To prepare the students to address social, technical and engineering challenges innovatively.
PEO 4	To enhance various skills of the students involved in decision making.
PEO 5	To motivate and prepare the students to take-up career in different industries or to pursue higher studies in mechanical and interdisciplinary programs.

Program Specific Objectives

PSO 1	To impart proper knowledge of science and mechanical engineering related subjects to the students.
PSO 2	To enhance the skills of the students with the ability to implement the scientific concepts for betterment of the society.
PSO 3	To prepare the students to become innovators who can address social, technical and engineering challenges.

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

B.Tech (1st Semester)

(Common to all branches)

S.No	Category	Code	Course Title	Hours Per Week			CIE	ESE	Total	Credits
				L	T	P				
1	BSC	BSC-101	Engineering Physics-I	3	1	THEORETICAL	40	60	100	4
2	BSC	BSC-102	Engineering Mathematics-I	3	1		40	60	100	4
3	ESC	ESC-101	Computer Fundamentals	3	1		40	60	100	4
4	ESC	ESC-102	Basics of Mechanical Engineering	3	1		40	60	100	4
5	MC	MC-I	Environmental Studies	2	0		40	60	100	0
6	HSMC	HSMC-101	Communicative English	3	0		40	60	100	3
7	ESC	ESC-103	Workshop Practice Lab	PRACTICAL	0	3	60	40	100	2
8	BSC	BSC-103	Engineering Physics-I Lab		0	2	60	40	100	1
9	ESC	ESC-104	Computer FundamentalsLab		0	2	60	40	100	1
10	HSMC	HSMC-102	Language Lab		0	2	60	40	100	1
			Total	**17**	**4**	**9**	**480**	**520**	**1000**	**24**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Engineering Physics (BSC-101)

Course Outcomes:

CO1: Understand and apply Maxwell's equations, which describe the fundamental laws of electromagnetism, including Gauss's law for electricity, Gauss's law for magnetism, Faraday's law of electromagnetic induction, and Ampère's law with Maxwell's addition.

CO2: Understand, apply, and manipulate Maxwell's equations to describe and analyze electromagnetic phenomena in both static and dynamic situations.

CO3: Understand and describe the impact of solid-state device capabilities and limitation on electronic circuit performance.

CO4: Understand the concepts of X-Rays and Ultrasonics.

CO5: Understand the basic concepts such as Nuclear Detectors, Characteristics of gas filled detectors and properties of Ionization chamber, proportional counter, G. M. Counter and Scintillation Counter.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	2		1			3				3	3	3	3
CO2	3	2	1		1			3	2			3	3	3	2
CO3	3	2	2		1		2	3	1		3	3	3	3	2
CO4	3	2	1		1		2	3	2			3	3	3	2
CO5	3	2	3		1			3	2		3	3	3	3	3

2. Engineering Mathematics-I (BSC-102)

Course Outcomes:

CO-1: To explore the fundamental knowledge of asymptote, curvature and their types.

CO-2: Use the Euler’s theorem, homogeneous function.

CO-3: Develop knowledge of double integration.

CO-4: Understand how to determine the natural of first order and higher order differential equation.

CO-5: Understand how to determine the nature of second order differential equation.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3

3. Computer Fundamentals (ESC-102)

Course Outcomes:

CO1: Demonstrate knowledge on C Programming constructs learn to develop simple applications in C using basic constructs.

CO2: Design and implement applications using arrays and string

CO3: Develop and implement modular applications in C using functions

CO4: Develop applications in C using structures and pointers.

CO5: Design applications using sequential and random access file processing.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3		1		2			2				3	3	3	3
CO2	3	1	1		2			2				3	3	3	3
CO3	3	2			2			2				3	3	3	3
CO4	3	3	2		2			2				3	3	3	3
CO5	3	2	1		2			2	1			3	3	3	3

4. Basics of MechanicalEngineering (ESC-102)

Course Outcomes:

CO1: Apply various laws of thermodynamics to various processes and real systems.

CO2: Familiarize you with the refrigerants, vapour compression refrigeration system and multi stage vapour compression system.

CO3: Under the basic concepts such as stress, strain, Hooks law, stress-strain diagram.

CO4: Familiarity with common manufacturing processes, such as machining, casting, welding, and their advantages and limitations.

CO5: Identify and analyze common machine elements and components, such as bearings, gears, shafts, and fasteners.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	1							3	3	3	3	3
CO2	3	3	2	1							3	3	3	3	3
CO3	3	3	2	1	2						3	3	3	3	3
CO4	3	3	2	1	2						3	3	3	3	3
CO5	3	3	2	1	2						3	3	3	3	3

5. Environmental Studies (MC-1)

Course Outcomes:

CO1: On completion of this course students will be able to describe the scientific inquiry in the field of modern ecology, explain the main limitations on patters of productivity, Energy Flow through the natural food chain and food webs, ecosystem dynamics and patterns in population and communities.

CO2: The students will understand the chemical properties of materials occurring in the environment, the phenomenon in the environment and apply the knowledge to various environmental processes.

CO3: Develop the ability to understand the patterns of air pollution dispersion with respect to micrometeorological changes.

CO4: The students will be able to describe the physical and chemical composition of water and wastewater and elucidate how and why these compositions fluctuate, main source of water pollution, the main types of pollutants and how each type can be controlled.

CO5: The students will understand the technical, legal and economic aspects of collection, transportation and management of hazardous wastes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	1	1	1	2	2						1	2		
CO2		1	2	2									1	1	
CO3			2						1			1			
CO4	1			2			1						2		
CO5															

6. Communicative English (HSMC-101)

Course Outcomes:

CO1: Use English Language effectively in spoken and written forms.

CO2: Comprehend the given texts and respond appropriately.

CO3: Communicate confidently in various contexts and different cultures.

CO4: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								3		3		3			2
CO2								3	2	3		3			2
CO3								3	2	3		3			2
CO4								3		3		3			2
CO5								3		3		3			2

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

B.Tech (2nd Semester)

(Common to all branches)

S.No	Category	Code	Course Title	Hours Per Week			CIE	ESE	Total	Credits
				L	T	P				
1	BSC	BSC-104	Communicative English II (BSC-104)	3	1	THEORETICAL	40	60	100	4
2	BSC	BSC-105	Engineering Mathematics-II	3	1		40	60	100	4
3	ESC	ESC-105	Programming with 'C'	3	0		40	60	100	3
4	ESC	ESC-106	Basics of Electrical & Electronics Engineering	3	1		40	60	100	4
5	ESC	ESC-107	Engineering Mechanics	3	1		40	60	100	4
6	BSC	BSC-106	Engineering Chemistry	3	0		40	60	100	4
7	ESC	ESC-108	Basics of Electrical & Electronics Engineering Lab	PRACTICAL	0	2	60	40	100	1
8	BSC	BSC-107	Engineering Physics-II Lab		0	2	60	40	100	1
9	ESC	ESC-109	Engineering Drawing Lab		0	3	60	40	100	1
10	ESC	ESC-110	Programming with 'C' Lab		0	2	60	40	100	1
11	BSC	BSC-108	Engineering Chemistry Lab		0	2	60	40	100	1
			Total	**18**	**4**	**11**	**540**	**560**	**1100**	**28**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Communicative English II (BSC-104)

Course Outcomes:

CO1: Use English Language effectively in spoken and written forms.

CO2: Comprehend the given texts and respond appropriately.

CO3: Communicate confidently in various contexts and different cultures.

CO4: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								3		3		3			2
CO2								3	2	3		3			2
CO3								3	2	3		3			2
CO4								3		3		3			2
CO5								3		3		3			2

2. Engineering Mathematics-II (BSC-105)

Course Outcomes:

CO1: Explore the knowledge of integration and differentiation to solve the orthogonality of two spheres.

CO2: define the rank of matrix to find the nullity of matrix and calculate the Eigen values.

CO3: Develop the knowledge of integration and differentiation to solve the curl and gradients questions.

CO4: Explore the knowledge of half range Fourier sine and cosine series.

CO5: Use Lagrange's function to solve the differential problems.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3

CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3

3. Programming with C (ESC-105)

Course Outcomes:

CO1: Demonstrate knowledge on C Programming constructs learn to develop simple applications in C using basic constructs

CO2: Design and implement applications using arrays and string

CO3: Develop and implement modular applications in C using functions

CO4: Develop applications in C using structures and pointers.

CO5: Design applications using sequential and random access file processing.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2			2			2	3	3	3	3
CO2	3	3	2		2			2			2	3	3	3	2
CO3	3	3	2		2			2			2	3	3	3	2
CO4	3	3	3	3	2			2			2	3	3	3	2
CO5	3	2	3	3	2			2	3		2	3	3	3	3

4. Basics of Electrical Engineering (ESC-106)

Course Outcomes:

CO1: Students will gain knowledge regarding the various laws and principles associated with electrical systems.

CO2: Students will gain knowledge regarding DC network and apply them for practical problems.

CO3: Students will gain knowledge regarding various types' of semiconductors.

CO4: Student will gain knowledge about transistors and their application.

CO5: Student will gain knowledge on Basic Electronic Circuits and Instrumentation.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	1	2	1						2	1	1	1	
CO2	2	2	2	3	2						2	2	3		
CO3	3	1	2	2								1	1		
CO4	3	1	2	3	1							2		1	
CO5	3	2	2		2						3	2	1	2	

5. Engineering Mechanics (ESC-107)

Course Outcomes:

CO1: Students will understand the concepts of engineering mechanics.

CO2: Understand the phenomenon of friction and transmission of power and ability to solve problem related to the same.

CO3: Students will gain knowledge regarding center of gravity and moment of inertia and apply them for practical problems.

CO4: Modelling and analysis of forces systems acting on rigid bodies to evaluate position velocity and acceleration.

CO5: Fundamental understanding of mechanical vibrations and finding out natural frequency for mechanical systems. Application of free damped and forced vibrations on mechanical systems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	1	3	2	2	3	3	3	3
CO2	3	3	3	3	3	3	2	1	2	2	2	3	3	3	3
CO3	3	3	3	3	3	2	2	1	2	2	2	3	3	3	3
CO4	3	3	3	3	3	3	3	1	2	2	2	3	3	3	3
CO5	3	3	3	3	3	3	3	1	2	3	2	3	3	3	3

6. Engineering Chemistry (BSC-106)

Course Outcomes:

CO1: Analyze the need, design and perform a set of experiments.

CO2: Identify the structure of unknown/new compounds with the help of new engg material.

CO3: Differentiate hard and soft water, solve the related numerical problems on water purification and its significance in industry and daily life.

CO4: Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.

CO5: Understand the causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	2	1		2	2	1	2	3	2	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	2	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	2	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	1
CO5	3	2	1	1	3	3	2		1	1	1	2	3	3	2

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (3rd Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	BSC	BSC- 201	Mathematics III (Multidisciplinary	3	1	THEORY	4	40	60	100
2	PCC	PCC- ME-201	Strength of Materials (Major Core)	3	1		4	40	60	100
3	PCC	PCC -ME - 202	Thermodynamics (Major Core)	3	1		4	40	60	100
4		PCC- ME-203	Material Science and Engineering (Major Core)	3	0		3	40	60	100
5	PCC	PCC- ME - 204	Manufacturing Process I (Major Core)	3	0		3	40	60	100
6	MC	MC-III	Introduction of Indian Law (Value Added Courses)	2	0		0	40	60	100
7	PCC	PCC-M-205	Machine Drawing and Auto Cad Lab (Major (Core)	PRACTICAL		3	1	60	40	100
8	PCC	PCC-ME-206	Thermodynamics Lab (Minor Core)			2	1	60	40	100
9	PCC	PCC-ME-207	Manufacturing Process I Lab (Major Core)			2	1	60	40	100
10	PCC	PCC-ME-208	Strength of Materials Lab (Major Core)			2	1	60	40	100
11	PCC	PCC-ME 209	Material Science & Engineering Lab			2	1	60	40	100
TOTAL				**17**	**03**	**11**	**24**	**480**	**560**	**1100**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Mathematics III (BSC-201)

Course Outcomes:

CO1: To explore the fundamental knowledge of transforms and their types.

CO2: Laplace Transform and their applications.

CO3: Develop knowledge of double integration.

CO4: Explore the distribution in different situations.

CO-5: Use Analytic functions

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3		3	2	2		1	2	1	2	3	3	2	3
CO2	3	3		3	2	2		1	1	1	2	3	2	2	3
CO3	3	3		2	2	2		1	2	1	2	3	3	2	3
CO4	3	2		3	2	2		1	1	1	2	3	3	2	3
CO5	3	2		3	2	2		1	1	1	2	3	3	2	3

2. Strength of Materials (PCC- ME-201)

Course Outcomes:

CO1: Apply materials and their elastic constants for composite bar subjected to various loads including thermal load.

CO2: Solve the problems on structural members subjected to Uni-axial load.

CO3: Construct Shear Force, Bending moment and Bending stress distribution in beams subjected to transverse load.

CO4: Determine the deflection of statically determinant beam.

CO5: Design Columns with different end conditions.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	1	1	2	2	2	3	3	3	2
CO2	3	2	3	3	3	3	1		2	2	2	3	3	3	2

CO3	3	2	3	3	3	2	1		3	2	2	3	3	3	2
CO4	3	2	3	3	3	2	1		3	2	2	3	3	3	2
CO5	3	2	3	3	3	3	1	1	2	2	2	3	3	3	2

3. Thermodynamics (PCC -ME -202)

Course Outcomes:

CO1: Apply various laws of thermodynamics to various processes and real systems.

CO2: Apply the concept of Entropy, Calculate heat, effort and other important thermodynamics properties for various ideal gas processes.

CO3: Estimate performance of various thermodynamics gas power cycles and gas refrigeration cycles and availability in each case.

CO4: Estimate stoichiometric air required for combustion, performance of vapour power cycle and vapour compression cycle.

CO5: Use psychometric charts and estimates various essential properties related to Psychrometry and process.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1					2	3	3	3	2
CO2	3	3	3	3	3	1					2	3	3	3	2
CO3	3	3	3	3	3	1					2	3	3	3	2
CO4	3	3	3	3	3	1					2	3	3	3	2
CO5	3	3	3	3	3	1					2	3	3	3	2

4. Material Science and Engineering (PCC -ME -203)

Course Outcomes:

CO1. Identify and depict the crystal structure and their properties based on the structure.

CO2. Quantify the imperfections in a crystal.

CO3. Analyze the mechanical properties of engineering materials, draw the stress – strain diagrams.

CO4. Classify composite materials and their importance in engineering design and determine the type of fracture mechanism.

CO5. Outline heat treatment process to obtain required mechanical properties for a given alloy.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2						3	3	3	3	3
CO2	3	3	3	3	2						3	3	3	2	3
CO3	3	3	3	3	2						3	3	3	2	3
CO4	3	3	3	3	2						2	3	3	3	2
CO5	3	3	3	3	2						2	3	3	3	2

5. Manufacturing Process- I (PCC -ME -204)

Course Outcomes:

CO1. To apply the knowledge of various manufacturing processes

CO2. To identify various process parameters and their effect on processes

CO3: Students should be able to design and analyze various manufacturing processes and tooling

CO4: To figure out the application of modernization in machining.

CO5: Get the knowledge of Jigs and Fixtures so as to utilize machine capability for variety of operations

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						2	3	3	3	3
CO5	3	3	3	3	3						2	3	3	3	3

6. Introduction of Indian Law (MC-1)

Course Outcomes:

CO1 Describe the Salient (Outstanding) features of Indian Constitution

CO2. Gain a deep understanding of the concept of equality as a fundamental human right and its significance in legal systems.

CO3. Students should be able to explain and analyze the three sub-clauses of Article 20 - protection against double jeopardy, protection against self-incrimination, and protection against retrospective criminal laws.

CO4. Students should be able to identify and understand the diverse minority communities in India and their unique cultural and educational needs.

CO5. Students should be familiar with the historical and socio-political context in which the original right to property provisions were framed.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								2	2	3	3	3			2
CO2								2	2	3	3	3			2
CO3								2	2	3	3	3			2
CO4								2	2	3	3	3			2
CO5								2	2	3	3	3			2

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (4th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-210	Kinematics of Machine (Minor Core)	2	1	THEORY	3	40	60	100
2	PCC	PCC-ME-211	Fluid Mechanics (Major Core)	3	0		3	40	60	100
3	PCC	PCC-ME-212	Manufacturing Process II (Major Core)	3	0		3	40	60	100
4	PCC	PCC ME 303	IC Engines (Major (Core)	2	1		3	40	60	100
5	PCC	PCC-ME-214	Industrial Engineering	2	1		3	40	60	100
6	PCC	PCC-ME-215	Design of Machine Element	2	1		3	40	60	100
7	PCC	PCC-ME-216	Kinematics of Machine Lab	2	0		1	40	60	100
8	PCC	PCC-ME-217	Fluid Mechanics Lab	PRACTICAL		2	1	60	40	100
9	PCC	PCC-ME-218	Manufacturing Process-II Lab			2	1	60	40	100
10	PCC	PCC-ME-219	Heat Transfer Lab			2	1	60	40	100
11	PCC	PCC ME 308	IC Engine Lab (Minor Core)			2	1	60	40	100
TOTAL				**16**	**03**	**06**	**22**	**460**	**540**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Kinematics of Machine (PCC -ME-210)

Course Outcomes:

CO1: Designing a suitable mechanism depending on application

CO2: Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers,

CO3: Drawing velocity and acceleration diagrams for different mechanisms,

CO4: Selecting gear and gear train depending on application.

CO5: Understand the kinetics of the rigid bodies and solve simple problems using work-energy method.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1					3	3	3	3	3
CO2	3	3	3	3	3	1					3	3	3	3	3
CO3	3	3	3	3	3	1					3	3	3	3	3
CO4	3	3	3	3	3	1					3	3	3	3	3
CO5	3	3	3	3	3	1					3	3	3	3	3

2. Fluid Mechanics (PCC -ME-211)

Course Outcomes:

CO1: To familiarize with the properties of fluids and fluid kinematics.

CO2: Apply Bernoulli's equation to fluid flow problems.

CO3: To understand the concept of dimensional analysis and incompressible flow.

CO4: Apply appropriate equations and principles to analyze pipe flow problems and turbulent flow.

CO5: Apply the boundary layer theory to determine lift and drag forces on a submerged body.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2							3	3	2	3

CO2	3	3	3	3	2							3	3	2	3
CO3	3	3	3	3	2							3	3	2	3
CO4	3	3	3	3	2							3	3	2	3
CO5	3	3	3	3	2							3	3	2	3

3. Manufacturing Process-II (PCC -ME -212)

Course Outcomes:

CO1: Student should be able to apply the knowledge of various manufacturing processes.

CO2: Student should be able to identify various process parameters and their effect on processes.

CO3: Student should be able to design and analyze various manufacturing processes and tooling.

CO4: Student should be able to figure out application of modernization in machining.

CO5: Students should get the knowledge of Jigs and Fixtures so as to utilize machine capability for variety of operations.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2					3	3	3	3	3
CO2	3	3	3	3	3	2					3	3	3	3	3
CO3	3	3	3	3	3	2					3	3	3	3	3
CO4	3	3	3	3	3	2					3	3	3	3	3
CO5	3	3	3	3	3	2					3	3	3	3	3

4. I.C Engines (PCC-ME-303)

Course Outcomes:

CO1: Understand different types of engines, applications, ideal cycles of operation and deviation with actual cycle and performance parameters

CO2: Understand fuel air cycles and deviations with actual cycles, effect of various operating variables of SI and CI engines, value timing diagrams and working of 2-S and 4-S engines.

CO3: Understand combustion phenomena in SI and CI engines and combustion chamber design, Knocking phenomena, fuel additives and different types of fuels.

CO4: Understand fuel supply systems, cooling systems and lubrication systems.

CO5: Apply basic calculations of the engine on performance and understand governing methods.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2						3	3	3	3	3
CO2	3	3	3	3	2						3	3	3	3	3
CO3	3	3	3	3	2						3	3	3	3	3
CO4	3	3	3	3	2						3	3	3	3	3
CO5	3	3	3	3	2						3	3	3	3	3

5. Industrial Engineering (PCC -ME -214)

Course Outcomes:

CO1: Students will be able to understand the Basic Concepts of Industrial Engineering as well as the organization structures of Industry.

CO2: Students will be able to understand the Various Production Systems and Sale Forecasting Methods.

CO3: Students will be able to understand the concept of work study to improve productivity of men, machines and materials.

CO4: Students will be able to understand the Importance of Planning in the Industry

CO5: Students will be able to know the Importance of Inventory Control and Material Handling systems.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2			1	2	3	3	3	3	3
CO2	3	2	3	2	3	2			1	2	3	3	3	3	3
CO3	3	2	3	2	3	2			1	2	3	3	3	3	3
CO4	3	2	3	2	3	2			1	2	3	3	3	3	3
CO5	3	2	3	2	3	2			1	2	3	3	3	3	3

6. Design of Machine Element (PCC -ME -215)

Course Outcomes:

CO1: To understand and apply principles of gear design for Spur, Helical, Bevel and Worm gear

CO2: To understand and analyse the concepts of Mechanical Joints like Riveted Joint, Welded Joints and Screwed Joints

CO3: To develop capability to design and analyse the Shaft diameter and different spring parameters.

CO4: To inculcate an ability to design belt drives and selection of belt, rope and chain drives.

CO5: To achieve an expertise in design of Sliding contact bearing in industrial applications.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (5th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC ME 301	Dynamics of Machines (Major Core)	2	1	THEORY	3	40	60	100
2	PCC	PCC ME 302	Hydraulic Machines (Major Core)	2	1		3	40	60	100
3	PCC	HSMC 301	Principle of Management (Value Added Courses)	3	0		3	40	60	100
	PCC	PCC-ME-213	Heat Transfer (Major Core)	2	1		3	40	60	100
5	HSMC	PCC ME 304	Design of Transmission Systems (Major Core)	2	0		2	40	60	100
6	PEC	PCC ME 305	Measurement and Metrology (Multidisciplinary)	2	0		2	40	60	100
7	PCC	PCC ME 306	Hydraulic Machines Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
8	PCC	PCC ME 307	Dynamics of Machines Lab (Major Core)			2	1	60	40	100
	PCC	PCC ME 308	Heat Transfer Lab (Minor Core)			2	1	60	40	100
	PCC	PCC-ME 309	Measurement & Metrology Lab			2	1	60	40	100
10	PROJ	PROJ ME 301	Industrial Training/ Project Seminar			2	1	60	40	100
TOTAL				**13**	**03**	**10**	**20**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Dynamics of Machines (PCC-ME-301)

Course Outcomes:

CO1: To equip the student with fundamental knowledge of dynamics of machines so that student can appreciate problems of dynamic force balance, transmissibility of forces, isolation of systems, vibrations.

CO2: Compute frictional losses, torque transmission of mechanical systems.

CO3: Develop knowledge of analytical and graphical methods for calculating balancing of rotary and reciprocating masses.

CO4: Develop understanding of dynamic balancing, gyroscopic forces and moments.

CO5: Understand how to determine the natural frequencies of continuous systems starting from the general equation of displacement.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

2. Hydraulic Machines (PCC-ME -302)

Course Outcomes:

CO1: Work out the hydrodynamic force by liquid jet on plane surface and curved vanes for fixed and moving conditions.

CO2: Apprehend working of impulse and reaction turbine and their components parts.

CO3: Design and analysis performance characteristics of Pelton wheel, Kaplan turbine and Francis turbine

CO4: Comprehend working of different types of pumps and work out the efficiency of Centrifugal pump.

CO5: Compare hydropower plants with other types of power plants and calculate load factor and capacity factor for the hydropower plants.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2							3	3	3	3
CO2	3	3	2	2	2							3	3	2	3
CO3	3	3	2	2	2							3	3	2	3
CO4	3	3	2	2	2							3	3	3	3
CO5	3	3	2	2	2							3	3	2	3

3. Principle of Management (HSMC-301)

Course Outcomes:

CO1: Identify and apply appropriate management techniques for managing business

CO2: Have a conceptual knowledge about the planning and decision making

CO3: Apply the concept of organizing for the effective functioning of a management

CO4: Evaluate leadership style to anticipate the consequences of each leadership style

CO5: Demonstrate the techniques for controlling and coordination

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3
CO2	3	3	3	2	3	2	2	3	3	3	3	3	3	3	3
CO3	3	3	3	2	3	2	2	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3

4. Heat Transfer (PCC -ME -213)

Course Outcomes:

CO1: Apply the principles of heat transfer to analyze and solve practical engineering problems.

CO2: Demonstrate proficiency in conducting experiments related to heat transfer.

CO3: Analyze and design heat exchangers and other heat transfer equipment.

CO4: Apply computational tools and software for heat transfer analysis.

CO5: Evaluate and select appropriate heat transfer techniques for specific engineering applications.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	2	2
CO2	3	3	3	3	3						3	3	3	2	2
CO3	3	3	3	3	3						3	3	3	2	2
CO4	3	3	3	3	3						3	3	3	2	2
CO5	3	3	3	3	3						3	3	3	2	2

5. Design of Transmission Systems (PCC-ME-304)

Course Outcomes:

CO1: Apply materials and their elastic constants for composite bar subjected to various loads including thermal load.

CO2: Solve the problems on structural members subjected to Uni-axial load.

CO3: Construct Shear Force, Bending moment and Bending stress distribution in beams subjected to transverse load.

CO4: Able to Determine the deflection of statically determinant beam.

CO5: Able to Design Columns with different end conditions.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

6. Measurement and Metrology (PCC-ME-305)

Course Outcomes:

CO1: Develop a solid understanding of the fundamental principles and concepts of measurement, including units, standards, and measurement systems.

CO2: Gain knowledge about the role of limits, fits, and tolerances in ensuring proper assembly and functionality of mechanical components.

CO3: Gain a comprehensive understanding of various measuring instruments used for dimensional measurement, such as calipers, micrometers, gauges, and dial indicators. Understand their working principles, features, and applications.

CO4: Gain proficiency in using thread gauges, thread micrometers, and other specialized measuring instruments for thread measurement.

CO5: Develop a comprehensive understanding of the geometric principles and concepts related to machine tools.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3		2				3	3	3	3	3
CO2	3	3	3	3	3		2				3	3	3	3	3
CO3	3	3	3	3	3		2				3	3	3	3	3
CO4	3	3	3	3	3		2				3	3	3	3	3
CO5	3	3	3	3	3		2				3	3	3	3	3

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (6th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME 310	Automobile Engineering	3	0	THEORY	3	40	60	100
2	OEC	PCC-ME 311	Mechanical Vibration	3	1		4	40	60	100
3	OEC	PCC-ME 312	Operation Research	3	1		4	40	60	100
4	PCC	PEC ME 301-303	Professional Elective-1 Multidisciplinary	3	1		4	40	60	100
5	OEC	OEC-301-303	Open Elective I (Multidisciplinary)	3	0		3	40	60	100
6	OEC	OEC-304-306	Open Elective II (Value Added Courses)	3	0		3	40	60	100
7	PCC	PCC-ME 313	Automobile Engineering Lab	PRACTICAL		2	1	60	40	100
8	PCC	PCC-ME 314	Mechanical Vibration Lab			2	1	60	40	100
TOTAL				**18**	**03**	**04**	**23**	**360**	**480**	**800**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Automobile Engineering (PCC-ME -310)

Course Outcomes:

CO1: Identify the different parts of the automobile

CO2: Explain the working of various parts like engine, transmission, clutch, Brakes

CO3: Describe how the steering and the suspension systems operate.

CO4: Understand the environmental implications of automobile emissions

CO5: Develop a strong base for understanding future developments in the automobile industry

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1	2				3	3	3	3	3
CO2	3	3	3	3	3	1	2				3	3	3	3	3
CO3	3	2	3	3	3	1	2				3	3	3	3	3
CO4	3	2	3	3	3	1	2				3	3	3	3	3
CO5	3	3	3	3	3	1	2				3	3	3	3	3

2. Mechanical Vibration (PCC-ME -311)

Course Outcomes:

CO1: Obtain equations of motion to understand the behavior of oscillatory systems.

CO2: Understand the fundamentals of various damping systems to reduce vibration.

CO3: Learn various vibration excitations, practical aspects of isolations, and vibration measuring instruments.

CO4: Analyze the mathematical modeling of the two degrees of freedom systems and various vibration-absorbing devices.

CO5: Understand the characteristics of noise, sound, and its relationship with power and intensity.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2				3	3	3	3	3
CO2	3	3	3	3	3	2	2				3	3	3	3	3
CO3	3	3	3	3	3	2	2				3	3	3	3	3
CO4	3	3	3	3	3	2	2				3	3	3	3	3
CO5	3	3	3	3	3	2	2				3	3	3	3	3

3. Operation Research (PCC-ME-312)

Course Outcomes:

CO1: Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.

CO2: Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods, Finding initial basic feasible and optimal solution of the Transportation problems

CO3: Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.

CO4: Model competitive real-world phenomena using concepts from game theory.

CO5: Formulate Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2			2	2	3	3	3	2	3
CO2	3	3	3	3	3	2			2	2	3	3	3	2	3
CO3	3	3	3	3	3	2			2	2	3	3	3	2	3
CO4	3	3	3	3	3	2			2	2	3	3	3	2	3
CO5	3	3	3	3	3	2			2	2	3	3	3	2	3

4. Tribology (PCC-ME-302)

Course Outcomes:

CO1: Understand the different techniques used to solve mechanical engineering problems.

CO2: Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.

CO3: Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.

CO4: Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.

CO5: Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3						1	3	3	3	2
CO2	3	3	2	2	3						1	3	3	3	2
CO3	3	3	2	2	3						2	3	3	3	2
CO4	3	3	2	2	3						2	3	3	3	2
CO5	3	3	2	2	3						1	3	3	3	2

5. Total Quality Management (OEC-302)

Course Outcomes:

CO1: To understand and apply the principles of total quality management.

CO2: Choose appropriate statistical techniques for improving processes.

CO3: Develop the organizational, competitive and economic potential of quality.

CO4: Integrate biblical principles with the practice of total quality management.

CO5: Identify requirements of quality improvement programs

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO2	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO3	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO4	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO5	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (7th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-401	Computer Aided Design (Major Core)	3	0	THEORY	3	40	60	100
2	PCC	PCC-ME-402	Refrigeration and Air Conditioning (Major Core)	3	1		4	40	60	100
3	HSMC	HSMC-401	Engineering Economics (Value Added Courses)	3	0		3	40	60	100
4	PEC	PEC-ME 401-403	Professional Elective-II (Skill Enhancement Course)	4	0		4	40	60	100
5	OEC	OEC-401-403	Open Elective-III	3	1		3	40	60	100
6	PCC	PCC-ME-403	Refrigeration and Air Conditioning Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
7	PROJ	PROJ-ME-402	Project-I			12	6	120	80	200
8	PROJ	PROJ-ME-401	Industrial Training /Project Seminar			2	2	120	80	200
TOTAL				**16**	**02**	**16**	**26**	**500**	**500**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Computer Aided Design (PCC-ME-401)

Course Outcomes:

CO1: Provide basic foundation in CAD, computer graphics and Coordinate systems etc.

CO2: Understand and develop the Mathematical representations of curves used in geometric construction

CO3: Understand and develop the Mathematical representations of solids used in geometric construction

CO4: Understand the concepts of Scan Conversion, Rendering, Rasterising polygons and Hidden surface removal etc.

CO5: Creation of part drawings and 3D models using CAD techniques.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3				2		2	3	3	3	2
CO2	3	3	3	2	3				2		2	3	3	3	2
CO3	3	3	3	2	3				2		2	3	3	3	2
CO4	3	3	3	2	3				2		2	3	3	3	2
CO5	3	3	3	2	3				2		2	3	3	3	2

2. Refrigeration and Air Conditioning (PCC-ME-402)

Course Outcomes:

CO1: Familiarize you with the terminology associated with refrigeration and air-conditioning.

CO2: To cover the basic principle of psychrometric and applied psychrometric.

CO3: Familiarize you with load calculation and duct design.

CO4: Familiarize you with the refrigerants, vapour compression refrigeration system and multi stage vapour compression system.

CO5: Understand the concept of vapour compression refrigeration system and other cooling system.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2		2				2	3	3	3	3
CO2	3	3	3	3	2		2				2	3	3	3	3
CO3	3	3	3	3	2		2				2	3	3	3	3
CO4	3	3	3	3	2		2				2	3	3	3	3
CO5	3	3	3	3	2		2				2	3	3	3	3

3. Engineering Economics (HSMC-401)

Course Outcomes:

CO1: To understand the core economic terms, concepts and theories.

CO2: Identify the key elements of the demand and supply model and use it to critically analyze the real world examples.

CO3: Compare and contrast economic profits with accounting profits

CO4: Identify economic indicators and utilize them to articulate the state of the economy and prescribe monetary and fiscal policy

CO5: To have a conceptual knowledge about the role of government in countries economical changes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	1	2			2	2				3	3		2	2
CO2	1	1	2			2	2				3	3		2	2
CO3	1	1	2			2	2				3	3		2	2
CO4	1	1	2			2	2				3	3		2	2
CO5	1	1	2			2	2				3	3		2	2

4. Welding Technology (PCC-ME-401)

Course Outcomes:

CO1: Identify the various materials for manufacturing process for a particular application.

CO2: Analyze gating systems and discuss mechanization procedures in foundries.

CO3: Explain various core making processes and special casting processes.

CO4: Select the various types of Fabrication Process for Mechanical applications.

CO5: To select and apply knowledge, techniques, skills, and modern tools of the Welding Processes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2			3		2				1	3	3	1	3
CO2	3	2			3		2				2	3	3	1	3
CO3	3	2			3		2				2	3	3	1	3
CO4	3	2			3		2				1	3	3	1	3
CO5	3	2			3		2				1	3	3	1	3

5. Non-Conventional Energy Sources (OEC-401)

Course Outcomes:

CO1: Demonstrate the generation of electricity from various non-Conventional sources of energy, have a working knowledge on types of fuel cells.

CO2: Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation.

CO3: Explore the concepts involved in wind energy conversion system by studying its components, types and performance.

CO4: Illustrate ocean energy and explain the operational methods of their utilization.

CO5: Acquire the knowledge on Geothermal energy.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3		1				1	3	3	1	3
CO2	3	2	3	2	3		1				2	3	3	1	3
CO3	3	2	3	2	3		1				2	3	3	1	3
CO4	3	2	3	2	3		1				1	3	3	1	3
CO5	3	2	3	2	3		1				1	3	3	1	3

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (8th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-404	Power Plant Engineering (Major Core)	3	0	THEORY	3	40	60	100
3	HSMC	HSMC-402	Entrepreneurship Development & Management	3	0		3	40	60	100
3	PCC	PEC-ME-405	CNC Machines and Automation (Skill Enhancement Course)	3	1		4	40	60	100
4	PEC	PEC-ME-404-406	Professional Elective-III	3	0		3	40	60	100
5	PEC	PEC-ME-407-409	Professional Elective-IV	3	0		3	40	60	100
6	OEC	OEC-404-406	Open Elective-IV	3	0		3	40	60	100
	PCC	PCC-ME-407	CNC Machine and Automation Lab (Minor Stream)	0	0	Practical	2	60	40	100
9	PROJ	PROJ-ME-403	Major Project II (Research Project) and Dissertation)	0	0		6	360	240	600
TOTAL				**06**	**02**	**20**	**20**	**560**	**440**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Power Plant Engineering (PCC-ME-404)

Course Outcomes:

CO1: Enable students to understand about different types of power plants and boilers and combined power plant

CO2: Identify elements and their functions and operations of steam power plants.

CO3: Identify elements and their functions and operations of nuclear and hydel power plants

CO4: Identify elements and their functions and operations of diesel and gas turbine power plants

CO5: To illustrate the students to get the exposure of different renewable energy resources and to understand the economics of power plants and pollution control techniques.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	3		2		3	3	3	3	3
CO2	3	3	3	2	2	2	3		2		3	3	3	3	3
CO3	3	3	3	2	2	2	3		2		3	3	3	3	3
CO4	3	3	3	2	2	2	3		2		3	3	3	3	3
CO5	3	3	3	2	2	2	3		2		3	3	3	3	3

2. Entrepreneurship Development & Management (HSMC-402)

CO1: Demonstrate the meaning, functions, types and roles of an entrepreneur and entrepreneurship

CO2: Develop and strengthen entrepreneurial behaviour, quality and motivation.

CO3: Understand and analyse how sales are often conducted by agents and middlemen and to examine the legal liability arising in commercial agency.

CO4: To impart information about the process, procedure and rules and regulations for setting up new projects.

CO5: Apply preventive measures to be followed for effective management of entrepreneurship.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO2	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO3	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO4	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO5	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2

3. CNC Machines and Automation (PEC-ME-405)

Course Outcomes:

CO1: Able to read and measure part drawings and design callouts correctly without any difficulty.

CO2: Able to Understand fundamentals of NC/CNC Machine for producing quality Product of complexity.

CO3: Able to interpret manually program correctly a CNC machine to reduce waste.

CO4: Capable to use conversation of M & G codes by reading the program and knowing what action the machine intends to take thereby confirming the intended Action.

CO5: Able to use NC Programming through CAD/CAM and able to produce as per Design and proper functioning Maintenance and Trouble Shooting of CNC machine tools to maintained market demand in time.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3				1	2	2	3	3	3	3
CO2	3	3	3	3	3				1	2	2	3	3	3	3
CO3	3	3	3	3	3				1	2	2	3	3	3	3
CO4	3	3	3	3	3				1	2	2	3	3	3	3
CO5	3	3	3	3	3				1	2	2	3	3	3	3

4. Rapid Prototyping (PECC-ME-405)

Course Outcomes:

CO1: Describe product development, conceptual design and classify rapid prototyping systems; explain stereo lithography process and applications.

CO2: Identify the process photopolymers, photo polymerization, layering technology, laser and laser scanning.

CO3: Applying of measurement and scaling technique for prototype manufacturing.

CO4: Identify the Rapid Prototyping Data Formats

CO5: Application for powder based rapid prototyping systems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	3		2		3	3	3	3	3
CO2	3	3	3	2	2	2	3		2		3	3	3	3	3
CO3	3	3	3	2	2	2	3		2		3	3	3	3	3
CO4	3	3	3	2	2	2	3		2		3	3	3	3	3
CO5	3	3	3	2	2	2	3		2		3	3	3	3	3

5. Advanced Manufacturing Process (PEC-ME-409)

Course Outcomes:

CO1: Compare advanced manufacturing machining, classification, material applications in material removal process, the principle and processes of ultrasonic machining and abrasive jet machining

CO2: Understand the principle, working and applications of chemical and thermal metal removal processes.

CO3: Identify the principle, working and applications of advanced casting processes.

CO4: Understanding the principle, working and applications of advanced welding processes.

CO5: Understand the principles, working and applications of metal forming process.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3

CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						2	3	3	3	3
CO5	3	3	3	3	3						2	3	3	3	3

6. Utilization of Electrical Power and Traction (OEC-404)

Course Outcomes:

CO1: Compare advanced manufacturing machining, classification, material applications in material removal process, the principle and processes of ultrasonic machining and abrasive jet machining

CO2: Apply an appropriate measurement and analysis technique of artificial lighting for different specific purposes..

CO3: Describe what happens to the ions in electrolysis and Be able to predict the products of electrolysis of metal halides.

CO4: Able to understand the maintaining stability, provide optimum propulsion at all speeds, and reduce driver workload.

CO5: Able to draw curve between speed time and speed distance to achieve traction motor control.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2						3	3	3	3	3
CO2	3	3	2	3	2						3	3	3	3	3
CO3	3	3	2	3	2						3	3	3	3	3
CO4	3	3	3	3	2						2	3	3	3	3
CO5	3	3	3	3	2						2	3	3	3	3

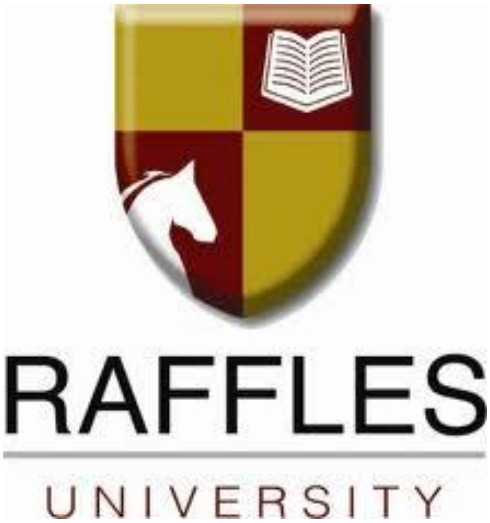
BACHELOR'S DEGREE PROGRAMME (B.Tech)

Choice Based Credit System

Syllabus

Academic Curricula-2022-26

Department Mechanical Engineering



Raffles University, Neemrana, Rajasthan [INDIA]-301705

www.rafflesuniversity.edu.in

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	BSC 101	ENGINEERING PHYSICS-I	BSC

UNIT I

Interference: Coherent sources, conditions for sustained interference, Analytical treatmentof interference, Division of Wave-Front – Fresnel‟s Biprism, Division of Amplitude-Interference by a plane parallel film, Wedge-shaped film, Newton‟s Rings, Michelson Interferometer, applications (Resolution of closely spaced spectral lines, determination of wavelengths).

UNIT II

Diffraction: Difference between interference and diffraction Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a single slit, Plane transmission diffraction grating, absent spectra, dispersive power, resolving power and Rayleigh criterion of resolution.

UNIT III

Polarisation: Polarised and unpolarised light, Uniaxial crystals, optic axis, double refraction, Nicol prism, quarter and half wave plates, Detection and Production of different types of polarized light, Polarimetry; Optical and specific rotation, Biquartz and Laurent‟s half shade polarimeter.

Laser and Fibre Optics: Spontaneous and Stimulated emission, Laser principle, Einstein‟s coefficients, characteristics of laser beam-concept of coherence, spatial and temporal coherence, He-Ne and semiconductor lasers (simple ideas), applications.
Propagation of light in optical fibres, numerical aperture, V-number, single and multimode fibres, Elementary idea of attenuation and dispersion, applications.

UNIT IV

Electrostatics: Dielectric polarization, dielectric relaxation process, types of polarization, relation between E,P and D, Gauss‟s law in the presence of a dielectric, Energy stored in a uniform electric field, dielectric losses and variation with frequency.

Electrodynamics: Maxwell‟s field equations –significance, differential and integral form, Maxwell‟s equations in different media- free space, dielectric and conductor.

UNIT V

Special Theory of Relativity: Inertial and non-inertial frames, Galilean transformations, Michelson‟s Morley Experiment, Postulates of Special Theory of Relativity, Lorentz transformations, Consequences of LT (length contraction and time dilation), addition ofvelocities, variation of mass with velocity, mass energy equivalence.

Text and Reference books:

1. Perspectives of Modern Physics - Arthur Beiser (TMH)
2. Optics – Ajoy Ghatak (TMH)
3. Modern Physics for Engineers – S.P.Taneja (R. Chand)
4. Engineering Physics – Satya Prakash (Pragati Prakashan)
5. Modern Engineering Physics – A.S.Vasudeva (S. Chand)
6. Engineering Physics (Vol-1)- S.L. Gupta (Dhanpat Rai)
7. Fundamentals of Physics – Resnick & Halliday (Asian Book)
8. Introduction to Electrodynamics – D.J. Griffith (Prentice Hall)

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	BSC 102	ENGINEERING MATHEMATICS-I	BSC

UNIT I

Differential Calculus: Asymptotes (Cartesian Coordinates Only), Curvature (Cartesian Coordinates Only), Concavity, Convexity and Point of Inflexion (Cartesian Coordinates Only), Successive differential.

UNIT II

Differential Calculus: Partial Differentiation, Euler‟s Theorem on Homogeneous Functions, Approximate Calculations, Maxima & Minima of Two and More Independent Variables, Lagrange‟s Method of Multipliers.

UNIT III

Integral Calculus: Surface and Volumes of Solids of Revolution, Double Integral, Double Integral by changing into polar form , Areas & Volumes by Double Integration ,Change of Order of Integration, Beta Function and Gamma Function (Simple Properties).

UNIT IV

Differential Equations: Differential Equations of First Order and First Degree - Linear Form, Reducible to Linear form, Exact Form, Reducible to Exact Form, and Linear Differential Equations of Higher Order with Constant Coefficients Only.

UNIT V

Differential Equations: Second Order Ordinary Differential Equations with Variables Coefficients, Homogeneous and Exact Forms, Change of Dependent Variable, Change of Independent Variable, and Method of Variation of Parameters.

Text and Reference books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley 9th Edition.
2. Calculus and Analytical Geometry, Thomas and Finney, Narosa Publishing House. New Delhi.
3. A Text Book of Differential Equations, M.Ray and Chaturvedi, Students Friends & Co. Publisher, Agra

4.Higher Engineering Mathematics, B.V.Ramana, Tata McGraw Hill.

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course

04	**3**	**1**	**0**	**ESC 101**	**COMPUTER FUNDAMENTALS**	**ESC**

UNIT I

Introduction to Computer: Definition of Computer, Evolution of Computer, Generations of Computer, types of Computer, classification of Computer, Input/output Devices, Arithmetic and Logical Unit, Central Processing Unit, Control Unit, Memory, Several Registers. Hardware and Software.

Introduction to Software and Hardware, types of Software, difference between System Software and Application Software, Files, types of Files, Random Access File, Direct Random Access File, Pseudo code.

UNIT-II

Operating System and Memory: Introduction to Operating System, Functions of Operating System, Types of Operating system, Introduction to Linux, Introduction to Memory, Primary Memory, types of Primary Memory, Secondary Memory, types of Secondary Memory, Extended Memory, Flash Memory.

UNIT III

Number System and Arithmetic Core: Binary Number System, Octal Number System, Hexadecimal Number System, BCD Codes, Addition, Subtraction, Multiplication and Division of Binary Number Systems.

Conversions: Conversion of Decimal to Binary, Binary to Decimal, Decimal to Octal,Binary to Octal, Octal to Decimal, Decimal to Hexadecimal, Hexadecimal to Decimal.

UNIT IV

Boolean Algebra And Logic Gates: Basic Boolean functions, Logic Gates, AND, OR, NAND, NOR Gates, Logic Circuits, Converting expression to Logic Circuits, Universal NAND Gate, Universal NOR Gate , Exclusive OR and Equivalence functions, Design of Combinational Circuit, Full and Half Adder, Parallel Binary Adder.

UNIT V

Programming and Languages: Introduction to Programming, Procedural Programming, Structural Programming, Object Oriented Programming, Machine Level Language, Assembly Language, Higher Level Language, Translator, Assembler, Linker, Loader, Advantages and Limitations of Programming Languages, Algorithms and Flow Charts.

Text and Reference books::

1. E Balagurusamy Fundamentals of Computer TMH Publications.

2. Rajaraman, V. (2004). Introduction to Information Technology. PHI.
3. PK Sinha Computer Fundamentals Sixth Edition BPB Publications.
4. Norton, P. (2001). Introduction to computers. TMH
5. Ram, B. (2003). Computer Fundamentals. New Age Publications

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	ESC 102	BASICS OF MECHANICAL ENGINEERING	ESC

UNIT I

Basic Concepts of Thermodynamics: Macroscopic and Microscopic Approaches, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Properties – Intensive and Extensive, Thermodynamic Equilibrium, State, Path, Process and Cycle, Concept of Thermodynamic Work and Heat, Zeroth Law of Thermodynamics, Energy and First law of Thermodynamics, First law applied to non-flow processes, Internal Energy and Enthalpy. Numerical Problems.

UNIT II

I.C. Engines: Introduction, classification, Constructional details and working of 2 stroke & 4 stroke petrol engine & diesel engine, Otto, diesel and dual cycles, simple problems on Otto & diesel cycles.

Refrigeration, Air-Conditioning: Refrigerants: properties of refrigerants, list of commonly used refrigerants. Refrigeration –Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, unit of Refrigeration. Principle and working of vapor compression refrigeration and vapour absorption refrigeration: Principles and applications of air conditioners, Room air conditioner.

UNIT III

Simple Lifting Machines: Definition of machine, velocity ratio, Mechanical advantage, Efficiency, Laws of machines, Reversibility of machine, Wheel and axle, Differential pulley block, Single, Double and Triple start worm and worm wheel, Simple and compound screwjacks, Problems.

Basics of Power Transmission: Transmission of mechanical power: introduction belt drives, gear drives, their advantages and disadvantages. Introduction to brakes and clutches.

UNIT IV

Stresses and Strains: Introduction, Concept & types of Stresses and Strains, Poisons ratio, stresses and Strains in simple and compound bars under axial loading, Stress– Strain diagrams, Hook's law, Elastic constants and Mechanical Properties of metals like mild steel and cast iron.

UNIT V

Basics of Manufacturing Processes and Measurements: Brief introduction to classification of

different manufacturing processes: Primary shaping processes, metal cutting processes, joining processes, finishing processes and processes bringing change in properties, Working principle, parts and specification of commonly used machine tools in workshop such as Lathe, Shaper and

Milling. Measuring Instruments: introduction to slip gauges, Go and No Go gauges, dial gauges,vernier calliper, micrometer, sine bar, vernier height gauges.

Text and Reference Books:

1. Basics of Mechanical Engineering- R.K Rajput Laxmi Pub, Delhi.

2. Elements of Mechanical Engineering- D.S Kumar, S.K Kataria and Sons.

3. Engineering Thermodynamics- P.K Nag TMH, New Delhi.

4. Workshop Technology Vol I & II –Hazra & Chaudhary, Asian Book Comp., New Delhi.5.Engineering Thermodynamics- C.P Arora, Pub- TMH, New Delhi.

6. Manufacturing Science- Amitabha Ghosh & Ashok Kumar Malik, - East- West Press.

7. Manufacturing Process & Systems- Oswald, Munoz, John Wiley.

8. Workshop Technology Vol I, II & III- Chapman, WAJ, Edward Arnold.

9. Basics of Mechanical Engineering – Vineet Jain, Dhanpat Rai Publications

10. Automobile Engineering by Dr Kirpal Singh, standard Publishers Distributors

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
00	2	0	0	MC-I	ENVIRONMENTAL STUDIES	MC

UNIT I

Multidisciplinary Nature Environmental Studies: Definition, scope and importance. Need for public awareness.

Natural Resources: Renewable and Non-Renewable Resources: Natural resourcesand associated problems:

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water.
- Mineral resources: Use and exploitation, environmental effects of extracting and mineral resources, case studies.
- Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems.
- Energy resources: Renewable and non- renewable energy sources, use of alternate energy sources. Case studies.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.

UNIT II

Ecosystems:

Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers anddecomposers.

- Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Nutrient cycling; biogeochemical cycle, N_2 Cycle, H_2O Cycle, Carbon cycle.

  a) Introduction & characteristic features, structure and function of the following ecosystem/ Biomes: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem

  d) Aquatic ecosystems (fresh & Marine)

UNIT III.

Biodiversity and its Conservation:

- Introduction – Definition: genetic, species and ecosystem diversity.

- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic andoption values.
- Bio geographical classification of India.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation. Hot-spots of biodiversity. Endangered and endemic species of India.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT IV

Environmental Pollution:

- Definition, Causes, effects and control measures of: a) Air pollution b) Water pollution c) Soil pollution d) Noise pollution e) Nuclear hazards
- Role of an individual in prevention of pollution.
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Disaster management: floods, earthquake, cyclone and landslides.

UNIT V

Social Issues and the Environment:

- Sustainable development; From Unsustainable to Sustainable development urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns.
- Environmental Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents.
- Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act
- Wildlife Protection Act.
- Public awareness & measures.

Text and Reference books:

1. Perspectives in Environmental Studies by A. Kaushik and C. P. Kaushik, New age international publishers.
2. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi
3. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
4. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela 2008 PHI Learning Pvt Ltd.
5. Environmental Science by Daniel B. Botkin& Edwards A. Keller, Wiley INDIA edition.
6. Fundamentals of Ecology by Odum, E.P., Barrick, M. and Barret, G.W. Thomson

Brooks/Cole Publisher, California, 2005.

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	HSMC 101	COMMUNICATIVE ENGLISH	HSMC

UNIT I

Basic Functional English

1. The English „Alphabet‟ with emphasis on Vowels‟ and their sounds.
2. Introduction to various Parts of Speech – Noun, Verb, Adjective, Adverb, Pronoun, Preposition, Conjunction, Interjection.
3. Simple Present Tense.
4. Introduction to sentence composition – Subject and Predicate, Subject-Verb agreement, construction of Simple Sentences.
5. Articles – Uses and exceptions.
6. Vocabulary – Synonyms, Antonyms, Homonyms.
7. Commonly Mispronounced and misspelled words.
8. Common technical/ scientific/ legal terminologies
9. Question Formation – Close ended, open ended, and tag questions.

UNIT II

Communicative English

1. English in every-day communication – greeting people, introducing oneself, giving public speeches and presentations, public speaking, making an argument, persuading someone, participating in interviews and group discussions, situational role plays, etc.
2. Politeness and etiquette in daily communications – Minding the Ps and Qs (please, quite, kindly, excuse me, pardon me, thank you, bless you, pleasure, etc).
3. *May* and *Can* for permission and possibility; *Could* for permission and possibility in the past; *Could* for politeness in the present.
4. *May* and *Might* for possibility; *Can* and *Be able to* for ability.
5. *Ought, Should, Must, Have to, Had to,* and *Need to* for obligation.

UNIT III

Reading Comprehension

1. Close reading and comprehension.
2. Summary paraphrasing. CV writing, official letters, memo, precise, and reports.
3. Analysis and interpretation of key texts.

UNIT IV

Oral Presentation

1. Oral presentation (with PPTs or PREZI) of reports, arguments, summary and analysis of texts, etc.
2. Extempore, speech delivery, Just a Minute Exercise
3. Group Discussion and PI

UNIT V

Introduction to Business Communication:

Definition, objectives, importance, elements, process, forms, models, levels of analysis of business communication, principles of effective communication, barriers to communication. Types of communication, formal and non-formal, verbal and non-verbal**.**

Text and Reference books:

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma & Binod Mishra, PHILearning Pvt. Ltd.
2. English for Engineers: Made Easy, Aeda Abidi & Ritu Chaudhary, CengageLearning, (New Delhi)
3. A Practical Course for Developing Writing Skills in English, J.K. Gangal, PHI Learning Pvt. Ltd., New Delhi.
4. Intermediate Grammar, Usage and Composition, Tickoo, A. E. Subramaniam & P. R.Subramaniam, Orient Longman (New Delhi)
5. The Written Word , Vandana R. Singh, Oxford University Press (New Delhi)
6. The Great Short Stories edited by D.C. Datta, Ram Narain Lal Publishers (Allahabad)
7. Professional Communication, Kavita Tyagi & Padma Misra, PHI Learning Pvt. Ltd., NewDelhi.
8. "Learn Correct English: Grammar, Usage and Composition" by Shiv K. Kumar &
9. Hemalatha Nagarajan, Pearson (New Delhi).
10. "Current English Grammar and Usage with Composition" by R.P. Sinha, Oxford
11. University Press (New Delhi).
12. "Grammar of the Modern English Language", by Sukhdev Singh & Balbir Singh, (New Delhi).

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
02	0	0	3	ESC 103	WORKSHOP PRACTICE LAB	ESC

Carpentry Shop

1. T – Lap joint
2. Bridle joint

Foundry Shop

1. Mould of any pattern
2. Casting of any simple pattern

Welding Shop

1. Gas welding practice by students on mild steel flat
2. Lap joint by gas welding
3. MMA welding practice by students
4. Square butt joint by MMA welding
5. Lap joint by MMA welding
6. Demonstration of brazing

Machine Shop Practice

1. Job on lathe with one step turning and chamfering operations
2. Job on shaper for finishing two sides of a job
3. Drilling two holes of size 5 and 12 mm diameter on job used / to be used for shaping
4. Grinding a corner of above job on bench grinder

Fitting and Smithy Shop

1. Finishing of two sides of a square piece by filing
2. Tin smithy for making mechanical joint and soldering of joint
3. To cut a square notch using hacksaw and to drill three holes on PCD and tapping

Text and Reference books :

1. Mechanical Workshop Practice, K.C. John, PHI Learning , New Delhi.
2. Elements of Workshop Technology Hajra & Choudhary, Media Promoters & Publisher.
3. Workshop Technology , W.A.J.Chapman, CBS Publisher & Distributor New Delhi.

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	BSC 103	ENGINEERING PHYSICS-I LAB	BSC

List of Experiments:

1. To determine the specific rotation of Glucose (Sugar) solution using a polarimeter.
2. To convert a Galvanometer in to an ammeter of range 1.5 amp. and calibrate it.
3. To convert a Galvanometer in to a voltmeter of range 1.5 volt and calibrate it.
4. To study the variation of a semiconductor resistance with temperature and hence determine the Band Gap of the semiconductor in the form of reverse biased P-N junction diode.
5. To measure the height of a terrestrial objects using Sextant.
6. To find out the horizontal component of earth‟s magnetic field by using tangent galvanometer.
7. To determine the wave length of monochromatic light with the help of Fresnel‟s biprism.

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	HSMC 102	LANGUAGE LAB-I	HSMC

List of Experiments:

1. Phonetic Symbols and Transcriptions
2. Word Formation
3. Affixes
4. Listening and speaking Skills.
5. Words often Mis-spelt and Mis- Pronounced
6. One Word for Many.
7. Synonyms and Antonyms.
8. Seminar Presentation.
9. Group Discussion.
10. Job Interview
11.

Text and Reference books:

1. Advanced Manual for Communication Laboratories and Technical Report Writing, D. Sudha Rani, Pearson, (New Delhi)
2. A Course in Phonetics and Spoken English, J. Sethi & P.V. Dhamija, PHI Learning Pvt. Ltd. (New Delhi)
3. English Language Laboratories: A Comprehensive Manual, Nira Konar, PHI Learning Pvt .Ltd. (New Delhi)
4. Communication Skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning Pvt. Ltd.(New Delhi).
5. Oxford English Learning Package.(With CDs: Headway Series)
6. Tata McGraw Hills English Learning Package (With CDs) 7. "Oxford Advanced Learners" Dictionary" published by Oxford University Press (New Delhi)

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	BSC 104	ENGINEERING PHYSICS-II	BSC

UNIT I

Electromagnetic Theory (EMT): Motion of Charged Particles in crossed electric & magnetic fields, Velocity Selector & Magnetic focussing, Gauss law, continuity equation, inconsistency in Ampere's Law, Maxwell's equations (differential and integral forms), poynting vector, Poynting Theorem (Statement only), propagation of plane electromagnetic waves in conducting and non- conducting medium.

UNIT II

Quantum Mechanics & Statistical Physics: De-Broglie Hypothesis, Davisson Germer experiment, wave function and its properties, expectation value, Wave Packet, Uncertainity principle. Schrodinger Equation for free Particle, Time Dependent Schrodinger Equation, Particle in a box (1-D), Single step Barrier, Tunneling effect.

Qualitative Features of Maxwell Bollzman, Bose-Einstein and Fermi-Dirac statistics distribution,functions & their comparison (no derivation)

UNIT III

Solid State Physics: Formation of energy bands in metals, semiconductors and insulators; intrinsic and extrinsic semiconductors, Fermi energy levels for doped, undoped semiconductors and pn junction; Tunnel diode, Zener diode.

Superconductivity: Meissner Effect, Type I and Type II Superconductors, BCS theory

(Qualitative only), London's equation, properties of superconductors & applications.

Unit IV

X-Rays: production and properties, Crystalline and Amorphous solids (Brief) Bragg's Law, Applications.

Ultrasonics: Introduction, Production of Ultrasonics (Magentostriction and piezoelectric methods), engineering applications.

Unit V

Nuclear Radiation: Nuclear Detectors, Characteristics of gas filled detectors: general

considerations, Constructions, Working and properties of: Ionization chamber, proportional counter, G. M.Counter and Scintillation Counter.

Text and Reference Books:

1. Concept of Modern Physics: A. BEISER
2. Quantum Physics: Greiner
3. Introduction to Electrodynamics: Griffith
4. Introduction to Superconductivity: Michael Tinkham
5. A Textbook of Nanoscience and Nanotechnology: T Pradeep
6. Electromagnetic waves and Radiating Systems: Jordan & Balmain
7. Solid State Physics: Kittel
8. Solid State Physics: R.L. Singhal
9. Quantum Mechanics: Schiff

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	BSC 105	ENGINEERING MATHEMATICS-II	BSC

Unit I

Coordinate Geometry of Three Dimensions: Equation of a sphere, Intersection of a sphere and a plane, tangent plane, Intersection of two spheres, orthogonality of two spheres, Right circular cone. Right circular cylinder.

Unit II

Matrices: Rank of a matrix, Rank of matrix by reducing to normal forms, Consistency of systems of linear simultaneous equations and its solution, Eigen values and Eigen vectors,Cayley Hamilton theorem (without proof), Diagonalization of matrix.

Unit III

Vector Calculus: Scalar and vector field, differentiation & integration of vector functions, Gradient, Divergence, Curl and Differential Operator, Line, Surface and volume Integrals.

Unit IV

Application of Vector Calculus: Green's Theorem in a Plane, Gauss's and Stoke's Theorem (without proof) and their Applications. Fourier Series: Expansion of simple functions in Fourier Series, half range Fourier sine and cosine series, change of interval. Harmonic Analysis.

Unit V

Differential Equations: Series Solutions of Second Order Linear Differential Equations with Variable Coefficients (Complementary Functions only), Partial Differential Equations of First Order : Lagrange's Form, Standard Forms, Charpit's Method .

Text and Reference books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley 9th Edition.

2. Calculus and Analytical Geometry, Thomas and Finney, Narosa Publishing House N. Delhi.

3. A Text Book of Differential Equations, M.Ray and Chaturvedi, Students Friends & Co.Publisher, Agra.

4. Higher Engineering Mathematics, B.V.Ramana, Tata Mcgraw Hill.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	ESC 105	PROGRAMMING WITH 'C'	ESC

UNIT I

Introduction to Programming: Concept of algorithms, Flow Charts, Data Flow diagrams etc., Introduction to the Editing tools such as vi or MS-VC editors, Concepts of the finite storage, bits bytes, kilo, mega and gigabytes. Concepts of character representation, Number System & BinaryAirthmatic.

UNIT II

Programming using C: The emphasis should be more on programming techniques rather than the language itself. The C Programming language is being chosen mainly because of the availability of the compilers, books and other reference materials.

Example of some simple C program. Concept of variables, program statements and function callsfrom the library (Print f for example)

UNIT III

Operation Using C: C data types, int, char, float etc., C expressions, arithmetic operation, relational and logic operations, C assignment statements, extension of assignment of the operations. C primitive input output using getchar and putchar, exposure to the scanf and printf functions, C Statements, conditional executing using if, else. Optionally switch and break statements may be mentioned.

UNIT IV

Iterations and Subprograms: Concept of loops, example of loops in C using for, while and do-while. Optionally continue maybe mentioned. One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations. Concept of Sub-programming, functions Example of functions. Argument passing mainly for the simple variables.

UNIT V

Pointers and Strings: Pointers, relationship between arrays and pointers Argument passing using pointers Array of pointers. Passing arrays as arguments. Strings and C string library.

Structure and Unions. Defining C structures, passing strings as arguments Programming examples.

Text and Reference Books:

1. Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.

2. Herbert Schildt, "C:The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.

3. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.

4. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	ESC 106	BASIC ELECTRICAL ENGINEERING	ESC

UNIT - I

A.C. CIRCUITS: Sinusoidal signal, instantaneous and peak values, RMS and average values, phase angle, polar & rectangular, exponential , R,L and C components, behaviors of these components in A.C. circuits. Concept of complex power, power factor.

SERIES AND PARALLEL A.C. CIRCUITS: Series and parallel A.C. circuits, series andparallel resonance, Q factor, cut-off frequencies and bandwidth.

UNIT -II

DC NETWORK THEOREMS: Thevenin's theorem, Norton's theorem, superposition theorem, maximum power transfer theorem, Star to Delta & Delta to Star transformation. Nodaland Loop methods of analysis

UNIT - III

THREE PHASE CIRCUITS: Phase and line voltages and currents, balanced star and delta circuits, Relation between star and delta quantities, power equation, measurement of power bytwo wattmeter method.

UNIT - IV

1-ϕ TRANSFORMERS: Principle of operation, construction & working of transformer, E.M.F-Equation, Phasor –diagrams, Voltage Regulation, S.C and O.C Test , losses and Efficiency , Auto Transformer.

BASIC INSTRUMENTS: Basics of Moving coil & Moving Iron instruments, Basics of indicating instruments – Wattmeter & Single phase Energy Meter.

UNIT - V

D.C. Machine: Principle of operation, construction, working & applications of D.C machines,Types of Machine.

Induction motor: Principle of operation, construction, working & applications, Types of motors,slip concept.

Synchronous motor: Principle, construction, Types of motors.

TEXT REFERENCE BOOKS:

1. Basic Electrical Engg (2nd Edition) : Kothari & Nagarath, TMH
2. Electrical Technology (Vol-I) : B.L Theraja & A K Theraja, S.Chand
3. **Electrical Engineering Fundamentals : Deltoro, PHI**
3. **Network Analysis :Valkenburg, PHI**

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	ESC 107	ENGINEERING MECHANICS	ESC

UNIT-I

Introduction of Engineering Mechanics: Basic concepts System of Forces- Coplanar Concurrent Forces - Components in Space - Resultant- Moment of Forces and its Application Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams- Equations of Equilibrium of Coplanar Systems and Spatial Systems.

UNIT –II

Friction: Types of friction - Limiting friction - Laws of Friction - static and Dynamic Frictions - Motion of Bodies - Wedge, Screw jack and differential Screw jack.

Transmission of Power: Belt Drivers - Open, Crossed and compound belt drives -length of belt - tensions - tight side - slack side - Power transmitted and condition for maximum power.

UNIT -III

Center of Gravity & Moment of Inertia: Centroids - Theorem of Pappus- Centroids of Composite figures - Centre of Gravity of Bodies - Area moment of Inertia: - polar Moment of Inertia - Transfer - Theorems - Moments of Inertia of Composite Figures - product of Inertia - Transfer Formula for product of Inertia. Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia - Mass moment of inertia of composite bodies.

UNIT -IV

Kinematics: Rectilinear and Curve linear motion - Velocity and Acceleration - Motion of a Rigid Body - Types and their Analysis in Planar Motion.

Kinetics: Analysis as a particles and Analysis as a Rigid Body in Translation - Central Forcesof motion - Equations of Plane Motion - Fixed Axis Rotation - Rolling Bodies - Work-Energy Method - Equation for Translation - Work-Energy application to Particle Motion, Connected System- Fixed axis Rotation and Plane Motion.

UNIT -V

Mechanical Vibrations: Definitions, Concepts - Simple Harmonic motion - free vibrations - Simple and compound pendulums - torsional vibrations.

Shear Force & Bending Moment Diagrams & Trusses: Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple. Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	BSC 106	ENGINEERING CHEMISTRY	BSC

UNIT I

Chemical Bonding: Potential Energy curve for H_2 molecule, co-ordinate bond, Werner's theory,effective atomic numbers, isomerism in co-ordinate compounds. Hydrogen bonding, Vander Waal's forces, hybridization including d-orbitals, Valence shell Electron Repulsion Theory (VSEPR). Discussion of structures of IF_3, $SnCl_2$, CO_3^{2-}, Molecular Orbital theory, Linear combination of atomic orbitals (LCAO) method. Structures of simple heteronuclear diatomic molecules such as CO, NO, HF, HCl.

UNIT II

Gaseous State: Gas laws and Kinetic theory of gases, Distribution of molecular velocities, Meanfree path, Real gases – non ideal behaviour, causes of deviation from ideal behaviour, Vander Waal's equation. Liquefaction of gases. Numericals based on above topics.

Thermo chemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), heat of dilution, heat of hydration, heat of neutralization and heat of combustion, Flame temperature.

UNIT III

Catalysis: Criteria for catalysis : Homogeneous catalysis – acid-base, Enzymatic catalysis, Catalysis by metal salts, Heterogeneous catalysis, concepts of promoters, inhibitors and poisoning, physiosorption, chemisorption, surface area.

The Phase Rule: Definitions of various terms, Gibb's Phase rule, Application of phase rule to one component system – the water system and Sulphur system. Two component system : Lead – Silver, $FeCl_3$ – water, Na_2SO_4 – water.

UNIT IV

Polymers and Composites: Functionality, Degree of polymerization, concept of molecular weight (number average, weight average & numerical based on them), Linear, branched and cross-linked polymers, Tacticity of polymers, Homo and Copolymers (Classification based on repeat unit), Structure – property relationship of polymers. Industrial applications of important thermoplastic, thermosetting polymers, Elastomers, Natural Polymers.

Conducting Polymers : Properties and applications.

UNIT V

Alkenes: Nomenclature of alkenes, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes and mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydro boration oxidation, oxy mercuration reduction, ozonolysis, hydration, hydroxylation and oxidation with KMnO4.

Text and Reference Books:

1. Inorganic Chemistry (Latest ed.) By J.D. Lee
2. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose & J.Rajaram
3. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania
4. Polymer Science (Latest ed.) By V.R. Gowarikar, N.V. Viswanathan & Jayadev Sreedha

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	ESC 108	BASIC ELECTRICAL ENGINEERING LAB	ESC

List of Experiments:

1. To study working principle of Fluorescent Tube Light.
2. To study working of single phase Induction motor & vary its speed by single phaseAuto- Transformer.
3. To prepare connections of Ceiling Fan & vary its speed by regulator.
4. To study working of three phase Induction motor & vary its speed by three phase Auto- Transformer.
5. To study Stair – Case wiring.
6. To study Thevenin & Nortons Theorem
7. To study & verify Superposition Theorem
8. To study & verify Maximum power Transfer Theorem.
9. To study speed control of D.C motor.
10. To study open circuit & short circuit test of single phase Transformer.
11. To study power measurement by two wattmeter method.
12. To study the frequency response of series RLC circuit.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	BSC 107	ENGINEERING PHYSICS-II LAB	BSC

List of Experiments:

1. To study and plot V-I characteristics of PN junction diode.

2. To Study and plot V-I characteristics Zener Diode.

3. To draw common emitter characteristics of a transistor and calculate transistor characteristicsparameters.

4. To draw common base characteristics of a transistor and calculate transistor characteristicsparameters.

5. To plot the waveform of the half wave rectifier and find the ripple factor for H.W.R.

6. To plot the waveform of the full wave bridge rectifier and analyze its output.

7. To study verify the truth table of all the logic gate.

8. To study Cathode Ray Oscilloscope (CRO).

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
02	3	0	3	ESC 109	ENGINEERING DRAWING LAB	ESC

UNIT - I

Introduction: Drawing Instruments and their uses, BIS conventions, Lettering, dimensioning Line conventions and free hand practicing.

UNIT - II

Orthographic Projections: Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straightlines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes. Projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.

UNIT - III

Projections of Solids (First Angle Projection Only): Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

UNIT - IV

Sections And Development of Lateral Surfaces of Solids: Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

UNIT - V

Isometric Projection (Using Isometric Scale Only): Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres.

TEXT AND REFERENCE BOOKS:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-CharotarPublishing House, Gujarat
2. Engineering graphics for degree - K.C. John, 2nd Edition, 2009 – PHI Learning

PrivateLimited.

3. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash PublishersBangalore

4. Engineering Graphics and Drafting :P.S. Gill, Milenium Edition, S.K. Kataria and Sons.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	ESC 110	PROGRAMMING WITH 'C' LAB	ESC

List of Experiments:

1. Write a program to produce ASCII equivalent of given number
2. Write a program to find divisor or factorial of a given number.
3. Write a program to evaluate the following algebraic expressions after readingnecessary values from the user

   (ax+b)/(ax-b)

   2.5 log x-cos 30+|x^2-y^2|+sqrt

   (2xy)(x^5+10x^4+8x^3+4x+2
4. Write a program to find sum of a geometric series
5. Write a program to cipher a string
6. Write a program to check whether a given string follows English capitalization rules
7. Write a program to find sum of the following series1+ 1/2+ 1/3 +___+1/20
8. Write a program to search whether a given substring exist in an input string or not and thendelete this string from input string.
9. Write a recursive program for tower of Hanoi problem
10. The fibonacci sequence of numbers is 1,1,2,3,5,8……. Based on the recurrence relation

    F(n)=F(n-1)+F(n-2)for n>2

    Write a recursive program to print the first m Fibonacci number
11. Write a menu driven program for matrices to do the following operation depending onwhether the operation requires one or two matrices
    a) Addition of two matrices
    b) Subtraction of two matrices
    c) Finding upper and lower triangular matrices
    d) Trace of a matrix
    e) Transpose of a matrix
    f) Check of matrix symmetry
    g) Product of two matrices.
12. Write a program that takes two operands and one operator from the user perform

theoperation and then print the answer

13. Write a program to print the following outputs:



14. Write functions to add, subtract, multiply and divide two complex numbers (x+iy) and (a+ib)Also write the main program.
15. Write a menu driven program for searching an sorting with following options:-
    a) Searching (1) Linear searching
    (2) Binary searching
    b) Sorting (1) Insersection sort
    (2) Selection sorting
16. Write a program to copy one file to other, use command line arguments.
17. Write a program to mask some bit of a number (using bit operations)
18. An array of record contains information of managers and workers of a company. Print allthe data of managers and workers in separate files.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	BSC 108	ENGINEERING CHEMISTRY LAB	ESC

List of Experiments

1. Determine the heat of hydration of $CuSO_4.5H_2O/FeSO_4.7H_2O$.

2. Determine the heat of neutralization of strong Acid (say H_2SO_4/HCl) with strong base (NaOH).

3. Determine the heat of neutralization of Weak Acid with strong base.

4. Determine the molecular weight of a substance by Rast Method.

5. Determine the reaction rate constant for 1^{st} order reaction.

6. Determine the surface tension of a liquid using drop weight method.

7. To determine the viscosity of the given liquid (density to be determined).

8. Preparation of a Polymer.

9. To determine the cell constant of a conductivity cell.

10. Titration of strong acid/strong base conduct metrically.

Text and Reference Books:

1. Practical Physical Chemistry (Latest ed.), By B.D. Khosla, A. Gulati & V.C. Garg

2. Laboratory Manual on Engineering Chemistry (Latest ed.), By S.K. Bhasin and Sudha Rani

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	BSC201	MATHEMATICS-III	BSC

Unit -I

Fourier transform: Discrete and Fast Fourier transform Complex form of Fourier transform and its inverse, Fourier sine and cosine transform and their inversion. Properties of F-transform, Convolution theorem for F-transform, Parse Val's identity of for F-transforms Applications of Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation.

Unit -II

Laplace transform, Inverse transform, properties, Transforms of derivatives and integrals, Unit step function, Dirac's delta function, Differentiation and integration of transforms, Applications to differential equations.

Unit -III

Statistical Techniques: Discrete and Continuous random variables–Moments–Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions, Moments, Moment generating functions, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non – linear

Unit -IV

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Unit -V

Cauchy-Riemann equations: Necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions.

Text and Reference books:

1. Chandrika Prasad, Mathematics for Engineers, Prasad Mudralaya
2. Jeffrey, Advanced Engineering Mathematics , ELSEVIER
3. Chandrika Prasad , Advanced Mathematics for Engineers, Prasad Mudralaya
4. Grewal B. S., Higher engineering Mathematics, Khanna Publication, New Delhi
5. Keyszig E., Advanced Engineering Mathematics, Wiley Eastern Publication
6. Peter V. O. Neil, Advanced Engineering mathematics, Thomson Publication

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 201	Strength of Material	PCC

Unit -I

Deformation in solids- Hooke's law, stress and strain- tension, Concept of factor of safety, compression and shear stresses- elastic constants and their relations- volumetric, linear, Equations of static equilibrium, Concept of free body diagram, Composite bars, Thermal stresses and principal stresses and principal planes- Mohr's circle

Unit –II

Beams and types transverse loading on beams- shear force and bend moment diagrams- Types of beam supports, simply supported and over-hanging beams, cantilevers. Theory of bending of beams, bending stress distribution and neutral axis, shear stress distribution, point and distributed loads.

Unit -III

Moment of inertia about an axis and polar moment of inertia, deflection of a beam using double integration method, computation of slopes and deflection in beams, Maxwell's reciprocal theorems.

Unit –IV

Torsion: Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity, Strain energy in torsion, Stresses in members subjected to combined axial, bending and torsional loads.

Unit –V

Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure

Columns and struts: Equilibrium, buckling and stability, Short, long and intermediate columns, Euler's formula for crippling load for columns, different end conditions, equivalent length, Eccentric loading Rankine formula and other empirical relations.

Text and Reference books:

1. James M. Gere, Mechanics of Materials, Cengage Learning (Brooks\Cole).
2. Ryder G.H., Strength of Materials, Macmillan India.
3. Sadhu Singh, Strength of Materials, Khanna Publishers.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 202	THERMODYNAMICS	PCC

Unit -I

Definition of thermodynamics, Fundamental concepts and definitions: Dimensions and units, Microscopic and Macroscopic approaches, Systems, Surroundings and Universe, Concept of Continuum, Control system boundary, Control volume, Thermodynamic properties, Thermodynamic Equilibrium types, Thermodynamic state, path, process and cycle, Reversibility and Irreversibility, Quasi static process, Energy and its forms, Work and Heat, Ideal gas, Real gas, Ideal Gas laws, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases.

Zeroth law of thermodynamics: Zeroth law of thermodynamics, Temperature and it's Measurement, Temperature scales.

Unit -II

First law of thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. First law analysis for closed system (non-flow processes), Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer, Limitations of first law of thermodynamics, PMM-I.

Unit -III

Second law: Devices converting heat to work, Thermal reservoir, Heat engines, Efficiency, Devices converting work to heat, Heat pump, refrigerator, Coefficient of Performance, Reversed heat engine, Kelvin Planck statement of second law of thermodynamics, Clausius statement of second law of thermodynamics, Equivalence of two statements of second law of thermodynamics, Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, thermodynamic temperature scale, PMM-II.

Unit -IV

Entropy : Clausius inequality, Concept of Entropy, Entropy change in different thermodynamic processes, TDS equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.

Unit -V

Properties of steam and thermodynamics cycles: Pure substance, Property of steam, Triplepoint, Critical point, Sub-cooled liquid, Saturation states, Superheated states, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T & P-V diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables &Mollier charts, Use of steam tables and R134a tables; Saturation tables; Superheated tables; Identification of states & determination of properties.

Text and Reference books:

1. Engineering Thermodynamics by P.K.Nag, Tata McGraw Hill Pub.
2. Thermodynamics by J. P. Holman, McGraw Hill.
3. Engineering Thermodynamics by Jones and Dugans, PHI Learning Pvt. Ltd.
4. Fundamentals of Thermodynamics by Sonntag, Wiley India Pvt. Ltd.
5. Fundamentals of Classical Thermodynamics by Van Wylen, John wiley& sons.
6. Engineering Thermodynamics by R.K.Rajput.
7. Engineering Thermodynamic, Moran, M. J. and Shapiro, H. N., 1999, John Wiley and Sons.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
3	3	0	0	PCC-ME 203	Material Science & Engineering	PCC

Unit-I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

Unit - II

Mechanical Property measurement: Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery; Hardness: Rockwell, Brinell and Vickers and their relation to strength.

Unit -III

Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstrctural aspects of ledeburite, austenite, ferrite and cementite, cast iron.

Unit - IV

Heat treatment of Steel: Annealing, tempering, normalising and spheroidising, isothermal transformation diagrams for Fe-C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening

UNIT - V

Alloying of steel, properties of stainless steel and tool steels, maraging steels- cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloys; brass, bronze and cupro-nickel; Aluminium and Al-Cu – Mg alloys- Nickel based superalloys and Titanium alloys

Text and Reference books:

1. W.D. Callister, Jr, - Material Science & Engineering Addition, Wiley Publishing Co.
2. Van Vlash - Elements of Material Science & Engineering, John Wiley & Sons.
3. S. K. Hazra Choudhary– Material Science & Processes, Media Promoters & Publishers
4. VanVlash - Elements of Material Science & Engineering, John Wiley & Sons.
3. V. Raghvan Material Science, Prentice Hall of India

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 204	MANUFACTURING PROCESSES- I	PCC

Unit-I

Metal Casting Processes: Advantages and limitations, sand mold making procedure. Patterns: Pattern materials, pattern allowances, types of pattern, color coding. Molding materials: Molding sand composition, sand preparation, Sand molding processes. Cores: Types of cores, core prints, chaplets, and chills. Gating systems: Gates and risers. Melting practice: Cupola furnace, Defects in castings and their remedies, Precision Investment Casting, Centrifugal Casting, and Continuous Casting.

Unit-II

Metal Forming Processes: Nature of plastic deformation, hot working and cold working .Principles of rolling, roll passes, roll pass sequences. Forging: Forging operations, smith forging, drop forging, press forging, forging defects.

Unit-III

Extrusion and Sheet Metal Operations: Extrusion principle, hot extrusion, cold extrusion, wire drawing, swaging, tube making. Sheet metal operations: Press tools operations, shearing action, drawing dies, spinning, bending, stretch forming, embossing and coining.

Unit-IV

Welding Process: Principles of welding, brazing and soldering, Classification of Welding Processes, gas welding and cutting process, equipment. Arc welding power source and consumables. Resistance welding: Principle and equipments, resistance spot welding, resistance seam welding, electro slag welding, forge welding.

Unit-V

Advance Welding Processes: Tungsten inert gas welding (TIG), metal inert gas welding (MIG), MMAW, electron beam welding, friction welding, and diffusion welding: their working principle, equipments, parameters and applications.

Powder Metallurgy: Powder manufacturing, compaction and sintering processes. Advantages and applications of Powder Metallurgy.

Text and Reference books:

1. Principles of Manufacturing Materials & Processes – Campbell J. S., Publisher – McGraw Hill.

2. Manufacturing Science - Ghosh A; Mallik A.K. Affiliated East-West Press Pvt. Ltd., New Delhi

3. Manufacturing Processes- H S Shan, Cambridge University Press 2nd Edition 2017.

4. Production Technology – P C Sharma –S.Chand publications, New Delhi.

5. Elements of Manufacturing Processes – B.S. NagendraParasher, RK Mittal, PHI N. Delhi

MANDATORY COURSES

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
2	2		0	MC-III	Introduction to Indian Law	MC

Unit – I

Salient features of the Indian constitution. Preamble Definition of State (Art. 12) Doctrines of Ultra-virus, severability, eclipse, waiver (Art, 13)

Unit – II

Right to equality (Art. 14) Prohibition of discrimination, Rights to equality of opport UNITy (Art. 15-16) Right to freedom under Article 19: Freedom of association; Freedom of movement; Freedom of residence; Freedom of assembly; Freedom of association; Freedom of movement; Freedom of residence; Freedom of occupation, trade and business; Right to take out processions; Right of the State to impose reasonable restrictions

Unit – III

Protection in respect of Conviction under Article 20, Ex-post-facto law; Double jeopardy; Self-incrimination; Right of Life and Personal Liberty (Act. 21), Protection in respect of arrest and detention Right to freedom of Religion (Articles 25-28)

Unit – IV

Cultural and Education Rights (Articles 29-30) Enforcement of Fundamental Right, Writ Jurisdiction of the Supreme Court and High Court (Article 32, 226)

Unit – IV

Right to property before and after the Constitution 42nd Amendment Act, 1976 Abolition of Untouchability, Titles (Articles 17-18) Right against exploitation (Articles 23, 24)

Text and Reference Books:

Austin Granville: Constitution of India: Cornerstone of a Nation; and Working A Democratic constitution Narender Kumar: Constitutional Law of India.

Basu D. D: Shorter Constitution of India

Jain, M.P.: Constitutional Law of India,

Seervai, H.M.: Constitutional Law of India, Vols. I-III

Shukla, V.N.: Constitutional of India (ed. M.P. Singh)

Mechanical Engineering (B. Tech.), III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
02	0	0	3	PCC-ME 205	Machine Drawing and Auto CAD Lab	PCC

SECTION A- MACHINE DRAWING

Introduction graphic language classification of drawing, principal of drawing, IS codes for machine drawing, lines, scales, section dimensioning, standard abbreviation, – Limits , fits and Tolerance (Dimensional and Geometrical tolerance) , Surface finish, Gears : Gear terminology, I.S. convention representation of assembly of spur gears, helical gears, bevel gears , worm and worm wheel.

Orthographic projections: principle of first and third angle projection, orthographic views from isometric views of machine parts / components. Drawing of sectional views:- Coupling, Crankshaft, Pulley, Piston and Connecting rod, Cotter and Knuckle joint. Riveted Joint and Welded Joint. Free hand sketching: Need for free hand sketching of standard parts and simple machines components.

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies: Lathe Tail stock, Machine vice, Pedestal bearing

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies Steam stop valve, Stuffing box, Drill jigs and Milling fixture.

SECTION B- Auto CAD

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.

2. Layout drawing of a building using different layer and line colors indicating all Building details. Name the details using text commands, Make a title Block.

3. To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving name the various components of the valve.

4. Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.

5. Draw quarter sectional isometric view of a cotter joint.

6. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion.

7. Draw 3D models by extruding simple 2D objects, dimension and name the objects.

8. Draw a spiral by extruding a circle.

Text and Reference Books:

1. Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.

2. A Text Book of Machine Drawing - P S Gill Pub.: S K Kataria& Sons.

3. Engineering Graphics with Auto CAD 2002 -JamesD.Bethune, Pearson Education.

4. A Text Book of Machine Drawing LaxmiNarayana and Mathur, M/s. Jain Brothers, New Delhi.

5. Machine drawing by N Sidheshwar, Kannaieh, V S Sastry, TMH., New Delhi.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
1	**0**	**0**	**2**	**PCC-ME 206**	**THERMODYNAMICS LAB**	**PCC**

LIST OF EXPERIMENTS

1. Study of temperature and its measuring devices.
2. Study of determination of Calorific Value of Fuels by using different calorimeters
3. Determinations of exhaust gas analysis by using Orsat Apparatus
4. Study and comparison of SI and CI Engines (Cut Models).
5. To draw valve timing diagram for a single cylinder diesel engine.
6. To perform constant speed load test on a single cylinder diesel engine and to plot performance curves: indicated thermal efficiency, brake thermal efficiency, mechanical efficiency Vs. Brake power.
7. To perform constant speed load test on computerized test rig and to plot performance curves along with pressure-theta diagram.
8. Morse Test: To estimate the Indicated Power, Friction Power and Mechanical Efficiency of a multi-cylinder Petrol Engine.
9. Study of two stage reciprocating compressor.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
1	**0**	**0**	**2**	**PCC-ME 207**	**Manufacturing Science –I lab**	**PCC**

LIST OF EXPERIMENTS

1. To study and observe various stages of casting through demonstration of Sand Casting Process.
2. To prepare a pattern for given object for lost form casting.
3. To study and observe through demonstration the metal forming processes (Rolling, Forging and Sheet metal forming).
4. To manufacture a small object using hot forging technique.
5. To prepare a sheet metal product (square container).
6. To study and observe the welding and brazing techniques through demonstration and practice (Gas, MIG, TIG, Plastic, Brazing)
7. To prepare a butt joint with mild steel strip using GMAW & MMAW technique.
8. To prepare a butt joint with mild steel strips using brazing technique.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
1	**0**	**0**	**2**	**PCC-ME 208**	**STRENGTH OF MATERIAL LAB**	**PCC**

LIST OF EXPERIMENTS

1. To perform Tensile/Compressive/Shear/torsion test on a given material and to determine its various mechanical properties under tensile/compression/Shear/torsional loading
2. To determine Rockwell/Brinell hardness of a given material
3. To study the impact testing machine and perform the impact Tests (Charpy test).
4. To study the impact testing machine and perform the impact Test(Izod test)
5. To perform Bending test and to determine the Young's Modulus of Elasticity via deflection of beam.
6. Creep testing on creep testing machine
7. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
8. Compression and tensile test on helical springs.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
1	**0**	**0**	**2**	**PCC-ME 209**	**Material Science & Engineering Lab**	**PCC**

LIST OF EXPERIMENTS

1. Classification of about 25 specimens of materials/machine parts into

(i) Metals and non-metals
(ii) Metals and alloys
(iii) Ferrous and nonferrous metals
(iv) Ferrous and non-ferrous alloys

2. Study of various crystals structures and defects in crystals through models.(Bravais Lattice structures).
3. Study of brittle and ductile fracture.
4. Metallographic examination /micro structural analysis of materials.
5. Grain Size determination of a given specimen.
6. Comparative study of microstructures of different given specimens (mild steel, gray C.I.)Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
7. Annealing of Steel -Effect of annealing temperatures and time on hardness.
8. Study of Microstructure and hardness of steel at different rates of cooling. Microstructure examination of white cast iron.
9. Study of Iron-Carbon Equilibrium Diagram and sketch the various structures present at room temperature.
10. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.

Reference and Text Books:

1. Vander Voort, Metallography: Principles and Practice, McGraw-Hill, 1984
2. Prabhudev K.H., Handbook of Heat Treatment of Steels, Tata McGraw-Hill, 2000.
3. Sadhu Singh, Machine Design, Khanna Publishers, New delhi, 1997.
4. Abdul Mubeen, Machine Design, Khanna Publishers 1995.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 210	KINEMATICS OF MACHINES	PCC

Unit -I

Classification of mechanisms- Basic kinematic concepts and definitions- Degree of freedom, mobility- Grashof's law, Kinematic inversions of four bar chain and slider crank chains- Limit positions- Mechanical advantage- Transmission angle- Description of some common mechanisms- Quick return mechanism, straight line generators- Universal Joint- Rocker mechanisms

Unit – II

Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, velocity and acceleration analysis using loop closure equations- kinematic analysis of simple mechanisms- slider crank mechanism dynamics Coincident points- Coriolis component of acceleration- introduction to linkage synthesis three position graphical synthesis for motion and path generation

Unit – III

Classification of cams and followers- Terminology and definitions- Displacement diagrams- Uniform velocity, parabolic, simple harmonic and cycloidal motions- derivatives of follower motions- specified contour cams- circular and tangent cams- pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers

Unit – IV

Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting- helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics

Unit – V

Surface contacts- sliding and rolling friction- friction drives- bearings and lubrication friction clutches- belt and rope drives- friction in brakes

Text and Reference Books:

1. Thomas Beven, Theory of Machines, Longman's Green & Co., London.
2. W. G. Green, Theory of Machines, Blackie & Sons, London
3. V. P. Singh, Theory of Machines, DhanpatRai.
4. Gosh and Malik, Theory of Mechanism and Machines, East-west Pvt. Ltd. 1988.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 211	FLUID MECHANICS	PCC

Unit -I

Fluid Properties and Fluid Statics: Definition, Distinction between solid and fluid Modules and dimensions, Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension. Pascal law, absolute, gauge and vacuum pressures, Pressure measurements by manometers and pressure gauges. Archimedes principle, Hydrostatic law, Centre of pressure, stability of floating bodies.

Fluid Kinematics: Flow visualization, Lines of flow, Types of flow, Velocity field and acceleration, Continuity equation (one and three dimensional differential forms), Equation of streamline, Stream function, Velocity potential function, Circulation, Flow net.

Unit -II

Fluid Dynamics: Definition,Equations of motion - Euler's equation along a streamline, Bernoulli's equation and its applications,Venturi-meter, Orifice meter, Pitot tube, Orifices, Mouthpieces, Notches and Weirs, Momentum theorem.

Unit -III

Dimensional Analysis: Dimensionless numbers- Reynolds, Froude, Mach, Weber and Euler, Applications of numbers, Undistorted model, Distorted model, scale effect.

Incompressible Fluid Flow: Viscous flow, Navier-Stoke's equation (Statement only), Shear stress, Pressure gradient relationship, Laminar flow between parallel plates, Laminar flow through circular tubes, Hagen Poiseulle's equation.

Unit -IV

Flow Through Pipes: Friction loss, Darcy-Weisbach Formula, Minor and major losses, Hydraulic and energy grade lines, Flow through pipes in series and in parallel, Power transmission, Water hammer and cavitation.

Turbulent Flow: Variation of friction factor with Reynold number, Moody's diagram, Shear stress in turbulent flow, Prandtl Mixing length theory, Velocity distribution in smooth pipes and rough pipes, Resistance of smooth and rough pipe.

Unit -V

The Boundary Layer: Description of the boundary layer, Boundary Layer thickness, Von-Karman momentum integral equation, Coefficient of drag, Boundary layer separation and control, Flow around a body, Drag and lift, Drag on sphere and cylinder, Development of lift on a circular cylinder, Development of lift on an airfoil.

Text and Reference Books:

1. Yunus A. Cengel and Cimbala, Fluid Mechanics, Tata McGrawHill
2. Frank M. White, Fluid Mechanics, Tata McGraw Hill.
3. Streeter V.L., K.W. Bedford and E.B.Wylie , Fluid Mechanics , Tata McGraw Hill
4. Robert W. Fox and Alan T. McDonald, Introduction to Fluid Mechanics, John Wiley &Sons.
5. Potter, Mechanics of Fluids, Cengage Learning.
6. John F. Douglas, Fluid Mechanics, Pearson Education.
7. Modi and Seth, Fluid Mechanics and Hydraulic Machinery, Standard Book House.
8. Som, S. K., &Biswas, G. Introduction to fluid mechanics and fluid machines, Tata McGraw-Hill.
9. Munson, B. R., Young, D. F., &Okiishi, T. H. Fundamentals of Fluid Mechanics, Wiley
10. Flud mechanics by R.K. B ansal

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 212	Manufacturing Processes-II	PCC

Unit-I

Mechanism of Metal Cutting: Deformation of metal during machining, nomenclature of lathe, milling tools, mechanics of chip formation, built-up edges, mechanics of orthogonal and oblique cutting, Merchant cutting force circle and shear angle relationship in orthogonal cutting, factors affecting tool forces. Cutting speed, feed and depth of cut, surface finish.Temperature distribution at tool chip interface.Numericals on cutting forces and Merchant circle.

Unit-II

Tool Wear and Machinability: Types of tool wear, tool life, factors governing tool life, Machinability: Definition and evaluation. Economics of machining, Numerical on tool life.

Cutting Tool Materials & Cutting Fluids: Characteristics of tool materials, various types of cutting tool materials, coated tools, cutting tool selection, Purpose and types of cutting fluids, basic actions of cutting fluids, effect of cutting fluid on tool life, selections of cutting fluid

Unit-III

Gear Manufacturing: Introduction, methods of manufacture. Gear generation and forming: Gear cutting by milling, single point form tool, gear hobbing and shaping. Gear finishing operations: Gear shaving, gear burnishing, gear grinding, lapping.

Unit-IV

Jigs & Fixtures: Introduction, location and location devices, clamping and clamping devices, Drill Jigs, Milling Fixtures.

Unit-V

Unconventional Machining Processes: introduction, classification of unconventional machining processes, Abrasive jet machining: Principles, advantages, disadvantages and applications. Ultrasonic machining: Principles, advantages, disadvantages and applications. Electro-chemical machining and grinding: Principles of operation, advantages, disadvantages and applications. Electric discharge machining: Principles, advantages, disadvantages and applications. Electron beam machining: principle, advantages, disadvantages and applications. Laser beam machining: Principles and applications.

Text and Reference Books:

1. Manufacturing Technology – Metal cutting and machine Tools: P.N. Rao, T.M.H, New Delhi
2. Workshop Technology -Vol II (Machine Tools) B.S Raghuwanshi, dhanpatRai and Company.
3. Manufacturing Processes- H S Shan, Cambridge University Press 2nd Edition 2017
4. Manufacturing Engg. & Tech, Kalpakian, Serope Addison -Wisly Publishing Co. New York.
5. Modern Machining Processes: P.C. Pandey& H.S. Shan, T.M.H. Company, New Delhi
6. Text Book of Production Engineering: P.C. Sharma, S.Chand& Sons.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 213	I.C. ENGINES	PCC

Unit -I

Introduction to IC Engines: Definition of engine, classification, Application of IC engines, Air Standard Cycle and deviation from air standard actual cycle, Indicator diagram, MEP (mean effective pressure), Shaft power, Indicated power.

Unit – II

Actual working of IC engine: Introduction to fuel air cycles and their significance, Composition of cylinder gases, Variable specific heats, Comparison of air standards & fuel air cycles, Effect of operating variables- compression ratio, fuel air ratio, actual cycles and their analysis, Difference between actual and fuel-air cycle, actual and fuel-air cycles for S.I. and C.I. engines.

Working of 4-stroke petrol & diesel engines and their valve timing diagram, Working of 2-stroke petrol & diesel engines & their valve timing diagrams, Comparison of 2-stroke &4-stroke engines, Actual working of 2 & 4 stroke gas engines and their valve diagram,

Unit – III

Fuel and Combustion: Fuels for SI and CI engine, Important qualities of SI and CI engines fuels, rating of SI engines, CI engines fuels, Dopes, Combustion in CI engines, Ignition delay, Knocking phenomena and its control, Combustion chamber design for CI engines. Combustion in SI engine, Detonation, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas and Alternatives fuels for IC engines.

Unit – IV

Fuel Supply System: Fuel supply system and fuel pumps, Properties of air fuel mixture, Carburettor and its working, Actual air fuel ratio of single jet carburettor, Supercharger, Petrol injection, Fuel injection systems for C.I., Cooling and lubricants of IC engines

Classification of injection systems, Injection pump, Fuel injection systems, Fuel Injector, Nozzle, Injection of S.I. Engines and Fuel filters.

Unit – V

Measurement and Testing: Measurement of shaft power, Indicated power, Measurement of speed, Air consumption, Fuel consumption, Heat carried by cooling water, Heat carried by the exhaust gases, Morse test, Heat balance sheet, Governing of I.C. Engines, Performance characteristics of I.C. Engines, Performance parameters, Performance of S.I. Engines, Performance of C.I. Engine

Text and Reference Books:

1. V. Ganeshan, Internal Combustion Engines, Tata McGraw Hill
2. Damundwar,A Course in Internal Combustion Engines,DhanpathRai& Sons

3. Obert E. F, "Internal Combustion Engines and Air Pollution", Harper and Row Publication Inc. NY, 1973.
4. Heywood J. B, "Internal Combustion Engine Fundamentals", McGraw Hill Book Co. NY,1989

Mechanical Engineering (B. Tech.) IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	**3**	**1**	**0**	**PCC-ME 214**	**INDUSTRIAL ENGINEERING**	**PCC**

Unit-I

Production system and Productivity: Introduction to production systems, Aim of production systems, generalized model of Production systems, Types and characteristics of production systems, Life cycle approach to production management, Product life cycle, Plant location, Plant layout, objectives, types, comparison and application of different types of layouts. Productivity definition, various methods of measurement, Factors effecting productivity, Strategies for improving productivity.

Unit-II

Manufacturing Cost Analysis: Fixed & variable costs, Direct, indirect & overhead costs, & Job costing, Recovery of overheads, Standard costing, Cost control, Cyber Laws And Security Cost variance Analysis - Labour, material, overhead in volume, rate & efficiency, Break even Analysis, Numerical Problems.

Unit-III

Work Study: Definition, Objectives, Method study, Principle of motion economy, Techniques of method study – Various charts, THERBLIGS, Work measurement - various methods, Time Study - PMTS, determining time, Work sampling. Numerical Problems.

Unit-IV

Materials Management : Strategic importance of materials in manufacturing industries, Relevant costs, Inventory control models - Economic order quantity (EOQ), Economic batch quantity (EBQ) with & without shortage, Inventory control systems - P,Q,Ss Systems, determination of order point & safety stock, Selective inventory control - ABC, FSN, SDE, VED,SCM , Numerical Problems.

Forecasting: Importance, Objectives, Forecasting and Prediction, Types, Classification of Forecasting Methods, Forecast Errors, Costs and Accuracy of Forecasts, Numerical Problems.

Unit-V

Production Planning & Control (PPC) : Objectives & variables of PPC, Aggregate planning - Basic Concept, its relations with other decision areas, Decision options - Basic & mixed

strategies, Master production schedule (MPS), Scheduling Operations Various methods for line & intermittent production systems, Gantt chart, Sequencing - Johnson algorithm for n-Jobs- 2 machines, n- Jobs-3 machines, 2 Jobs n-machines, n-Jobs m-machines Various means of measuring effectiveness of PPC, Numerical Problems.

Text and Reference Books:

1. Production & Operations Management – Chary, TMH, New Delhi.
2. Modern Production Management – S.S. Buffa, Pub.John Wiley.
3.Operations Management - Schroeder, McGraw Hill ISE.
4. Operation Management - Monks, McGraw Hill ISE.
5. Production & Operations Management - Martinich, John Wiely SE.
6. Industrial & Systems Engineering - Turner, Mize, Case, Prentice Hall Pub.
7. Industrial Engineering & Operations Management – SK Sharma, Pub-S. K.Kataria
8. Industrial Engineering – Ravi Shankar, Galgotia Pub.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 215	Design of Machine Elements	PCC

Unit -I

Design considerations - limits, fits and standardization, Review of failure theories for static and dynamic loading (including fatigue failure) and Design Against Static Load: Modes of failure, factor of safety, principle stresses, stresses due to bending and torsion, theory of failures.

Unit – II

Cyclic stresses, fatigue and endurance limit, stress concentration factor, stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria.

Unit – III

Riveting methods, materials, types of rivet heads, types of riveted joints, failure of riveted joints, efficiency of riveted joints, design of boiler joints, eccentric loaded riveted joint, Welded joints and Screwed fasteners.

Unit – IV

Cause of failure in shaft, materials for shaft, stress in shaft, and design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, shaft subjected to fatigue loads, design for rigidity.

Design of springs: helical compression, tension, torsional and leaf springs

Unit – V

Design of transmission elements: spur, helical, bevel and worm gears; belt and chain drives.Analysis and applications of power screws and couplings.Analysis of clutches and brakes

Text and Reference Books

1. Design of Machine Elements by V. B. Bhandari, TMH Publishing Co. Ltd., New Delhi
2. Machine Design by Norton, Prentice Hall.
3. Machine Design by Shigley Tata McGraw hill
4. Sharma PC and Aggarwal DK, “Machine Design”, Kataria Publishers (2002)

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 216**	**KINEMATICS OF MACHINES LAB**	**PCC**

LIST OF EXPERIMENTS

1. To study inversions of four bar chain: Coupling Rod, Beam Engine
2. To study Steering Mechanisms; Davis and Ackerman.
3. Study of quick return mechanism and draw velocity and acceleration diagram.
4. Study of inversion of Double slider chain Oldham Coupling, Scotch Yoke and Elliptical Trammel.
5. Study of various cam-follower arrangements.
6. To plot displacement v/s angle of rotation curve for various cams
7. To determine co-efficient of friction using two roller oscillating arrangement.
8. Study of various types of dynamometers, Brakes and Clutches.
9. Study of a lathe gear box.
10. Study of a sliding mesh automobile gear box.
11. Study of various gear trains.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	PCC-ME 217	FLUID MECHANICS LAB	PCC

LIST OF EXPERIMENTS

1. Determination of Metacentre height of a given body.
2. Determination of C_d, C_v & C_c for given orifice.
3. Calibration of contracted Rectangular Notch and / Triangular Notch and determination of flow rate.
4. Determination of velocity of water by Pitot tube.
5. Verification of Bernoulli's theorem.
6. Determination of Coefficient for minor losses in pipes.
7. Calibration and flow rate determination using Venturimeter & Orifice meter and Nozzle meter
8. Determination of head loss in given length of pipe.
9. Determination of the Reynold's number for laminar, turbulent and transient flow in pipe.
10. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
11. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 218**	**Manufacturing processes –II Lab**	**PCC**

LIST OF EXPERIMENTS

1. Produce a rectangular block by face milling and prepare a slot on one face with a slotting cutter / side and face cutter.
2. Gear manufacturing by some indexing device on a milling machine
3. Job on grinding using - Surface grinding - Cylindrical grinding - Centreless grinding
4. Grinding and sharpening of lathe tool, drills.
5. Grinding of surface at 45°, 60°, 75° on tool and cutter grinder.
6. Milling cutter grinding on tool and cutter grinder.
7. Prepare a V-block to ± 0.2 mm accuracy on shaper machine.
8. Exercise on key way cutting and spline cutting.
9. Preparation of job through eccentric turning.
10. Practice of taper turning.
11. Exercise on EDM for preparation of electrodes (male and female).

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 219**	**I. C. ENGINES LAB**	**PCC**

LIST OF EXPERIMENTS

1. Study of IC Engine models
2. Study of working of two stroke petrol engine and four stroke petrol engine with the help of cut section models.
3. Study of working of two stroke diesel and four stroke diesel engine with the help of cut section models.
4. Study of fuel supply system of a petrol engine (fuel pump and simple carburettor)
5. Study of complete carburettor
6. Study of Diesel Injection System.
7. Study of fuel supply system of a Diesel engine (fuel pump and fuel injector)
8. Study of Ignition systems of an IC Engine (Battery and Magneto ignition system) and Electronic ignition system.
9. Study of Lubrication system of an IC Engine (mist, splash and pressure lubrication)
10. Study of cooling systems of an IC Engine (air cooling and water cooling)
11. To conduct a performance test on diesel engine to draw heat balance sheet for given load and speed
12. To determine friction power of diesel engine by Willan's line or fuel rate extrapolation method.
13. To conduct a performance test on the variable compression ratio engine and to draw the heat balance sheet for given compression ratio, speed and load and plot the performance curves.
14. To conduct a performance test on a four cylinder four stroke petrol engine and to draw the heat balance sheet and performance curves.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 301	DYNAMICS OF MACHINES	PCC

Unit -I

Force Analysis and Flywheels: Static force analysis of mechanisms, D'Alemberts principle, inertia force and inertia torque, dynamic force analysis, dynamic analysis in reciprocating engines, gas forces, equivalent masses, bearing loads, crank shaft torque, engine shaking forces, turning moment diagrams, flywheels of engines and punch press

Unit -II

Analysis Gear Trains: Force analysis on Simple, compound, reverted and epicyclical gear trains, analytical, tabular, and graphical and vector methods for velocity ratio, gear boxes-sliding and constant mesh for automobile.

Unit -III

Governors: classification of centrifugal governor, Porter, Proell, Hartnell and spring controlled governors, governor effort, power, stability, sensitivity,.

Unit -IV

Gyroscope: Principle of gyroscopic couple, effect of gyroscopic couple and centrifugal force on vehicle taking a turn, stabilization of sea vessels. Inertia force analysis, Velocity and acceleration of slider crank and four bar mechanism, inertia force, piston thrust and forces on connecting rod, turning moment diagram, flywheel.

Unit -V

Dynamometers: absorption and transmission type dynamometers, prony, rope and hydraulic dynamometers braking system of automobiles.

Balancing: Balancing of rotating masses, balancing of reciprocating masses, locomotives, IC Engines, balancing machines.

Text and Reference Books:

1.Theory of Machines and Mechanisms, Uicker, Pennocle and Shigley, Oxford University Press.
2. Mechanism And Machine Theory, Ambekar A. G., Prentice-hall Of India
3. Theory of Mechanisms and Machines, Sharma and Purohit, Prentice-hall Of India
4. Theory of Mechanisms and Machines, Ghosh A., Affiliated East West Press.
5. Theory of Machines, Abdulla Shariff, DhanpatRai Publications.
6. Theory of Machines, S.S. RATAN TATA McGraw Hill

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 302	HYDRAULIC MACHINES	PCC

Unit -I

General Concepts : Euler's turbo machinery equation, Specific speed, impulse and reaction principle, Impulse momentum principle, jet impingement on stationary and moving flat plates and vanes, calculations for force exerted, work done and efficiency of jet. Basic components of a turbo machine and its classification.

Hydraulic Devices: Description, operation and application of hydraulic systems – hydraulic ram, hydraulic jack, hydraulic brake, hydraulic accumulator, hydraulic door closer, hydraulic press, selection of specification of above systems for different applications

Unit – II

Pelton Turbine :Components and operation; velocity triangles, work output; Effective head, available power and efficiency; design aspects such as mean diameter of wheel, jet ratio, number of jets, number of buckets with working proportions

Unit – III

Francis and Kaplan Turbines: Components and operation, velocity triangles and work output; working proportions and design parameters for the runner; Degree of reaction; Draft tubes, its function and types. Function and brief description of commonly used surge tanks

Unit – IV

Centrifugal Pumps : Main elements and their functions; Various types and classification; Pressure changes in a pump, suction, delivery and manometric heads; vane shape and its effect on head-capacity relationships; Departure from Euler's theory and losses; pump output and efficiency; Minimum starting speed and impeller diameters at the inner and outer periphery;

Unit – V

Reciprocating Pumps: Components, working principle; pressure variations due to piston acceleration; acceleration effects in suction and delivery pipes; work done against friction; maximum permissible vacuum during suction stroke; Air vessels

Text and Reference Books:

1. Hydraulic Machines by R. K. Rajput, S. Chand publication.

2. Fluid Mechanics and Fluid Power Engineering by Kumar D S, S K Kataria and Sons, Delhi

3. Hydraulic Machines by JagdishLal, Metropolitan Book Co Pvt. Ltd.

4. Sharma PC and Aggarwal DK, "Machine Design", Kataria Publishers (2002)

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	HSMC301	Principles of Management	HSMC

Unit-I

Introduction To Management And Organizations:

Definition of Management – Science or Art – Manager Vs Entrepreneur – types of managers – managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current trends and issues in Management.

Unit- II

Planning:

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

Unit-III

Organising:

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

Unit-IV

Directing:

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

Unit-V

Controlling:

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

Text and Reference Books:

1. P C Tripathi and P N Reddy , ‘Principles of management’
2. Davis and H. Olison, ‘Management Information System, Gordan’, McGraw Hill Pub.
3. William Werther and Keith Davis, ‘ Human Resources and Personal Management’
4. V S Ramaswamy and S Namakumari, ‘Marketing Management’
5. High Arnold and Daniel Feldman, ‘Organization Behavior’, McGraw Hill.
6. Stephen A. Robbins & David A. Decenzo& Mary Coulter, “Fundamentals of Management” 7th Edition, Pearson Education, 2011.
7. Robert Kreitner&MamataMohapatra, “ Management”, Biztantra, 2008.
8. Harold Koontz & Heinz Weihrich “Essentials of management” Tata McGraw Hill,1998.
9. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 303	HEAT TRANSFER	PCC

Unit -I

Introduction to Heat Transfer Processes: Introduction to three modes of heat transfer, Fourier's law of heat conduction, thermal conductivity, thermal conductivity of solids, liquids and gases, Effect of temperature on thermal conductivity, Newton's law of cooling, Definition of overall heat transfer coefficient, General parameters influence the value of heat transfer coefficient.

Conduction : General 3-Dimensoinal conduction equation in Cartesian, Cylindrical and spherical coordinates, Different kinds of boundary conditions, Nature of differential equations, One-dimensional heat conduction with and without heat generation, Electrical analogy, Heat conduction through composite walls, Critical thickness of insulation.

Unit -II

Heat Transfer from Finned Surfaces: Types of fin, Fin efficiency and effectiveness, Biot number, two dimensional steady state heat conduction using analytical and numerical methods, Periodic heat conduction.

Convection: Review of Navier–Stokes and energy equation, Hydrodynamic and thermal boundary layers, Laminar boundary layer equations, Forced convection appropriate non-dimensional members, Effect of prandtl number, Empirical relations for flow over a flat plate and flow through pipes.

Unit -III

Natural Convection: Dimensional analysis, Grashof number, Boundary layers in external flows (flow over a flat plate only), Boundary layer equations and their solutions, Heat transfer correlations.

Heat Transfer with Change of Phase: Nature of vaporization phenomena, Boiling and Condensation heat transfer, Pool boiling curve, Different regimes of boiling heat transfer, Correlations for saturated liquid vaporization, condensation on flat plates, Correlation of experimental results, Drop wise condensation.

Unit-IV

Heat Exchanger: Different types of heat exchangers, LMTD, Heat transfer coefficient for parallel, Counter and cross flow type heat exchanger, Effectiveness of heat exchanger, N.T.U. method, Fouling factor, Constructional and manufacturing aspects of heat exchangers.

Unit -V

Thermal Radiation: Plank distribution law, Kirchhoff's law, Radiation properties, Diffuse radiations, Lambert's law, Radiation intensity, Heat exchange between two black bodies heat exchanger between gray bodies, Reradiating surfaces heat transfer in presence of radiating surfaces, Shape factor, view factors and the radiosity method.

Text and References Books:

1. Heat Transfer, Holman J.P., Tata McGraw-Hill, New Delhi.
2. Heat and Mass Transfer, Cengel, Tata McGraw-Hill, New Delhi.
3. Heat Transfer, R. S. Khurmi, S. Chand Publication.
4. Heat and Mass Transfer, Kumar D.S., Kataria and Sons.
5. Heat Transfer, Sharma and Lal, Vardhan Publisher Jaipur.
6. Heat and Mass Transfer, Nag P.K., Tata McGraw-Hill, New Delhi.
7. Fundamental of Heat and Mass Transfer, Thirumaleshwar M., Pearson Education.
8. Heat Transfer, Rajput R.K., S. Chand Publication.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 304	Design of Transmission Systems	PCC

Unit –I

Flexible transmission elements- design of flat belts & pulleys, selection of V-belts and pulleys, selection of hoisting wire ropes and pulleys, design of chains and sprockets

Unit – II

Gear transmission- speed ratios and number of teeth, force analysis, tooth stresses, dynamic effects, fatigue strength, factor safety, gear materials; Design of straight tooth spur gear and parallel axis helical gears based on strength and wear considerations, pressure angle in the normal and transverse plane; equivalent number of teeth and forces for helical gears.

Unit – III

Straight bevel gear- tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of a pair of straight bevel gears; Worm gear, merits & demerits, terminology, thermal capacity, materials, forces & stresses, efficiency, estimating the size of worm gear pair. Cross helical gears, terminology, helix angles, sizing of a pair of helical gears.

Unit – IV

Gear box- geometric progression, standard step ratio; Ray diagram, kinematics layout; Design of sliding mesh gear box- Design of multi-seed gear box for machine tool applications; constant mesh gear box, speed reducer unit; Variable speed gear box; Fluid couplings, Torque converters for automotive applications.

Unit – V

Cam design, types: pressure angle and undercutting base circle determination, forces and surface stresses; Design of plate clutches, axial clutches, cone clutches, internal expanding rim clutches; Electromagnetic clutches; Band and Block brakes, external shoe brakes, internal expanding shoe brake.

Text and References Books:

1. Shigley, J. E., Mechanical Engineering Design, 5th ed., McGraw-Hill, 1989.
2. Bhandari, V. B., “Design of Machine Element” Tata McGraw-Hill
3. Shigley J., Mischke C., Budynas R. and Nisbett K., Mechanical Engineering Design, 8th ed., Tata McGraw Hill, 2010.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 305	MEASUREMENT& METROLOGY	PCC

Unit-I

STANDARD AND MEASUREMENTS; Need of standards, classification primary, secondary and tertiary standards traceability of standards, length standard, line and end standards, derivation of end standards from lline standards gauges and their calibration, wave length standards, angle standards, angle, slip gauges , precision polygons and div. circles.

Unit-II

LIMITS, FITS AND TOLERENCES: Concept of interchangeability, type of interchangeability, needs standards system of limits, fits and tolerances, BIS 919,1963standard system, selection of limits and exercise on limit, fits and tolerances, design principle for limit gauges. Taylor's principle, types of gauges , tolerances on limit gauges.

Unit-III

MEASURING AND GAUGING INSTRUMENTS; Design principle of measuring instruments, kinematics design, principle of alignment pivots and bearing , sources of error in measurement, calibration of measuring instruments, mechanical linear and angle measuring instrument, vernier callipers, micrometres, dial gauge, bevel protector, sine bar, spirit level , optical instruments, autocollimator tool room microscope, length measuring machines, comparator magnification principles, types of comparators, mechanical optical pneumatic electrical and electronic comparator.

GEOMETRICAL METROLOGY: Concept of form error, straightness, roundness, squareness and concentricity error and their measurement.

Unit-IV

SCREW THREAD AND GEAR METROLOGY; Element of screw metrology, measurement of major, minor and effective diameters of external and internal screw thread, measurement of pitch and screw thread angel, effect of pitch error , element of gear metrology, measurement of gear tool thickness, gear profile, gear concentricity, pitch and run out for involute gears , gear rolling test. MEASUREMENT OF SURFACE FINISH: Concept of macro and micro errors , scales, surface roughness measures, datum for surface roughness measurement, M and E system,

measurement of surface roughness stylus methods using, mechanical, optical and electrical(talysurf) magnification(Tomlinson testers) (foster)

Unit-V

MACHINE TOOL METROLOGY; alignment tests of machine tools, lathe, drilling machines and milling machine performance test lathe

Text and Reference Books;

1. Metrology by R.K.JAIN,
2. Khanna publication statistical quality control by M. MAHAJAN, Dhanpat Rai publication
3. Statistical quality control by R.S NAGARAJAN
4. Total quality management by dale H. Bester field publication Pearson education
5. Metrology ASTM hand book

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 306**	**HYDRAULIC MACHINES LAB**	**PCC**

LIST OF EXPERIMENTS

1. To Study the Constructional details of Kaplan Turbine and draw Its Fluid Flow Chart.
2. To Study the Constructional details of Francis Turbine and draw Its Fluid Flow Chart
3. To Study the Constructional details of Pelton Turbine and draw Its Fluid Flow Chart
4. To Study the Constructional details of Hydraulic Ram and determine It's Various Efficiencies.
5. To Study the Constructional details of Centrifugal Pump and draw Its Characteristic Curve.
6. To Draw the Following Performance Characteristics of pelton turbine Constant Head, Constant Speed And Constant Efficiency Curve
7. To Draw the Following Performance Characteristics of Francis Turbine Constant Head, Constant Speed and Constant Efficiency Curve.
8. Performance Test on two stage centrifugal pump

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 307**	**DYNAMICS OF MACHINES LAB**	**PCC**

LIST OF EXPERIMENTS

1. To find experimentally the Gyroscopic couple on Motorized Gyroscope and compare with applied couple
2. To plot force vs. radius and lift vs. speed curves for Governors of Proel.
3. To plot force vs. radius and lift vs. speed curves for Governors of Porter.
4. To plot force vs. radius and lift vs. speed curves for Governors of Hartnell.
5. To plot pressure distribution curves on a journal bearing.
6. To perform wheel balancing.
7. To perform static and dynamic balancing on balancing set up.
8. To determine mass moment of inertia of a flywheel.
9. To study the different types of brakes.
10. To study the various types of dynamometers.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	PCC-ME 308	HEAT TRANSFER LAB	PCC

LIST OF EXPERIMENTS

1. To determine thermal conductivity of Insulating Powders.
2. To determine thermal conductivity of a Good Conductor of Heat (Metal Rod).
3. To Measure the thermal conductivity of Liquid.
4. To determine the transfer Rate and Temperature Distribution for a Pin Fin.
5. To Determine Stefan Boltzmann Constant of Radiation Heat Transfer.
6. To Determine Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection.
7. Determination of Heat Transfer Coefficient in Drop Wise and Film Wise condensation.
8. To Determine Critical Heat Flux in Saturated Pool Boiling.
9. To Study Performance of Simple Heat Pipes by force convection air flowing through it for different flow rate and heat flow rate.
10. To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.
11. To Find the Heat transfer Coefficient in Forced Convection in a tube. .
12. To find out the thermal conductivity of given slab.
13. To study the rates of heat transfer for different materials and geometries
14. To study the heat transfer through the insulating medium.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 309**	**MEASUREMENT& METROLOGY LAB**	**PCC**

LIST OF EXPERIMENTS

1. Calibration of Pressure Gauge
2. Calibration of Thermocouple
3. Calibration of LVDT
4. Calibration of Load cell
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.
6. Measurements using Optical Projector / Toolmaker Microscope.
7. Measurement of angle using Sine Center / Sine bar / bevel protractor
8. Measurement of alignment using Autocollimator / Roller set
9. Measurement of Screw threads Parameters using Two wire or Three wire method.
10. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
11. Measurement of gear tooth profile using gear tooth vernier / flange micrometer
12. Calibration of Micrometer using slip gauges.
13. Measurement using Optical Flats.
14. Use of dial indicator for measuring taper.
15. Use of combination set, bevel protector and sine bar for measuring taper.
16. Measurement of thread characteristic using vernier and gauges.
17. Use of slip gauge in measurement of centre distance between two pins.
18. Study of tolerance-limit-fit.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PROJ-ME 301**	**INDUSTRIAL TRAINING-I**	**PROJ**

Objective of Industrial Training: The objective of industrial training is to provide work experience so that students engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

Scheme of Studies: Duration 4 weeks in summer break after IV semester, assessment to be done in V semester practical examination .During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of Faculty of the concern Department of mechanical engineering. Then they will present a seminar on their training and present it in the institute in front of the committee headed by the HOD/Faculty Member.

Learning through Industrial Training: During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/equipment/instrument-their working and specifications.
- Product development procedure and phases.
- Project Planning, monitoring and control.
- Quality control and assurance.
- Maintenance system Costing system Stores and purchase systems.
- Layout of Computer/EDP/MIS centres.
- Problems related to various areas of work etc.
- Students are supposed to acquire the knowledge on above by Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- Hands on" experience Undertaking/assisting project work. Solving problems at the work place.
- Presenting a seminar participating in group meeting/discussion.
- Consulting current technical journals and periodicals in the library.

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 310	AUTOMOBILE ENGINEERING	PCC

UNIT-I

Introduction to Automobiles : Classification, Components, Requirements of Automobile Body; Vehicle Frame, Separate Body & Frame, Unitised Body, Car Body Styles, Bus Body & Commercial Vehicle Body Types; Front Engine Rear Drive & Front Engine Front Drive Vehicles, Four Wheel Drive Vehicles, Safety considerations; Safety features of latest vehicle; Future trends in automobiles.

UNIT-II

Clutches : Requirement of Clutches – Principle of Friction Clutch – Wet Type & Dry Types; Cone Clutch, Single Plate Clutch, Diaphragm Spring Clutch, Multi plate Clutch, Centrifugal Clutches, Electromagnetic Clutch, Over Running Clutch; Clutch Linkages.

Power Transmission : Requirements of transmission system; General Arrangement of Power Transmission system; Object of the Gear Box; Different types of Gear Boxes; Sliding Mesh, Constant Mesh, Synchro- mesh Gear Boxes; Epi-cyclic Gear Box, Freewheel Unit. Overdrive unit-Principle of Overdrive, Advantage of Overdrive, Transaxle, Transfer cases.

UNIT-III

Drive Lines, Universal Joint, Differential and Drive Axles: Effect of driving thrust and torque reactions; Hotchkiss Drive, Torque Tube Drive and radius Rods; Propeller Shaft, Universal Joints, Slip Joint; Constant Velocity Universal Joints; Front Wheel Drive; Principle, Function, Construction & Operation of Differential; Rear Axles, Types of load coming on Rear Axles, Full Floating, Three quarter Floating and Semi Floating Rear Axles.

Suspension Systems: Need of Suspension System, Types of Suspension; factors influencing ride comfort, Suspension Spring; Constructional details and characteristics of leaf springs.

UNIT-IV

Steering System : Front Wheel geometry & Wheel alignment viz. Caster, Camber, King pin Inclination, Toe-in/Toe-out; Conditions for true rolling motions of Wheels during steering; Different types of Steering Gear Boxes; Steering linkages and layout; Power steering – Rack & Pinion Power Steering Gear, Electronics steering.

UNIT-V

Automotive Brakes, Tyres & Wheels : Classification of Brakes; Principle and constructional details of Drum Brakes, Disc Brakes; Brake actuating systems; Mechanical, Hydraulic, Pneumatic Brakes; Factors affecting Brake performance, Power & Power Assisted Brakes; Tyres of Wheels; Types of Tyre & their constructional details, Wheel Balancing, Tyre Rotation; Types of Tyre wear & their causes.

Text and Reference books:

1. Automobile Engineering by Anil Chhikara, SatyaPrakashan, New Delhi.

2. Automobile Engineering by Dr. Kirpal Singh, standard Publishers Distributors.

3. Automobile Engineering by D.S. Kumar, S.K. Kataria and Sons, New DelhiMechanical Engineering

(B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 311	MECHNAICAL VIBRATION	PCC

Unit-I

INTRODUCTION: Study of Vibrations, Mathematical Modelling, Degree of Freedom, Classification of Vibration, Simple Harmonic Motion,

SINGLE DEGREE OF FREEDOM (SDOF) SYSTEMS: Springs, Elastic Elements as Springs, Parallel, Series and General Combination of Springs, Other Sources of Potential Energy, Viscous Damping, Inertia Elements, Equivalent Mass, Inertia Effects of Springs, Free-Body Diagram Method, Small Angle or Displacement Assumption, Equivalent Systems Method

Unit-II

FREE VIBRATIONS OF SDOF SYSTEMS: Standard Form of Differential Equation, Free Vibrations of an Undammed System, Under damped, Critically Damped, over damped Free Vibrations, Coulomb Damping, Hysteretic Damping,

Unit-III

HARMONIC EXCITATION OF SDOF SYSTEMS: Forced Response of a Viscously Damped System Subject to a Single-Frequency Harmonic Excitation, Frequency-Squared Excitations, Rotating Unbalance, Response Due to Harmonic Excitation of Support, Vibration Isolation, Vibration Isolation from Frequency-Squared Excitations, Practical Aspects of Vibration Isolation, Seismic Vibration Measuring Instruments, Seismometers, Accelerometers

Unit-IV

TWO DEGREE-OF-FREEDOM SYSTEMS: Derivation of the Equations of Motion, Natural Frequencies and Mode Shapes, Free Response of Undamped Systems, Free Vibrations of a System with Viscous Damping, Harmonic Response of Two Degree-Of-Freedom Systems, Frequency Response , Dynamic Vibration Absorbers

Unit-V

NOISE: Effects, Ratings and Regulations, Non-auditory effects of noise on people, Auditory Effects of noise, Noise standards and limits in India, Major sources of the noise, Industrial noise sources, Industrial noise control-strategies, Noise control at the source, Noise control along the path, Acoustic barriers, Noise control at the receiver.

SOUND LEVEL AND SUBJECTIVE RESPONSE TO SOUND: Frequency dependent human response to sound, Sound pressure dependent human response, Decibel scale, Decibel addition, subtraction and averaging, Relationship among sound power, sound

intensity and sound pressure level, Sound spectra, Octave band analysis, Loudness.

Text and Reference Books:

1. S. Graham Kelly: Mechanical Vibrations: Theory and Applications
2. Den Hartog, J. P.: Mechanical Vibrations
3. Rao, S. S.: Mechanical Vibrations
4. J. S. Rao, Dr. K. Gupta: Introductory Course on Theory and Practice of Mechanical Vibrations
5. Mechanical Vibrations: G.K. Grover

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 312	OPERATION RESEACH	PCC

Unit-I

Basics of operations research, linear programming, scope, problem formulation, graphical method, simplex methods, primal and dual problem sensitivity analysis.

Unit-II

Transportation and assignment problems, deterministic dynamic programming, multistage decision problems and solution, principle of optimality.

Unit-III

Decision theory, decision under various conditions, game theory, two person zero sum game, solution with/without saddle point, dominance rule, methods like algebraic, graphical, liner programming sequencing basic assumption, *n* jobs through two/three machines, jobs on *m* machines.

Unit-IV

Stochastic inventory models - single and multi-period models with continuous and discrete demands, service level and reorder policy simulations - use, advantages& limitations, Monte-Carlo simulation, application to queuing, inventory and other problems.

Unit-V

Queuing models, characteristics of queuing model, M/M/1 and M/M/S system, cost consideration, project management concepts, rules for drawing the network diagram, Applications of CPM and PERT in project planning and control; crashing of operations; resource allocation.

Text and References Books:

1. Operations Research, Wangner
2. Operations Research, Taha
3. Introduction to Management Science, Hiller & Hiller
4. Operations Research by, Wayne L. Winston

PROFESSIONAL ELECTIVE COURSE (PEC)

Professional Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PEC-ME-301	Applied Thermodynamics	PEC

Unit -I

Steam Boiler: Boilers and their classification, comparison between fire tube and water tube boilers, essentials of a good boiler. Constructional and operational details of Locomotive, Babcock-Wilcox, and Lamont boilers, Boiler mountings and accessories. Natural draft from chimney, height of chimney, maximum draft and chimney efficiency, forced draft and induced draft, Boiler Heat Balance Sheet.

Unit -II

Compressible flow: Basics of compressible flow. Stagnation properties, Isentropic flow of a perfect gas through a nozzle, choked flow, subsonic and supersonic flows- normal shocks- use of ideal gas table for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, super-saturation- compressible flow in diffusers, efficiency of nozzle and diffuser. Reciprocating compressors, staging of reciprocating compressors, optimal stage pressure ratio, effect of inter-cooling, minimum work for multistage reciprocating compressors.

Unit -III

Steam Turbines: Classification, flow through impulse blades, velocity diagram, calculation of power output and efficiency, maximum blade efficiency of single stage impulse turbine, blade friction, compounding of impulse turbine. Flow through impulse reaction blades, degree of reaction, velocity diagram, calculations for power output, efficiency and blade height, comparison of impulse and impulse reaction turbines.

Unit -IV

Efficiency and Governing in Steam Turbines: Losses in steam turbines, stage efficiency overall efficiency and reheat factor. Governing of steam turbines, throttle governing, nozzle control governing and by pass governing. Steam for heating and process work, back pressure turbines and pass out turbines.

Unit -V

Steam Condensers: Elements of a condensing plant, types of condensers, comparison of jet and surface condensers. Condenser vacuum, air leakage and loss of vacuum, vacuum efficiency and condenser efficiency, Dalton's law and air vapour mixture, air pumps.

Pschyrometric chart: Properties of dry and wet air, use of pschyrometric chart, processes involving heating/cooling and humidification/dehumidification, dew point.

Text and Reference books

1. Thermodynamics – An Engineering Approach, Cengel, Y.A., & Boles, M.A, McGraw – Hill Inc.
2. Thermal Engineering, Rajput, R.K., Laxmi Publications.
3. Engineering Thermodynamics by P.K.Nag, Tata McGraw Hill Pub
4. Thermodynamics and Heat Engines, Vol-II, R. Yadav, Central Publishing House.
5. A textbook of Thermal Engineering, R.S.Khurmi, S.Chand& Sons.
6. Thermal Engineering, Bellany, P.L., Khanna Publishers.
7. Applied Thermodynamics for Engineering Technologists, T.D. Eastop & A McConkey, Pearson Education.
8. Heat Engineering, V.P. Vasandani & D.S. Kumar, Metropolitan Book Co. Pvt. Ltd.

Professional Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PEC-ME-302	Tribology	PEC

Unit -I

Introduction to the concept of tribo design: Principles of tribo design, tribological problems in machine design, Plain sliding bearings, Rolling contract bearings, piston rings and cylinder liners.

Unit-II

Elements of Contact mechanics: Introduction, Concentrated and distributed forces on plane surfaces, Contact between two elastic bodies in the form of spheres, Contact between cylinders and between bodies of general shape, Failures of contacting surfaces. Thermal effects in surface contact.

Unit -III

Friction, lubrication and wear in lower kinematic pairs: Introduction, The concept of friction angle, Friction in screws with a square thread, Friction in screws with a triangular thread, , Boundary lubricated sliding bearings.

Unit -IV

Sliding-element bearings : Derivation of the Reynolds equation, Hydrostatic bearings Squeeze-film lubrication bearings, Thrust bearings, Journal bearings, Journal bearings for specialized applications, Gas bearings, Dynamically loaded journal bearings Modern developments in journal bearing design, Selection and design of thrust bearings self-lubricating bearings.

Unit -V

Rolling contact bearings: Introduction, Analysis of friction in rolling-contact bearings, Deformations in rolling contact bearings, Kinematics of rolling-contact bearings, Lubrication of rolling-contact bearings, Acoustic emission in rolling-contact bearings.

Text and Reference books

1. Dudley D.Fulier" Theory and practice of Lubrication for Engineers", New YorkCompany.1998
2. Moore "Principles and applications of Tribology" Pergamon press, 1975
3. Oscar Pinkus, Beno Sternlicht, “Theory of hydrodynamic lubrication”, McGraw-Hill, 1961
7. Tribology in Machine Design by T.A. Stolarski

Professional Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PEC-ME-303	Numerical Methods & Analysis	PEC

Unit-I

Basic concepts: round-off errors, floating point arithmetic, Convergence. Numerical solution of Nonlinear Equations a) Bisection method, fixed-point iteration, Newton's method, Error analysis for Iterative Methods, Computing roots of polynomials.

Unit-II

Interpolation and Polynomial Approximation: LaGrange Polynomial, Divided Differences, Hermite Interpolation

Unit-III

Numerical integration and differentiation: Trapezoidal rule, etc., Gaussian quadrature and Euler-Maclaurin formula. Applied Linear Algebra, Direct methods for solving linear systems, numerical factorizations, Eigenvalue problems.

Unit-IV

IVP problems for ODE: Euler's, Taylor, Runge-Kutta, and multistep methods, Stability, Numerical linear algebra, Directmethods, Iterative methods

Unit-V

Approximation theory : Least square approximation,ApproximatingEigenvalues,Power method, Householder's method , BVP for ODE ,Shooting method

Text and Reference books

[1] J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, Springer-Verlag, ISBN 0-387-90420-4

[2] L.N. Trefethen and D. Bau, Numerical Linear Algebra, Society of Industrial and Applied Mathematics

[3] C.T. Kelley, Iterative methods for linear and nonlinear equations, Society of Industrial and Applied Mathematics

OPEN ELECTIVE COURSE (OEC)

Open Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC301	Instrumentation &Control	OEC

Unit-I

Definition — Basic principles of measurement — Measurement systems, generalized configuration and functional descriptions of measuring instruments — examples.Dynamic performance characteristics — sources of error, Classification and elimination of error.

Measurement of Displacement: Theory and construction of various transducers to measure displacement — Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

Measurement of Temperature: Classification — Ranges — Various Principles of measurement — Expansion, Electrical Resistance — Thermistor — Thermocouple — Pyrometers — Temperature Indicators

Unit-II

Measurement of Pressure: Units — classification — different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows — Diaphragm gauges. Low pressure measurement — Thermal conductivity gauges — ionization pressure gauges, Mcleod pressure gauge.

Measurement of Level: Direct method — Indirect methods — capacitative, ultrasonic, magnetic, cryogenic fuel level indicators — Bubbler level indicators.

Unit-III

Flow Measurement: Rota meter, magnetic, Ultrasonic, Turbine flow meter, Hot — wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed: Mechanical Tachometers — Electrical tachometers — Stroboscope, Non- contact type of tachometer.

Measurement of Acceleration and Vibration: Different simple instruments — Principles of Seismic instruments — Vibro meter and accelerator meter using this principle.

Unit-IV

Stress Strain Measurements: Various types of stress and strain measurements — electrical strain gauge — gauge factor — method of usage of resistance strain gauge for bending compressive and tensile strains — usage for measuring torque, Strain gauge Rosettes.

Measurement of Humidity: Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

Measurement Of Force, Torque And Power: Elastic force meters, load cells, Torsion meters, Dynamometers.

Unit-V

Elements of Control Systems: Introduction, Importance — Classification — Open and closed systems Servomechanisms — Examples with block diagrams — Temperature, speed and position control systems.

Text and Reference Books

1. Measurement Systems: Applications & Design I D.S Kumar/Anuradha Agencies.
2. Instrumentation, measurement & analysis IB.C.Nakra&K.K.Choudhary/ TMH.
3. Beckwith Thomas G., "Mechanical Measurements", Narosa Publishing House, New Delhi.
4. Doeblein E. O., "Measurement Systems", Application Design, McGraw Hill, 1990
5. Kumar K. J., "Engineering metrology", MacDonald and Co, 1963
6. Gupta I. C., "Engineering Metrology", DhanpatRai& Sons, New Delhi, 1994.

Open Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-302	Total Quality Management	OEC

UNIT-I

Introduction: Evolution of Quality Management, Philosophy, Concepts of Product and Service Quality, Dimensions of Quality, Quality Guru's, Quality Awards, Quality Cost.

UNIT-II

Quality Assurance: Inspection, Quality control, Quality assurance, Concept and Advantage of quality assurance, Quality rating, Quality survey/audit, Vendor rating, Quality function deployment.

Process Quality Improvement: Introduction to Process Quality, Graphical and statistical techniques for Process Quality Improvement, Graphical tools for data representation, 7QC tools, Process capability analysis, Measurement system analysis.

UNIT-III

Acceptance Sampling: Concept of acceptance sampling, advantage and limitations of sampling inspection, Sampling methods, Operating characteristics curve, producer and consumer risk, Average outgoing quality limits, sampling plans, sampling plans for variables, Problems.

UNIT-IV

Control Charts: Chance and assignable causes of process variation, statistical basis of the control chart, control charts for variables - $\bar{x}$ and R charts, attribute control charts - p, np, c and u-Construction and application, Problems.

UNIT-V

Contemporary Trends in Quality Engineering & Management: Introduction to Quality Management Standards – ISO : 9000, ISO:14000, Reliability, Quality circles, Concept of Six sigma, Basic steps involve in six sigma, National and International bodies for quality aspects, Introduction to Japanese's quality techniques such as 5S, Kaizen, SMED, TQM,TPM.

Text and References Books:

1. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990. .
2. Greg Bounds. "Beyond Total Quality Management". McGraw Hill, 1994.

3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

Open Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-303	PRODUCT DESIGN AND DEVELOPMENT	OEC

Unit-I

Need for developing products – the importance of engineering design – types of design –the design process – relevance of product lifecycle issues in design –designing to codes and standards- societal considerations in engineering design –generic product development process – various phases of product development-planning for products –establishing markets- market segments- relevance of market research

Unit-II

Identifying customer needs –voice of customer –customer populations- hierarchy of human needs gathering methods – affinity diagrams – needs importance- establishing engineering characteristics-competitive benchmarking- quality function deployment- house of quality-product design specification-case studies

Unit-III

Creative thinking –creativity and problem solving- creative thinking methods- generating design concepts-systematic methods for designing –functional decomposition – physical decomposition – functional representation –morphological methods-TRIZ- axiomatic design

Unit-IV

Decision making –decision theory –utility theory –decision trees –concept evaluation methods – Pugh concept selection method- weighted decision matrix –analytic hierarchy process – introduction to embodiment design –product architecture – types of modular architecture –steps in developing product architecture

Unit-V

Industrial design – human factors design –user friendly design – design for serviceability – design for environment – prototyping and testing – cost evaluation –categories of cost –overhead costs – activity based costing –methods of developing cost estimates – manufacturing cost – value analysis in costing

References Books

1. George E.Dieter, Linda C.Schmidt, "Engineering Design", McGraw-Hill International Edition, 4th Edition, 2009, ISBN 978-007-127189-9

2. Anita Goyal, Karl T Ulrich, Steven D Eppinger, “Product Design and Development “, 4th Edition, 2009, Tata McGraw-Hill Education, ISBN-10-007-14679-9
3. Kevin Otto, Kristin Wood, “Product Design”, Indian Reprint 2004, Pearson Education, ISBN 9788177588217
4. Yousef Haik, T. M. M. Shahin, “Engineering Design Process”, 2nd Edition Reprint, Cengage Learning, 2010, ISBN 0495668141

Open Elective-II

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-304	Cyber Laws And Security	OEC

UNIT-I

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles.

UNIT-II

Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards. Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls, Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges

UNIT-III

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls

UNIT-IV

Design and Implementation Issues, Policies Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN

UNIT-V

Security metrics- Classification and their benefits Information Security & Law, IPR, Patent Law, Copyright Law, Legal Issues in Data mining Security, Building Security into Software Life

Cycle Ethics- Ethical Issues, Issues in Data and Software Privacy Cyber Crime Types & overview of Cyber Crimes

Text and References Books:

1. Godbole,“ Information Systems Security”, Willey

2. Merkov, Breithaupt, “ Information Security”, Pearson Education

3. Yadav, “Foundations of Information Technology”, New Age, Delhi

4. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill

Open Elective-II

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-305	Soft Computing	OEC

Unit-I

Neural Networks: History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithm perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perception Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

Unit-II

Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation.

Unit-III

Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

Unit-IV

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Unit-V

Fuzzy Logic: Classical Logic, Multi valued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Uncertainty based Information: Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets. Genetic Algorithms, Scope & application areas, solution of 0-1Knapsack problem using GA

Text and Reference books:

1. “Fuzzy sets and Fuzzy Logic: Theory and applications”,G.J. Klir,B.Yuan, PHI
2. “Introduction to Fuzzy sets and Fuzzy Logic”, M.Ganesh , PHI
3. “An Introduction to Fuzzy Control”, D Driankov, H Hellendoorn, M Reinfrank, Narosa Publishing Company
4. “ Neural Networks: A classroom approach”, Satish Kumar , Tata McGraw Hill
5. Haykin S., “Neural Networks-A Comprehensive Foundations”, Prentice-Hall International, New Jersey, 1999.

Open Elective-II

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-306	Special Electrical Machines	OEC

UNIT 1

Different types of FHP motors and uses in domestic & industrial applications, Single phase Induction motor, Qualitative examination starting and running performance of I-Phase Induction Motors.

UNIT 2

Linear Induction Motors and Actuators and its principle of operation, Linear Levitated machine & applications, Permanent magnet motors, High performance energy efficient machines, Effect of E.M.F injected into secondary circuits, quantitative study, scharge motor.

UNIT 3

Special Induction generations, Special motors and generators associated with Wind, Solar, Tidal, Biogas and other unconventional energy forms and their applications.

UNIT 4

Synchronous motors, Series universal motors, Stepper motor, Servo motor, Typical applications in Computers, Electronics, Communications and Information Technologies.

UNIT 5

Permanent magnet D.C. motor, Permanent magnet AC motors, Switch reluctance motors. Shaded pole motor, brush less D.C motor, Typical applications in Computers, Electronics, Communications and Information Technologies.

Text and References books:

1. Generalized Electrical Machines by P. S. Bhimbra
2 Generations of Electrical Energy by A. E. Fitzgerald/Charles , Kingsley J. R.
3 The Performance &design of A.C Commutator Motor by O.E .Taylor
4 Performance & Design of A.C machines by M.G. Say

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME-313**	**AUTOMOBILE ENGINEERING LAB**	**PCC**

LIST OF EXPERIMENTS

1. Study of cooling system of an automotive vehicle
2. Study of the ignition system, setting of contact breaker points and spark plug gap
3. Demonstration of steering system and measurement of steering geometry angles and their impact on vehicle performance.
4. Model Study of braking system with specific reference to master cylinder, brake shoes, overhauling of system and the adjusting of the system.
5. Model Study of transmission system elements as clutches, gear box assembly and differential.
6. Replacing of ring and studying the method of replacing piston after repair.
7. Model Study of fuel injection system, carburettor.

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME-314**	**Mechanical Vibration Lab**	**PCC**

LIST OF EXPERIMENTS

1. To verify relation $T = 2\pi * (l/g)^{1/2}$ for a simple pendulum.
2. To determine radius of gyration of compound pendulum.
3. To determine the radius of gyration of given bar by using bifilar suspension.
4. To determine natural frequency of a spring mass system.
5. To study undammed free vibration of Equivalent spring mass system.
6. To determine natural frequency of free torsional vibrations of single rotor system.
   i. Horizontal rotor
   ii. Vertical rotor
7. To study the damped torsional oscillation and to determine the damping coefficient.
8. To verify the dunker ley's rule Viz.
9. Study the forced vibration of the beam for different damping.
10. Study of Vibration measuring instruments.
11. To study torsional vibration of single rotor system.
12. To study the free vibration of two rotor system and to determine the natural frequency of vibration theoretically and experimentally.

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 401	COMPUTER AIDED DESIGN	PCC

Unit-I

Fundamentals of Computer Graphics- Product cycle, sequential and concurrent engineering, Computer Aided Design, CAD system architecture, computer graphics, Coordinate systems, 2D and 3D transformations, viewing transformation

Unit-II

Geometric Modeling- representation of curves, Hermite curves, Bezier curves, B-spline curves, rational curves, Techniques of surface modelling, surface patch, Coons and bicubic patches, Bezier and B-spline surfaces

Unit -III

Parametric representation of curves, Plane curves - line, circle, ellipse, parabola and hyperbola, , Solid modelling techniques, CSG and B-rep. Visual realism- hidden line-surface-solid removal algorithms, shading, colouring, computer animation

Unit -IV

Scan Conversion, Rendering, Rasterising polygons, Hidden surface removal, Antialiasing, Reflection, shading, generation of character

Computer Hardware: Introduction, Classification, fundamental of computer; Data communication, Design of workstation, Interactive display devices, Input devices, Output devices.

Unit -V

Assembly of parts- assembly modelling, interferences of positions and orientation, tolerance analysis, mass property calculations, mechanism simulation and interference checking CAD standards- Graphical Kernel System (GKS), standards for vexchange images, Open Graphics Library (OpenGL), Data exchange standards- IGES, STEP, CALS etc.,

Communication standards

Text and References Books:

1. Mathematical elements for Computer Graphics, Rogers and Adams, Tata McGraw Hill
2. CAD/CAM: Theory and Practice, Zeid and Sivasubramanian., Tata McGraw Hill
3. Elements of Computer Aided Design and Manufacturing, Pao Y.C., John Wiley and Sons.

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 402	REFRIGERATION & AIR CONDITIONING	PCC

Unit-I

Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect and C.O.P., Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Boot strap refrigeration.

Unit-II

Vapour Compression System, Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P., Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P. of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirements, Inter cooling, Different configuration of multistage system, Cascade system.

Unit-III

Principle of vapour absorption refrigeration system, Comparison between absorption and compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature - concentration diagram and Enthalpy – concentration diagram, Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Refrigerants: Classification, nomenclature, properties, Types of refrigerants.

Unit-IV

Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside and outside design conditions, Heat transfer through walls & roofs, Infiltration and ventilation, Internal heat gain, Sensible heat factor, By pass factor, Grand Sensible heat factor, Apparatus dew point.

Unit-V

Refrigeration and air conditioning equipment's: Compressors, Condensers, Evaporators &Expansion devices, Air washers, Cooling towers and humidifying efficiency, Cold storage and food preservation, Freezers, Ice plant, Water coolers, Basic difference between comfort and industrial air conditioning.

Text and Reference Books:

1. R.S. Khurmi and J. K. Gupta, Refrigeration and Air conditioning, S Chand publication.
2. Arora, C.P., Refrigeration and Air conditioning, Tata McGraw Hill, 2nd Edition, 2000.

3. Gosney, W.B, Principles of Refrigeration, Cambridge University Press, 1982.
4. Refrigeration and Air conditioning, Arora and Domkundwar.

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	HSMC 401	Engineering Economics	HSMC

Unit -I

Basic Principles and Methodology of Economics. Demand/Supply – elasticity – Government Policies and Application. Theory of the Firm and Market Structure. Basic Macro-economic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes

Unit –II

Public Sector Economics –Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve.

Unit -III

Elements of Business/Managerial Economics and forms of organizations. Cost &Cost Control – Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money (present and future worth of cashflows). Business Forecasting – Elementary techniques. Statements – Cash flow, Financial. Case Study Method.

Unit -IV

Indian economy - Brief overview of post-independence period – plans. Post reform Growth, Structure of productive activity. Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment–Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors.

Unit -V

Estimation /Measurements for various items- Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour

costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying.

Text and Reference Books:

1. Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia
2. V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw Hill
3. Misra, S.K. and Puri (2009), Indian Economy, Himalaya
4. PareekSaroj (2003), Textbook of Business Economics, Sunrise Publishers
5. M Chakravarty, Estimating, Costing Specifications & Valuation

Professional Elective-II

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	4	0	0	PEC-ME-401	Welding Technology	PEC

Unit-1

Electron beam welding, friction stir welding, plasma arc welding and ultrasonic welding, Laser beam welding, types of lasers, equipment, power calculation, applications, dual laser beam welding

Unit-II

Ultrasonic welding, propagation of ultrasonic waves in matter, mode of joint formation, joint types and design of product for ultrasonic welding, details of equipment

Unit-III

Investment casting, shell moulding, squeeze casting, vacuum casting, counter-gravity low - pressure casting, directional and mono-crystal solidification, semisolid metal casting and forging.

Unit-IV

Design of weldment, determination of distortion in weldments, modeling of temperature distribution. Design for casting, determination of hot spots, location of turbulence and other defects, modeling of flow in molds, modeling of heat transfer in castings.

Unit-V

NDT methods for welding, visual inspection, radio graphic, die penetrant, ultrasonic and magnetic particle inspection techniques.

Text and Reference Books:

1. Ravi B, Metal Casting- Computer Aided Design and Analysis, Prentice Hall, 2005.
2. Richard L Little, Welding and Welding Technology, Tata McGraw Hill, 2004.
3. John Campbell, Casting Practice, Elsevier Science Publishing Co., 2004.
4. Larry Jeffus, Welding: Principles and Applications, Delmar Publishers, 2004.
5. John Campbell, Casting, Butterworth Heinemann, 2003.

6. KlasWeman, Welding Processes Handbook, 2003.
7. Howard B Cary, Modern Welding Technology, Prentice Hall, 2002.

Professional Elective-II

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	**3**	**1**	**0**	**PEC-ME-402**	**Advanced strength of material**	**PEC**

Unit-I

Introduction to Cartesian tensors, Strains: Concept of strain, derivation of small strain tensor and compatibility, Stress: Derivation of Cauchy relations and equilibrium and symmetry equations, principal stresses and directions

Unit-II

Constitutive equations: Generalized Hooke's law, Linear elasticity, Material symmetry; Boundary Value Problems: concepts of uniqueness and superposition.

Unit-III

Plane stress and plane strain problems, introduction to governing equations in cylindrical and spherical coordinates, axisymmetric problems.

Unit-IV

Application to thick cylinders, rotating discs, torsion of non-circular cross-sections, stress concentration problems, thermo-elasticity, 2-d contact problems.

Unit-V

Solutions using potentials.Energy methods.Introduction to plasticity.

Text and Reference books

[1] G. T. Mase, R. E. Smelser and G. E. Mase, Continuum Mechanics for Engineers, Third Edition, CRC Press, 2004.
[2] Y. C. Fung, Foundations of Solid Mechanics, Prentice Hall International, 1965.
[3] Lawrence. E. Malvern, Introduction to Mechanics of a Continuous Medium, Prentice Hall international, 1969.

Professional Elective-II

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	4	0	0	PEC-ME-403	Production planning &control	PEC

Unit-I

Introduction to Production Systems: Production Systems: Classification & Characterization, Overview of Production Planning and Control issues, Review of EOQ & inventory control systems.

Unit-II

Just in Time Production Systems: Just-in-Time System: Evolution, Characteristics of JIT Systems, Continuous Improvement, The Kanban System, Strategic Implications of JIT System.

Unit-III

Material Requirement Planning: Dependent Demand & Material Requirement Planning, Structure of MRP system, MRP Calculations, Planning Issues, Implementation Issues.

Unit-IV

Factory Physics: Basic factory dynamics, Variability basics, Push and pull production systems, Lean manufacturing.

Aggregate Planning: Aggregate Planning: Purpose & Methods, Reactive and Aggressive Alternatives, Planning Strategies, Master Production Scheduling.

Unit-V

Issues in PPC: New developments in Planning & Control of Product-focused Systems and Process-focused Systems, Theory of Constraints.

Text and Reference Books:

1. Production & Operations Management – Chary, TMH, New Delhi.

2. Modern Production Management – S.S. Buffa, Pub.John Wiley.

3. Krajewski L.J. and Ritzmen L.P., Operations Management: Strategy and Analysis, 9th Edition, Pearson Education, 2010.

4. Chase, R.B., Jacobs, F.R. and Aquilano, N.J., Operations Management for Competitive Advantage, 11th Edition, Tata McGraw Hill Book Company, New Delhi, 2010.
5. Hopp, WJ and Spearman, ML, Factory Physics: Foundations of Manufacturing Management, McGraw Hill International Edition, Third Edition, 2008.

OPEN ELECTIVE-III

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-401	NON CONVENTIOANL ENERGY SOURCES	OEC

Unit-I

Global and National scenarios, Form and characteristics of renewable energy sources.

Solar Energy: Solar radiation, its measurements and prediction, Solar thermal collectors, flat plate collectors, concentrating collectors, Basic theory of flat plate collectors, solar heating of buildings, solar still, solar water heaters, solar driers, conversion of heat energy in to mechanical energy, solar thermal power generation systems.

Solar Photovoltaic: Principle of photovoltaic conversion of solar energy, types of solar cells and fabrication, **Photovoltaic applications:** battery charger, domestic lighting, street lighting, water pumping, power generation schemes.

Unit -II

Wind Energy: Atmospheric circulations, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS- classification, characteristics and applications.

Unit -III

Ocean Energy: Ocean energy resources, ocean energy routes, Principles of ocean thermal energy conversion systems, ocean thermal power plants, Principles of ocean wave energy conversion and tidal energy conversion.

Unit-IV

Other Sources: Nuclear fission and fusion, Geothermal energy- Origin, types of geothermal energy sites, site selection, geothermal power plants, Magneto-hydro-dynamic (MHD) energy conversion, Formation of biomass, photosynthesis, Biomass resources and their classification, Chemical constituents and physicochemical characteristics of biomass, Biomass conversion processes.

Unit-V

Fuel Cells: Thermodynamics and electrochemical principles, Basic design, types, applications. **Hydrogen Energy:** Economics of hydrogen, Production methods.

Text and References Books:

1. Power Generation through Renewable Source of Energy, Rai and Ram Prasad, Tata McGraw-Hill,
2. Ashok V. Desai,"Nonconventional Energy", New Age Internantional Publishers Ltd.

3. BansalKeemann, Meliss," Renewable energy soucesa and conversion technology", Tata McGraw Hill
4. RaiG.D,"Non-Conventional energy Sources", Khanna Publishers.

OPEN ELECTIVE-III

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC402	Management information system	OEC

Unit-I

Organisation & Types, Decision Making, Data & information, Characteristics & Classification of information, Cost & value of information, Various channels of information & MIS.

Unit-II

Foundation of Information System: Introduction to Information System in Business Fundamentals of Information System, Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria. Tool and Techniques of MIS-dataflow diagram, flow chart etc.

Unit-III

Business application of information technology, electronic commerce, Internet, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage.

Unit-IV

Managing Information Technology, Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change. Reports: Various types of MIS reports, GUI & Other Presentation tools.

Unit-V

Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resources, Finance, Accounting, Production & Logistics. Supply Chain Management, CRM, Procurement Management System Object Oriented modeling case studies.

Text and References Books:

1. O.Brian, “Introduction to Information System”, Mc-Graw Hill.
2. O.Brian, “Management Information System”, TMH. Alter,
3. “Information Systems : A Management Perspective”, Addison Wesley.
4. Arora& Bhatia, “Information Systems for Managers”,
5. Excel Bansal, “Information System Analysis & Design”, TMH. Jawadegar,

OPEN ELECTIVE-III

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3		0	OEC403	Soft Skills for Engineers	OEC

UNIT- I

SELF ANALYSIS: SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem.

CREATIVITY: Out of box thinking, Lateral Thinking**.**

UNIT- II

ATTITUDE: Factors influencing Attitude, Challenges and lessons from Attitude, Etiquette.

UNIT- III

MOTIVATION: Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.

UNIT-IV

GOAL SETTING : Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals.

TIME MANAGEMENT: Value of time, Diagnosing Time Management, Weekly Planner To do list, Prioritizing work

UNIT- V

LEADERSHIP: Skills for a good Leader, Assessment of Leadership Skills, Conflicts in Human Relations – Reasons Case Studies, Approaches to conflict resolution.

DECISION MAKING: Importance and necessity of Decision Making, Process and practical way of Decision Making, Weighing Positives & Negatives.

Text and Reference Books

1. Covey Sean, Seven Habit of Highly Effective Teens, New York, Fireside Publishers, 1998.

2. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.

3. Thomas A Harris, I am ok, You are ok , New York-Harper and Row, 1972

4. Daniel Coleman, Emotional Intelligence, Bantam Book, 2006

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 403**	**REFRIGERATION AND AIR CONDITIONING LAB**	**PCC**

LIST OF EXPERIMENTS

1. Study & Performance test rig and to study vapour compression Refrigeration Cycle
2. To find COP of water cooler.
3. To study and perform experiment on vapour absorption apparatus.
4. To find the performance parameter of experimental water cooling tower.
5. To study various components in room air conditioner.
6. To study different control devices of a refrigeration system.
7. To study various compressors.
8. To find the performance parameters of Ice Plant.
9. To perform the experiment & calculate various Performance parameters on a blower apparatus.
10. To study vapour compression water cooler test rig.

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
02	0	0	2	PROJ-ME 401	Industrial Training-II/ Seminar	PROJ

Objective of Industrial Training: This two credit course is meant to give students practice the objective of undertaking industrial training is to provide work experience so that students engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

Scheme of Studies: This two credit course is meant to give students of Duration 4 weeks in summer break after VI semester; assessment to be done in VII semester During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of Faculty of the concern Department Then they will present a seminar on their training and present it in the institute in front of the committee headed by the HOD/Faculty Member.

Learning through Industrial: Training: During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/equipment/instrument-their working and specifications.
- Product development procedure and phases. Project Planning, monitoring and control.
- Quality control and assurance.
- Maintenance system Costing system Stores and purchase systems.
- Layout of Computer/EDP/MIS centers.
- Problems related to various areas of work etc. Students are supposed to acquire the knowledge on above by Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- Hands on" experience Undertaking/assisting project work. Solving problems at the work place. Presenting a seminar participating in group meeting/discussion.
- Consulting current technical journals and periodicals in the library.

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
06	0	0	6	PROJ- ME 402	PROJECT-I	PROJ

The minor project work can be a design project, experimental fabrication project or software development project on any of the topics of mechanical engineering interest - it can be allotted as a group project with groups consisting of three or four students The assessment of all the minor projects should be done by a committee consisting of three or four faculty members specialized in the various fields of Mechanical Engineering - the students will present their project work and give a seminar on that topic for about thirty minutes - a committee consisting of at least three faculty members (preferably specialized in different fields of mechanical engineering) will assess the presentation of the seminars before the committee - the relative grading and group average marks for the various projects will be fixed by the committee - the guide will award the marks for the individual students in the project maintaining the group average - each group will prepare the project report and submit one copy of a write up of his minor project to the department through the guide - the Head of the Department will certify the copies and keep them in the departmental library

INSTRUCTIONS FOR PROJECT REPORT/ DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of B.E. (Mechanical Engineering).

1. Prepare one spiral Bound Copies of your manuscript

2. Limit your Dissertation report to 50– 60 pages (preferably)

3. The footer must include the following: Institute Name, B.E. (Mechanical) Times New Roman 10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using

a. Letter quality computer printing.

b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.

c. Use 1.5 line spacing.

d. Entire report shall be of 5- 7 chap

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 404	POWER PLANT ENGINEERING	PCC

Unit -I

Introduction To Power Plants & Boilers: Layout of Steam, Hydel, Diesel, MHD, Nuclear and Gas Turbine Power Plants, Combined Power Cycles, Comparison and Selection, Load Duration Curves. Steam Boilers and Cycles, High Pressure and Super Critical Boilers, Fluidised Bed Boilers

Unit – II

Steam Power Plant: Fuel and Ash Handling, Combustion Equipment for burning coal, Mechanical Stokers, Pulveriser, Electrostatic Precipitator, Draught, different types, Surface Condenser Types, Cooling Towers

Unit –III

Nuclear And Hydel Power Plants: Basics of nuclear energy conversion, Layout and subsystems of nuclear power plants, Nuclear Energy, Fission, Fusion Reaction, Types of Reactors, pressurized water reactor, Boiling Water Reactor, Waste Disposal and safety measures for nuclear power plants. Hydel Power Plant, Essential Elements, Selection of Turbines, Governing of Turbines, Micro Hydel developments.

Unit –IV

Diesel And Gas Turbine Power Plant: Types of Diesel Plants, Components, Selection of Engine Type, Applications Gas Turbine Power Plant, Fuels, Gas Turbine Material, Open and Closed Cycles, Reheating, Regeneration and Inter-cooling, Combined Cycle.

Unit –V

Other Power Plants: Hydroelectric power plants, classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems. capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants, Energy Rates, Types of Tariffs, power tariffs and Economics of load sharing, comparison of economics of various power plants.

Text and Reference Books:

1. G. R. Nagpal, “Power Plant Engineering”, Hanna Publishers, 1998.
2. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
3. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	HMSC-402	Entrepreneurship development & Management	HMSC

Unit I: Entrepreneurship

- Theories of Entrepreneurship
- Role and Importance of Entrepreneur in Economic Growth.

Unit II: Entrepreneurial Behaviours

- Entrepreneurial Motivation, Need for Achievement Theory
- Risk Taking Behavior
- Innovation and Entrepreneur

Unit III: Entrepreneurial Traints

- Definitions, Characteristics of Entrepreneurial Types
- Functions of Entrepreneur.

Unit IV: Entrepreneurial Development in India

- History, Objectives, Stages of Growth
- Target Group, Programmes
- Govt. Policy towards SSI's

Unit V: Project Feasibility Analysis

- Business Ideas – Sources, processing; Input requirements, Sources of Financing, Technical Assistance, Marketing Assistance
- Preparation of Feasibility Reports, Legal Formalities and Documentation.

Text and Reference books:

1. McClelland, D.C. & Winter, W.G. : Motivating Economic Achievement, Free Press.
2. Pareek, U &VenkateswaraRao, T : Developing Entrepreneurship – A Handbook on Learning Systems, Learning Systems, New Delhi.

3. Desai, A.N. : Entrepreneur and Environment, Ashish, New Delhi.
4. Druckar, Peter : Innovation and Entrepreneurship, Heinemann.
5. Chakraborty, Tridib : Introducing Entrepreneurship Development, Modern Book Agency

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 405	CNC Machines & Automation	PCC

Unit-I

Automation Introduction to CAM, Automated Manufacturing system, Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends. Features of NC Machines Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system, Methods for improving Accuracy considering the factors such as tool deflection and chatter and Productivity.

Unit-II

NC Part Programming & Common Problems in CNC Machines Part programming and basic concepts of part programming, NC words, part programming formats, simple programming for rotational components, part programming using canned cycles, subroutines and do loops, tool off sets, cutter radius compensation and wear compensation Manual (word address format) programming, Examples: Drilling, Turning and Milling, Canned cycles, Subroutine and Macro. APT programming, Geometry, Motion and Additional statements, Macro- statement. Common problems in mechanical, electrical, pneumatic, electronic and PC components of CNC machines, diagnostic study of common problems and Remedies , use of on-time fault finding diagnosis tools in CNC machines.

Unit-III

System Devices Introduction to DC motors, stepping motors, feedback devices such as encoder, counting devices, digital to analog converter and vice versa.

Interpolators Digital differential Integrator-Principle of operation, exponential declaration, DDA Hardware Interpolator- Linear, Circular, DDA Software Interpolator

Control of NC Systems Open and closed loops, Control of point to point systems, Incremental open loop control, Incremental close loop, Absolute close loop, Control loop in contouring systems, Adaptive control.

Unit-IV

Computer Integrated Manufacturing system Group Technology, Flexible Manufacturing System, CIM, CAD/CAM, Computer aided process planning Retrieval and Generative, Concept of Mechatronics, Computer aided Inspection.

Unit-V

Robotics and Intelligent Manufacturing Types and generations of Robots, Structure and operation of Robot, Robot applications, Economics, Robot programming methods. Introduction to Artificial Intelligence for Intelligent manufacturing.

Text and Reference Books:

1. Numerical Control and Computer aided Manufacturing, By Kundra, Rao and Tewari.

2. Automation, Production Systems and Computer Integrated Manufacturing by MikellP.Groover.

3. Computer Aided Manufacturing by Kundra and Rao.

4. Computer control of Manufacturing systems by Koren.

5. NC Machine Tools by S.J. Martin.

6. Computer Aided Design and Manufacture by Groover and Zimmer, PHI.

7. Technology of Computer aided Design and Manufacturing by Kumar and Jha, DhanpatRai and Sons

8. CNC Machines –Programming and Applications by M Adithan and BS Pabla, New Age International (P) Ltd., Delhi.

9. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata McGraw Hill,New Delhi.

10. Numerical Control of Machines Tools by YoremKorem and IB Uri, KhannaPublishers, New Delhi.

PROFESSIONAL ELECTIVE-III

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PEC-ME 404	MECHATRONICS,	PEC

Unit-I

Introduction about Mechatronics: scope of Mechatronics, application, process control automation and N/c Machines.

Unit-II

Sensors and Transducers: Introduction, classification, specification, characteristics of transducers, type of transducers displacement, strain, vibration pressure, flow, temperature, force and torque, tactile.

Unit-III

Hydraulic Pneumatic and Electrical actuators: Pumps and Compressors, control valves and accessories, actuators, fluid power symbols, fluid power systems, switching devices, solenoids, motors.

Unit-IV

Data Acquisition and Control System: Introduction, Quantitating theory, Analog to Digital Conversion, Digital to Analog (D/A) conversation, transfer function, transient response and frequency response and frequency response, stability criteria

Unit-V

Design of Mechatronic systems: Introduction, Automatic front and book and cutting in steel rolling mill, lift control system, CNC lathe, temperature control of a heat treatment furnace, EOT crane control panel, Grey grain separators, electrode arm control in electric arc furnace.

Text and References Books

1. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, Bolton, W., Pearson Education
2. Mechatronics: Principles, Concepts and applications, Mahalik N.P., Tata McGraw Hill.
3. Mechatronics, HMT Hand Book, Tata McGraw Hill.
4. Mechatronics, Singh and Joshi, Prentice Hall of India.

PROFESSIONAL ELECTIVE-III

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	0	0	0	PEC-ME 405	RAPID PROTOTYPING	PEC

Unit-I

Introduction: Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP

Unit-II

CAD Modelling and Data Processing for RP: CAD model preparation, Data Requirements, Data formats (STL, SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP), Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation

Unit-III

RP Systems: Photo polymerization Stereo lithography (SL), SL resin curing process, SL scan patterns, Micro stereo lithography, Applications of Photo polymerization Processes. Powder Bed Fusion: Selective laser Sintering (SLS), Powder fusion mechanism and powder handling, SLS Metal and ceramic part creation, Electron Beam melting (EBM), Applications of Powder Bed

Unit-IV

Fusion Processes. Extrusion-Based RP Systems: Fused Deposition Modelling (FDM), Principles, Plotting and path control, Applications of Extrusion-Based Processes. 3D Printing : 3D printing (3DP), Research achievements in printing deposition, Technical challenges in printing, Printing process modelling, Applications of Printing Processes. Sheet Lamination: Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC), Gluing, Thermal bonding, LOM and UC applications. Beam Deposition: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Processing-structure-properties, relationships, Benefits and drawbacks.

Unit-IV

Errors in RP Processes: Pre-processing, processing, post-processing errors, Part building errors in SLA, SLS.

RP Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Text and Reference Books:

1. Chua C K, Leong K F, Chu S L, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific.
2. Gibson D W Rosen, Brent Stucker., Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer.
3. Chua C K, Leong K F, Chu S L, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific.
4. Noorani R, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons.
5. Liou W L, Liou F W, Rapid Prototyping and Engineering applications: A tool box for prototype development, CRC Press

PROFESSIONAL ELECTIVE-III

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	4	0	0	PEC-ME 406	Foundry Technology	PEC

UNIT-I

Introduction and types of foundries: Basic steps in the process of metal casting; comparison of casting with metal joining. Pattern and Pattern Making: Patterns: Materials, types and design of Patterns, Pattern, Pattern allowances, Pattern colors

UNIT-II

Mould and Mould Making: Introduction, Moulding Sand – Types and Properties, Moulding Tools and Equipment- Moulding Machines and Hand Moulding tools, Function of Core, Types of Cores, Core Prints, Core Venting and Baking, Core Shifting and Chaplets, Moulding Processes- Bench Moulding, Floor Moulding, Pit Moulding, Stack Moulding, Green Sand Moulding, Dry Sand Moulding, Loam Moulding, Core Moulding, Machine Moulding.

UNIT-III

Foundry Furnaces: Types of Foundry Furnaces- Cupola Furnace, Electric Arc Furnace, Induction Furnace.

Gating Systems: Gating System- types of Gates and Risers, Gating Ratios and chills, Riser location & design in actual casting, Directional Solidification in Casting, Physical Behavior of Metals during Solidification.

Finishing & Heat Treatment Processes: Various Fettling, Finishing and Heat Treatment of Casting

UNIT-IV

Advance Casting Processes: Investment Casting, Centrifugal Casting, Shell Moulding, Gravity die/ permanent mold, casting, Continuous Casting, pressure die casting, Slush Casting, Non - metal Molding /Ceramic Molding.

UNIT-V

Inspection and Testing of Casting: Defects in Casting, its causes and remedies, Inspection and Non destructive Testing of Casting

Modernization and Mechanization of Foundry: Material Handling, Pollution Control in Foundry, Application of Computers in Casting Processes

Text and Reference Books:

1. A Text Book of Foundry Technology by O.P. Khanna& M. Lal, DhanpatRai.

2. Manufacturing Technology Foundry Forming & Welding by P.N. Rao – TMH.

3. Foundry Technology by P.L. Jain.

4. Production Technology by P.C.Sharma – S Chand.

5. Process and Materials of Manufacture By Lindberg – PHI.

6. Casting Technology by Chakravarty – New Age.

7. Metal Casting by Ravi, PHI.

8. Metal Casting by RamaRao- New Age Publication.

9. Principles of Foundry Technology by R.K.Jain.

10. Principle of Metal Casting by Hein

Professional Elective-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PEC-ME 407	Gas Turbine and Gas Power Plant	PEC

Unit-I

Review of Basic Principles and Fundamentals of Rotating Machines: Cycle arrangements-Open cycle and closed cycle arrangements, Basic requirement of the working medium, Properties of various working media, Applications of gas turbine, Comparison of gas turbines with reciprocating engines, Ideal cycles, Simple gas turbine cycle, Heat exchange cycle, Reheat cycle with heat exchange, Intercooled cycle, Intercooled cycle with heat exchanger and reheat, Comparison of various cycles.

Unit -II

Practical Cycles and their Analysis: Effect of variable specific heat, Mechanical losses, Loss due to incomplete combustion, polytrophic efficiency, Performance of actual cycles, Comparison of ideal versus actual cycles and Jet propulsion cycles.

Unit -III

Thermodynamic Cycles: Advantages, disadvantages and performance characteristics of Ram jet engine, pulse jet engine, turbo prop engine, turbo jet engine, turbo fan engine, Calculation of specific thrust and efficiency.

Unit -IV

Combustion Systems: Combustion theory applied to gas turbine combustor, Factors affecting combustion chamber design and performance, Combustion chamber geometry, Fuel injection and ignition, Use of cheap fuels, Impulse and reaction type gas turbines, Velocity triangles and calculation of work done, Efficiency etc.

Unit -V

Advantages of a gas turbine power plant, Comparison with steam, Diesel and hydro power plant, Performance of GT power plant-part load efficiency, Airflow rate, Thermal efficiency, Gas turbine blading and fuels, Gas turbine materials, Free piston engine plant.

Text and Reference Books:

1. Power Generation Handbook, Philip Kiameh, McGraw Hill**.**
2. Gas Turbine Engineering Handbook, Meherwan P. Boyce, Gulf Professional Publication.

Professional Elective-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PEC-ME 408	AERODYNAMICS & THEIR ANALYSIUS	PEC

Unit -I

Introduction: Lift, drag, moment and related coefficients; Vector operations (review); conservation equations (mass, momentum and energy); Streamlines, streaklines and pathlines; Velocity potential and stream function

Unit -II

Inviscid, Incompressible flow: Bernoulli's equation, low-speed wind tunnel flows; Governing equations and boundary conditions; Elementary flows (uniform, sources, sinks and vortex); ideal lifting flow past a circular cylinder, Kutta-Joukowski theorem and lift generation; source panel method for non-lifting flows; d' Alembert's paradox.

Unit -III

Incompressible flow over airfoils: Introduction; Kutta Condition; Thin airfoil theory (symmetric, cambered); Aerodynamic center; vortex panel method for lifting flows; qualitative picture of viscous flow.

Unit -IV

Finite Wing Theory: Introduction; Downwash and induced drag; Biot-Savart Law and Helmholtz's Theorems; Prandtl's lifting line theory; Numerical lifting-line method; Someractical aspects. Introduction to Compressible flows (Inviscid): Thermodynamics review; Governing equations; Compressibility.

Unit -V

Normal Shock, Oblique Shock and Expansion Waves: Basic relations; flow over wedges and cones; shock interactions; blunt body flow; Prandtl-Meyer expansion waves; qualitative pitcute of shock wave-boundary layer interaction; quasi-one-dimensional flow through nozzles and diffusers.Linearized Theory for Subsonic and Supersonic Flows: Introduction; Velocity potential equation and linearized form; Prandtl-Glauert correction; Improved corrections; Critical Mach number; Drag divergence; Supercritical airfoils and area rule.

Text and Reference Books:

1.Houghton and Carruthers,"Aerodynamics for engineering students",Edward Arnold (1982).
2. McCormick B.W,"Aerodynamics, aeronautics and flight mechanics", John Wiley (1995).
3. Anderson, Jr. J.D "Aircraft performance and design" McGraw Hill International edition (1999).
4. Eshelby ,M.E."Aircraftperformancetheory and practice" , Butterworth-Heinemann, Oxford,U.K.,(2001).
5. Pamadi,B.,"Performance, stability, dynamics and control of an airplane",AIAA (2004).
6. Phillips, W.F."Mechanics of flight" 2nd Edition, John Wiley (2010).

Credits	L	T	P	Course Code	Course Title	Category of Course
03	**3**	**3**	**0**	**PEC-ME 409**	**Advance Manufacturing Processes**	**PEC**

Unit-I

ADVANCE MECHANICAL MACHINING PROCESSES: Classification of AMPs-process selection; Ultrasonic machining; machining setup; mechanics of cutting; parameter analysis; process capability; application. Abrasive water jet machining.

Unit-II

ADVANCE CHEMICAL AND THERMAL MACHINING PROCESSES: Electrochemical machining; electrochemical grinding; electrochemical honing; chemical machining; electric discharge machining; wire cut EDM; electron beam machining; laser beam machining.

Unit-III

ADVANCE CASTING PROCESSES: Metal mold casting: low and high pressure; continuous casting; squeeze casting; vacuum mold casting; evaporative pattern casting; chemical shell casting.

Unit-IV

ADVANCE WELDING PROCESSES: Electron beam welding; laser beam welding; ultrasonic welding

Unit-V

ADVANCE METAL FORMING PROCESSES: High rate energy forming (HERF) processes; electromagnetic forming; explosive forming; electro-hydraulic forming; stretch forming; contour roll forming.

Text and References books:

1. Manufacturing Engineering & Technology, 7th Edition SeropeKalpakjian, Illinois Institute of Technology Steven Schmid, The University of Notre Dame ©2014 |Pearson
2. Non traditional Manufacturing Processes Gary F. Benedict CRC Pres
3. Manufacturing Science by ghosh and mallik ; Prentice hall of India, 8th Edition
4. Shan & Pandey; Non traditional manufacturing

OPEN ELECTIVE-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC404	Utilization of electrical power &traction	OEC

Unit-1

Electric Heating: Different methods of electric heating. Principle of high frequency induction and di-electric heating. Construction, operation, performance and applications of arc furnace and induction furnace.

Electric Welding: Welding process, welding transformer, Classification of Electric Welding: arc welding, resistance welding, welding of various metals.

Unit-2

Illuminations: Definitions, laws of illuminations, polar curves, luminous efficiency, photometer, incandescent lamps: filament materials, halogen lamp. electric discharge lamps: sodium vapour lamp mercury vapour lamp and fluorescent lamp.

Light Calculations: commercial, industrial, street and flood lighting.

Unit-3

Electrolytic Process: Principles and applications of electrolysis, electro-deposition, manufactures of chemicals, anodizing, electro polishing electro-cleaning, electroextraction, electrorefinig, electro-stripping (parting) power supplies for electrolytic process.

Unit-4

Electric Traction & Means of Supplying Power: Systems of Electric Traction: DC & AC Systems, Power Supply for Electric Traction System: Comparison and application of different systems. Sub-station equipment and layout, conductor rail & pantograph.

Unit-5

Traction Methods: Types of services, speed time and speed distance curves, estimation of power and energy requirements, Mechanics of train movement. Co-efficient of adhesion, Adhesive weight, effective weight.

Traction Motor Controls: DC and AC traction motors, Series parallel starting. Methods of electric braking of traction motors.

Text and Reference Books

1. H. Partab,“Art and Science of Electrical Energy” DhanpatRai& Sons
2. H. Partab, “Modern Electric Traction” DhanpatRai& Sons.
3. C.L. Wadhwa – Utilization of Electric Traction Electric Power.
4. G.K.Dubey,“Fundamentals of Electric Drives” Narosa Publishing House
5. Vedam and Subrahmanyam – Concept & Application of Electric Drives (TMH)

OPEN ELECTIVE-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC405	Optimization techniques in Engineering	OEC

Unit-I

Unconstrained Optimization: Optimizing Single-Variable Functions, conditions for Local Minimum and Maximum, Optimizing Multi-Variable Functions.

Unit-II

Optimizing Multivariable Functions with Equality Constraint: Direct Search Method, Lagrange Multipliers Method, Constrained Multivariable Optimization with inequality constrained: Kuhn-Tucker Necessary conditions, Kuhn –Tucker Sufficient Conditions.

Unit-III

Quasi-Newton Methods and line search, least squares optimization, Gauss-Newton, Levenberg-Marquartd, Extensions of LP to Mixed Integer Linear Programming (MILP), Non-Linar Programming, The Newton Algorithm, Non-Linear Least Squares, Sequential Quadratics Programming (SQP), Constrained Optimization, SQP Implementation,

Unit-IV

Multi-Objective Optimization, Branch and Bound Approaches, Genetic Agorthms and Genetic Programming, Singular Based Optimization, On-Line Real Time Optimization, Optimization in Econometrics Approaches – Blue.

Unit-V

The Finite Difference Method for Poisson's Equation in two Dimensions and for the Transient Heat Equation, Eulers Method, The Modified Euler Method and the Runge-Kutta Method for Ordinary Differential Equations, Jacobi's Iteration Method.

Text and Reference Books:

1. Winston W L: Operations Research: Applications and Algorithms
2. Rao S.S., Optimization: Theory and Applications.
3. Walsh G R: M methods of Optimization.
4. Williams H.P.: Model Building in Mathematics Programming.
5. Williams H.P.: Model Solving in Mathematics Programming

3. H.A. Taha,"Operations Research:An Introduction", 5th Edition, Macmillan, New York, 1992. 4. K. Deb,"Optimization for Engineering DesignAlgorithms and Examples",Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.
5. K.SrinivasaRaju and D. Nagesh Kumar, "Multicriterion Analysis in Engineering and Management",PHI Learning Pvt. Ltd., New Delhi, India, ISBN 978-81-203-3976-7, pp.288

OPEN ELECTIVE-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC406	Microprocessor& microcontroller	OEC

Unit-I

Architecture of Microprocessors (6) General definitions of mini computers, microprocessors, micro controllers and digital signal processors.Overview of 8085 microprocessor.Overview of 8086 microprocessor. Signals and pins of 8086 microprocessor

Unit-II

Assembly language of 8086 (6) Description of Instructions.Assembly directives. Assembly software programs with algorithms

Unit-III

Interfacing with 8086 (8) Interfacing with RAMs, ROMs along with the explanation of timing diagrams. Interfacing with peripheral ICs like 8255, 8254, 8279, 8259, 8259 etc.Interfacing with key boards, LEDs, LCDs, ADCs, and DACs etc.

Unit-IV

Coprocessor 8087 (4) Architecture of 8087, interfacing with 8086. Data types, instructions and programming,Architecture of Micro controllers (4) Overview of the architecture of 8051 microcontroller. Overview of the architecture of 8096 16 bit microcontroller.

Unit-V

Assembly language of 8051 (4) Description of Instructions.Assembly directives. Assembly software programs with Algorithms.Interfacing with 8051 (5) Interfacing with keyboards, LEDs, 7 segment LEDs, LCDs, Interfacing with ADCs. Interfacing with DACs, etc. Module 8: High end processors (2) Introduction to 80386 and 80486

Text and Reference Books:

1. N.Senthilkumar, M.Saravanan, S,Jeevanathan, “Microprocessors and Microcontrollers”, Oxford University Press, 2011.
2. Kenneth J Ayala, “The 8086 Microprocessor: Programming and Interfacing the PC”, Cengage Learning, Reprint 2014.
3. 5. Kenneth J Ayala, “The 8051 Microcontroller”, 3rd edition, Cengage Learning, Reprint 2014.

4. 6. Muhammed Ali Mazidi, Janice GillispleMaidi, Rolin.D. McKinlay, “ The 8051 Microcontroller and Embedded Systems, Using Assembly and C”, Second edition, Pearson Prentice Hall, 2015.

OPEN ELECTIVE-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-407	RELIABILITY AND MAINTINENCE ENGINEERING	OEC

Unit-I

Introduction: Maintenance Objectives and Functions, Maintenance Organisation and Administration of Maintenance Systems, Need of planned maintenance, Maintenance policies, Breakdown, time based maintenance, Block replacement, age replacement and periodic replacement policy, Corrective and preventive maintenance, Maintenance planning, Scheduled maintenance, Cost of maintenance versus Cost of equipment and production delays.

Inspection: Inspection intervals, Inspection reports, card history system.

Unit-II

Predictive Maintenance: Equipment wear records, standards, Equipment used inpredictive maintenance. Computerized maintenance, Total Productive Maintenance, Methods of condition monitoring, Non-destructive testing, Liquid Penetrate, Magnetic particles, Ultrasonic testing, and Vibration analysis, Oil analysis, Radiographic testing.

Unit-III

Reliability: Definition, failure data analysis, Mean failure rate, mean time to failure(MTTF), mean time between failures (MTBF), hazard rate, Bathtub curve, Use of Weibull probability chart foe assessing characteristics life, guarantee period etc.

Unit-IV

System Reliability: Series, parallel and mixed configuration, Simple problems.

Reliability Improvement: Techniques, use of Pareto analysis-Design for reliability, redundancy unit and stand by redundancy, Optimization of reliability.

Unit-V

Spare Parts Management: Spare parts, features and categorization of spares, cost considerations, Techniques of cost reduction, Selective controls used in spare parts control, ABC analysis, FSN, XYZ, VED and other approaches, Inventory control of spares.

Text and Reference Books

1. Reliability Engineering, Srinath L.S., Affiliated East West Press.
2. Maintainability Principles and Practices, Blanchand, B.S., McGraw Hill
3. C.E. Ebeling, An Introduction to Reliability and Maintainability Engineering, McGrawHill, 1997.
4. . V. A. Profillidis, Railway management and engineering, 3rd Edition, Burlington, Ashgate Pub. Co., 2006.
5. Bury St Edmunds, Railway rolling stock, organized by the Railway Division of the Institution of Mechanical Engineers (IMechE) and the Institution of Civil Engineers (ICE) for IMechE, 2001

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	PCC-ME 407	CNC Machines & Automation Lab	PCC

PART - A

CNC part programming using CAM packages. Simulation of Turning, Drilling, Milling operations. 3 typical simulations to be carried out using simulation packages like Master- CAM, or any equivalent software.

PART - B

(Only for Demo/Viva voce)

1. FMS (Flexible Manufacturing System): Programming of Automatic storage and Retrieval system (ASRS) and linear shuttle conveyor Interfacing CNC lathe, milling with loading unloading arm and ASRS to be carried out on simple components.

2. Robot programming: Using Teach Pendent & Offline programming to perform pick and place, stacking of objects, 2 programs.

PART - C

(Only for Demo/Viva voce)

Pneumatics and Hydraulics, Electro-Pneumatics: 3 typical experiments on Basics of these topics to be conducted.

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
06	**0**	**0**	**6**	**PROJ- ME 403**	**Major Project**	**PROJ**

The major project work can be a Modelling and Simulation, Case study, Design or Experiments in the field of Mechanical Engineering. It can be allotted as a group project with groups consisting of 3 to 4 students. The major project work started in the seventh semester (minor project) may be continued in this semester - the students should complete the project work in this semester and present it before the assessment committee The assessment committee will assess the various projects, fix the relative grading and group average marks - the guides will award the marks for the individual students in a project maintaining the group average - each group should submit three copies of a write up of his major project of the completed project report signed by the department (in the format prescribed by the department) through the guide - the Head of the Department-Dean of School of engineering and Technology will certify the copies and one copy return them to the students - other copy will be kept in the departmental and university library

INSTRUCTIONS FOR PROJECT REPORT/ DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of B.E. (Mechanical Engineering).

1. Prepare Three Hard Bound Copies of your manuscript and if possible publish at least one international journal paper by each group for value addition of your project.

2. Limit your Dissertation report to 80 – 120 pages (preferably)

3. The footer must include the following: Institute Name, B.E. (Mechanical) Times New Roman 10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using

a. Letter quality computer printing.

b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.

c. Use 1.5 line spacing.

d. Entire report shall be of 5- 7 chapters.

6. Use the paper size 8.5‘‘× 11‘‘or A4 (210 × 197 mm).

Margin Location	Paper 8.5‘‘× 11‘‘	Paper A4 (210 × 197 mm)
Top	1‘‘	25.4 mm
Left	1.5‘‘	37 mm
Bottom	1.25‘‘	32 mm
Right	1‘‘	25.4 mm

7. All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.
8. Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.
9. Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, black and white. Illustrations downloaded from internet are not acceptable.

a. Illustrations should not be more than two per page. One could be ideal
b. Figure No. and Title at bottom with 12 pt
c. Legends below the title in 10 pt
d. Leave proper margin in all sides
e. Illustrations as far as possible should not be photo copied.

11. Photographs if any should of glossy prints

12. Please use SI system of units only.

13. Please number the pages on the front side, centrally below the footer

14. References should be either in order as they appear in the thesis or in alphabetical order by last name of first author

15. Symbols and notations if any should be included in nomenclature section only

16. Following will be the order of report

i. Cover page and Front page as per the specimen on separate sheet
ii. Certificate from the Institute as per the specimen on separate sheet
iii. Acknowledgements
iv. List of Figures
v. List of Tables
vi. Nomenclature vii. Contents
vii. Abstract

(A brief abstract of the report not more than 150 words. The heading of abstract i.e. word ―Abstract‖ should be bold, Times New Roman, 12 pt and should be typed at the centre. The contents of abstract

should be typed on new line without space between heading and contents. Try to include one or two sentences each on motive, method, key-results and conclusions in Abstract

1) Introduction (2-3 pages) (TNR – 14 Bold)
Problem statement (TNR – 12)
1.1 Objectives
1.2 Scope
1.3 Methodology
1.4 Organization of Dissertation
2) Literature Review (20-30 pages) Discuss the work done so far by researchers in the domain area and their significant conclusions. No derivations, figures, tables, graphs are expected.

3)This chapter shall be based on your own simulation work (Analytical/ Numerical/FEM/CFD) (15- 20 pages)
4) Experimental Validation - This chapter shall be based on your own experimental work (15-20 pages)
5) Concluding Remarks and Scope for the Future Work (2-3 pages) References ANNEXURE (if any) (Put all mathematical derivations, Simulation program as Annexure)
17.All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, ….and for subheadings 1.1, 1.2, …. etc and section subheadings 2.1.1, 2.1.2, …. etc.
18. References should be given in the body of the text and well spread. No verbatim copy or excessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it.

Please follow the following procedure for references / Reference Books/ Patent/ Internet

- Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press, UK, 1996, pp. 110 – 112.
- 2. Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, ASHRAE Trans, 1991, 97 (1), pp. 90 – 98.
- Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillary tubes, Int. Journal of Refrigeration, 1996, 19 (8), pp.497 – 505.
- Papers from Conference Proceedings Colbourne, D. and Ritter, T. J., Quantitative assessment of flammable refrigerants in room air conditioners, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002, pp. 34 – 40.

Reports, Handbooks etc.

- United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent

- Patent no., Country (in parenthesis), date of application, title, year.

Internet

- www.(Site) [Give full length URL

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SCHOOL OF ENGINEERING & TECHNOLOGY (SOET)

RAFFELS UNIVERSITY, NEEMRAN

BTECH (4 Years Degree Program)

2022-23

PROGRAM B. TECH(CSE)

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

Engineering Graduates will be able to:

1) Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.

2) Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3) Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

4) Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

5) Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6) The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

7) Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9) Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

10) Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

11) Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12) Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.

Program Educational Objective (PEO)

PEO-1: To train students with practical skills and experimental practices related to core and applied areas of Computer Application to expand their knowledge horizon beyond books.

PEO-2: Graduate will establish himself/herself as effective professionals by solving real world problems using investigative and analytical skills along with the knowledge acquired in the field of Computer Application.

PEO-3: To improve team building, team working and leadership skills of the students with high regard for ethical values and social responsibilities.

PEO- 4: Graduate will embrace professional code of ethics in the profession while deliberately being part of projects which contributes to the society at large without disturbing the ecological balance.

Program Specific Outcomes (PSO)

PSO 1. To collect requirements, analyse, design, implement and test software Systems.

PSO 2. To analyse the errors and debug them within minimal time.

Scheme for B.Tech (3rd Sem)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 201	Data structure & algorithm using C	3	1	0	20	20	60	100	4
2	PCC	PCC-CSE 202	Object oriented programming through C++	3	1	0	20	20	60	100	4
3	PCC	PCC-CSE 203	Database Management System	3	1	0	20	20	60	100	4
4	PCC	PCC-CSE 204	Unix & Shell Programming	3	1	0	20	20	60	100	4
5	BSC	BSC 201	Mathematics –III	3	1	0	20	20	60	100	4
6	HSMC	HSMC 201	Human Values	3	1	0	20	20	60	100	4
7	PCC	PCC-CSE 205	Data structure & algorithm Using C Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 206	Object oriented programming through C++ Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE 207	Database Management System Lab	0	0	2	30	30	40	100	1
10	PCC	PCC-CSE 208	Unix & Shell Programming Lab	0	0	2	30	30	40	100	1
			Total	**18**	**6**	**8**				**1000**	**28**

SUBJECT NAME: -DATA STRUCTURE & ALGORITHM USING C

SUBJECT CODE: -PCC-CSE 201

Course outcomes:

CO1. Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented and used them and their common applications.

CO2. Discuss the efficiency of the sorting and searching algorithms

CO3. Implementation of Trees and Graphs and perform various operations on these data structures.

CO4. Understanding the concept of recursion, application of recursion and its implementation.

CO5. Identify the alternative implementations of data structures with respect to its performance to solve a real-world problem.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	

SUBJECT NAME: -OBJECT ORIENTED PROGRAMMING USING C++

SUBJECT CODE: -PCC-CSE-202

Course outcomes:

CO1. Able to develop programs with reusability.

CO2. Develop programs for file handling.

CO3. Handle exceptions in programming.

CO4. Develop applications for a range of problems using OOP techniques

CO5. Demonstrate the use of various OOPs concepts with the help of programs.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2									3		2
CO2	3	2	2									3		2
CO3	3	3	2									2		3
CO4	3	3	3	2	2	1			2		2	3	2	2
CO5	3											2		2

SUBJECT NAME: -DATABASE MANAGEMENT SYSTEM

SUBJECT CODE: -PCC-CSE-203

Course Outcomes:

CO 1. Describe the fundamental elements of relational database management systems.

CO 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO 3. Design ER-models to represent simple database application scenarios

CO 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

CO 5. Improve the database design by normalization.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3										1	2		
CO2	3	2	3								2	2	3	3
CO3	3	3	3	2	2	1	1		2	1	2	2	2	2
CO4	3	2		1								1		
CO5	3		2									2	1	

SUBJECT NAME: -UNIX & SHELL PROGRAMMING

SUBJECT CODE: - PCC-CSE-204

Course Outcomes:

CO1: Understand the basic concepts of UNIX Architecture and basic Command.

CO2: Understand the commands related to Shell basics, vi editor and regular expression commands.

CO3: Understand the concepts of advance file concepts, commands related to Shell script and filter commands.

CO4: Understand the concepts in Korn Shell and Interactive C Shell.

CO5: Understand different types of Files, File system and basic file system commands.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1									1		2
CO2	3	2	1									1		2
CO3	3	1	1									1		2
CO4	3	1			1							1		2
CO5	3		1									1		2

SUBJECT NAME: -Mathematics III

SUBJECT CODE: - BSC - 201

Course Outcomes:

CO1: To explore the fundamental knowledge of transforms and their types.

CO2: Laplace Transform and their applications.

CO3: Develop knowledge of double integration.

CO4: Explore the distribution in different situations.

CO5: Use Analytic functions

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2

SUBJECT NAME: -HUMAN VALUES

SUBJECT CODE: - HSMC 201

Course outcomes:

CO1. CO1: Understand and analyse the essentials of human values and skills, self-exploration, happiness and prosperity.

CO2: Evaluate coexistence of the “I” with the body.

CO3: Identify and evaluate the role of harmony in family, society and universal order.

CO4: Understand and associate the holistic perception of harmony at all levels of existence.

CO5: Develop appropriate technologies and management patterns to create harmony in professional and personal lives.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

CBCS Scheme for B.Tech (4th Sem)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 209	Digital Electronics	4	1	0	20	20	60	100	5
2	PCC	PCC-CSE 210	Discrete Mathematics	3	1	0	20	20	60	100	4
3	PCC	PCC-CSE 211	Computer Organization & Architecture	3	0	0	20	20	60	100	3
4	PCC	PCC-CSE 212	Design & Analysis of Algorithm	4	0	0	20	20	60	100	4
5	PCC	PCC-CSE 213	Operating Systems	4	0	0	20	20	60	100	4
6	HSMC	HSMC 401	Organizational Behaviour	3	0	0	20	20	60	100	3
7	PCC	PCC-CSE 214	Computer Organization & Architecture Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 215	Operating Systems Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE 216	Design & Analysis of Algorithm Lab	0	0	2	30	30	40	100	1
10	MC	MC-III	Constitutional Law	0	0	0	0	0	100	100	0
			Total	**21**	**2**	**6**				**1000**	**26**

SUBJECT NAME: - Digital Electronics

SUBJECT CODE: - PCC-CSE-209

Course outcomes:

CO1: Identify and enumerate different electronic components.

CO2: Illustrate reduction of logical expressions using boolean algebra and implement the functions using logic gates. Design and analyse synchronous and asynchronous sequential circuits using flip-flops.

CO3: Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.

CO4: Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

CO5: Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	2	3		2	2		3		1	1	1	1		
CO3	1	2	2	2	2	2		3		2		2		
CO4		2		2		2		2			1			
CO5	2		1	1	1		2	1	1	1	1	1		2

SUBJECT NAME: -Discrete Mathematics

SUBJECT CODE: - PCC-CSE-210

Course outcomes:

CO1: Explore the knowledge of set theory in relation, function and partially ordered relation.

CO2: define the concepts of truth table and modulus form to explore the universal quantification.

CO3: Develop the knowledge of generating function for recurrence relation.

CO4: Explore the knowledge of prime group, cyclic group and concept of ring.

CO5: Use graph theory to find the shortest path between any to vertices.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	1	2	1		2	2	1	2	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO4	3	3	3	3	3	2	2		2	1	1	1	2	3
CO5	3	2	1	1	3	3	2		1	1	1	2	2	3

SUBJECT NAME: -Computer Organization and Architecture

SUBJECT CODE: - PCC-CSE-211

Course outcomes:

CO1: Understand the theory and architecture of central processing unit.

CO2: Analyze some of the design issues in terms of speed, technology, cost, performance.

CO3: Design a simple CPU with applying the theory concepts.

CO4: Use appropriate tools to design verify and test the CPU architecture.

CO5: Learn the concepts of parallel processing, pipelining and interprocessor communication.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	2	1	1	1								2	2	2
CO3	2	2	2		2							2		
CO4	3	2	2	1	3							3		
CO5	3	1							1	1		2		

SUBJECT NAME: - DESIGN AND ANALYSIS OF ALGORITHM

SUBJECT CODE: - PCC-CSE-212

Course Outcomes:

CO1.Students will be introduced with algorithm.

CO2.Students will learn to design algorithms.

CO3.Students will learn to implement algorithm for coding.

CO4. Argue the correctness of algorithms using inductive proofs and invariants.

CO5. Analyze worst-case running times of algorithms using asymptotic analysis.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1							1	3	1
CO2	2	1	1	1	1							1	1	1
CO3	2	2	2	1	1							1	3	1
CO4	2	2	2	1	1							1	3	1
CO5	2	1	1	1	1							1	1	2

SUBJECT NAME: - OPERATING SYSTEM

SUBJECT CODE: - PCC-CSE-213

Course Outcomes:

CO 1. Identify the role of Operating System. To understand the design of control unit.

CO2. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.

CO3. Describe the role of paging, segmentation and virtual memory in operating systems.

CO4. Description of protection and security and also the Comparison of UNIX and Windows based OS.

CO5. Defining I/O systems, Device Management Policies and Secondary Storage Structure.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	3	2			2							3	2	2
CO3	3	2										2		
CO4	2				2							2		
CO5	2											1		

SUBJECT NAME: - ORGANIZATIONAL BEHAVIOUR

SUBJECT CODE: - HSMC- 401

Course Outcomes:

CO 1: Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organization behavior.

CO 2: Critically evaluate the potential effects of important developments in the external environment on organizational behavior.

CO 3: Analyze organizational behavioral issues in the context of organizational behavior theories, models, and concepts.

CO 4: Manage conflict in organizational context and deal with stress.

CO 5: Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

Scheme for B.Tech (5th Sem)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 301	Data Communication	4	0	0	20	20	60	100	4
2	PCC	PCC-CSE 302	Software Engineering	4	0	0	20	20	60	100	4
3	PCC	PCC-CSE 303	Formal Language & Automata Theory	3	1	0	20	20	60	100	4
4	PCC	PCC-CSE 304	Java Programming	3	0	0	20	20	60	100	3
5	HSMC	HSMC-CSE-301	Human Resource Management	3	0	0	20	20	60	100	3
6	PEC	PEC-CSE 301-303	Elective – I	4	0	0	20	20	60	100	4
7	PCC	PCC-CSE 305	Software Engineering Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 306	Java Programming Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE 307	Data Communication Lab	0	0	2	30	30	40	100	1
10	PROJ	PROJ-CSE 301	Industrial Training/ Project Seminar	0	0	4	0	0	100	100	2
			Total	**21**	**1**	**10**				**1000**	**27**

SUBJECT NAME: - DATA COMMUNICATION NETWORK

SUBJECT CODE: - PCC-CSE-301

Course Outcomes:

CO1 Student will be able to understand network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model.

CO2 Student will be able to understand various types of transmission media, network devices; and parameters of evaluation of performance for each media and device.

CO3 Student will be able to understand the concept of flow control, error control and LAN protocols; to explain the design of, and algorithms used in, the physical, data link layers

CO 4 Student will understand the working principles of LAN and the concepts behind physical and logical addressing, subnetting and supernetting

CO5 Student shall understand the functions performed by a Network Management System and to analyze connection establishment and congestion control with respect to TCP Protocol.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

SUBJECT NAME: - SOFTWARE ENGINEERING

SUBJECT CODE: - PCC-CSE-302

Course Outcomes:

CO 1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO 2. An ability to work in one or more significant application domains.

CO 3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO 4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO 5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2								3	2	2
CO2	3		1	1								2		
CO3	2	2	3	2	2	1	1		3	2	2	3	3	3
CO4	3				2							2		
CO5	3				3	2	1					2		

SUBJECT NAME: -FORMAL LANGUAGE AND AUTOMATA THEORY

SUBJECT CODE: - PCC-CSE 303

Course Outcomes:

CO 1 Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.

CO 2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics .

CO 3 Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.

CO 4. Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language

CO 5. Attitude- Develop a view on the importance of computational theory.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3	2	3	2								3	2	2
CO3	3	2	3	2								2	2	2
CO4	2	3	3	3								2	2	1
CO5	2											1		

SUBJECT NAME: - Java Programming

SUBJECT CODE: - PCC-CSE 304

Course Outcomes:

CO 1. Learn to apply object-oriented programming features and concepts for solving given problem.

CO2. Learn to use java standard API library to write complex programs

CO 3. Learn implementation of object-oriented programming concepts using java

CO 4. Able to develop interactive programs using applets and swings.

CO 5. Develop advanced skills for programming in Java.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											3		
CO2	2	2	2	2	3				2			2	2	2
CO3	3											2		
CO4	2											2		
CO5	3	2	2	2	2	2			2	2	2	3	2	3

SUBJECT NAME: - EMBEDDED SYSTEM

SUBJECT CODE: - PCC-CSE 304

Course Outcomes:

CO 1. Understand the microprocessor architecture and its components used in embedded systems

CO 2. Write the 8051-assembly language code for specific purposes

CO 3. Implement code for interfacing various devices.

CO 4. Develop simple embedded systems for real time operations

CO 5. Compose simple embedded system with error free software to obtain target system.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

SUBJECT NAME: - HUMAN RESOURCE MANAGEMENT

SUBJECT CODE: - HSMC-CSE-301

Course Outcomes:

CO 1. To develop the understanding of the concept of human resource management and to understand its relevance in organizations.

CO 2. To develop necessary skill set for application of various HR issues.

CO 3. To analyze the strategic issues and strategies required to select and develop manpower resources.

CO 4. To integrate the knowledge of HR concepts to take correct business decisions.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

Scheme for B.Tech (6th Seme)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 308	Compiler Design	3	1	0	20	20	60	100	4
2	PCC	PCC-CSE 309	Data Mining & Ware-housing	3	0	0	20	20	60	100	3
3	PCC	PCC-CSE 310	Computer Network	3	0	0	20	20	60	100	3
4	PEC	PEC-CSE 304-306	Elective-II	4	0	0	20	20	60	100	4
5	PEC	PEC-CSE 307-309	Elective-III	4	0	0	20	20	60	100	4
6	OEC	OEC-CSE 301-303	Open Elec-tive-I	3	0	0	20	20	60	100	3
7	PCC	PCC-CSE 311	Compiler Design Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 312	Computer Network Lab	0	0	2	30	30	40	100	1
9	PROJ	PROJ-CSE 302	Minor Pro-ject- I	0	0	4	50	50	100	200	2
			Total	**20**	**1**	**8**				**1000**	**25**

SUBJECT NAME: - Compiler Design

SUBJECT CODE: - PCC-CSE 308

Course Outcomes:

CO1. To realize basics of compiler design and apply for real time applications.

CO 2. To introduce different translation languages

CO 3. To understand the importance of code optimization

CO 4. To know about compiler generation tools and techniques

CO 5. To learn working of compiler and non-compiler applications and design of compiler for simple programming language.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1									2		
CO2	2											1		
CO3	3	3	2	2	3							2		
CO4	2				3							2		
CO5	3	2	3	2	2							3	3	3

SUBJECT NAME: - Data Mining & Ware-housing

SUBJECT CODE: - PCC-CSE 309

Course Outcomes:

CO 1. Understand the functionality of the various data mining and data warehousing component.

CO 2. Appreciate the strengths and limitations of various data mining and data warehousing models.

CO 3. Explain the analyzing techniques of various data.

CO 4. Describe different methodologies used in data mining and data ware housing.

CO 5. Compare different approaches of data ware housing and data mining with various technologies.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3				2							2		
CO3	2	2										2	2	
CO4	3				3							3		
CO5	2	2		1	2							2	2	

SUBJECT NAME: - Computer Network

SUBJECT CODE: - PCC-CSE 310

Course Outcomes:

CO 1. Students will be aware about computer networking.

CO 2. Students will know about various layers of OSI Model.

CO 3. Students will learn about wired & wireless technologies.

CO 4. Students will learn about the services of different layers.

CO 5. Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3											2		
CO3	3				1					1		2		
CO4	3	2		2	2							3		
CO5	3	3		2	2							2	1	

SUBJECT NAME: - Elective-II (Theory of Computation-305)

SUBJECT CODE: - PEC-CSE 304-306

Course Outcomes:

CO1. Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.

CO2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics - Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.

CO3 Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language

CO4 Attitude- Develop a view on the importance of computational theory.

CO5. Describing the limitations of a computing machine.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3	2	3	2								3	2	2
CO3	3	2	3	2								2	2	2
CO4	2	3	3	3								2	2	1
CO5	2											1		

SUBJECT NAME: - Elective III (Web and Internet Technology-309)

SUBJECT CODE: -PEC-CSE 307-309

Course Outcomes:

CO 1. Students will be familiar with Internet.

CO 2. Students will be familiar with different protocols of internet.

CO 3. Students will learn different services of internet.

CO 4. Analyze a web page and identify its elements and attributes.

CO 5. Students will learn HTML, CSS, JAVA Scripts for web designing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3	2	2	3	2	3		3	3	
CO2	3											2		
CO3	3											2		
CO4	3				3	2	2	3		3	2	3	3	2
CO5	3				3	3	2	3	2	2		3	3	2

SUBJECT NAME: - Open Elective-I Cyber Laws and Ethics-302)

SUBJECT CODE: - OEC-CSE 301-303

Course Outcomes:

CO 1. Make learner conversant with the social and intellectual property issues emerging from cyberspace.

CO 2. Explore the legal and policy developments in various countries to regulate cyberspace.

CO 3. Develop the understanding of relationship between commerce and cyberspace.

CO 4. Give learners in depth knowledge of information technology act and legal framework of right to privacy, data security and data protection.

CO 5. Make study on various case studies on real time crimes

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					2		3				3		
CO2	3					2		3				3		
CO3	3					3		3				3		
CO4	3					2		3				3		
CO5	3					3		3				3		

Scheme for B.Tech (7th Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 401	Network Security & Cryptography	3	1	0	20	20	60	100	4
2	PEC	PEC-CSE 401-403	Elective- IV	4	0	0	20	20	60	100	4
3	PEC	PEC-CSE 404-406	Elective- V	3	1	0	20	20	60	100	4
4	OEC	OEC-CSE 401-403	Open Elective- II	3	0	0	20	20	60	100	3
5	PCC	PCC-CSE 401	Network Security & Cryptography Lab	0	0	2	30	30	40	100	1
6	PROJ	PROJ-CSE-401	Minor Project-II	0	0	16	50	50	400	500	8
			Total	**13**	**1**	**18**				**1000**	**24**

SUBJECT NAME: - Network Security & Cryptography

SUBJECT CODE: - PCC-CSE-401

Course Outcomes:

CO 1. Understand basic cryptographic algorithms, message and web authentication and security.

CO 2. Identify information system requirements for both of them such as client and server.

CO 3. Understand the current legal issues towards information

CO 4. Distinguish and explain different protocol like SSL, TLS Visà-vis their applications.

CO 5. Comprehend and explain security services and mechanisms.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					3						3		
CO2	2	2				2		2				2	2	
CO3	3					2		3				2		
CO4	3					3						3		
CO5	3				2	3		3				3	3	2

SUBJECT NAME: - Parallel and Distributed Algorithm

SUBJECT CODE: - PEC-CSE-402

Course Outcomes:

CO 1. Understand the requirements for programming parallel systems and how they can be used to facilitate the programming of concurrent systems.

CO 2. To learn and apply knowledge of parallel and distributed computing techniques and methodologies.

CO 3. To learn the architecture and parallel programming in graphics processing units (GPUs).

CO 4. Understand the memory hierarchy and cost-performance tradeoffs.

CO 5. To gain experience in the design, development, and performance analysis of parallel and distributed applications.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3		2	2	2			2	2		1	2	3	2
CO3	3											2		
CO4	2											2		
CO5	3	2	3	2	3	2	2		2	2	2	3	3	3

SUBJECT NAME: -Cloud Computing

SUBJECT CODE: - PEC-CSE-406

Course Outcomes:

CO1. Able to understand basic concepts, principles and paradigm of Cloud Computing

CO2. Able to interpret various Cloud computing models and services.

CO3. Able to identify the significance of implementing virtualization techniques.

CO4. Able to understand the need of security in Cloud computing.

CO5. Understand the concept SOA and cloud based storage in Cloud computing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1			1	1		1			1	2		
CO2	1	2	1	3	1		1					2		
CO3		1	3	1	2	1		1				3		
CO4	2	1	2	1		2	1					2		
CO5		1	1	2	1	2		1				3		

Scheme for B.Tech (8th Sem)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 403	Advanced Computer Architecture	3	1	0	20	20	60	100	4
2	PCC	PCC-CSE 404	Artificial Intelligence & Expert Systems	3	0	0	20	20	60	100	3
3	PEC	PEC-CSE 407- 409	Elective- VI Optimization Techniques	3	1	0	20	20	60	100	4
4	OEC	OEC-CSE 404-406	Open Elective- III Industrial Relations	3	0	0	20	20	60	100	3
5	PCC	PCC-CSE 405	Artificial Intelligence & Expert Systems Lab	0	0	4	30	30	40	100	2
6	PROJ	PROJ-CSE-402	Major Project	0	0	16	50	150	400	600	8
			Total	**12**	**2**	**20**				**1100**	**24**

SUBJECT NAME: -Advanced Computer Architecture

SUBJECT CODE: - PEC-CSE-403

Course Outcomes:

CO1.Demonstrate concepts of parallelism in hardware/software.

CO2.Discuss memory organization and mapping techniques.

CO3.Describe architectural features of advanced processors.

CO4.Interpret performance of different pipelined processors.

CO5.Explain data flow in arithmetic algorithms.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3											3		
CO3	3											3		
CO4	3	3			2							3	2	
CO5	3											3		

SUBJECT NAME: -Artificial Intelligence & Expert System

SUBJECT CODE: - PEC-CSE-404

Course Outcomes:

CO1 Study the concepts of AI and related searching algorithms.

CO2 Develop the knowledge skills and it's representational structure in AI.

CO3 Study the concepts of natural language processing in AI.

CO4 Study the concepts of supervised/unsupervised machine learning and game technique.

CO5 Study how design the programming skill in PROLOG, and concepts of pattern recognition approaches.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1					3		
CO2	1	2	3	1	2		1					2		
CO3	1	1		1	1		3					2		
CO4	2	1	2	3	1		1					2		
CO5	1	2	3	3	2		1					3	2	2

SUBJECT NAME: -Optimization Technique

SUBJECT CODE: - PEC-CSE 407

Course Outcomes:

CO1: Formulate the engineering problems as an optimization problem.

CO2: Apply necessary and sufficient conditions for a given optimization problem for optimality

CO3: Select appropriate solution methods and strategies for solving an optimization problem and interpret and analyze the solution obtained by optimization algorithms

CO4: Justify and apply the use of modern heuristic algorithms for solving optimization problems

CO5: Solve Engineering Design and Manufacturing related optimization problem using software tools.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	1	1				1	1		1	1	
CO2	1	3	2	1						1			1	
CO3	1	3	2	1	1				2	1				
CO4	2	2	2	2	2				2	1				
CO5	1	3	3	2	3				2	2		1		

SUBJECT NAME: - INDUSTRIAL RELATIONS

SUBJECT CODE: - OEC-CSE – 406

Course Outcomes:

CO 1. Students should able to elaborate the concept of Industrial Relations.

CO 2. The students should able to illustrate the role of trade union in the industrial setup.

CO 3. Students should able to outline the important causes & impact of industrial disputes.

CO 4. Students should able to elaborate Industrial Dispute settlement procedures.

CO 5. Student should be able to summarize the important provisions of Wage Legislations, in reference to Payment of Wages Act 1936, Minimum Wages Act 1948 & Payment of Bonus Act 1965.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							1		2		2	2		
CO2							1				1	2	2	
CO3							1				2	2		2
CO4							1				2	2		2
CO5							1		1		1	2		

Semester III (Second year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 201	Data structure & algorithm using C	3	1	0	4

Total Hrs:45

Unit I: Arrays, Records and Pointers **(7Hr)**

Introduction to Linear Arrays, Arrays ADT, Representation Linear in Memory, Traversing Array

Inserting and deleting, Sorting; Bubble Sort, Searching; Linear Search, Binary Search, Multidimensional Arrays, Representation of Polynomials Using Arrays, Pointers; Pointer Arrays, Dynamic Memory Management, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, Sparse Matrices.

Unit II: Linked List (9Hrs)

Introduction Linked Lists, Representation of Linked Lists in Memory Traversing a Linked List Searching a Linked List, Memory Allocation; Garbage Collection, Insertion into a Linked List, Deletion from a Linked List, Header Linked List, Circularly Linked Lists, Two-Way Lists (or Doubly Linked Lists), Josephus Problem and its Solution, Buddy Systems.

Unit III: Stacks, Queue and Recursion *(9Hrs)*

Introduction Stacks, Array Representation of Stacks, Linked Representation of Stacks, Stack as ADT, Arithmetic Expression; Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of Recursive Procedures by Stacks, Queue, Linked Representation of Queues, Queues as ADT, Circular of Queues, Deques, Priority Queues, Applications of Queues.

Unit IV: Trees (10Hrs)

Introduction Binary Trees ,Representing Binary Tree in Memory ,Traversing Binary Trees, Traversal Algorithms Using Stacks, Header Nodes; Threads, Threaded Binary Trees ,Binary Search Trees ,Searching and Inserting in Binary Search Trees ,Deleting in a Binary Search Tree, Balanced Binary Trees, AVL Search Trees ,Insertion in an AVL Search Tree ,Deletion in an AVL Search Tree, m-way Search Trees ,Searching, Insertion and Deletion in an m-way Search tree, B- Trees ,Searching, Insertion and Deletion in a B-tree, B+-Trees.

Unit V: Graphs and their Applications *(6Hrs)*

Introduction, Graph Theory Terminology, Sequential Representation of Graphs; Adjacency Matrix; Path Matrix, Warshall ‟s Algorithm; Shortest Paths, Linked Representation of a Graph, Operations on Graphs, traversing a Graph, Topological Sorting, Spanning Trees

Unit VI: Sorting and Searching *(4Hrs)*

Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort, Radix Sort, Searching and Data Modification, Hashing.

Text Books:

1. Seymour Lipschutz, Schaums Outlines, „Data Structures with C‟,Tata Mc Graw Hill

Reference Books:

1. S. Sahani, „Data Structures in C‟

2. D.Samantha, „Classic Data Structure‟, PHI Publications

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 202	Object oriented programming through C++	3	1	0	4

Total Hrs:45

Unit-I: Principles of Object Oriented Programming (8 Hrs)

Differences between C and C++.A look at procedure Oriented programming, object oriented programming paradigm, basic concepts of OOP, Benefits of OOP, OO languages, A sample program, structure of C++ program. Introduction to OOPS: The origins of C++, What is Object Oriented Programming? Some C++ fundamentals, Headers & Name Spaces, Introducing C++Classes & Object.

Unit-II: Overloading (10Hrs)

Introduction of overloading, Function overloading, Operator overloading, Inheritance, Constructors & Destructors, Function & Operator Overloading constructor functions, Localizing variables, Function overloading & Ambiguity, Finding the address of an overloaded function, this Pointer, References, Using reference to overload a unary operator, overriding**.**

Unit-III: Inheritance, Virtual Functions and polymorphism (7 Hrs)

Inheritance and the access specifies, Constructors and Destructors in derived classes, Multiple Inheritance, Passing parameters to a basic class, Pointers and references to derived types, Virtual Functions, Why virtual functions?, Pure virtual functions and abstract types, Early Vs Latebinding.

Unit-IV: Static & Dynamic memory allocation (10Hrs)

Static & Dynamic allocation using new and delete, static class members, Virtual base classes, const member functions and mutable, volatile member functions, Using the as keyword, linkage specification, The .* and ->* operators, Creating conversion functions, Copy constructors, Granting access, namespaces, Explicit constructors, type name and export.

Unit-V: Exceptions Handling (10 Hrs)

Exception Handling, fundamentals, options the uncaught exception ( ), Applying exception Handling, and RTTI, casting operators, Recent trends in Object Oriented Programming in C++ , Advanced topics & its Application.

Templates : Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters.

Text Books:

1. Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications
2. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH

Reference Books:

1. Y. Kanetkar, „Let‟s C++‟, BPB publications
2. E Balagurusamy, „Object oriented programming with C++‟, 4th edition, TMH
3. Sourav Sahay , „Object-Oriented Programming with C++‟ , Oxford University Press, 2006.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 203	Database Management System	3	1	0	4

Total hrs: 45

UNIT – I: Database System Applications: (8 Hrs)

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

Unit-II: Database Design Theory *(9 Hrs)*

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

Unit-III: Physical Database Design and Memory Management in database (9 Hrs)
SQL: Queries, Constraints, Triggers: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases. Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

Unit -IV: Query Optimization and Performance Tuning (9 Hrs)
Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

Unit-V: Transaction Management (10Hrs)

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing,

Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Text Books:

1. Fundamentals of Database Systems – Emissary ,Navathe & Gupta, Pearson Education
2. Database System Concepts by Henry Korth

Reference Books:

1. Database Systems by S. K. Singh, Pearson Education.
2. Principles of Database Systems – Ullman, Golgotia Publications 1998.
3. Database Systems by Connolly, 3rd edition, Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 204	Unix & Shell Programming	3	1	0	4

Total Hrs:45

Unit-I Introduction (8Hrs)

Introduction to Unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

Unit-II Introduction To File *(7Hrs)*

The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions-I,Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

Unit-III Regular Expressions: *(8Hrs)*

Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

Unit-IV Korn Shell: (7Hrs)

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

Unit-V Interactive C Shell *(7Hrs)*

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The Read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

Unit-VI File Management *(8Hrs)*

The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control.

Text Book:

1.UNIX and Shell Programming Richard F. Gilberg

Reference Books:

1. Mastering UNIX Shell Scripting: Bash, Bourne, and Korn Shell.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
BSC	BSC 201	Mathematics - III	3	1	0	4

Unit –I (9Hours)

Fourier transform: Discrete and Fast Fourier transform Complex form of Fourier transform and its inverse, Fourier sine and cosine transform and their inversion. Properties of F-transform, Convolution theorem for F-transform, Parse Val‟s identity of for F-transforms Applications of Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation.

Unit –II (9Hours)

Laplace transform, Inverse transform, properties, Transforms of derivatives and integrals, Unit step function, Dirac‟s delta function, Differentiation and integration of transforms, Applications to differential equations.

Unit –III (9Hours)

Statistical Techniques: Discrete and Continuous random variables–Moments–Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions, Moments, Moment generating functions, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non –linear

Unit –IV (9Hours)

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Unit –V (9Hours)

Cauchy-Riemann equations: Necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions.

Text and Reference books:

1. Chandrika Prasad, Mathematics for Engineers, Prasad Mudralaya
2. Jeffrey, Advanced Engineering Mathematics , ELSEVIER
3. Chandrika Prasad , Advanced Mathematics for Engineers, Prasad Mudralaya
4. Grewal B. S., Higher engineering Mathematics, Khanna Publication, New Delhi
5. Keyszig E., Advanced Engineering Mathematics, Wiley Eastern Publication
6. Peter V. O. Neil, Advanced Engineering mathematics, Thomson Publication
7. Gerald, C.F., and Wheatley, P.O., Applied Numerical Analysis, Addison Wesley.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
HSMC	HSMC 201	Human Values	3	1	0	4

Total Hrs:45

UNIT-I: Course Introduction *(9Hrs)*

Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self-Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self -exploration. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-II: Harmony in the Human Being *(9Hrs)*

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT-III: Relationship and Goals **(9Hrs)**

Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT-IV: Nature and Values **(9Hrs)**

Understanding Harmony in the nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT-V: Ethics and Ability **(9Hrs)**

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems.

Text books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values andProfessional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart StudentPublications, 3rd Edition.

Reference books:

1. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 205	Data structure & algorithm using C lab	0	0	2	1

Total Hrs: 20

List of Practical's-

1. Write and execute a program in C to implement stack using arrays
2. Write and execute a program in C to implement queue using arrays
3. Write and execute a program in C to implement simple linked list
4. Write and execute a program in C to implement stack using linked list
5. Write and execute a program in C to implement queue using linked list
6. Write and execute a program in C to implement doubly linked list
7. Write and execute a program in C to implement circular linked list.
8. Write and execute a program in C to reverse a singly and doubly linked list
9. Write and execute a program in C to insert a node in a linked list in a sorted fashion 154
10. Write and execute a program in C to implement binary tree, finding the depth of a tree
11. Write and execute a program in C to implement in order, preorder and post order traversals
12. Write and execute a program in C to find if two trees are identical

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 206	Object oriented programming through C++ lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. **Write a C++ program to find the sum of individual digits of a positive integer.**
2. Write a C++ program to generate the first n terms of the sequence
3. Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C++ program to find both the largest and smallest number in a list of integers.
5. Write a C++ program to sort a list of numbers in ascending order.
6. Write a Program to illustrate New and Delete Keywords for dynamic memory allocation
7. Write a program Illustrating Class Declarations, Definition, and Accessing Class Members.
8. Program to illustrate default constructor, parameterized constructor and copy constructors
9. Write a Program to Demonstrate the i)Operator Overloading.ii) Function Overloading.
10. Write a Program to Demonstrate Friend Function and Friend Class.
11. Write a Program to Access Members of a STUDENT Class Using Pointer to Object Members.
12. Write a Program to Generate Fibonacci Series use Constructor to Initialize the Data Members.
13. Write C++ programs that illustrate how the following forms of inheritance are supported:
    a. Single inheritance b)Multiple inheritance c)Multi level inheritance d)Hierarchical inheritance
14. Write a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class.
15. Write a Program to Invoking Derived Class Member Through Base Class Pointer
16. Write a Program Containing a Possible Exception. Use a Try Block to Throw it and a Catch Block to Handle it Properly.
17. Write a Program to Demonstrate the Catching of All Exceptions.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 207	Database Management System Lab	0	0	2	1

Total Hrs: 20

List of Practicals:

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based onconditions.
3. Creation of Views, Synonyms, Sequence, Indexes, save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Study of PL/SQL block.
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.
9. Creation of Procedures.
10. Creation of database triggers and functions.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 208	Unix & Shell Programming Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. Write a shell script to write your user name as a banner to the front of the file being sent to the printer
2. Write a shell script to print the first five arguments in reverse order
3. Write a shell script to append a line to the file. Both the file name and line have to be specified to the script at the command line. Ensure that it runs the sh shell script. Print the number of lines in the file after you done.
4. Write a shell script that tests and print outs the name of all the files in a directory that are executable. Do not print any other file or directory names. If there are subdirectories, go down recursively. How would you change this script to not go down recursively?
5. Write a shell script that given a person‟s UID, tells you how many times that person is **logged on**
6. Write a shell script called lsdirs which lists just the directories in the current directory
7. Write a shell script called see taking a filename name as argument which uses ls if the file is a directory and more if file is otherwise
8. Write a shell script that asks a user to type w word in, then tells the user how long that word is.
9. In many versions of UNIX there us a –i argument for cp so that you will be prompted for confirmation if you are about to overwrite a file. Write a script called cpi which will prompt if necessary without using the –i argument.
10. Write a shell script that takes a uid as an argument and prints out that person‟s name, **home directory, shell and group number, and other groups that person may belong to.**
11. Sort /etc/passwd using the uid as the key.
12.
    a. Write a program to generate Machine OpCode Table, Symbol Table and Pseudo OpCode table during First Pass Assembler.
    b. Write a program to generate Machine Opcode table using two pass Assembler.

Semester IV (Second year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 209	Digital Electronics	4	1	0	5

Total Hrs:45

Unit –I

Overview of electronics: Electronic Components-Resistor, capacitor and Inductors, Semiconductor devices: Diodes, transistors (BJT and FET). Integrated circuits, Popular IC packages, Analog vs digitalelectronics, Transistor as a switch.
Boolean algebra: Representation of values and complements, De'Morgans theorem-simplifyingexpressions.

Unit –II

Logic gates: AND, OR, NOT, XOR, XNOR, NAND, NOR gates and their truth tables, combining logic circuits for expressions using NAND and NOR gates, Logic circuit families and characteristics, SSI, MSI, LSI and VLSI circuits. Combinational and sequential circuits: (Simple block diagrams, truth tables and IC packages only required).
Adders, decoders, multiplexers, encoder circuits , Flip-flops: RS, clocked RS, JK, D and T flip flops, Master-slave flip flops, edge and level triggering, Multivibrators - A stable, Bistable, Monostable,counters-ripple and decade. Registers, latches and Tristate buffers.

Unit –III

Building blocks of a computer system: Basic building blocks-I/O, memory, ALU, Control and their interconnections, Control unit and its functions- Instruction-word, Instruction execution cycle, organizational sequence of operation of control registers; controlling of arithmetic operations; branch, skip, jump and shift instructions, ALU-its components.

Unit –IV

Addressing techniques and registers: Addressing Techniques-Direct, immediate addressing; paging, relative, Indirect and indexed addressing. Memory buffer register; accumulators; Registers-Indexed, General purpose, Special purpose; overflow, carry, shift, scratch registers; stack pointers; floating point; status information and buffer registers

Unit –V

Memory: Main, RAM, static and Dynamic, ROM, EPROM, EAROM, EEPROM, Cache and Virtual memory. Interconnecting System components: Buses, Interfacing buses, Bus formats-

address, data and control, Interfacing keyboard, display, auxiliary storage devices, and printers. I/O cards in personal computers. Development of Indian Super Computer 'PARAM': History, Characteristics, Strengths, Weakness and basic Architecture.

Text / Reference Books

1. A.S.Tannenbaum : Structured Computer Organization, Pearson
2. Thomas C. Bartee : Digital Computer Fundamentals, McGraw-Hill
3. Duglus V Hall : Microprocessors and Interfacing: programming and Hardware, McGraw-Hill, 1986.
4. Introduction to Computer Architecture, Stone S.Galgotia Publicatons 1996.
5. Microprocessor Architecture Programming & Applications, R. Gaonkar, Wiley Eastern-1987.
6. Computer Architecture and Organization by N.P. Carter, 4th Edition, McGraw-Hill, 2014.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 210	Discrete Mathematics	3	1	0	4

UNIT-I: Set Theory, Relation: Definition, Function: (10Hrs)

Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and count ability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle. Types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. Definition and types of function, composition of functions, recursively defined functions.

UNIT-II: Propositional logic: (8Hrs)

Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.

UNIT-III: Combinatories: (8Hrs)

Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)

Unit-IV: Algebraic Structure: (9Hrs)

Binary composition and its properties definition of algebraic structure; Groyas Semi group, Monoid Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).

UNIT-V: Graphs: (10Hrs)

Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number. Tree: Definition, types of tree(rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder,

postorder). Finite Automata: Basic concepts of Automation theory, Deterministic finite Automation(DFA), transition function, transition table, Non Deterministic Finite Automata (NDFA), Mealy and Moore Machine, Minimization of finite Automation.

Text/Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.

2. J.P.Tremblay & R. Manohar, "Discrete Mathematical Structure with Applications toComputer Science" Mc.Graw Hill, 1975.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 211	Computer Organization & Architecture	3	0	0	3

Unit I: Basic Structure of Computers **(7 Hrs)**

Functional Units, Basic operational concepts, Bus structures Addressing modes, subroutines: parameter passing, Instruction formats, expanding op codes method.

Unit II: Basic Processing Unit **(8 Hrs)**

Bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format, Bit slice concept.

Unit III: Arithmetic Unit **(7 Hrs)**

Number representations and their operations, Design of Fast Adders, Signed multiplication, Booth‟s Algorithm, bit pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding.

Unit IV: The Memory System **(8 Hrs)**

Various technologies used in memory design, higher order memory design, multimodal memories and interleaving, Associative Memory, Cache memory, Virtual Memory.

Unit V: Input /Output Organization **(7Hrs)**

I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access COMPUTER PERIPHERALS: I/O devices such as magnetic disk, magnetic tape, CDROM systems.

Unit VI: RISC **(8 Hrs)**

Pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, influence of pipelining on instruction set design, multiple execution Units, performance considerations, Basic concepts in parallel processing & classification of parallel architectures. Vector Processing0, Array Processors. Recent trends in Computer Architecture & Organization.

Text Books:

1. V.C.Hamacher,Z.G.Vranesic and S.G.Zaky, „Computer Organization", McGraw Hill,5th edition ,2002.

References Books:

1.A.S.Tanenbaum, "Structured Computer Organization" 4th Edition, Pearson Education.

2.M Mano, "Computer System and Architecture", Pearson Education

3.W. Stallings, "Computer Organization & Architecture", Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 212	Design & Analysis of Algorithm	4	0	0	4

Unit – I: Introduction (8 Hrs)

INTRODUCTION: Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation, recurrences, probabilistic analysis, disjoint set operations, union and find algorithms.

Unit – II: Asymptotic notations (8 Hrs)

DIVIDE AND CONQUER: General method, applications-analysis of binary search, quick sort, merge sort, AND OR Graphs. GREEDY METHOD: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.

Unit – III: Advanced data structures (9 Hrs)

GRAPHS (Algorithm and Analysis): Breadth first search and traversal, Depth first search and traversal, Spanning trees, connected components and bi-connected components, Articulation points. DYNAMIC PROGRAMMING: General method, applications - optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design

Unit – IV: Greedy Method & Dynamic Programming (10Hrs)

BACKTRACKING: General method, Applications- n-queen problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles. BRANCH AND BOUND: General method, applications - travelling sales person problem, 0/1 knapsack problem- LC branch and bound solution, FIFO branch and bound solution.

Unit-V*: Traversal and Search Techniques* *(9 Hrs)*

NP-HARD AND NP-COMPLETE PROBLEMS: Basic concepts, non-deterministic algorithms, NP-hard and NP-complete classes, Cook‘s theorem

Text Books:

1. Thomas H. Cormen et. al. “Introduction to Algorithms”, Prentice Hall of India.
2. Design & Analysis of Computer Algorithms by Aho,. Horowitz, Sahani, Rajsekharam, Pearsoneducation

Reference Books:

1. “Computer Algorithms”, Galgotia Publications Pvt. Ltd. Brassard, Bratley, “Fundamentals ofAlgorithms”, **Prentice Hall**
2. 2. Computer Algorithms: Introduction to Design and analysis, 3rd Edition, By Sara Baase & A. **V. Gelder Pearson Education.**

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 213	Operating Systems	4	0	0	4

Total Hrs:45

Unit-I: Introduction (6 Hrs)

Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation.

Unit-II: File Systems (8Hrs)

File systems: File concept, Access methods, Disk space management and space allocation strategies, directory structures, Recovery, Log-structured File System, disk arm scheduling strategies.

Unit-III: Process and Its Scheduling (7Hrs)

Process concept, process control block, Types of scheduler, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms.

Unit-IV: Memory Management (8Hrs)

Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging , Virtual Memory Concepts, page faults and instruction restart , page replacement algorithms , working sets ,Locality of reference, Thrashing, Garbage Collection.

Unit-V: Process management and synchronization

(8Hrs) Concurrency conditions, Critical section problem, software and hardware solution, semaphores,conditional critical regions and monitors, classical inter process communication problems

Unit-VI: Deadlocks detection & avoidance (8Hrs)

Deadlock definitions, Prevention, Avoidance, detection and Recovery, Goals of Protection, access matrix, Deadlock implementation.

Text Books:

1. Operating System concepts – Silberchatz & Galvin, Addison Wesley, 6th Edn.
2. Modern Operating Systems – Tanenbaum, Pearson Edn. 2ndedn.

Reference Books:

1. Operating Systems – S R Sathe, Macmillan Publishers, India, 2008
2. Operating System –Milan Milenkovik, McGraw-Hill, 1987

Category	Code	Course Title	Hours PerWeek			Credit
			L	T	P	
HSMC	HSMC 401	Organizational Behavior	3	0	0	3

Total Hrs: 45

Unit-l: OrganizationalBehavior (9 Hrs)

Definition - Importance - Historical Background - Fundamental concepts of OB - 21st Century corporate - Different models of OB i.e. autocratic, custodial, supportive, collegial and SOBC.

Unit II: Perception Process & Personality & Attitudes (9 Hrs)

Nature & Importance - Perceptual Selectivity - Perceptual Organization - Social Perception – Impression Management Meaning of personality - Development of personality - Nature and dimensions of attitude - Job Satisfaction - Organizational Commitment.

Unit III: Learning & Motivation (9 Hrs)

Process of Learning - Principles of Learning - Organizational Reward Systems - Behavioral Management Motives - Characteristics - Classification of motives - Primary Motives - Secondary motives - Morale - Definition and relationship with productivity - Morale Indicators Theories of Work Motivation - Maslow's theory of need hierarchy - Herzberg's theory of job loading.

Unit IV: Leadership & Organizational Design (9Hrs)

Definition - Importance - Leadership Styles - Models and Theories of Leadership Styles Various organizational structures and their effects on human behaviour - Organizational Climate - Organizational Culture - Organizational Effectiveness.

Unit V: Conflict Management (9 Hrs)

Modern view of conflict - Constructive and Destructive conflict - Conflict Process - Strategies for encouraging constructive conflict - Strategies for resolving destructive conflict. Stress Management - Concept of stress - Sources of stress - Effects of stress on humans - Management of Stress.

Text Books:

1. Organizational Behaviour, 9th Ed. - Stephen Robbins

2. Human Behaviour at work - Davis and Newstorm

3. Organizational Behaviour - Uma Sekaran

Reference Books:

4. Organizational Behaviour - Fred Luthans
5. Organizational Behaviour - K.Aswathappa
6. Human Behaviour at Work - Keith Davis

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 214	Computer Organization & Architecture Lab	0	0	2	1

Total Hrs: 20

List of practicals -

1. Machine and assembly languages (generic)
2. The process of assembly and linking
3. Special assembly language programming issues
4. Parameter passing: assembly language and "external"a.Return addresses and co-routines

b.Traps and interrupts: mechanism and handling

c. Worms and viruses: malicious code and defending against it

5. Special miscellaneous topics
6. Operating system interface: traps and interrupts

a.Access to IO devices: display, keyboard, real-time clocks, DMA

b.Communications (serial and parallel), simple error detection and correction codes (parity,Hamming),

7. Low level programming in C. This includes all sorts of "tricks" that emphasize the power of low-level computing, as an aid to understanding computing systems in depth: Pointers to functions and their applications for self modifying code and applications.
8. Write the working of 8085 simulators GNUsim8085 and basic architecture of 8085 along with small introduction.
9. Study the complete instruction set of CPU and write the instructions in the instruction set of 8085 along with examples.
10. Write an assembly language code in GNUsim8085 to implement data transferinstruction.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 215	Operating Systems Lab	0	0	2	1

Total Hrs:20

List of practical's -

1. Basics of UNIX commands.
2. Shell programming
3. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
5. Implement Semaphores
6. Implement File Organization Techniques
7. Implement Bankers algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique f memory management.
12. Implement Threading & Synchronization Applications

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 216	Design & Analysis of Algorithm Lab	0	0	2	1

Total Hrs: 20

List of practicals -

1. To find HCF and LCM of two numbers
2. Code and analyses to find median element in an array of integers.
3. Code and analyse to find majority element in an array of integers.
4. Code and analyse to sort an array of integers using merge sort
5. Code and analyse to sort an array of integers using quick sort
6. To implement maximum and minimum problem using divide and conquer strategy
7. To implement binary search using divide and conquer strategy
8. To implement program of Heap Sort.
9. WAP of minimum spanning tree using Kruskal algorithm.
10. WAP of minimum spanning tree using Prim‟s algorithm.
11. WAP to implement matrix chain multiplication
12. Code to find the shortest path in graph using Dijkstra‟s algorithm.
13. Code to find the shortest path using Bellman-Ford algorithm.
14. To implement LCS problem using Dynamic Programming.
15. To implement matrix chain multiplication problem using dynamic programming.
16. Code and analyze to find the minimum spanning tree in a weighted, undirected graph.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	MC-III	Constitutional Law	3	0	0	0

Unit – I (9 Hrs)

Salient features of the Indian constitution. Preamble Definition of State (Art. 12) Doctrines of Ultra-virus, severability, eclipse, waiver (Art, 13)

Unit – II (9 Hrs)

Right to equality (Art. 14) Prohibition of discrimination, Rights to equality of opportUNITy (Art. 15-16) Right to freedom under Article 19: Freedom of association; Freedom of movement; Freedom of residence; Freedom of assembly; Freedom of association; Freedom of movement; Freedom of residence; Freedom of occupation, trade and business; Right to take out processions; Right of the State to impose reasonable restrictions

Unit – III (9 Hrs)

Protection in respect of Conviction under Article 20, Ex-post-facto law; Double jeopardy; Self-incrimination; Right of Life and Personal Liberty (Act. 21), Protection in respect of arrest and detention Right to freedom of Religion (Articles 25-28)

Unit – IV (9 Hrs)

Cultural and Education Rights (Articles 29-30) Enforcement of Fundamental Right, Writ Jurisdiction of the Supreme Court and High Court (Article 32, 226) Right to property before and after the Constitution 42nd Amendment Act, 1976 Abolition of Untouchability, Titles (Articles 17-18) Right against exploitation (Articles 23, 24)

Reference Books:

1. Austin Granville: Constitution of India: Cornerstone of a Nation and Working A Democraticconstitution
2. Narender Kumar : Constitutional Law of India.
3. Basu D. D : Shorter Constitution of India
4. Jain, M.P.: Constitutional Law of India,
5. Seervai, H.M. : Constitutional Law of India, Vols. I-III
6. Shukla, V.N. : Constitutional of India (ed. M.P.Singh)
7. B.R. Sharma : Constitutional Law and judicial Activism

Semester V (Third Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 301	Data Communication	4	0	0	4

Total Hrs: 45

Unit-l: Signals (8Hrs)

ANALOG AND DIGITAL: Analog and digital data, Analog and digital signals; PERIODIC AND APERIODIC SIGNALS, ANALOG SIGNALS: Simple analog signals; TIME AND FREQUENCY
DOMAINS; COMPOSITE SIGNALS: Frequency spectrum and Bandwidth; DIGITAL SIGNALS: Decomposition of digital signal; TRANSMISSION MODES: Serial and Parallel transmission, Asynchronous and Synchronous Transmission, Simplex, Half-Duplex and Full-Duplex communication.

Unit II: Encoding And Modulation (8Hrs)

DIGITAL-TO-DIGITAL CONVERSION: Unipolar, Polar, Bipolar; ANALOG-TO-DIGITAL CONVERSION: Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM), Sampling Rate, How many Bits per Sample? Bit rate; DIGITAL-TO-ANALOG CONVERSION: Aspects of Digital-to-Analog conversion, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase shift Keying (PSK), Quadrature Amplitude modulation (QAM), Bit / Baud comparison; ANALOG-TO-ANALOG CONVERSION: amplitude modulation (AM), Frequency Modulation (FM), Phase Modulation(PM).

Unit III: Interfaces and Modems (8Hrs)

DIGITAL DATA TRANSMISSION: Parallel transmission, Serial Transmission; DTE-DCE INTERFACE: Data Terminal Equipment (DTE), Data Circuit-Terminating Equipment (DEC), Standards, EIA-232 Interface; OTHER INTERFACE STANDARDS: EIA-449, EIA-530.

Unit IV: Communication Media (7Hrs)

GUIDED MEDIA: Twisted pair cable, Coaxial cable, Optical Fiber cable; UNGUIDED MEDIA: Radio frequency allocation, Propagation of Radio waves, Terrestrial microwave, Satellite communication, Cellular Telephony; TRANSMISSION IMPAIRMENTS: Attenuation, Distortion, Noise; PERFORMANCE: Throughput, Propagation Speed, Propagation time.

Unit V: MULTIPLEXING (7Hrs)

FREQUENCY DIVISION MULTIPLEXING (FDM), TIME DIVISION MULTIPLEXING (TDM): Inverse Multiplexing, WAVE-DIVISION MULTIPLEXING, MULTIPLEXING APPLICATIONS: THE TELEPHONE SYSTEM: Common carrier services and hierarchies, Analog services, Digital Services.

Unit VI: Data Compression (7Hrs)

Huffman code, Run-Length Encoding, Relative Encoding, Lempel-Ziv Encoding, Image Compression, PEG, MPEG.

Text Book:

1. Behrouz A. Forouzan , „Data Communications and 161 Networking", 4th edition, Tata McGraw Hill.

Reference Book:

1. William A.Shay,„Understanding Data Communications and Networks", 2nd Edition,Vikas publication

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 302	Software Engineering	4	0	0	4

Total Hrs: 45

Unit-I: Introduction (5 Hrs)

An Introduction to Software Engineering, Software Myths, Software Engineering- A Layered Technology, Software Process Framework, Software Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Process Model, Agile Process Models.

Unit-II: Software Planning (5 Hrs)

Software Engineering Practice An overview, Communication Practices, Planning Practices, Modeling Practices, Construction Practice & Deployment, System Engineering Hierarchy, Business Process Engineering, Product Engineering, System Modeling, Requirements Engineering.

Unit-III : Software Analysis And Design (9 Hrs)

Software Engineering Analysis & Design An overview, Requirements Analysis, Analysis Modeling Approaches, Data Modeling, Object-Oriented Analysis, Scenario Based Modeling, Flow-Oriented Modeling, Class-based Modeling, Behavioral Model. Design Engineering Concepts, DesignModel, Pattern-Based Software Design.

Unit-IV: Software Testing (9 Hrs)

Testing Strategies and Tactics An overview, level of testing: Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging techniques. Software Testing Fundamentals, Black-Box Testing, White-Box Testing.

Unit-V: Software Metrics And Software Quality Management (8 Hrs)

Product Metrics An overview, Software Quality, A Framework for Product Metrics, Metrics for Analysis & Design Models, Metrics for Source Code, Metrics for Testing & Maintenance, Software Project Management An overview, Software Measurements, Metrics for Software Quality, Software Project Estimation Techniques, Project Scheduling, Risk Management, Quality Management, Change Management, Software Reengineering.

Unit-VI: Trends in Software Engineering And Project Management (9 Hrs)

Software project management (PERT/CPM): Developing a network plan, overview of PERT /CPM, basic rules for developing network, basic rules for developing project network. Recent trends in Software Engineering and Project.

Text Book:

1. Software Engineering- A Practitioner‟s Approach (Sixth Edition) - Roger Pressman (TMH)

Reference Books:

1. Software Engineering (Seventh Edition)- Ian Summerville, Pearson Education.
2. Software Engineering Theory and Practice by Pfleeger, Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 303	Formal Language & Automata Theory	3	1	0	4

Total Hrs: 45

Unit-I: Fundamentals (9Hrs)

Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and nondeterministic finite automaton, transition diagrams and Language recognizers.

Unit-II: Finite Automata & Regular Languages (8Hrs)
NFA with Î transitions – Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without Î transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM"s, Finite Automata with output- Moore and Melay machines. Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

Unit-III: Context Free Grammars & Grammar Formalism (9Hrs)
Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted).Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings.

UNIT-IV: Push Down Automata & Turing Machine (9Hrs)
Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA. Turing Machine: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church"s hypothesis, counter machine, types of Turing machines (proofs not required).

UNIT-V: Computability Theory (10Hrs)
Chomsky hierarchy of languages, linear bounded automata and context sensitive language,LR(0) grammar, decidability of, problems, Universal Turing Machine, undecidability of posts. Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

***Text Book**:*

1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.

Reference Book:

1. Introduction to languages and the Theory of Computation ,John C Martin, TMH

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 304	Java Programming	3	0	0	3

Total Hrs: 45

UNIT-I: (9Hrs)

Introduction to OOP, procedural programming language and object-oriented language, principles of OOP, applications of OOP, history of java, java features, JVM, program structure. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control.

UNIT-II:
(8Hrs)

Classes and objects, class declaration, creating objects, methods, constructors and constructor overloading, garbage collector, the importance of static keyword and examples, this keyword, arrays, command line arguments, nested classes.

UNIT-III: (8Hrs)

Inheritance, types of inheritance, super keyword, final keyword, overriding an abstract class. Interfaces, creating the packages, using packages, the importance of CLASSPATH and java.lang package. Exception handling, the importance of try, catch, throw throws and finally block, user-defined exceptions, Assertions.

UNIT-IV: (8Hrs)

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data to files, random access file,

UNIT-V: (6Hrs)

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

UNIT-VI: (6Hrs)

AWT: introduction, components and containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Container class, Layouts, Menu and Scrollbar.

TEXT BOOK:

1. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.

REFERENCES Books:

1. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.
2. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
HSMC	HSMC-CSE-301	Human Resource Management	3	0	0	3

Total Hrs: 45

Unit-I:Introduction (9Hrs)

Overview of Human Resources, Historical evolution, Integrated HR function, Corporate and HR environment, Strategic environment, Strategic Management

Unit-Ii: Planning (9Hrs)

HR planning at Enterprise level, Need for systematic planning, Planning process, Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supplyforecasting. Retention-Redeployment and Exit strategies

Unit-Iii:Skilles Development (9hrs)

Career management-Recruitment and Selection, Employee Induction Programme, Employee training, Training needs & objective setting, Methods of training, Development & Development needs, Human Resource Development, Development process

Unit-Iv: Performance Planning (9hrs)

Performance Planning – Performance Appraisal, Measures of appraisal, System components appraisal methods, Ethics of appraisal, Problems & issues

Unit-V: Human Resource (9hrs)

Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level

Text Book:

1. Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia

Reference Books

1. John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A
   Reader, SAGE Publications, 1998
2. Christopher Mabey, Rosemary Thomson (2011): Developing Human

Resources,Routledge, Taylor and francis group, New York, USA.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 301	Soft Computing	4	0	0	4

Total Hrs: 45

Unit-I: Neural Networks (9 Hours)

Fundamentals of Neural Networks – History- Architectures- Learning methods XOR problem-Delta rule-derivation-Back propagation- applications- parameters in BPN- Associative memory – Hetero associative- BAM-energy function problems-applications of associative memories-ART1-ART2- applications of adaptive networks.

Unit-Ii: Fuzzy Logic (9 Hours)

Fuzzy set theory – crisp sets – fuzzy sets – crisp relations – Fuzzy relations – Fuzzy systems-Crisp logic – predicate logic – fuzzy logic- fuzzy based systems Defuzzification methods – applications.

Unit-Iii: Genetic Algorithms (9 Hours)

Fundamentals Of Ga – Creation Of Offspring‟S – Encoding – Fitness Function Reproduction – crossover- insertioo & deletion- mutation- bitwise operators – applications.

Unit-Iv: Hybrid Systems (9 Hours)

Hybrid Systems – Neuro Fuzzy – Neuro Genetic – Fuzzy Genetic Hybrids- GA Based Weight determination and applications- fuzzy BPN – simplified fuzzy ARTMAP.

Unit-V: Programming Using Matlab (9 Hours)

Using Neural Network toolbox – Using Fuzzy Logic toolbox- Using Genetic Algorithm & directedsearch toolbox.

TEXT BOOKS:

1. Rajasekaran S. and VijayalakshmiPai G.A, “Neural Networks, Fuzzy Logic and GeneticAlgorithms”, PHI, 2011.

2. Timothy J.Ross, “Fuzzy Logic with Engineering applications”, John Wiley and Sons, 2010.

REFERENCES

1. Jang J.S.R, Sun C.T, Mizutani E, “Neuro fuzzy and Soft Computing”, PHI Learning Pvt. Ltd.,

2012.

2. Davis E. Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y.,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 302	Image Processing	4	0	0	4

Total Hrs: 45

Unit-I: Introduction (8Hrs)

Origins of digital image processing, Various Imaging techniques, components of an image processing system, Image sensing and acquisition, Image sampling and quantization, neighbors of a pixel, Adjacency, Connectivity, Regions and boundaries.

Unit-II: Filtering (8Hrs)

Basic intensity transformation and spatial filtering, Image negatives, log transforms power-law transformations, median filtering, Histogram equalization, Histogram matching spatial correlation and convolutions

Unit-III: Transformation (8Hrs)

Two-dimensional orthogonal and Unitary Transforms, properties of unitary transforms 2D-DFT, Cosine transforms, Sine transforms, Hadamard transform, Haar transforms, Slant transforms.

Unit-IV: Image Degradation /Restoration Process

(7Hrs) Model of image Degradation/Restorations process, Noise models, Restoration in the presence of noise only, periodic noise reduction by Frequency domain filtering, Image reconstructionfrom Projections, Image compression models, Huffman coding, LZW coding, Run length coding,Bit-plane coding.

Unit-V: Image Morphology (7Hrs)

Some basic algorithms, Boundary extraction, convex hull, thinning, morphological Reconstruction. Color image color models. skeletons, morphological processing, color models, RGB color models, CMY and CMYK color models the HIS.

Unit-VI: Image Segmentation (7Hrs)

Image segmentation, Fundamentals, Point, Line and edge detection, of segmentation, Thresholding, Regionbased segmentation, watershed segmentation algorithm Applications of segmentation.

Text Book:

1. Digital image processing by Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson PHIPublication.

Reference Books:

1. Fundamental of Digital Image Processing by A. K. Jain, P. H. I. Publication.
2. Digital image processing by S. Jayaraman, S. Esakkirajan, T. Virakumar, McGraw Hill.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 303	Embedded System	4	0	0	4

Total Hrs: 45

Unit- I: Microcontrollers (10Hrs)

Microprocessors and Micro-controllers, Types of Microcontrollers, External memory, Processor Architecture – Harvard v/s Van Neumann; CISC v/s RISC, Microcontroller, Memory types, Software development tools like assembler, cross- compiler, emulator, and 173 simulator, 8051 controller, Block Diagram &Architecture.

Unit-II: Device and Communication Bus for Devices Network (10Hrs)IO

Types and examples, Serial communication devices, Parallel Device ports, Sophisticated Interfacing Feature in Devices Ports, Wireless Devices, Timer and Counting Devices, Watch dog timer, Real time clock, Network Embedded Systems, Serial Bus Communication Protocols, parallel Bus Devices protocol Parallel communication Network using ISA, PCI, PCI-X and advanced buses, Internet Enabled Systems- Network protocols, Wireless and mobile system protocol.

Unit-III: Device Drivers and Interrupt Services Mechanism (10Hrs)

Programmed-I/O Busy-wait Approach without Interrupt Services Mechanism, ISR Concept, Interrupt Sources, Interrupt Servicing (Handling) Mechanism, Multiple Interrupts, Context and the Periods for Context Switching, Interrupt Latency and Deadline, Classification of Processor Interrupt Service Mechanism from Context-Saving Angle, Direct Memory Access, Device Driver Programming.

Unit-IV: Inter process Communication and Synchronization (8Hrs)

Multiple process in an application, Multiple Threads in an application, Task and Task state, Task and Data, Clear-cut Distinction between Functions, ISRS and Tasks by their Characteristics, Concept of Semaphores, Shared Data, Inter process Communication, Signal Function, Semaphore Functions, Message Queue Functions, Mailbox Functions, Pipe Functions, Socket Functions, RPC Functions.

Unit-V: Interfacing Buses (7Hrs)

Industrial Interfacing Buses (10 Hrs) PCI, ESA, EISA, I2C, USB, RS232. Advance topics on embedded system.

Text Book

1. Myke Predko, “Programming and Customizing The 8051 Micro-controller”, Tata McGrawHill edition.

2. John B. Peatman, “Design with PIC Microcontrollers”, Low Price Edition, Pearson Education Asia.

Reference Books:

1. Embedded System :Architecture, programming and design by Rajkamal,TMH

2. ARM Assembly Language: Fundamentals and Techniques, William Hohl, CRC Press

3. ARM Architecture Reference Manual / Edition 2, by David Seal.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 305	Software Engineering lab	0	0	2	1

List of Practical's-

1. Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements. For a set of about 20 sample problems
2. Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem(Use of a CASE tool required). (1 class)
3. Develop structured design for the DFD model developed. (1 class)
4. Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose,Argo UML, or Visual Paradigm etc. is required)
5. Develop Sequence Diagrams
6. Develop Class diagrams.
7. Develop code for the developed class model using Java
8. Use testing tool such as Joint.
9. Use configuration management tool
10. Use any one project management tool such as Microsoft Project or Gantt Project, etc.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 306	Java Programming Lab	0	0	2	1

Total Hrs:20

List of Practical's:

1. Create a java program to implement stack and queue concept.
2. Write a java package to show dynamic polymorphism and interfaces.
3. Write a java program to show multithreaded producer and consumer application.
4. Create a customized exception and also make use of all the exception keywords.
5. Convert the content of a given file into the uppercase content of the same file.
6. Develop an analog clock using applet.
7. Develop a scientific calculator using swings.
8. Create an editor like MS-word using swings.
9. Create a servlet that uses Cookies to store the number of times a user has visited your servlet.
10. Create a simple java bean having bound and constrained properties.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 307	Data Communication Lab	0	0	2	1

Total Hrs: 20

List of Practical's:

1. Study of basic data communication system.
2. Demonstrate Analog and digital signals.
3. To Convert Analog signal into digital signal.
4. To Convert digital signal into Analog signal.
5. Study of Amplitude modulation.
6. Study of Frequency modulation.
7. Study of Phase modulation.
8. Study of Amplitude shift keying.
9. Study of Frequency shift keying.
10. Study of Binary Phase shift keying.
11. Study of Quadrature amplitude shift keying.
12. Study of Frequency division Multiplexing (FDM)
13. Study of Time division Multiplexing (TDM)
14. Study of various interface standards.
15. Study of Twisted pair cable, Coaxial cable and Optical Fiber cable

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ- CSE 301	Industrial Training/ Project Seminar	0	0	2	2

Objective of Industrial Training: The objective of industrial training is to provide work experience so that students engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineeringproblem and possibly an industry guide for their Major Project in final semester.

Scheme of Studies: Duration 4 weeks in summer break after IV semester, assessment to be done in V semester practical examination. During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of Faculty of the concern Department of mechanical engineering. Then they will present a seminar on their training and present it in the institute in front of the committee headed by the HOD/Faculty Member.

Learning through Industrial Training: During industrial training students must observe followingto enrich their learning:

- Industrial environment and work culture.
- Organizational structure and inter personal communication. Hardware
- / Software configuration knowledge and specifications.Project
- Planning, development and maintenance.
- Problems related to various areas of work etc.
- Students are supposed to acquire the knowledge on above by Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- Hands on" experience Undertaking/assisting project work. Solving problems at the work place.
- Presenting a seminar participating in group meeting/discussion.
- Consulting current technical journals and periodicals in the library.

Semester VI (Third Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 308	Compiler Design	3	1	0	4

Total Hrs: 45

Unit-I: Introduction To Compilers (8hrs)

Translators-Compilation and Interpretation-Language processors -The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools - Programming Languagebasics.

Unit-Ii: Lexical Analysis (8hrs)

Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language.

Unit-Iii: Syntax Analysis (10hrs)

Need and Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies-Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item-Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language .

Unit-Iv: Syntax Directed Translation & Run Time Environment (10hrs)

Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type checker-Equivalence of Type Expressions-Type Conversions. RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables- Dynamic Storage Allocation-Storage Allocation in FORTAN.

Unit-V: Code Optimization And Code Generation (9hrs)

Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis- Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm.

Text Book:

1. A Retarget able C Compiler: Design and Implementation Fraser and Hansen, Benjamin-Cummings, 1995.

References Books:

1. Advanced Compiler Design and Implementation, Much nick, Morgan and Kaufmann,1998.
2. Crafting a Compiler, Fischer and LeBlanc, Benjamin-Cummings, 1988.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 309	Data Mining & Warehousing	3	4	0	3

Total Hrs: 45

UNIT-I **(9Hrs)**

Data warehouse: Introduction to Data warehouse, Difference between operational database systems and data warehouses, Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction-Transformation-Loading, Logical(Multi-Dimensional), Data Modeling, Schema Design, Star and Snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non Addictive Measures; Fact-Less-Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

UNIT-II

(9Hrs)Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration &Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT-III

(9Hrs)Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set-Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT-IV (9Hrs)

Classification: Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers , Classification techniques, Decision Trees-Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction ; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics. Prediction: Accuracy and Error measures, Evaluating the accuracy of classifier or a predictor, Ensemble methods.

UNIT-V (9Hrs)

Clustering: Clustering Overview, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, , Partitioning Clustering-K-Means Algorithm, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Key Issues in Hierarchical Clustering, Strengths and Weakness, Outlier Detection.

Text Book:

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 310	Computer Network	3	0	0	3

Total Hrs:45

UNIT – I (9Hrs)

INTRODUCTION: Network applications, network hardware, network software, reference models: OSI, TCP/IP, Internet, Connection oriented network - X.25, frame relay. THE PHYSICAL LAYER: Theoretical basis for communication, guided transmission media, wireless transmission, the public switched telephone networks, mobile telephone system.

UNIT – II (9Hrs)

THE DATA LINK LAYER: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless Bluetooth.

UNIT – III (9Hrs)

THE NETWORK LAYER: Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.

UNIT – IV (9Hrs)

THE TRANSPORT LAYER: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP.

UNIT – V (9Hrs)

THE APPLICATION LAYER: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet..

Text Books:

1. Data Communication & Networking by Behrouz A. Forouzan McGraw Hill

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 304	Distributed System	4	0	0	4

Total Hrs:45

UNIT – I (9Hrs)

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT – II (9Hrs)

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture.

UNIT – III (9Hrs)

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, Ocean Store.Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging. Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT – IV (9Hrs)

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT – V (9Hrs)

Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, Consistency models.

Text Books:

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill

2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill

Reference Books:

1. Vijay K.Garg Elements of Distributed Compuitng , Wiley

2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson **Education**

3. Tenanuanbaum, Steen," Distributed Systems", PHI.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 305	Theory of computation	4	0	0	4

Total Hrs:45

Unit I: Mathematicalpreliminaries (7Hrs)

Sets, operations, relations, strings, transitive closure, count ability and diagonalisation, induction and proof methods-pigeon-hole principle and simple applications – concept of language – grammars and production rules –Chomsky hierarchy.

Unit II: Finite automata & regular expressions (8Hrs

) Finite State machine, regular languages, deterministic finite automata, conversion to deterministic automata, E-closures – regular expressions, finite automata, and minimization of automata, Moore and Mealy machine and their equivalence.

Unit III: Regular grammar & context free grammar

(9Hrs) Pumping lemma for regular sets- closure properties of regular sets- decision properties forregular sets, equivalence between regular language and regular grammar. Context – freelanguages – parse trees and ambiguity, reduction of CFGS ,Chomsky and Griebach normal forms.

Unit IV: Push – down Automata (PDA) (9Hrs)

Non Determinism – acceptance by two methods and their equivalence, conversion of PDA to CFG CFLs and PDAs-closure and decision properties of CFLs.

Unit V: Turing machines (12Hrs)

Variants – recursively enumerable (r.e.) set – recursive sets ,TM as computer of function – decidability and solvability – Halting Problem – reductions – Post correspondence Problem (PCP) and un solvability of ambiguity problem of CFGs, Church‟s hypothesis, Introduction to recursive function theory – primitive recursive and partial recursive functions.

Text Books

1. Introduction Of Automata Theory, Languages and computation- J.E. Hopcroft , J.D.Ulman, Pearson education.

Reference Books

1. John Martin, „Introduction Of Automata Theory, Languages and computation“
2. Peter Linz , „Introduction to formal languages and automata“,Norasa,2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 306	Speech and Natural Language Processing	4	0	0	4

Total Hrs: 45

Unit-I: Introduction (9Hrs)

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

Unit-Ii: Word Level Analysis (9Hrs)

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

Unit-Iii: Syntactic Analysis (9Hrs)

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures,Unification of feature structures.

Unit-Iv: Semantics And Pragmatics (9Hrs)

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

Unit-V: Discourse Analysis And Lexical Resources (9Hrs)

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Co reference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill‟s Tagger, WorldNet, Prop Bank, Frame Net, Brown Corpus, British National Corpus (BNC).

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction toNatural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition,
OReilly Media, 2009.

REFERENCES:

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java, OReilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford
University Press,
2008.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 307	Advance Operating System	4	0	0	4

Total Hrs: 45

Unit-I: Fundamentals Of Operating Systems (9 Hrs)

Overview – Synchronization Mechanisms – Processes And Threads - Process Scheduling – Deadlocks: Detection, Prevention And Recovery – Models Of Resources – Memory Management Techniques.

Unit-Ii: Distributed Operating System (9 Hrs)

Issues In Distributed Operating System – Architecture – Communication Primitives –Lamport‟S Logical Clocks – Causal Ordering Of Messages – Distributed Mutual Exclusion Algorithms – Centralized And Distributed Deadlock Detection Algorithms – Agreement Protocols.

Unit-Iii: Distributed Resource Management (9 Hrs)

Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms For Implementing Distributed Shared Memory–Issues In Load Distributing – Scheduling Algorithms –Synchronous And Asynchronous Check Pointing And Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol – Security And Protection.

Unit-Iv: Real Time And Mobile Operating Systems (9 Hrs)

Basic Model Of Real Time Systems - Characteristics- Applications Of Real Time Systems –Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes And Threads - Memory Management - File System.

Unit-V: Case Studies (9 Hrs)

Linux System: Design Principles - Kernel Modules - Process Management Scheduling -Memory Management - Input-Output Management - File System - Interprocess Communication. Ios And Android: Architecture And Sdk Framework - Media Layer -Services Layer - Core Os Layer - File System.

REFERENCES BOOKS:

1. Mukesh Singhal and Niranjan G. Shivaratri, “Advanced Concepts in Operating SystemsDistributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 308	Real Time Operating System	4	0	0	4

Total Hrs:45

Unit-I: Introduction (9Hrs)

Real-time Versus Conventional Software, Computer Hardware for Monitoring and Control, Software Engineering Issues. SOFTWARE ARCHITECTURES: Process and State-based Systems model, Periodic and Sporadic Process, Cyclic Executives, CE definitions and Properties, Foreground-Background Organizations, Standard OS and Concurrency, Systems Objects and Object-Oriented Structures, Abstract Data Types, General Object Classes.

Unit-II: Requirements And Design Specifications (9Hrs)

Classification of Notations, Data Flow Diagrams, Tabular Languages, State Machine, Communicating Real Time State Machine- Basic features, Timing and clocks, Semantics Tools and Extensions, State chartsConcepts and Graphical Syntax, Semantics and Tools.

Unit-III: Declarative Specifications And Deterministic Scheduling (9Hrs)

DECLARATIVE SPECIFICATIONS Regular Expressions and Extensions, Traditional Logics-Propositional Logic, Predicates, Temporal logic, Real time Logic. DETERMINISTIC SCHEDULING Assumptions and Candidate Algorithms, Basic RM and EDF Results, Process Interactions-Priority Inversion and Inheritance.

Unit-IV: Execution Time Specification (9Hrs)

Measurement of Software by software, Program Analysis with Timing Schema, Schema Concepts, Basic Blocks, Statements and Control, Schema Practice, Prediction by optimization, System Interference and Architectural Complexities Timer Application, Prosperities of Real and ideal clocks, Clock Servers – Lamport "s Logical clocks, Monotonic Clock service, A software Clock server, Clock Synchronization Centralized Synchronization, Distributed Synchronization.

Unit-V: Programming Language (9Hrs)

PROGRAMMING LANGUAGES: Real Time Language Features, Ada-Core Language, Annex Mechanism for Real Time Programming, Ada and Software Fault Tolerance, Java and Real-time Extensions, CSP and Occam.

Text Book:

Real – Time Systems and software by Alan C. Shaw ; John Wiley & Sons Inc, 2001.

Reference Book:

1. Real-Time Systems, Jane W.S. Liu, Prentice Hall, 2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 309	Web and Internet	4	0	0	4

Total Hrs: 45

UNIT I: (9Hrs)

Web Basics and Overview: Introduction to Internet, World Wide Web, Web Browsers, URL, MIME, HTTP, Web Programmers Toolbox. HTML Common tags: List, Tables, images, forms, frames, Cascading Style Sheets (CSS) & its Types. Introduction to Java Script, Declaring variables, functions, Event handlers (onclick, on submit, etc.,) and Form Validation.

UNIT II: (9Hrs)

Introduction to XML: Document type definition, XML Schemas, Presenting XML , Introduction to XHTML, Using XML Processors: DOM and SAX. PHP: Declaring Variables, Data types, Operators, Control structures, Functions.

UNIT III: (9Hrs)

Web Servers and Servlets: Introduction to Servlets, Lifecycle of a Servlet, JSDK, Deploying Servlet, The Servlet API, The javax. Servlet Package, Reading Servlet parameters, Reading Initialization parameters. The javax. servlet HTTP package, Handling Http Request & Responses, Cookies and Session Tracking.

UNIT IV: (9Hrs)

Database Access: Database Programming using JDBC, JDBC drivers, Studying Javax.sql.* package, Connecting to database in PHP, Execute Simple Queries, Accessing a Database from a Servlet. Introduction to struts frameworks.

UNIT V: (9Hrs)

JSP Application Development: The Anatomy of a JSP Page, JSP Processing. JSP Application Design and JSP Environment, JSP Declarations, Directives, Expressions, Scripting Elements, implicit objects. Java Beans: Introduction to Beans, Deploying java Beans in a JSP page.

Reference Book

1. Greenlaw R and Hepp E "Fundamentals of Internet and www" 2nd EL, Tata McGrawHill,2007.

2. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", 3rd Edition, BPB Publications.

3.D. Comer, "The Internet Book", Pearson Education, 2009.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 301	Management & employee performance	3	0	0	3

Total Hrs: 45

Unit I: Performance Management (PM) Conceptual FrameWork (9 Hrs)

Introduction to Performance Management, Definition, nature, scope, importance, Business and sub functional Performance Management, Performance Management as a management Tool, Performance objectives and standards, Standards of Performance. Performance Domains and dimensions.

Unit II: Performance Planning (9 Hrs)

Performance Planning Process, Contents of Performance Plan, 8 Step Model, Individual and Group Performance Planning, Role clarity and Job description, Meaning of Performance appraisal, methods and approaches to performance appraisal, Obstacles in appraisal, Designing appraisal for better results, Performance Appraisal Interview, Potential Appraisal.

Unit III: Performance Appraisal (9 Hrs)

Introduction, Definition, Purpose and Role of appraisal in Performance Management, Methods and Steps in Performance Appraisal. Why Appraisal Fail, Types of Appraisal, Approaches and Design, MBO, 360*, Potential Appraisal, Performance Review, Performance counseling/ Mentoring. Team Performance Appraisal.

Unit IV: Performance Management System (9Hrs)

Introduction to PMS, Importance, Features, Process of Building PMS, PMS Dimensions, Conceptual Framework. 4 pillars of PMS, PMS Prism, Strategic Performance Management, Performance and Strategy linkage, Components of SPM, SPM- Balanced Score Card, SPM and Metrix, SPM Environment teatre and Risks.

Unit V: Latest trends in Performance Management (9 Hrs)

Competency Based Performance Management System, Performance Measurement, Performance Measurement through BSC, Performance and Succession Plan/ Career Development, International Performance Management, Performance Audit, Human Resource Valuation accounting andAudit.

***Text Book**:*

D. K. Bhattacharya, Performance Management Systems and Strategies- Text book, Pearson.

Reference Books:

- Aquinis, Performance Management, Pearson.
- Chadha, Performance Management, Macmillan.
- Armstrong, Michael, Baron, Jaico, Performance Management.
- Cardy, Performance Management, PHI.
- Kohli, Deb, Performance Management, Oxford.
- D Sharma, Performance Management, HPH.
- R.K. Sahu, Performance Management System, EB.
- TV Rao, Performance Management and Appraisal, Sage.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 302	Cyber law & ethics	3	0	0	3

Total Hrs:45

Unit-I: Introduction (9 Hrs)

Concepts of Technology and Law Understanding Technology, Basic Concepts of Technology and Law Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence.

Unit-II: Law of Digital Contracts (9 Hrs)

The Essence of Digital Contracts, the System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography.

Unit-III: Intellectual Property Issues in Cyber Space (9 Hrs)

Domain Names and Related issues, Copyright in the Digital Media, Patents in the Cyber World, Rights of Netizens and E-Governance ,Privacy and Freedom Issues in the Cyber World, E-Governance E-Governance, Cyber Crimes and Cyber Laws.

Unit-IV: International Scenario in Cyber Laws (9Hrs)

Data Protection Laws in EU and USA ,Child Abuse Protection Laws in EU and USA, Cyber Laws - the Malaysian Approach.

Unit-V: Cyber law Issues For Management (9Hrs)

Cyber Law Issues in E-Business Management, Major issues in Cyber Evidence Management ,Cyber Law Compliancy Audit

Text Book:

1. “The Law of the Internet” by J. Rosenoer, Cyber Law (Springer Verlag).

Reference Books:

1. "Cyber Laws in India.. ITA-2000 and Beyond" by Navvi
2. “Handbook of Cyber Laws” By Sharma Vakul.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 303	Non- Conventional Energy Sources	3	0	0	3

Total Hours: 45

Unit-I (9 Hrs)

Global and National scenarios, Form and characteristics of renewable energy sources.
Solar Energy: Solar radiation, its measurements and prediction, Solar thermal collectors, flat plate collectors, concentrating collectors, Basic theory of flat plate collectors, solar heating of buildings, solar still, solar water heaters, solar driers, conversion of heat energy in to mechanical energy, solar thermal power generation systems.

Solar Photovoltaic: Principle of photovoltaic conversion of solar energy, types of solar cells and fabrication, Photovoltaic applications: battery charger, domestic lighting, street lighting, water pumping, power generation schemes.

Unit-II (9 Hrs)

Wind Energy: Atmospheric circulations, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS- classification, characteristics and applications.

Unit-III (9 Hrs)

Ocean Energy: Ocean energy resources, ocean energy routes, Principles of ocean thermal energy conversion systems, ocean thermal power plants, Principles of ocean wave energy conversion and tidal energy conversion.

Unit-IV (9 Hrs)

Other Sources: Nuclear fission and fusion, Geothermal energy- Origin, types of geothermal energy sites, site selection, geothermal power plants, Magneto-hydro-dynamic (MHD) energy conversion, Formation of biomass, photosynthesis, Biomass resources and their classification, Chemical constituents and physicochemical characteristics of biomass, Biomass conversion processes.

Unit-V (9 Hrs)

Fuel Cells: Thermodynamics and electrochemical principles, Basic design, types, applications.

References Books:

1. Power Generation through Renewable Source of Energy, Rai and Ram Prasad, Tata McGraw-Hill,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 311	Compiler Design Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1 & 2 implement a lexical analyzer in "C".

3. Use LEX tool to implement a lexical analyzer.

4. Implement a recursive descent parser for an expression grammar that generates arithmetic expressions with digits, + and *.

5. Use YACC and LEX to implement a parser for the same grammar as given in problem

6. Write semantic rules to the YACC program in problem 5 and implement a calculator that takes an expression with digits, + and * and computes and prints its value.

7 & 8. Implement the front end of a compiler that generates the three address code for a simple language with: one data type integer, arithmetic operators, relational operators, variable declaration statement, one conditional construct, one iterative construct and assignment statement.

9 &10. Implement the back end of the compiler which takes the three address code generatedin problems 7 and 8, and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assemblies instructions can be simple move, add, sub, and jump. Also simple addressing modes are used.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 312	Computer Network Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. To demonstrate the operation of the Ethernet – network using OPNET IT Guru
2. To demonstrate the implementation of the token ring network using OPNET IT Guru
3. To demonstrate the implementation of the Switched local area network using OPNET IT Guru
4. To demonstrate the basics of designing a network using OPNET IT Guru
5. To examine the effect of ATM adaptation layers and service classes on the performance of network using OPNET IT Guru.
6. To Configure & analyze the performance of routing information protocol (RIP) model using OPNET IT Guru
7. To configure & analyze the performance of open shortest path first (OSPF) routing protocol using OPNET IT Guru
8. To demonstrate the congestion control algorithm implemented by the TCP using OPNET ITGuru
9. To create a network cable using RJ-45 connectors. 10. To install a network interface card
10. Simulation of Dijkstra Algorithm in C
11. Simulation of Spanning tree algorithm in C
12. To configure a Wireless access point in a local network
13. To install and configure wireless LAN card in the computer
14. To understand the working of layer-3 switch for address sub netting in the network.

Semester VII (Fourth Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE401	Cyber Security & Cryptography	3	1	0	4

Total Hrs: 45

UNIT– I: Security Concepts (9 Hrs)

Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT– II: Symmetric key Ciphers (9 Hrs)

Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT– III: Cryptographic Hash Functions (9 Hrs)

Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastruct ure

UNIT – IV: Transport-level Security (9 Hrs)

Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH) Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE

802.11i Wireless LAN Security

UNIT – V: E-Mail Security (9 Hrs)

Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange Case Studies on Cryptography and security: Secure Multiparty

Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Crosssite Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practice: William Stallings, PearsonEducation, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, WileyIndia, 1st Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3rdEdition.

Categor	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE401	Data Analytics	4	0	0	4

Total Hrs: 4

UNIT-I: INTRODUCTION TO BIG DATA [9 Hours]

Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis v/s reporting – Modern data analytic tools, Statical concepts: Sampling distributions, re-sampling, statistical inference, prediction error.

Unit-Ii: Data Analysis [9 hours]

Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics – Rule induction – Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

Unit-Iii: Mining Data Streams [9 hours]

Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions.

Unit-Iv :Frequent Itemsets And Clustering [9 hours]

Mining Frequent item sets – Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means

– Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

Unit-V: Frameworks And Visualization [9 hours]

Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed file systems –

Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications:

TEXT BOOKS:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets,CambridgeUniversity Press, 2012.

REFERENCES:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streamswith advanced analystics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big DataGlossary,
   O‟Reilly, 2011.
3. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier,
   Reprinted 2008.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE402	Parallel and Distributed Algorithm	4	0	0	4

Total Hrs: 45

Unit - I: Fundamentals: (9 Hrs)

Introduction to distributed systems, synchronous / asynchronous network models, leader election problem in ring and general networks; Type of faults, fail safe systems, Byzantine faults, distributed consensus with link and process failures.

Unit- ll: The PRAM Model: (9 Hrs)

Balancing, divide and conquer, parallel prefix computation, pointer jumping, symmetry breaking, list ranking, sorting and searching, graph algorithms, parallel complexity and complexity classes, lower bounds.

Unit - lll: Interconnection Networks: (9 Hrs)

Topologies (arrays and mesh networks, trees, systolic networks, hyper cubes, butterfly) and fundamental algorithms, matrix algorithms, sorting, graph algorithms, routing, and relationship with PRAM models; Asynchronous Parallel Computation; Distributed Models and Algorithms.

Unit- IV: Concepts of Distributed Computation: (9Hrs)

Termination; Failure tolerance; Network topology. Distributed Search: Algorithms for BFS, DFS,shortest paths and spanning trees in distributed systems.

Unit - V: Distributed Networks: (9 Hrs)

Broadcasting; Robust distributed networks. Processor organizations such as mesh and hypercube, embedding of problem graphs into processor graphs.

REFERENCES BOOK:

1. V. Kumar, A. Grama, A. Gupta, G. Kaarypis, Introduction to Parallel Computing, AddisonWesley Press

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE403	Neural Networks and Deep Learning	4	0	0	4

Total Hrs: 45

Unit - I: Introduction: Neuro Computing andNeuroscience (9 Hrs)

Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

Unit - II: Data processing (9 Hrs)

Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, Eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit - III: Multilayered network architecture (9 Hrs)

Back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation propertiesof RBF networks and comparison with multilayer perceptron.

Unit - IV: Deep Learning (9 Hrs)

Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network. Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing.

Unit - V: Deep Learning Search and tools (9 Hrs)

Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network. Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing.Deep Learning Tools: Caffe, Theano,Torch.

Reference Books:

1.J.A. Anderson, An Introduction to Neural Networks, MIT

2.Hagen Demuth Beale, Neural Network Design, Cengage Learning

Text Books:

T1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.T2. Bishop, C.,M., Pattern Recognition and Machine Learning, Springer, 2006

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 404	Multi-agent Intelligent	3	0	0	3

Total Hrs: 45

Unit - Introduction to Agents (9 Hrs)

Agents and Environment; Performance measure; Nature of Environment; Abstract and Concrete Architecture for intelligent agents; Problem solving and planning: Result sharing, Task sharing and Distributed planning

Unit - II: The design of Intelligent Agents (9 Hrs)

Deductive reasoning agents: AgentO, Practical Reasoning Agents: HOMER architecture; Reactive agents: Subsumption architecture; Hybrid agents: Touring Machines, InteRRaP.

Unit - III: Agent Communication and Interaction Protocols (9 Hrs)

Agent Communications: Knowledge Query and manipulation Language (KQML), Knowledge Interchange Format (KIF), Ontology, Coordination protocols, Cooperation Protocols, Contract Net, Blackboard Systems, Negotiation, Multi-agent Belief Maintenance, Market Mechanisms.

Unit - IV: Multi-Agent System Interactions & Agreements (9 Hrs)

Classifying multi-agent interactions: Multi-agent Encounters - Dominant Strategies and Nash Equilibria - Competitive and zero-sum and other interactions; Cooperation: the Prisoner's dilemma and Axelrod's experiments; Reaching Agreements: Interactions between self-interested agentsauctions & voting systems – negotiation - Argumentation; Interactions between benevolent agents: Cooperative Distributed Problem Solving (CDPS), partial global planning; coherence and coordination

Unit -V: Multi-agent Methodologies and Applications (9 Hrs)

Agent Methodologies- Mobile agents; Typical application areas of agent systems: Business Process Management, Distributed Sensing, Information Retrieval and Management, Electronic Commerce, Human-Computer Interfaces, Social Simulation etc.

***Reference Books*:**

1.M. Wooldridge, An Introduction to Multiagent Systems; John Wiley & Sons, New York, NY, 2002.

2.J.M. Vidal, Fundamentals of Multiagent Systems with NetLogo Examples; Lecture Notes, University of South Car olina, Columbia, SC, 2007.

3.St. Preitl, R.-E. Precup, Regulatoare pentru servosisteme: metode de proiectare; Editura Orizonturi Universitare, T imisoara, 2007 (in Romanian + slides in English).

Text Books:

1.K.-H. Dietsche, M. Klingebiel, Automotive Handbook; Robert Bosch Gmbh, Plochingen, 2007.

2.N.P. Padhy, Artificial Intelligence And Intelligent Systems; Oxford University Press, Oxford,2005.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE405	Internet of Things	3	0	0	3

Total Hrs: 45

Unit-I: Fundamentals Of Iot (9hrs)

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

Unit- ll: Iot Protocols (9hrs)

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e,

1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks –
Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application
Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

Unit-lll: Design And Development (9hrs)

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

Unit-IV: Data Analytics And Supporting Services (9 Hrs)

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning
– No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics
– Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

Unit-V: Case Studies/Industrial Applications (9hrs)

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide EthernetModel (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart TrafficControl Analyze applications of IoT in real time scenario.

Textbook:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton And Jerome Henry, ―Iot Fundamentals:
   Networking Technologies, Protocols And Use Cases For Internet Of Things, Cisco Press,2017

References:

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach,Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Keyapplications and Protocols, Wiley, 2012 (for Unit 2).

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 406	Cloud Computing	3	0	0	3

Total Hrs: 45

Unit-l: Introduction to Cloud Computing (9Hrs)

Virtualization Concepts, Cloud Computing Fundamental: Overview of Computing Paradigm, Evolution of cloud computing, Defining cloud computing, Components of a computing cloud, Essential Characteristics of Cloud Computing, Cloud Taxonomy.

Unit-II: Cloud Computing Architectural Framework (10Hrs)

Cloud architectural principles, Role of Networks in Cloud computing, Role of Web services, Benefits and challenges to Cloud architecture, Cloud Service Models, cloud computing vendors. Cloud Services Management, Performance and scalability of services, tools and technologies used to manage cloud services deployment.

Unit-III: Exploiting Cloud Services (9Hrs)

Software as a Service(SaaS): Introduction to SaaS, Inspecting SaaS technologies, Implementing web services, Deploying Infrastructure as a Service(IaaS): Introduction to IaaS, Scalable server clusters, Machine Image, Virtual Machine (VM). Elastic storage devices, Data storage in cloud computing, Delivering Platform as a Service(PaaS): Introduction to PaaS, Service Oriented Architecture (SOA), Cloud Platform and Management, Hardware-as-a-service: HaaS.

Unit-IV: Cloud Application Development (9 Hrs)

Role of business analyst, Technical architecture considerations, Service creation environments to develop cloud based applications, Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages, Cloud Economics.

Unit-V: Cloud Security and Risk Management (9Hrs)

Cloud Security: Understanding cloud based security issues and threats, Data security and Storage, Identity & Access Management, Risk Management in cloud, Governance and Enterprise Risk Management.

Text Books:

1. Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet by KaiHwang, Jack Dongarra & Geoffrey C. Fox., Morgan Kaufmann Publishers, 2012.

2. Cloud Computing Bible, Barrie Sosinsky, WileyIndia, 2010

3. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011

4. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, LeeGillam, Springer, 2012

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 401	Economics Policy in India	3	0	0	3

Total Hrs: 45

Unit – I: Economic Development and its Determinants (9 Hrs)

Approaches to economic development and its measurement – sustainable development; Role of State, market and other institutions; Indicators of development – PQLI, Human Development Index (HDI), gender development indices.

Unit-II: Planning in India (9 Hrs)

Objectives and strategy of planning; Failures and achievements of Plans; Developing grass-root organizations for development – Panchayats, NGOs and pressure groups.Demographic Features, Poverty and Inequality. Broad demographic features of Indian population; rural-urbanmigration; Urbanization and civic amenities; Poverty and

Unit-III: Inequality (9 Hrs)

Resource Base and Infrastructure. Energy; social infrastructure – education and health; Environment; Regional imbalance; Issues and policies in financing

Unit-IV: Infrastructure development and Polices (9 Hrs)

The Agricultural Sector, Institutional Structure – land reforms in India; Technological change in agriculture – pricing of agricultural inputs and output; industry; Agricultural finance policy; Agricultural Marketing and Warehousing; Issues Terms of trade between agriculture and in food security – policies for sustainable agriculture. Industrial policy; Public Sector enterprises and their performance; Problem of sick units in India; Privatization and policy – issues in labour market reforms; approaches for employment generation.

Unit-V: Public Finances (9 Hrs)

Fiscal federalism – Centre-State financial relations; Finances of central government; Finances of state governments; Parallel economy; Problems relating to fiscal policy; Fiscal sector reforms in India. Money, Banking and Prices. Analysis of price behavior in India; Financial sector reforms; Interest rate policy; Review of monetary policy of RBI; Money and capital markets; Working of SEBI in India. External Sector Structure and direction of foreign trade; Balance of payments; Issues in export-import policy and FEMA; Exchange rate.

Reference Books:

1. Ahluwalia, I. J. and I. M. D Little (Eds.) (1999), India's Economic Reforms and Development (Essays in honour of Manmohan Singh), Oxford University Press, NewDelhi.
2. Bardhan, P. K. (9th Edition) (1999), The Political Economy of Development in India,Oxford University Press, New Delhi.
3. Bawa, R. s. and P. S. Raikhy (Ed.) (1997), Structural Changes in Indian Economy, GuruNanak Dev University Press.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 402	Reliability & Maintenance engineering	3	0	0	3

Total Hrs: 45

Unit-I Introduction: (9Hrs)

Maintenance Objectives and Functions, Maintenance Systems, Need of planned maintenance, Maintenance policies, Breakdown, time based maintenance, Block replacement, age replacement and periodic replacement policy, Corrective and preventive maintenance, Maintenance planning, Scheduled maintenance, Cost of maintenance versus Cost of equipment and production delays.

Inspection: Inspection intervals, Inspection reports, card history system.

Unit-II Predictive Maintenance: (9Hrs)

Equipment wear records, standards, Equipment used in predictive maintenance. Computerized maintenance, Total Productive Maintenance, Methods of condition monitoring, Non-destructive testing, Liquid Penetrate, Magnetic particles, Ultrasonic testing, and Vibration analysis, Oil analysis, Radiographic testing.

Unit-III Reliability: (9Hrs)

Definition, failure data analysis, Mean failure rate, mean time to failure(MTTF), mean time between failures (MTBF), hazard rate, Bathtub curve, Use of Weibull probability chart foe assessing characteristics life, guarantee period etc.

Unit-IV System Reliability Improvement: (9Hrs)

Series, parallel and mixed configuration, Simple problems. Techniques, use of Pareto analysis-Design for reliability, redundancy unit and stand by redundancy, Optimization of reliability.

Unit-V Spare Parts Management: (9Hrs)

Spare parts, features and categorization of spares, cost considerations, Techniques of cost reduction, Selective controls used in spare parts control, ABC analysis, FSN, XYZ, VED and other approaches, Inventory control of spares.

Reference Books:

1. Reliability Engineering, Srinath L.S., Affiliated East West Press.
2. Maintainability Principles and Practices, Blanchand, B.S., McGraw Hill

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 403	Management training & development	3	0	0	3

Total Hours: 45

Unit-I: Training (9 Hrs)

Training: Introduction - Conceptual framework of training - approaches on training – Difference between Training and Development - Training and applied psychology - principles of training - Learning and skills acquisition - Transfer and retention of skills.

Unit-II: Need for Training (9 Hrs)

Methods of Identification of Training needs - Training policy - Planning and organizing the training programmes - Methods of Training - – on the job training – off the job training – choosing optimum method – the lecture –panel discussion – behavior modeling – interactive demonstrations – brain storming – case studies, incident process, in- transactional analysis, exception analysis.

Unit-III: Management Development (9 Hrs)

Management Development (MD) and Organizational Development (OD) - Difference between MD and OD - Aims and objectives of MD and OD - Methods of MD -OD interventions – Succession Planning and Career development.

Unit-IV: Evaluation of training (9 Hrs)

Evaluation of training-need for evaluation, Principles of evaluation, Criterion and Approaches: Return on investment in training, Process of calculating ROI in training; emerging trends in training and development; new perspectives on training- Cross culture training.

Unit-V: Technology in training (9 Hrs)

Technology in training: CBT, Multimedia training, e-learning/Online learning,Distance learn.

Text Book:

1. B.L.Gupta(2011), Management Training and Development, Vrinda Publication, New Delhi.

Refrence Books:

1. Alan M. Saks, Robert R. Haccoun (2010): Managing Performance Through Training andDevelopment, 5e, Nelson Education ltd. USA.
2. Craig Eric Schneier, Craig J. Russell (1994): The Training and Development Sourcebook
3. 2e, Human Resource Development Press Inc, USA.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE-402	Network Security & Cryptography lab	0	0	2	1

Total Hrs: 20

List of Practical's-

1. Write a program to implement the Caesar Cipher
2. Write a program to implement the Play air Cipher
3. Write a program to implement the Hill Cipher
4. Write a program to implement the Vigenere Cipher
5. Write a program to implement the Rail fence row & Column Transformation
6. Write a program to implement the DES algorithms
7. Write a program to implement the RSA Algorithm
8. Write a program to implement the Diffiee-Hellman algorithms
9. Write a program to implement the MD5 algorithms
10. Write a program to implement the SHA-1 algorithms
11. Implement the SIGNATURE SCHEME -Digital Signature Standard
12. Demonstrate how to provide secure data storage, secure data transmission

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ-CSE-401	Minor Project	0	0	16	8

The minor project work can be a design project, experimental fabrication project or software development project on any of the topics of mechanical engineering interest - it can be allotted as a group project with groups consisting of three or four students The assessment of all the minor projects should be done by a committee consisting of three or four faculty members specialized in the various fields of Mechanical Engineering - the students will present their project work and give a seminar on that topic for about thirty minutes - a committee consisting of at least three faculty members (preferably specialized in different fields of mechanical engineering) will assess the presentation of the seminars before the committee - the relative grading and group average marks for the various projects will be fixed by the committee - the guide will award the marks for the individual students in the project maintaining the group average - each group will prepare the project report and submit one copy of a write up of his minor project to the department through the guide - the Head of the Department will certify the copies and keep them in the departmental library

Instructions For Project Report/ Dissertation Writing

It is important that the procedures listed below be carefully followed by all the students of B.E. (Computer Science engineering).

1. Prepare one spiral Bound Copies of your manuscript
2. Limit your Dissertation report to 50– 60 pages (preferably)
3. The footer must include the following: Institute Name, B.E. (CSE) Times New Roman 10 pt.and centrally aligned.
4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.
5. Print the manuscript using
   I. Letter quality computer printing.
   II. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.
   III. Use 1.5 line spacing.

Semester VIII (Fourth Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE-403	Advanced Computer Architecture	3	1	0	4

Total Hrs: 45

Unit-I: Fundamentals Of Computer Design [9 Hours]

Review of Fundamentals of CPU, Memory and IO – Trends in technology, power, energy and cost, Dependability – Performance Evaluation

Unit-II : Instruction Level Parallelism [9 Hours]

ILP concepts – Pipelining overview – Compiler Techniques for Exposing ILP – Dynamic Branch Prediction – Dynamic Scheduling – Multiple instruction Issue – Hardware Based Speculation – Static scheduling – Multi-threading – Limitations of ILP – Case Studies.

Unit- III : Data-Level Parallelism [9 Hours]

Vector architecture – SIMD extensions- Graphics Processing units – Loop level parallelism

Unit-IV : Thread Level Parallelism [9 Hours]

Symmetric and Distributed Shared Memory Architectures – Performance Issues –Synchronization –

Models of Memory Consistency – Case studies: Intel i7 Processor, SMT & CMP Processors.

Unit-V : Memory And I/O [9 Hours]

Cache Performance – Reducing Cache Miss Penalty and Miss Rate – Reducing Hit Time – Main Memory and Performance – Memory Technology. Types of Storage Devices – Buses – RAID – Reliability, Availability and Dependability – I/O Performance Measures.

Text Book:

John L Hennessey and David A Patterson, “Computer Architecture A Quantitative Approach”, Morgan Kaufmann/ Elsevier, Fifth Edition, 2012.

References:

Kai Hwang and Faye Briggs, “Computer Architecture and Parallel Processing”, Mc Graw-Hill International Edition, 2000.

Sima D, Fountain T and Kacsuk P, ”Advanced Computer Architectures: A Design Space Approach”, Addison Wesley, 2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 404	Artificial Intelligence & Expert System	3	0	0	3

Total Hrs:45

Unit-I: Introduction (9Hrs)

Introduction: Aim and objective of AI, AI problems, AI technique, Production system Characteristics, Basics of problem solving: problem representation paradigms defining problem as a state space representation. Intelligent Agents, Performance Measure, Rationality, Structure of Agents, Problem solving agents, Problem Formulation.

Unit-II: Search Techniques (9Hrs)

Search Techniques: Uninformed Search Strategies Problem size, complexity, approximation and search; depth, breadth and best search; Informed Heuristic Based Search: Informed (Heuristic) Search and Exploration, Greedy best first search, Memory bounded heuristic search, Heuristic functions, inventing admissible heuristic functions, Hill climbing, best-first search, branch and bound And OR Graph: A* algorithm and AO* Algorithm. Simulated Annealing, Online search.

Unit-III: A.I Problems (9Hrs)

Constraint Satisfaction Problems, Backtracking Search, variable and value ordering, constraint propagation, intelligent backtracking, local search for CSPs, Adversarial Search, Games, The minimax algorithm, Alpha-Beta pruning, Imperfect Real-Time Decisions, Games that include an Element of Chance

Unit-IV Structured Knowledge Representation (9Hrs)

Structured Knowledge Representation: Semantic Nets, Frames, and Scripts. Learning: Block architecture of learning system, Types of learning, performance Measures First order logic, Unification, and Resolution in Predicate Logic Uncertainty Treatment: formal and empirical approaches including Exact and Approximate inference in Bayesian Networks, Bayesian theory, belief functions, certainty factors

Unit-V: Inference Techniques (9Hrs)

Inference Techniques: Types of reasoning deductive, inductive, abductive, analogical, common-sense and non-monotonic, types of inference forward and backward chaining, inference using full joint distributions, fuzzy logic. Recent advances in Artificial Intelligence, Algorithms for artificial intelligence, Genetic algorithms. Tools for development of Artificial Intelligence: Open Neural network library. Applications of artificial Intelligence.

Text Books:

1. Artificial Intelligence a Modern Approach: Russel and Norvig , Pearson Education, 2nd
2. 2. Artificial Intelligence – A Practical Approach: Patterson, Tata McGraw Hill, 3rd

Reference Books:

1. Maus, R. and Keyes, J., "Handbook of Expert Systems in Manufacturing", McGraw Hill, 1991
2. Robert Levine, "A comprehensive guide to artificial intelligence and expert systems",
3. Elain Rich ,"Artificial Intelligence", PHI Publication
4. Introduction to Artifitial Intelligence by E.Charniack and D. Mcdermott, Pearson Education.
5. Artifitial Intelligence structures and strategies for complex problem solving, 4 th edition, Pearson education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE407	Optimization Techniques	3	1	0	4

Total Hours: 40

Unit- I: Linear Programming (10 Hrs)

Introduction – formulation of linear programming model-Graphical solution–solving LPP usingsimplex algorithm – Revised Simplex Method.

Unit- II: Advances In Lpp (10 Hrs)

Duality theory- Dual simplex method – Sensitivity analysis–-Transportation problems Assignment problems-Traveling sales man problem -Data Envelopment Analysis.

Unit- III: Non Linear Programming (10 Hrs)

Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tuckerconditions– Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.

UNIT- IV: DYNAMIC PROGRAMMING (10 Hrs)

Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming–Backward and Forward recursion–Computational procedure– Conversion offinal value problem in to Initial value problem.

Text Books:

1.Hillier and Lieberman “Introduction to Operations Research”, TMH, 2000.

2.R.Panneerselvam, “Operations Research”, PHI, 2006

3.Hamdy ATaha, “Operations Research –An Introduction”, Prentice Hall India, 2003.

References:

1. Philips, Ravindran and Solberg, “Operations Research”, John Wiley, 2002.

2. Ronald L.Rardin, “Optimization in Operation Research” Pearson Education Pvt. Ltd. New Delhi, 2005.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE408	Human Computer Interaction	3	1	0	4

Total Hours:45

Unit- I: Foundations Of Hci (9hrs)

The Human: I/O Channels – Memory – Reasoning And Problem Solving; The Computer: Devices – Memory – Processing And Networks; Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity-Paradigms.

Unit- II: Design & Software Process (9hrs)

Interactive Design Basics – Process – Scenarios – Navigation – Screen Design – Iteration And Prototyping. Hci In Software Process – Software Life Cycle – Usability Engineering – Prototyping In Practice – Design Rationale. Design Rules – Principles, Standards, Guidelines, Rules. Evaluation Techniques – Universal Design.

Unit- III: Models And Theories (9hrs)

Cognitive Models –Socio-Organizational Issues And Stake Holder Requirements – Communication And Collaboration Models-Hypertext, Multimedia And Www.

Unit- IV: Mobile HCI (9hrs)

Mobile Ecosystem: Platforms, Application Frameworks- Types Of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements Of MobileDesign, Tools.

Unit- V: Web Interface Design (9hrs)

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays And Virtual Pages, Process Flow. Case Studies.

Text Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition,
   Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009 (UNIT –IV)

3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O‘Reilly, 2009.(UNIT-V)

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE409	Digital Signal Processing	3	1	0	4

Total Hours: 45

Unit-I: Signals And Systems (9 Hrs)

Basic elements of DSP – concepts of frequency in Analog and Digital Signals – sampling theorem – Discrete – time signals, systems – Analysis of discrete time LTI systems – Z transform – Convolution – Correlation.

Unit – II: Frequency Transformations (9 Hrs)

Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms - Decimation – in – time Algorithms, Decimation – in – frequency Algorithms – Use of FFT in Linear Filtering – DCT – Use and Application of DCT.

Unit – III: Iir Filter Design (9 Hrs)

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF,BPF, BRF) filter design using frequency translation.

Unit – IV: Fir Filter Design (9 Hrs)

Structures of FIR – Linear phase FIR filter – Fourier series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques.

Unit-V: Finite Word Length Effects In Digital Filters (9 Hrs)

Binary fixed point and floating point number representations – Comparison - Quantization noise – truncation and rounding – quantization noise power- input quantization error- coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling.

Refrences:

1. Emmanuel C..Ifeachor, & Barrie.W.Jervis, “Digital Signal Processing”, Second Edition, Pearson
   Education / Prentice Hall, 2002.

2. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata Mc Graw Hill, 2007.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE404	Human Resources Management	3	0	0	3

Total Hours: 45

Unit-I: Overview (9 Hours)

Overview of Human Resources, Historical evolution, Integrated HR function, Corporate and HR environment, Strategic environment, Strategic Management

Unit-II: Planning (9 Hours)

HR planning at Enterprise level, Need for systematic planning, Planning process, Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supplyforecasting. Retention-Redeployment and Exit strategies

Unit-III: Career management (9 Hours)

Career management-Recruitment and Selection, Employee Induction Programme, Employee training, Training needs & objective setting, Methods of training, Development & Development needs, Human Resource Development, Development process

Unit-IV: Performance Policies (9 Hours)

Performance planning – Performance appraisal, Measures of appraisal, System components appraisal methods, Ethics of appraisal, Problems & issues

Unit-V: Human Resource Information System (9 Hours)

Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level

Text Book:

1. Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia

Reference Books

1. John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A Reader, SAGE Publications, 1998
2. Christopher Mabey, Rosemary Thomson (2011): Developing Human Resources,Routledge, Taylor and francis group, New York, USA.
3. Dessler & Varkkey, (2010): Human Resource Management 11e, India, Prentice Hall
4. Richard D. Johnson, Michael J. Kavanagh, Mohan Thite (2011): Human ResourceInformation System 2e, SAGE Publications, 2011.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE405	Total Quality Management	3	0	0	3

Total Hours:45

Unit-I (9 Hours)

Quality Concepts Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.
Control on Purchased Product Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.
Manufacturing Quality Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

Unit-II (9 Hours)

Quality Management Organization structure and design, Quality function, decentralization, Designing and fitting

organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.
Human Factor in Quality Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

Unit-III (9 Hours)

Control Charts Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.
Attributes of Control Charts Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

Unit-IV (9 Hours)

Defects Diagnosis and Prevention Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

Unit-V (9 Hours)

IS0-9000 and its concept of Quality Management: ISO 9000 series, Taguchi method, JIT in some details.

Text and References Books:

1. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990. .

2. Greg Bounds. “Beyond Total Quality Management”. McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE406	Industrial Relations	3	0	0	3

Total Hours:45

Unit - I: Industrial Relations (9 Hours)

Industrial Relations- Concept and scope, Stake holders; Approaches to Industrial Relations; Labor Market, Demand and Supply of Labor, Nature and composition of Indian labor, Employment and Unemployment Scenarios.

Unit - II: History (9 Hours)

History: Evolution of Industrial Relations UK), Emergence of Industrial relations/ Trade Union movement in India, Government initiatives, Industrial relations machineries, ILO and its impact on Indian IR scenarios.

Unit - III: Industrial Disputes resolutions (9 Hours)

Industrial Disputes resolutions: Sources – Wages, service conditions and discipline, Concept of wages, Wage theories, wage differentials, Regulations for protection of wages, service conditions and Work discipline. Law of natural justice and domestic enquiries; Workers participation in Management, Works committees, Joint Councils.

Unit - IV: Industrial Conflict (9 Hours)

Industrial Conflict: Negotiation, Mediation/ Conciliation, Arbitration, Adjudication- Labor court, Industrial Tribunal, National Tribunal; Special reference to Pay Commissions.

Unit - V: Trends (9 Hours)

Trends: Globalization and its impact on Industrial Relations, Employee Engagement practices, current trends in Industrial Relations in India, Industrial Relations bill- ifs and buts, Ethics, governance and Industrial Relations.

Text Books:

1. P. N. Singh, Neeraj Kumar, Employee Relations Management, Pearson.
2. Personnel Management and Industrial Relations, P.C. Tripathi, Sultan chand and sons.

Reference Books:

1. Arun Monappa, Industrial Relations, Tata Mc Graw Hill.
2. Michael V P, HRM and Human Relations, Himalaya publications.
3. Mamoria and Mamoria, Dynamics of Industrial Relations in India, Himalaya publications.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 405	Artificial Intelligence & Expert system Lab	0	0	4	2

Total Hours: 20

List of Practical's-

1. Study of facts, objects, predicates and variables in PROLOG
2. Study of Rules and Unification in PROLOG
3. Study of "cut" and "fail" predicate in PROLOG
4. Study of arithmetic operators, simple input/output and compound goals in PROLOG
5. Study of recursion in PROLOG. 6 Study of Lists in PROLOG
6. Study of dynamic database in PROLOG
7. Implement string operations like substring, string position, palindrome etc.)
8. Write a prolog program to maintain family tree.
9. Write a prolog program to implement all set operations (Union, intersection, complement etc.)
10. Write a prolog program to solve "Water Jug Problem".

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ-CSE-402	Major Project	0	0	16	8

The major project work can be a Modeling and Simulation, Case study, Design or Experiments in the field of Mechanical Engineering. It can be allotted as a group project with groups consisting of 3 to 4 students. The major project work started in the seventh semester (minor project) may be continued in this semester - the students should complete the project work in this semester and present it before the assessment committee The assessment committee will assess the various projects, fix the relative grading and group average marks - the guides will award the marks for the individual students in a project maintaining the group average - each group should submit three copies of a write up of his major project of the completed project report signed by the department (in the format prescribed by the department) through the guide - the Head of the Department-Dean of School of engineering and Technology will certify the copies and one copy return them to the students - other copy will be kept in the departmental and university library

INSTRUCTIONS FOR PROJECT REPORT/ DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of B.E. (Mechanical Engineering).

1. Prepare Three Hard Bound Copies of your manuscript and if possible publish at least one international journal paper by each group for value addition of your project.

2. Limit your Dissertation report to 80 – 120 pages (preferably)

3. The footer must include the following: Institute Name, B.E. (Mechanical) Times New Roman10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using

a. Letter quality computer printing.

b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.

c. Use 1.5 line spacing.

d. Entire report shall be of 5- 7 chapters.

6.Use the paper size 8.5„„× 11„„or A4 (210 × 197 mm).

Margin Location	Paper 8.5„„× 11„„	Paper A4 (210 × 197 mm)
Top	1„„	25.4 mm
Left	1.5„„	37 mm
Bottom	1.25„„	32 mm
Right	1„„	25.4mm

7.All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.

8.Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.

9.Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, black and white. Illustrations downloaded from internet are not acceptable.

1. Illustrations should not be more than two per page. One could be ideal
2. Figure No. and Title at bottom with 12 pt
3. Legends below the title in 10 pt
4. Leave proper margin in all sides
5. Illustrations as far as possible should not be photo copied.

11. Photographs if any should of glossy prints

12. Please use SI system of units only.

13. Please number the pages on the front side, centrally below the footer

14. References should be either in order as they appear in the thesis or in alphabetical order bylast name of first author

15. Symbols and notations if any should be included in nomenclature section only

16. Following will be the order of report

i. Cover page and Front page as per the specimen on separate sheet
ii. Certificate from the Institute as per the specimen on separate sheet
iii. Acknowledgements
iv. List of Figures
v. List of Tables
vi. Nomenclature vii. Contents
vii. Abstract

(A brief abstract of the report not more than 150 words. The heading of abstract i.e. word ―Abstract‖ should be bold, Times New Roman, 12 pt and should be typed at the centre. The contents of abstract should be typed on new line without space between heading and contents.

Try to include one or two sentences each on motive, method, key-results and conclusions in bstract

1) Introduction (2-3 pages) (TNR – 14 Bold) Problem statement (TNR – 12)
1.1 Objectives
1.2 Scope
1.3 Methodology
1.4 Organization of Dissertation

2) Literature Review (20-30 pages) Discuss the work done so far by researchers in the domain area and their significant conclusions. No derivations, figures, tables, graphs are expected.

3)This chapter shall be based on your own simulation work (Analytical/ Numerical/FEM/CFD)(15- 20 pages)
4) Experimental Validation - This chapter shall be based on your own experimental work (15-20 pages)
5) Concluding Remarks and Scope for the Future Work (2-3 pages) References ANNEXURE (ifany) (Put all mathematical derivations, Simulation program as Annexure)

17. All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, …. and for subheadings 1.1, 1.2, …. etc and section subheadings 2.1.1, 2.1.2, …. etc.

18. References should be given in the body of the text and well spread. No verbatim copy orexcessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it.

Please follow the following procedure for references / Reference Books/ Patent/ Internet

- Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., OxfordUniversity Press, UK, 1996, pp. 110 – 112.
- 2. Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport

properties and surface tension of pure and mixed refrigerants, ASHRAE Trans, 1991, 97 (1), pp. 90 – 98.

- Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillarytubes, Int. Journal of Refrigeration, 1996, 19 (8), pp.497 – 505.
- Papers from Conference Proceedings Colbourne, D. and Ritter, T. J., Quantitative assessment of flammable refrigerants in room air conditioners, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002,pp. 34 – 40.

Reports, Handbooks etc.

- United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent

- Patent no., Country (in parenthesis), date of application, title, year.

Internet

- www.(Site) [Give full length URL]

DEPARTMENT OF ELECTRICAL ENGINEERING

ABOUT THE PROGRAMMME

Raffles University, Neemrana established in 2011, to produce highly practical oriented personnel in fields of engineering to meet specific manpower requirements of industries. Electrical Engineering Department was started in 2011 and has been conducting B.Tech Course in Electrical Engineering of 4-Years duration since 2011. Students are admitted through university entrance or direct counselling nominated by university management in 1st Year and 2nd year through lateral entry entrance test. The total intake for the programme is 60. The Electrical Engineering Department has been well known for its track record of employment of the pass out students since its inception. The Department has well managed class rooms andfully equipped laboratories and Conference Room. It has excellent and distinguished faculty. The syllabi of programme in Electrical Engineering Department, has been prepared by subject experts with active participation from Industry. The Department is organizing number of expert lectures from industry experts for students in every semester. Summer training/ Industry Internship is mandatory for every student after completion of second year and third year (Two times in 4 years). Emphasis has been given on project work, workshop and Lab Course for skill enhancement of students. Choice based credit system allows students to study the subjects of his/her choice from a number of elective courses /audit courses.

PROGRAMMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To train students with practical skills and experimental practices related to core and

applied areas of Electrical Engineering to expand their knowledge horizon beyond books.

PEO-2: To enable students to design, develop and maintain Electrical equipments which are useful for the society.

PEO-3: To improve team building, team working and leadership skills of the students with high regard for ethical values and social responsibilities.

PEO- 4: To enable students to communicate effectively and demonstrate the knowledge of project management and independent research.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

1) Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and Electrical engineering to the solution of engineering problems.

2) Problem Analysis: Identify, formulate, review literature and analyse Electrical engineering problems to design, conduct experiments, analyse data and interpret data.

3) Design /Development of Solutions: Design solution for Electrical engineering problems and design system component of processes that meet the desired needs with appropriate consideration for the public health and safety, and the cultural, societal and the environmental considerations.

4) Conduct Investigations of Complex Problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions in Electrical engineering.

5) Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to mechanical engineering activities with an understanding of the limitations.

6) The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to Electrical engineering practice.

7) Environment and Sustainability: Understand the impact of the Electrical engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Electrical engineering practice.

9) Individual and Team Work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in Electrical engineering.

10) Communication: Communicate effectively on complex engineering activities with the engineering committee and with society at large, such as, being able to comprehend and write affective reports and design documentation, make effective presentations in Electrical engineering.

11) Project Management and Finance: Demonstrate knowledge & understanding of the Electrical engineering principles and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments in Electrical engineering.

12) Life - Long Learning: Recognize the need for, and the preparation and ability to engage in independent research and lifelong learning in the broadest contest of technological changes in Electrical engineering.

PROGRAM SPECIFIC OUTCOMES (PSOs):

1) To apply practical skills, knowledge of engineering fundamentals and Electrical engineering, to industries and institutions.

2) To explore, create and develop innovations in various aspects of engineering. The student will be ready to take-up career or to pursue higher studies with high regard to ethical values and social responsibilities.

B.TECH ELCTRICAL ENGINEERING SCHEME CREDITS CALCULATION

S.No.	Category of Course	Abbreviation Used	Credits
1.	Humanities and Social Sciences including Management Courses	HSMC	13
2.	Basic Sciences Courses	BSC	26
3.	Engineering Sciences Courses including workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc.	ESC	26
4.	Professional Core Courses	PCC	98
5.	Professional Elective C ourses relevant to chosen specialization/ branch	PEC	13
6.	Open Subjects- Electives from other technical and /or emerging subjects	OEC	12
7.	Project Work, Seminar and internship in industry or elsewhere	PROJ	16
8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
Total			**204**

Abbreviations Used:

L -Lectuer

T - Tutorial

P - Practical

IA - Internal Assessment

EA - External Assessment

TA - Teacher's Assessment

MTA - Mid Tern Assessment

ETA - End Term Assessment

PROGRAMMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To train students with practical skills and experimental practices related to core and applied areas of Electrical Engineering to expand their knowledge horizon beyond books.

PEO-2: To enable students to design, develop and maintain Electrical equipments which are useful for the society.

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Engineering Graduates will be able to:

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5) Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to mechanical engineering activities with an understanding of the limitations.

6) The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to Electrical engineering practice.

7) Environment and Sustainability: Understand the impact of the Electrical engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

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10) Communication: Communicate effectively on complex engineering activities with the engineering committee and with society at large, such as, being able to comprehend and write affective reports and design documentation, make effective presentations in Electrical engineering.

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12) Life - Long Learning: Recognize the need for, and the preparation and ability to engage in independent research and lifelong learning in the broadest contest of technological changes in Electrical engineering.

PROGRAM SPECIFIC OUTCOMES (PSOs):

1) To apply practical skills, knowledge of engineering fundamentals and Electrical engineering, to industries and institutions.

2) To explore, create and develop innovations in various aspects of engineering.

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1.	Humanities and Social Sciences including Management Courses	HSMC	13
2.	Basic Sciences Courses	BSC	26
3.	Engineering Sciences Courses including workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc.	ESC	26
4.	Professional Core Courses	PCC	98
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8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
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Abbreviations Used:

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T - Tutorial

P - Practical

IA - Internal Assessment

EA - External Assessment

TA - Teacher's Assessment

MTA - Mid Tern Assessment

ETA - End Term Assessment

1	PCC-EE	PCC-EE-201	**Electrical Circuit Analysis**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1. Apply network theorems for the analysis of electrical circuits

CO2. Obtain the transient and steady-state response of electrical circuits

CO3. Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
CO4.Analyze two port circuit behavior

CO5. Synthesize networks and filters

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	**PCC-EE**	**PCC-EE-203**	**Analog Electronics**

UNIT	**CONTENT**

Course Outcomes

At the end of this course, students will demonstrate the ability to:

CO1. Understand the working principle of PN junction diode and its applications.

CO2. Understand the working of BJT and its applications.

CO3. Understand the working of JFET and MOSFET

CO4. Analysis and design of Differential, multi-stage and operational amplifiers

CO5. Analysis and design of Linear applications of op-amp. Analysis and design of Nonlinear applications of op-amp.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-205	**Electrical Machines – I**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1. Understand the concepts of magnetic circuits

CO2. Understand the operation of DC machines

CO3. Analyse the differences in operation of different DC machine configurations

CO4. Analyse single phase transformers circuits.

CO5. Analyse three phase transformers circuits.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-207	**Electromagnetic Fields**

UNIT	CONTENT

Course Outcomes:

At the end of the course, students will demonstrate the ability:

CO1. To understand the basic laws of electromagnetism

CO2. To obtain the electric and magnetic fields for simple configurations under static conditions

CO3. To analyse time varying electric and magnetic fields

CO4. To understand Maxwell's equation in different forms and different media.

CO5. Investigate behavior of EM waves in different medias and to calculate average power density radiated.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

6	ESC	ESC- 201	Engineering Mechanics
UNIT	CONTENT		

9	MC	MC-I	Indian Constitution

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Understand the concepts of co-ordinate systems

CO2. Analyse the three-dimensional motion

CO3. Understand the concepts of rigid bodies

CO4. Explain and solve numerical problems on kinematics of particles and rigid bodies

CO5. Explain and apply work-energy principle, impulse-moment principle to solve numerical problems on linear and angular motion and collision.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Syllabus**for B.Tech (Batch 2022-26)**

4th Semester

1	PCC-EE	PCC-EE202	Digital Electronics
UNIT	**CONTENT**		

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1- Understand number systems, basic logic gates, Boolean algebra and derive digital logic circuits
CO2- Classify various minimization techniques and choose the best for designing logic circuit.
CO3- Define characteristics of logic families and calculate their parameters
CO4- Design combinational logic circuits such as adder, subtractor, multiplexer, decoder.

S No.	Category	Code	Course Title	Hours Per				Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
C 1	PCC-EE	PCC-EE202	Digital Electronics	3	0	0	3	40	60	100
2	PCC-EE	PCC-EE-204	Electrical Machines – II	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-206	Power Electronics	3	1	0	4	40	60	100
4	PCC-EE	PCC-EE-208	Signals and Systems	3	0	0	3	40	60	100
5	BSC	BSC -201	Mathematics–III	3	0	0	3	40	60	100
6	BSC	BSC -202	Biology-medical instrumentation	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE-210	Digital Electronics Laboratory	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-212	Electrical Machines Laboratory – II	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-214	Power Electronics Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

O5. Classify the different types of flip flops and design counters, registers using flip flops.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-204	**Electrical Machines – II**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Understand the construction and working of AC machines .

CO2- Understand the generation of rotating magnetic field in AC machines.

CO3- Solve the performance parameters of AC machines.

CO4- Interpret the behavior of AC machines using phasors, equivalent circuits and its characteristics.

CO5- Examine the performance behavior of AC machines under different loading condition.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-206	Power Electronics

UNIT	**CONTENT**

Course Outcomes:

At the end of this course students will demonstrate the ability to:

CO1-Understand the differences between signal level and power level devices

CO2-Analyse controlled rectifier circuits

CO3-Analyse the operation of DC-DC choppers

CO4-Analyse the operation of voltage source inverters

CO5- Interpret the speed control of DC motors using converters and choppers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-208	Signals and Systems
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1-Understand the concepts of continuous time and discrete time systems.

CO2-Analyse systems in complex frequency domain

CO3-Understand sampling theorem and its implications

CO4- Understand mathematical tools to be able to apply in state variable modeling

CO5- Analyze signal and system properties like stability and causality using Laplace and Z transforms.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	BSC	BSC -201	Advance Mathematics
UNIT	**CONTENT**		

Course Objectives: The objective of this course is to familiarize the student with statistical techniques. It aims to equip he students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline

Course Outcomes: At the end of the course, the student will be able to

CO1-Have basics knowledge about measure of central tendency, kurtosis and moments and their applications in engineering fields.

CO2-Familiarize the student with expectations of discrete and continuous random variable

CO3-Familiarize probability techniques and random variables and detailed knowledge of probability distribution with so as to use it with any date of engineering problem formulation

CO4-Have basic idea about statistics including correlation, regression and then up to advanced level with testing of large samples that is important in solving problems related to engineering

CO5- **Use Z-transform and its applications to solve difference equations**

	PO 1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3											2
CO2	3	3	3											2
CO3	3	3	3											2
CO4	3	3	3											2
CO5	3	3	3											2

6	BSC	BSC -202	Bio-medical instrumentation

UNIT	CONTENT

Course Outcomes

At the end of this course students will demonstrate the ability to

CO 1. understand basic Biomedical Instruments and their functioning

CO2. describe Microelectrodes, Electro conduction systems

CO3. explain ECG, EEG, EMG, ERG, etc.

CO4. understand Ventilators and other important Clinical Instruments

CO5- Outline medical imaging techniques and equipment for certain diagnosis and therapies.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2021-25)

5th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PCC-EE	PCC-EE-301	Power Systems – I	3	1	0	4	40	60	100
2	PCC-EE	PCC-EE-303	Control Systems	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-305	Microprocessors	3	0	0	3	40	60	100
4	PEC-EE	PEC-EE-301	Program Elective - 1	3	0	0	3	40	60	100
5	OEC-EE	OEC-EE-301	Open Elective-1	3	0	0	3	40	60	100
6	HSMC	HSMC-301	Engineering Economics	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE307	Power Systems Laboratory - I	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-309	Control Systems Laboratory	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-311	Microprocessors Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

1	PCC-EE	PCC-EE-301	Power Systems – I

UNIT	CONTENT	No. Of Hrs.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the concepts of power systems.

CO 2 Understand the various power system components.

CO 3 Evaluate fault currents for different types of faults.

CO 4 Understand the generation of over-voltages and insulation coordination.

CO 5 Understand basic protection schemes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-303	Control Systems

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the modelling of linear-time-invariant systems using transfer function and state-space representations.

CO 2 Understand the concept of stability and its assessment for linear-time invariant systems. Design simple feedback controllers.

CO3- Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

CO4- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system

CO5- Design simple Lag, Lead, Lag- Lead network & PID controllers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2

CO4	3	3	3	2	2						2	3	2
CO5	3	3	3	2	2						2	3	2

	PCC-EE	PCC-EE-305	Microprocessors
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Study of 8085 and 8086 Microprocessors.

CO 2 Do assembly language programming.

CO 3 Do interfacing design of peripherals like 8255, 8253,8279,8251 etc

CO4: Acquire the knowledge of synchronous and asynchronous communication and interfacing to protocols like blue-tooth, etc.

CO5: Design electrical circuitry to the microcontroller I/O ports in order to interface the processor to exter

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 a	Wind and solar Energy Systems

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1-Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.

CO2- Understand the basic physics of wind and solar power generation.

CO3- Understand the power electronic interfaces for wind and solar generation.

CO4- Understand the issues related to the solar technologies and wind topologies.

CO5: Demonstrate the Solar Thermal and PV applications along with its storage systems.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2

CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 b	**Line Commutated and Active PWM Rectifiers**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1-Analyse controlled rectifier circuits.

CO2- Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations.

CO3- Understand the operation of PWM rectifiers –.

CO4- operation in rectification and regeneration modes and lagging, leading and unity power factor mode

CO5-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 c	Electrical Drives

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

(i) Understand the characteristics of dc motors and induction motors.

(ii) Understand the principles of speed-control of dc motors and induction motors.

(iii) Apply the knowledge of power electronics to understand the working of dc-dc converters.

(iv) Apply the knowledge of control system for the speed control of electrical machines.

CO5- Illustrate control of slip ring induction motor (SLIM).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

CO5	3	3	3	2	2							2	3	2	

5	OEC-EE	OEC-EE-301a	Electronic Devices

UNIT	CONTENT

Course Outcomes

At the end of this course students will demonstrate the ability to:

1. Understand physics of semiconductors and behavior of charge carriers within semiconductors 2. Understand the working of semiconductor diodes supported with mathematical explanation. 3. Understand the working of BJT and MOSFET with their equivalent small signal models.

4. Understand the chemical processes used in fabrication of integrated circuits.

5	OEC-EE	OEC-EE-301b	Data Structures and Algorithms

UNIT	CONTENT

Course outcomes

Student will be able to:

CO 1. Understand operations like searching, insertion, deletion, traversing on linear Data Structures and to determine their computational complexities

CO2. Understand operations like searching, insertion, deletion, traversing on various non linear Data Structures and to determine their computational complexities

CO3. Write algorithms for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.

CO4. Apply appropriate Data Structure as per specific problem definition
CO5-Identify, model, solve and develop algorithms for real-life problems like shortest path and MST using graph theory.

	PO 1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2

CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-301c	Analog and Digital Communication
UNIT	**CONTENT**		

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth

CO2. Analyze the behavior of a communication system in presence of noise

CO3. Investigate pulsed modulation system and analyze their system performance

CO4. Analyze different digital modulation schemes and can compute the bit error performance

CO5-Apply time division multiplexing concepts in different pulse modulation techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

6	HSMC	HSMC-301	Engineering Economics

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Understand the basic principles, scope and the applications of Engineering Economics

CO2. Understand and apply the knowledge of elasticity of demand and supply on price determination.

CO 3. Apply the knowledge of demand forecasting to make effective demand forecast.

CO4. Understand the complexity of uncertain market structure and be able to take decisions of price determinations.

CO 5. Understand the various management concepts and thoughts and using for better resource management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

1	PCC-EE	PCC-EE-302	Power Systems – II

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Use numerical methods to analyze a power system in steady state.

CO2- Understand stability constraints in a synchronous grid.

CO3- Understand methods to control the voltage, frequency and power flow.

CO4-Understand the monitoring and control of a power system

CO5- Acquire knowledge about the Regulatory framework, ancillary services, power system economics and power management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-304	**Measurements and Instrumentation**

Course Outcomes

After completion of this course, students will be able to –
CO1-Identify various types instrument suitable for specific measurement.
CO2- Classify various errors present in measuring instruments.
CO3- Understand construction, working principle and types of oscilloscopes.
CO4-Comprehend different types of signal generators and analyzers, their construction and operation.
CO5-Describe the working principle, selection criteria and applications of various transducers used in measurem systems.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 a	**Electrical Engineering Materials**

UNIT	**CONTENT**

Course Outcomes:
CO 1 To Understand the basic concepts of materials.
CO 2 To use simplified materials selection concepts for design purposes.
CO 3 To Understand the properties of Materials.

CO4 Acquire knowledge of Conductivity of metals Ohm's law and relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.
CO5: Acquire knowledge of Classification of semiconductors, semiconductor conductivity, temperature dependence, Carrier density and energy gap, Trends in materials used in Electrical Equipment.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 b	**Electrical Machine Design**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the construction and performance characteristics of electrical machines.

CO 2 Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines

CO 3 Understand the principles of electrical machine design and carry out a basic design of an ac machine.

CO 4 Use software tools to do design calculation

CO5 Identify the limitations (assumptions) of traditional designs and need for CAD analysis, synthesis and hybrid models.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 c	**Power System Protection**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand power system protection.

CO 2 Understand the main components used in power system protection for electric machines, transformers.

CO 3 Understand the bus bars, overhead and underground feeders.

CO 4 Understand the earthing protection.

CO5 Explain the simulation of protection schemes by using Electro-Magnetic Transients (EMT) programs.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 b	**Renewable Energy Sources**

UNIT	CONTENT

Course Outcomes:

CO 1 To Understand the Need, importance and scope of non-conventional and alternate energy resources.

CO 2 To understand role significance of solar energy and wind energy

CO 3 To understand the role of ocean energy in the Energy Generation.

CO 4 To get the utilization of Biogas plants and geothermal energy

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 c	**High Voltage Engineering**

UNIT	CONTENT

Course outcomes:

At the end of the course, the student will demonstrate

CO1-Understand the basic physics related to various breakdown processes in solid, liquid, and gaseous insulating materials.

CO2- Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.

CO3- Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.

CO4- Knowledge of how over-voltages arise in a power system, and protection against these over-voltages.

CO5- Study and understand the nature of faults happening on both the AC and DC sides of the converters and formulate protection schemes for the same.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 a	**Computer Networks**

UNIT	CONTENT

Course Outcomes: The student will be able to:

CO1: Explain the functions of the different layer of the OSI Protocol;

CO2:. Describe the function of each block of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs);

CO3: Develop the network programming for a given problem related TCP/IP protocol; &

CO4: Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available

CO5 ***Analyze*** the features and operations of various application layer protocols such as HTTP, DNS and SMTP.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 b	Embedded System

Course Outcomes

After completion of this course, students will be able to –
CO1-Define basic operations of embedded microcontroller cores, processors and memories.
CO2-Describe the concept of Embedded System and its design for real life applications.
CO3-Explain the technological aspects of embedded systems through analog and digital blocks, sub systems user interfacing.
CO4-Examine design metrics, design tradeoffs and software aspects of embedded systems.
CO5- Illustrate Real Time Programming Languages and Real Time operating systems.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

CO4	3	3	3	2	2							2	3	2	

5	OEC-EE	OEC-EE-302 c	VLSI Circuits

UNIT	CONTENT

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. understand the process of VLSI fabrication

2. Investigate the Oxidation processes for VLSI/ULSI device fabrication

3. Learn about the environment for VLSI/ULSI technology

4. Understand Lithography and deposition processes

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

6	HSMC	HSMC-302	Personality Development Programme

UNIT	CONTENT

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

7th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PEC-EE	PEC-EE404	Program Elective -4	3	0	0	3	40	60	100
2	PEC-EE	PEC-EE-405	Program Elective -5	3	1	0	4	40	60	100
3	OEC-EE	OEC-EE-403	Open Elective -3	3	0	0	3	40	60	100
4	OEC-EE	OEC-EE-404	Open Elective -4	3	0	0	3	40	60	100
5	PROJ-EE	PROJ-EE01	Project Stage-I	0	0	2	2	180	120	300
6	SI	EE-SI	Summer Internship	0	0	2	2	120	80	200
			Total	**12**	**1**	**4**	**17**			**900**

1	PEC-EE	PEC-EE304a	**Electrical Energy Conservation and Auditing**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the current energy scenario and importance of energy conservation. Understand the concepts of energy management.

CO 2 Understand the methods of improving energy efficiency in different electrical systems.

CO 3 Understand the concepts of different energy efficient devices.

CO4: To analyze, calculate and improve the energy efficiency and performance of electrical and industrial utilities.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304b	**Industrial Electrical Systems**

UNIT	CONTENT

Course Outcomes:

CO1-At the end of this course, students will demonstrate the ability to

CO2- Understand the electrical wiring systems for residential, commercial, and industrial consumers, representing the systems with standard symbols and drawings, SLD.

CO3- Understand various components of industrial electrical systems.

CO4- Analyze and select the proper size of various electrical system components.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304c	**Power System Dynamics and**

			Control

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1- Understand the problem of power system stability and its impact on the system.

CO2- Analyse linear dynamical systems and use of numerical integration methods.

CO3-Model different power system components for the study of stability.

CO4-Understand the need and plan the methods to improve stability.

CO5: Design a mini project on having 2-3 generation sources having 3 generation sources and perform the process of power transfer from source to load with the help of transformers and at least three loads.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305a	NEURAL NETWORKS

UNIT	CONTENT

Course Outcomes:

At the end of the course, students will demonstrate the ability to

CO1. Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning

CO2. Get the response of an Learning Processes system

CO3 Apply Artificial Neural Network models to handle uncertainty and solve engineering problems.

CO4 Recognize the feasibility of applying a Neuro-model for a particular problem

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305b	**Digital signal Processing**

UNIT	CONTENT

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain

2. Get the response of an LSI system to different signals

3. Design of different types of digital filters for vari ous applications

4 Implement Z transform and inverse Z transform of discrete signals

5 Model IIR and FIR filter using window techniques

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305c	**Computer Architecture**

Course Outcomes:

After completion of this course, students will be able to:
CO1: Understand the basics of computer architecture and its organization.
CO2: Recognize processor models based on their organization, addressing modes and instruction set.
CO3: Understand basics of ALU, control unit and computer organization such as memory & I/O.
CO4: Understand various architectures based on performance, cost and applicability.
CO5: Understand impact of modern techniques like pipelining, express buses processor performance.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403a	**Image Processing**

Course Outcomes:

After completion of this course, students will be able to:

CO1- ***Identify*** the fundamental elements of an image and ***Describe*** the need of digital image processing

CO2- ***Understand*** different types of image transformation techniques and their properties.

CO3- ***Use*** various noise models and ***Calculate*** the values for restoration and degradation models.

CO4- ***Analyze*** and ***Evaluate*** various image compression techniques.

CO5- ***Integrate*** and ***Demonstrate*** various Image Transformation and Segmentation Techniques

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403b	**Power Quality and FACTS**

Course Outcomes

After completion of this course, students will be able to:

CO1: Acquire knowledge of the advantage of compensation and will learn several aspects such as description, operation and characteristics of Thyristor-based FACTS devices: Static VAR Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Braking Resistor and Single Pole Single Throw (SPST) Switch.

CO2: Acquire knowledge of the operation and applicability of Voltage Source Converters and their realization details for implementation in FACTS Devices.

CO3: Analyze different possible applications of FACTS devices in order to improve stability and for achieving better voltage regulation along with the applicability of these as a solution provider for power quality problems in distribution networks.

CO4: Acquire the knowledge of custom power device DSTATCOM, classification of DSTATCOM, different topological realizations, operation control of DSTATCOM and reference current extraction paradigm based on Synchronous Reference Frame Theory.

CO5: Acquire the knowledge of custom power devices for voltage power quality problems (DVR, UPQC) and for current power quality problems (UPQC), different topological aspects of DVR and UPQC, principle of operation of these devices along with control paradigms

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403c	GENERATION OF ELECTRICAL POWER

UNIT	CONTENT

Course Outcomes:

At the end of the course, students will demonstrate the ability to

CO1- Understand the load curves, load-duration Curve.

CO2-Understand the power plant economics and tariff

CO3- Explore the significance of economic operation of steam plants

CO4- Apply techniques to evaluate generation cost, depreciation reserve and Acquire knowledge of different method of energy cost reduction.

CO5- Apply techniques to evaluate tariff and comparative study of various power plants.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO

CO1	1	3	3	2	1							2	3	2	
CO2	3	3	3	2	1							2	3	2	
CO3	3	3	3	2	2							2	3	2	
CO4	3	3	3	2	2							2	3	2	
CO5	3	3	3	2	2							2	3	2	

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Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

8th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PEC-EE	PEC-EE-406	Program Elective -6	3	0	0	3	40	60	100
2	OEC-EE	OEC-EE-405	Open Elective -5	3	0	0	3	40	60	100
3	OEC-EE	OEC-EE-406	Open Elective -6	3	1	0	4	40	60	100
4	PROJ-EE	PROJ-EE-02	Project Stage-II	0	0	2	2	360	240	600
			Total	**9**	**1**	**2**	**12**			**900**

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1	PEC-EE	PEC-EE-306a	**MODERN CONTROL THEORY**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand various design specifications.

CO 2 Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).

CO 3 Design controllers using the state space approach.

CO 4-Understand various design Adaptive control sysem

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306b	**Smart grid technology**

UNIT	CONTENT

Course Outcomes :

At the end of this course, students will demonstrate the ability to:

CO 1 Understand technologies for smart grid.

CO 2 Appreciate the smart transmission as well distributionsystems.

CO 3 Realize the distribution generation and smart consumption.

CO 4 Know the regulations and market models for smart grid.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306c	**Artificial intelligence techniques**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.

CO 2 Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing

CO 3 Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.

CO4 Classify different learning paradigms and its application in Neural Network

CO5 Explain concepts of Natural Language processing and discuss Expert System

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405b	**Power System Engineering**

course Outcomes

CO1: Understand power stability problems and the basic concepts of modeling and analysis of dynamical systems.
CO2: Analyze the behavior of Steady State, Dynamic and transient stability on power systems.
CO3: Analyze stability of single machine and multi-machine systems.
CO4: Analyze the stability of power system by Modified Euler's and Runge – Kutta method.
CO5: Comprehend various factors affecting steady state and transient stabilities.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405c	**Power System Planning**

Course Outcomes:

After completion of this course, students will be able to:

CO1: Gain information about basic building blocks of Power System planning.

CO2: Understand the basic concept of Power system reliability at generation, transmission and distribution level.

CO3: Analyze the effect of various parameters involved in Generation, Transmission and Distribution systems.

CO4: Understand the impact of demand side planning in deregulated market environment

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406a	**Computer Aided Power System Analysis**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 To introduce computer applications in the analysis of power systems.

CO 2 To understand the solution methods and techniques used in power system studies.

CO 3 To solve numerically the complex IEEE bus networks and the energy flow

Co4- **CO3:** Elaborate the concept of digital protection and signal conditioning

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406b	**Advanced Power Electronics**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the operation of power electronic converters and their control strategies.

CO 2 Understand the vector control strategies for ac motor drives

CO 3 Understand the implementation of the control strategies using digital signal processors.

CO4: Acquire knowledge about different AC voltage controllers and their control.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406c	**Power System Transients**

CO1- To explain the sources and effects of lightning, switching and temporary over voltages.

CO2 -To model and estimate the over voltages in power system

CO3- To develop travelling wave equation and to analyze travelling wave.

CO4- To analyze the insulation coordination of power system and protective devices.

CO5- To develop the modeling of power system for transient over voltages using Electromagnetic Transient Program (EMTP)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	Project Stage-II		Credit
No of Practical	PROJ-EE	PROJ-EE-02	Max. Marks: 600 (IA:360, TE:240) (0L+0T+2P 1)

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

(i) Apply and verify basic scientific principals and technologies.

(ii) Identify the scope of interdisciplinary knowledge

(iii) Make and design a prototype which is preferably a working model

Guidelines

1) A group of 3-4 students under the mentorship of a teacher to make a minor project. Interdisciplinary projects to be encouraged.

2) The project title and scope to be decided and presented in first 2nd/3rd weeks of the semester.

3) The progress of the project to be evaluated (internal) in 8th/9th week of the semester.

4) A draft of the project report to be prepared and the project to be evaluated (internal) 12th/13th week of the semester.

5) The project report and the project to be submitted in the department at the time of external evaluation.

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
B.Tech (1st Semester)
(Common to all branches)

Engineering Graduates will be able to:

1) Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.
2) Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3) Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
4) Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
5) Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6) The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7) Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9) Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
10) Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11) Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12) Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	BSC	BSC-101	Engineering Physics (Common to all) (Major Core)	3	1	THEORY	4	40	60	100
2	BSC	BSC-102	Engineering Mathematics I (Major Core)	3	0		3	40	60	100
3	ESC	ESC-101	Computer Fundamentals (Ability Enhancement)	3	0		3	40	60	100
4	ESC	ESC-102	Basics of Mechanical Engineering (Multidisciplinary)	3	0		3	40	60	100
5	MC	MC-I	Environmental Studies (Minor stream) (Multidisciplinary)	2	0		2	40	60	100
6	HSMC	HSMC-101	Communicative English (Common to all)	2	0		2	40	60	100
7	ESC	ESC-103	Branch wise Workshop Practice Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
8	BSC	BSC-103	Engineering Physics I Lab (Minor Stream)			2	1	60	40	100
9	ESC	ESC-104	Computer Fundamentals Lab(Ability Enhancement)			2	1	60	40	100
10	HSMC	HSMC-102	Language Lab (Skill Enhancement Course)			2	1	60	40	100
TOTAL				**16**	**01**	**08**	**21**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Engineering Physics (BSC-101)

CO1: Understand and apply Maxwell's equations, which describe the fundamental laws of electromagnetism, including Gauss's law for electricity, Gauss's law for magnetism, Faraday's law of electromagnetic induction, and Ampère's law with Maxwell's addition.

CO2: Understand, apply, and manipulate Maxwell's equations to describe and analyze electromagnetic phenomena in both static and dynamic situations.

CO3: Understand and describe the impact of solid-state device capabilities and limitation on electronic circuit performance.

CO4: Understand the concepts of X-Rays and Ultrasonics.

CO5: Understand the basic concepts such as Nuclear Detectors, Characteristics of gas filled detectors and properties of Ionization chamber, proportional counter, G. M. Counter and Scintillation Counter.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	2		1			3				3	3	3	3
CO2	3	2	1		1			3	2			3	3	3	2
CO3	3	2	2		1		2	3	1		3	3	3	3	2
CO4	3	2	1		1		2	3	2			3	3	3	2
CO5	3	2	3		1			3	2		3	3	3	3	3

2. Engineering Mathematics-I (BSC-102)

CO-1: To explore the fundamental knowledge of asymptote, curvature and their types.
CO-2: Use the Euler's theorem, homogeneous function.
CO-3: Develop knowledge of double integration.
CO-4: Understand how to determine the natural of first order and higher order differential equation.
CO-5: Understand how to determine the nature of second order differential equation.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3

3. Computer Fundamentals (ESC-102)

CO1: Demonstrate knowledge on C Programming constructs learn to develop simple applications in C using basic constructs.
CO2: Design and implement applications using arrays and string
CO3: Develop and implement modular applications in C using functions
CO4: Develop applications in C using structures and pointers.
CO5: Design applications using sequential and random access file processing.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3		1		2			2				3	3	3	3
CO2	3	1	1		2			2				3	3	3	3

CO3	3	2			2			2				3	3	3	3
CO4	3	3	2		2			2				3	3	3	3
CO5	3	2	1		2			2	1			3	3	3	3

4. Basics of MechanicalEngineering (ESC-102)

CO1: Apply various laws of thermodynamics to various processes and real systems.

CO2: Familiarize you with the refrigerants, vapour compression refrigeration system and multi stage vapour compression system.

CO3: Under the basic concepts such as stress, strain, Hooks law, stress-strain diagram.

CO4: Familiarity with common manufacturing processes, such as machining, casting, welding, and their advantages and limitations.

CO5: Identify and analyze common machine elements and components, such as bearings, gears, shafts, and fasteners.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	1							3	3	3	3	3
CO2	3	3	2	1							3	3	3	3	3
CO3	3	3	2	1	2						3	3	3	3	3
CO4	3	3	2	1	2						3	3	3	3	3
CO5	3	3	2	1	2						3	3	3	3	3

5. Environmental Studies (MC-1)

CO1: On completion of this course students will be able to describe the scientific inquiry in the field of modern ecology, explain the main limitations on patters of productivity, Energy Flow through the natural food chain and food webs, ecosystem dynamics and patterns in population and communities.

CO2: The students will understand the chemical properties of materials occurring in the environment, the phenomenon in the environment and apply the knowledge to various environmental processes.

CO3: Develop the ability to understand the patterns of air pollution dispersion with respect to micrometeorological changes.

CO4: The students will be able to describe the physical and chemical composition of water and wastewater and elucidate how and why these compositions fluctuate, main source of water pollution, the main types of pollutants and how each type can be controlled.

CO5: The students will understand the technical, legal and economic aspects of collection, transportation and management of hazardous wastes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	1	1	1	2	2						1	2		
CO2		1	2	2									1	1	
CO3			2						1			1			
CO4	1			2			1						2		
CO5															

6. Communicative English (HSMC-101)

CO1: Use English Language effectively in spoken and written forms.

CO2: Comprehend the given texts and respond appropriately.

CO3: Communicate confidently in various contexts and different cultures.

CO4: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								3		3		3			2
CO2								3	2	3		3			2
CO3								3	2	3		3			2
CO4								3		3		3			2
CO5								3		3		3			2

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
B.Tech (2nd Semester)
(Common to all branches) Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	BSC	BSC-104	Communicative English II	2	0		2	40	60	100

2	BSC	BSC-105	Engineering Mathematics II (Major Core)	3	0		3	40	60	100
3	ESC	ESC-105	Programming with C (Ability Enhancement)	3	0		3	40	60	100
4	ESC	ESC-106	Basics of Electrical Engineering (Multidisciplinary)	3	0		3	40	60	100
5	ESC	ESC-107	Engineering Mechanics (Major Core)	3	0		3	40	60	100
6	BSC	BSC-106	Engineering Chemistry (Common to all)	3	0		3	40	60	100
7	ESC	ESC-108	BEE Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
9	ESC	ESC-109	Engineering Drawing Lab (Skill Enhancement Course)			2	1	60	40	100
10	ESC	ESC-110	Programming with C (Ability Enhancement)			2	1	60	40	100
11	BSC	BSC-108	Engineering Chemistry Lab (Minor Stream)			2	1	60	40	100
TOTAL				**17**	**01**	**10**	**21**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Communicative English II (BSC-104)

CO1: Use English Language effectively in spoken and written forms.

CO2: Comprehend the given texts and respond appropriately.

CO3: Communicate confidently in various contexts and different cultures.

CO4: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								3		3		3			2
CO2								3	2	3		3			2
CO3								3	2	3		3			2
CO4								3		3		3			2
CO5								3		3		3			2

2. Engineering Mathematics-II (BSC-105)

CO1: Explore the knowledge of integration and differentiation to solve the orthogonality of two spheres.

CO2: define the rank of matrix to find the nullity of matrix and calculate the Eigen values.

CO3: Develop the knowledge of integration and differentiation to solve the curl and gradients questions.

CO4: Explore the knowledge of half range Fourier sine and cosine series.

CO5: Use Lagrange's function to solve the differential problems.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3

3. Programming with C (ESC-105)

CO1: Demonstrate knowledge on C Programming constructs learn to develop simple applications in C using basic constructs

CO2: Design and implement applications using arrays and string

CO3: Develop and implement modular applications in C using functions

CO4: Develop applications in C using structures and pointers.

CO5: Design applications using sequential and random access file processing.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2			2			2	3	3	3	3
CO2	3	3	2		2			2			2	3	3	3	2
CO3	3	3	2		2			2			2	3	3	3	2
CO4	3	3	3	3	2			2			2	3	3	3	2
CO5	3	2	3	3	2			2	3		2	3	3	3	3

4. Basics of Electrical Engineering (ESC-106)

CO1: Students will gain knowledge regarding the various laws and principles associated with electrical systems.

CO2: Students will gain knowledge regarding DC network and apply them for practical problems.

CO3: Students will gain knowledge regarding various types' of semiconductors.

CO4: Student will gain knowledge about transistors and their application.

CO5: Student will gain knowledge on Basic Electronic Circuits and Instrumentation.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	1	2	1						2	1	1	1	
CO2	2	2	2	3	2						2	2	3		
CO3	3	1	2	2								1	1		
CO4	3	1	2	3	1							2		1	
CO5	3	2	2		2						3	2	1	2	

5. Engineering Mechanics (ESC-107)

CO1: Students will understand the concepts of engineering mechanics.

CO2: Understand the phenomenon of friction and transmission of power and ability to solve problem related to the same.

CO3: Students will gain knowledge regarding center of gravity and moment of inertia and apply them for practical problems.

CO4: Modelling and analysis of forces systems acting on rigid bodies to evaluate position velocity and acceleration.

CO5: Fundamental understanding of mechanical vibrations and finding out natural frequency for mechanical systems. Application of free damped and forced vibrations on mechanical systems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	1	3	2	2	3	3	3	3
CO2	3	3	3	3	3	3	2	1	2	2	2	3	3	3	3
CO3	3	3	3	3	3	2	2	1	2	2	2	3	3	3	3
CO4	3	3	3	3	3	3	3	1	2	2	2	3	3	3	3
CO5	3	3	3	3	3	3	3	1	2	3	2	3	3	3	3

6. Engineering Chemistry (BSC-106)

CO1: Analyze the need, design and perform a set of experiments.

CO2: Identify the structure of unknown/new compounds with the help of new engg material.

CO3: Differentiate hard and soft water, solve the related numerical problems on water purification and its significance in industry and daily life.

CO4: Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.

CO5: Understand the causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PS O1	PS O2	PS O3
CO1	3	3	2	3	1	2	1		2	2	1	2	3	2	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	2	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	2	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	1
CO5	3	2	1	1	3	3	2		1	1	1	2	3	3	2

SUBJECT NAME:-DATA STRUCTURE & ALGORITHM USING C
SUBJECT CODE:-PCC-CSE 201

CO1. Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented and used them and their common applications.
CO2. Discuss the efficiency of the sorting and searching algorithms
CO3. Implementation of Trees and Graphs and perform various operations on these data structures.
CO4. Understanding the concept of recursion, application of recursion and its implementation.
CO5. Identify the alternative implementations of data structures with respect to its performance to solve a real-world problem.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	

SUBJECT NAME: -OBJECT ORIENTED PROGRAMMING USING C++
SUBJECT CODE: -PCC-CSE-202

CO1. Able to develop programs with reusability.
CO2. Develop programs for file handling.
CO3. Handle exceptions in programming.
CO4. Develop applications for a range of problems using OOP techniques

CO5. Demonstrate the use of various OOPs concepts with the help of programs.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2	2									3		2
CO2	3	2	2									3		2
CO3	3	3	2									2		3
CO4	3	3	3	2	2	1			2		2	3	2	2
CO5	3											2		2

SUBJECT NAME:-DATABASE MANAGEMENT SYSTEM
SUBJECT CODE:-PCC-CSE-203
Course Outcomes:

CO 1. Describe the fundamental elements of relational database management systems.
CO 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
CO 3. Design ER-models to represent simple database application scenarios
CO 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
CO 5. Improve the database design by normalization.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3										1	2		
CO2	3	2	3								2	2	3	3
CO3	3	3	3	2	2	1	1		2	1	2	2	2	2
CO4	3	2		1								1		
CO5	3		2									2	1	

SUBJECT NAME:-UNIX & SHELL PROGRAMMING
SUBJECT CODE: - PCC-CSE-204
Course Outcomes:

CO1: Understand the basic concepts of UNIX Architecture and basic Command.
CO2: Understand the commands related to Shell basics, vi editor and regular expression commands.
CO3: Understand the concepts of advance file concepts, commands related to Shell script and filter commands.
CO4: Understand the concepts in Korn Shell and Interactive C Shell.
CO5: Understand different types of Files, File system and basic file system commands.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2	1									1		2
CO2	3	2	1									1		2
CO3	3	1	1									1		2

CO 4	3	1			1						1		2
CO 5	3		1								1		2

SUBJECT NAME:-Mathematics III

Course Outcomes:

CO1: To explore the fundamental knowledge of transforms and their types.

CO2: Laplace Transform and their applications.

CO3: Develop knowledge of double integration.

CO4: Explore the distribution in different situations.

CO5: Use Analytic functions

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3	3	2	3	1	2	1		2	2	1	2	3	3
CO 2	3	3	3	3	2	2	1		1	1	1	1	3	3
CO 3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO 4	3	3	3	3	3	2	2		2	1	1	1	3	2
CO 5	3	2	1	1	3	3	2		1	1	1	2	3	2

SUBJECT NAME:- Digital Electronics

CO1: Identify and enumerate different electronic components.

CO2: Illustrate reduction of logical expressions using boolean algebra and implement the functions using logic gates. Design and analyse synchronous and asynchronous sequential circuits using flip-flops.

CO3: Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.

CO4: Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

CO5: Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO 1	PSO 2
CO 1	2											2		
CO 2	2	3		2	2		3		1	1	1	1		
CO 3	1	2	2	2	2	2		3		2		2		
CO 4		2		2		2		2			1			
CO 5	2		1	1	1		2	1	1	1	1	1		2

SUBJECT NAME:-Discrete Mathematics

CO1: Explore the knowledge of set theory in relation, function and partially ordered relation.

CO2: define the concepts of truth table and modulus form to explore the universal quantification.

CO3: Develop the knowledge of generating function for recurrence relation.

CO4: Explore the knowledge of prime group, cyclic group and concept of ring.

CO5: Use graph theory to find the shortest path between any to vertices.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO 1	PSO 2
CO 1	3											1		
CO 2	3											3		
CO 3	2											2		
CO 4	3											3		
CO 5	3											3		

SUBJECT NAME:-Computer Organization and Architecture

CO1: Understand the theory and architecture of central processing unit.

CO2: Analyze some of the design issues in terms of speed, technology, cost, performance.

CO3: Design a simple CPU with applying the theory concepts.

CO4: Use appropriate tools to design verify and test the CPU architecture.

CO5: Learn the concepts of parallel processing, pipelining and interprocessor communication.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	2											2		
CO 2	2	1	1	1								2	2	2
CO 3	2	2	2		2							2		
CO 4	3	2	2	1	3							3		
CO 5	3	1							1	1		2		

SUBJECT NAME: - DESIGN AND ANALYSIS OF ALGORITHM
SUBJECT CODE: - PCC-CSE-212
Course Outcomes:
CO1.Students will be introduced with algorithm.
CO2.Students will learn to design algorithms.
CO3.Students will learn to implement algorithm for coding.
CO4. Argue the correctness of algorithms using inductive proofs and invariants.
CO5. Analyze worst-case running times of algorithms using asymptotic analysis.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	2	2	2	1	1							1	3	1
CO 2	2	1	1	1	1							1	1	1
CO 3	2	2	2	1	1							1	3	1
CO 4	2	2	2	1	1							1	3	1
CO 5	2	1	1	1	1							1	1	2

SUBJECT NAME: - OPERATING SYSTEM

SUBJECT CODE: - PCC-CSE-213

Course Outcomes:

CO 1. Identify the role of Operating System. To understand the design of control unit.

CO2. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.

CO3. Describe the role of paging, segmentation and virtual memory in operating systems.

CO4. Description of protection and security and also the Comparison of UNIX and Windows based OS.

CO5. Defining I/O systems, Device Management Policies and Secondary Storage Structure.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	2											2		
CO 2	3	2			2							3	2	2
CO 3	3	2										2		
CO 4	2				2							2		
CO 5	2											1		

SUBJECT NAME: - SOFTWARE ENGINEERING

SUBJECT CODE: - PCC-CSE-302

Course Outcomes:

CO 1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO 2. An ability to work in one or more significant application domains.

CO 3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO 4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO 5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3	2	2	2								3	2	2
CO 2	3		1	1								2		
CO 3	2	2	3	2	2	1	1		3	2	2	3	3	3
CO 4	3				2							2		

CO 5	3				3	2	1					2		

SUBJECT NAME:-FORMAL LANGUAGE AND AUTOMATA THEORY
SUBJECT CODE: - PCC-CSE 303
Course Outcomes:
CO 1 Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.
CO 2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics .
CO 3 Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.
CO 4. Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language
CO 5. Attitude- Develop a view on the importance of computational theory

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											2		
CO 2	3	2	3	2								3	2	2
CO 3	3	2	3	2								2	2	2
CO 4	2	3	3	3								2	2	1
CO 5	2											1		

SUBJECT NAME: - Java Programming
SUBJECT CODE: - PCC-CSE 304
Course Outcomes:
CO 1. Learn to apply object oriented programming features and concepts for solving given problem.
CO2. Learn to use java standard API library to write complex programs
CO 3. Learn implementation of object oriented programming concepts using java
CO 4. Able to develop interactive programs using applets and swings.
CO 5. Develop advanced skills for programming in Java

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											3		
CO 2	2	2	2	2	3				2			2	2	2

CO 3	3											2		
CO 4	2											2		
CO 5	3	2	2	2	2	2			2	2	2	3	2	3

SUBJECT NAME: - Compiler Design
SUBJECT CODE: - PCC-CSE 308
Course Outcomes:
CO1. To realize basics of compiler design and apply for real time applications.
CO 2. To introduce different translation languages
CO 3. To understand the importance of code optimization
CO 4. To know about compiler generation tools and techniques
CO 5. To learn working of compiler and non-compiler applications and design of compiler for simple programming language.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3	1	1									2		
CO 2	2											1		
CO 3	3	3	2	2	3							2		
CO 4	2				3							2		
CO 5	3	2	3	2	2							3	3	3

SUBJECT NAME: - Data Mining & Ware-housing
SUBJECT CODE: - PCC-CSE 309
Course Outcomes:
CO 1. Understand the functionality of the various data mining and data warehousing component.
CO 2. Appreciate the strengths and limitations of various data mining and data warehousing models.
CO 3. Explain the analyzing techniques of various data.
CO 4. Describe different methodologies used in data mining and data ware housing.
CO 5. Compare different approaches of data ware housing and data mining with various technologies.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											2		

CO 2	3				2							2		
CO 3	2	2										2	2	
CO 4	3				3							3		
CO 5	2	2		1	2							2	2	

SUBJECT NAME: - Computer Network
SUBJECT CODE: - PCC-CSE 310
Course Outcomes:
CO 1. Students will be aware about computer networking.
CO 2. Students will know about various layers of OSI Model.
CO 3. Students will learn about wired & wireless technologies.
CO 4. Students will learn about the services of different layers.
CO 5. Explain the different Transport Layer function i.e. Port addressing, Connection Management,
Error control and Flow control mechanism.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											2		
CO 2	3											2		
CO 3	3				1					1		2		
CO 4	3	2		2	2							3		
CO 5	3	3		2	2							2	1	

SUBJECT NAME: - Elective-II (Theory of Computation-305)
SUBJECT CODE: - PEC-CSE 304-306
Course Outcomes:
CO1. Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.
CO2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics - Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.
CO3 Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language
CO4 Attitude- Develop a view on the importance of computational theory.

CO5. Describing the limitations of a computing machine.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											2		
CO 2	3	2	3	2								3	2	2
CO 3	3	2	3	2								2	2	2
CO 4	2	3	3	3								2	2	1
CO 5	2											1		

SUBJECT NAME: - Elective III (Web and Internet Technology-309)
SUBJECT CODE: -PEC-CSE 307-309

Course Outcomes:

CO 1. Students will be familiar with Internet.
CO 2. Students will be familiar with different protocols of internet.
CO 3. Students will learn different services of internet.
CO 4. Analyze a web page and identify its elements and attributes.
CO 5. Students will learn HTML, CSS, JAVA Scripts for web designing.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3				3	2	2	3	2	3		3	3	
CO 2	3											2		
CO 3	3											2		
CO 4	3				3	2	2	3		3	2	3	3	2
CO 5	3				3	3	2	3	2	2		3	3	2

SUBJECT NAME: - Open Elective-I Cyber Laws and Ethics-302)
SUBJECT CODE: - OEC-CSE 301-303

Course Outcomes:

CO 1. Make learner conversant with the social and intellectual property issues emerging from cyberspace.
CO 2. Explore the legal and policy developments in various countries to regulate cyberspace.
CO 3. Develop the understanding of relationship between commerce and cyberspace.
CO 4. Give learners in depth knowledge of information technology act and legal framework of right to privacy, data security and data protection.
CO 5. Make study on various case studies on real time crimes.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3					2		3				3		
CO 2	3					2		3				3		
CO 3	3					3		3				3		
CO 4	3					2		3				3		
CO 5	3					3		3				3		

SUBJECT NAME:- Network Security & Cryptography
SUBJECT CODE:- PCC-CSE-401
Course Outcomes:
CO 1. Understand basic cryptographic algorithms, message and web authentication and security.
CO 2. Identify information system requirements for both of them such as client and server.
CO 3. Understand the current legal issues towards information
CO 4. Distinguish and explain different protocol like SSL, TLS Visà-vis their applications.
CO 5. Comprehend and explain security services and mechanisms.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3					3						3		
CO 2	2	2				2		2				2	2	
CO 3	3					2		3				2		
CO 4	3					3						3		
CO 5	3				2	3		3				3	3	2

SUBJECT NAME: - Parallel and Distributed Algorithm
SUBJECT CODE:- PEC-CSE-402
Course Outcomes:
CO 1. Understand the requirements for programming parallel systems and how they can be used to facilitate the programming of concurrent systems.
CO 2. To learn and apply knowledge of parallel and distributed computing techniques and methodologies.
CO 3. To learn the architecture and parallel programming in graphics processing units (GPUs).
CO 4. Understand the memory hierarchy and cost-performance tradeoffs.
CO 5. To gain experience in the design, development, and performance analysis of parallel and distributed applications.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											2		
CO 2	3		2	2	2			2	2		1	2	3	2
CO 3	3											2		
CO 4	2											2		
CO 5	3	2	3	2	3	2	2		2	2	2	3	3	3

SUBJECT NAME:-Cloud Computing
SUBJECT CODE:- PEC-CSE-406
Course Outcomes:

CO1. Able to understand basic concepts, principles and paradigm of Cloud Computing
CO2. Able to interpret various Cloud computing models and services.
CO3. Able to identify the significance of implementing virtualization techniques.
CO4. Able to understand the need of security in Cloud computing.
CO5. Understand the concept SOA and cloud based storage in Cloud computing.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3	1			1	1		1			1	2		
CO 2	1	2	1	3	1		1					2		
CO 3		1	3	1	2	1		1				3		
CO 4	2	1	2	1		2	1					2		
CO 5		1	1	2	1	2		1				3		

SUBJECT NAME:-Advanced Computer Architecture
SUBJECT CODE:- PEC-CSE-403

CO1.Demonstrate concepts of parallelism in hardware/software.
CO2.Discuss memory organization and mapping techniques.
CO3.Describe architectural features of advanced processors.
CO4.Interpret performance of different pipelined processors.
CO5.Explain data flow in arithmetic algorithms.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2

CO 1	3											2		
CO 2	3											3		
CO 3	3											3		
CO 4	3	3			2							3	2	
CO 5	3											3		

SUBJECT NAME:-Artificial Intelligence & Expert System
SUBJECT CODE:- PEC-CSE-404

CO1 Study the concepts of AI and related searching algorithms.
CO2 Develop the knowledge skills and it's representational structure in AI.
CO3 Study the concepts of natural language processing in AI.
CO4 Study the concepts of supervised/unsupervised machine learning and game technique.
CO5 Study how design the programming skill in PROLOG, and concepts of pattern recognition approaches.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	2	3	3	2	2	1	1					3		
CO 2	1	2	3	1	2		1					2		
CO 3	1	1		1	1		3					2		
CO 4	2	1	2	3	1		1					2		
CO 5	1	2	3	3	2		1					3	2	2

SUBJECT NAME:-Optimization Technique
SUBJECT CODE:- PEC-CSE 407

CO1: Formulate the engineering problems as an optimization problem.

CO2: Apply necessary and sufficient conditions for a given optimization problem for optimality

CO3: Select appropriate solution methods and strategies for solving an optimization problem and interpret and analyze the solution obtained by optimization algorithms

CO4: Justify and apply the use of modern heuristic algorithms for solving optimization problems

CO5: Solve Engineering Design and Manufacturing related optimization problem using software tools.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	2	3	1	1	1				1	1		1	1	
CO 2	1	3	2	1						1			1	
CO 3	1	3	2	1	1				2	1				
CO 4	2	2	2	2	2				2	1				
CO 5	1	3	3	2	3				2	2		1		

SUBJECT NAME:- Human Resource Management
SUBJECT CODE:- OEC-CSE 404

CO1: To understand Strategic HRM, Aligning systems with business strategy

CO2: Be able to establish the linkage between firm strategy and HR practices of the firm through Resource-based view of Competitive Advantage and Sustained Competitive Advantage.

CO3: Be able to identify the HR Strategy in work force utilization, employee shortage and surplus.

CO4: Be able to identify strategies for performance and development. Able to develop view point for performance from employer and employee both side.

CO-5: To understand effectiveness and future of SHRM, Measure cost and benefit of HRM.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1				3										
CO 2	2			3										
CO 3		1	2		3									
CO 4			3		3	2							2	2
CO 5		3				1								

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
RAFFLES UNIVERSITY, NEEMRANA
Department of Mechanical Engineering
B.Tech (4 Years Degree Program)

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.
PO 2	Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO 5	Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO 11	Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO 12	Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change

Program Education Objective

PEO 1	To impart deep knowledge of mechanical engineering and interdisciplinary subjects.
PEO 2	To use modern tools in academic to enhance the technical skills of the students for implementation of the scientific concepts.

PEO 3	To prepare the students to address social, technical and engineering challenges innovatively.
PEO 4	To enhance various skills of the students involved in decision making.
PEO 5	To motivate and prepare the students to take-up career in different industries or to pursue higher studies in mechanical and interdisciplinary programs.

Program Specific Objectives

PSO 1	To impart proper knowledge of science and mechanical engineering related subjects to the students.
PSO 2	To enhance the skills of the students with the ability to implement the scientific concepts for betterment of the society.
PSO 3	To prepare the students to become innovators who can address social, technical and engineering challenges.

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (3rd Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	BSC	BSC- 201	Mathematics III (Multidisciplinary	3	0	THEORY	3	40	60	100
2	PCC	PCC-ME- 201	Strength of Materials (Major Core)	3			3	40	60	100
3	PCC	PCC -ME-202	Thermodynamics (Major Core)	3	0		3	40	60	100
4		PCC-ME- 203	Material Science and Engineering (Major Core)	3	0		3	40	60	100
5	PCC	PCC- ME-204	Manufacturing Process I (Major Core)	3	0		3	40	60	100
6	MC	MC-III	Introduction of Indian Law (Value Added Courses)	2	0		2	40	60	100
7	PCC	PCC-M-205	Machine Drawing and Auto Cad Lab (Major (Core)	PRACTICAL		2	1	60	40	100
8	PCC	PCC-ME-206	Thermodynamics Lab (Minor Core)			2	1	60	40	100
9	PCC	PCC-ME-207	Manufacturing Process I Lab (Major Core)			2	1	60	40	100

10	PCC	PCC-ME-208	Strength of Materials Lab (Major Core)			2	1	60	40	100
TOTAL				**15**	**02**	**08**	**21**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Mathematics III (BSC-201)

CO1: To explore the fundamental knowledge of transforms and their types.

CO2: Laplace Transform and their applications.

CO3: Develop knowledge of double integration.

CO4: Explore the distribution in different situations.

CO-5: Use Analytic functions

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3		3	2	2		1	2	1	2	3	3	2	3
CO2	3	3		3	2	2		1	1	1	2	3	2	2	3
CO3	3	3		2	2	2		1	2	1	2	3	3	2	3
CO4	3	2		3	2	2		1	1	1	2	3	3	2	3
CO5	3	2		3	2	2		1	1	1	2	3	3	2	3

2. Strength of Materials (PCC- ME-201)

Course Outcomes:

CO1: Apply materials and their elastic constants for composite bar subjected to various loads including thermal load.

CO2: Solve the problems on structural members subjected to Uni-axial load.

CO3: Construct Shear Force, Bending moment and Bending stress distribution in beams subjected to transverse load.

CO4: Determine the deflection of statically determinant beam.

CO5: Design Columns with different end conditions.

CO-PO Mapping

Course	Program Outcomes	PSO

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	1	1	2	2	2	3	3	3	2
CO2	3	2	3	3	3	3	1		2	2	2	3	3	3	2
CO3	3	2	3	3	3	2	1		3	2	2	3	3	3	2
CO4	3	2	3	3	3	2	1		3	2	2	3	3	3	2
CO5	3	2	3	3	3	3	1	1	2	2	2	3	3	3	2

3. Thermodynamics (PCC -ME -202)

Course Outcomes:

CO1: Apply various laws of thermodynamics to various processes and real systems.

CO2: Apply the concept of Entropy, Calculate heat, effort and other important thermodynamics properties for various ideal gas processes.

CO3: Estimate performance of various thermodynamics gas power cycles and gas refrigeration cycles and availability in each case.

CO4: Estimate stoichiometric air required for combustion, performance of vapour power cycle and vapour compression cycle.

CO5: Use psychometric charts and estimates various essential properties related to Psychrometry and process.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1					2	3	3	3	2
CO2	3	3	3	3	3	1					2	3	3	3	2
CO3	3	3	3	3	3	1					2	3	3	3	2
CO4	3	3	3	3	3	1					2	3	3	3	2
CO5	3	3	3	3	3	1					2	3	3	3	2

4. Material Science and Engineering (PCC -ME -203)

CO1. Identify and depict the crystal structure and their properties based on the structure.

CO2. Quantify the imperfections in a crystal.

CO3. Analyze the mechanical properties of engineering materials, draw the stress – strain diagrams.

CO4. Classify composite materials and their importance in engineering design and determine the type of fracture mechanism.

CO5. Outline heat treatment process to obtain required mechanical properties for a given alloy.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	3	3	2						3	3	3	3	3
CO2	3	3	3	3	2						3	3	3	2	3
CO3	3	3	3	3	2						3	3	3	2	3
CO4	3	3	3	3	2						2	3	3	3	2
CO5	3	3	3	3	2						2	3	3	3	2

5. Manufacturing Process- I (PCC -ME -204)

CO1. To apply the knowledge of various manufacturing processes

CO2. To identify various process parameters and their effect on processes

CO3: Students should be able to design and analyze various manufacturing processes and tooling

CO4: To figure out the application of modernization in machining.

CO5: Get the knowledge of Jigs and Fixtures so as to utilize machine capability for variety of operations

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						2	3	3	3	3
CO5	3	3	3	3	3						2	3	3	3	3

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (4th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-210	Kinematics of Machine	2	1	THEORY	3	40	60	100

			(Minor Core)							
2	PCC	PCC-ME-211	Fluid Mechanics (Major Core)	3	0		3	40	60	100
3	PCC	PCC-ME-212	Manufacturing Process II (Major Core)	3	0		3	40	60	100
4	PCC	PCC-ME-213	Heat Transfer (Major Core)	2	1		3	40	60	100
5	PCC	PCC-ME-214	Industrial Engineering	2	1		3	40	60	100
6	PCC	PCC-ME-215	Design of Machine Element	2	1		3	40	60	100
7	PCC	PCC-ME-216	Kinematics of Machine Lab	2	0		1	40	60	100
8	PCC	PCC-ME-217	Fluid Mechanics Lab	PRACTICAL		2	1	60	40	100
9	PCC	PCC-ME-218	Manufacturing Process-II Lab			2	1	60	40	100
10	PCC	PCC-ME-219	Heat Transfer Lab			2	1	60	40	100
TOTAL				**16**	**03**	**06**	**22**	**460**	**540**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Kinematics of Machine (PCC -ME-210)

CO1: Designing a suitable mechanism depending on application

CO2: Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers,

CO3: Drawing velocity and acceleration diagrams for different mechanisms,

CO4: Selecting gear and gear train depending on application.

CO5: Understand the kinetics of the rigid bodies and solve simple problems using work-energy method.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1					3	3	3	3	3
CO2	3	3	3	3	3	1					3	3	3	3	3

CO3	3	3	3	3	3	1					3	3	3	3	3
CO4	3	3	3	3	3	1					3	3	3	3	3
CO5	3	3	3	3	3	1					3	3	3	3	3

2. Fluid Mechanics (PCC -ME-211)

CO1: To familiarize with the properties of fluids and fluid kinematics.

CO2: Apply Bernoulli's equation to fluid flow problems.

CO3: To understand the concept of dimensional analysis and incompressible flow.

CO4: Apply appropriate equations and principles to analyze pipe flow problems and turbulent flow.

CO5: Apply the boundary layer theory to determine lift and drag forces on a submerged body.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	3	3	2							3	3	2	3
CO2	3	3	3	3	2							3	3	2	3
CO3	3	3	3	3	2							3	3	2	3
CO4	3	3	3	3	2							3	3	2	3
CO5	3	3	3	3	2							3	3	2	3

3. Manufacturing Process-II (PCC -ME -212)

CO1: Student should be able to apply the knowledge of various manufacturing processes.

CO2: Student should be able to identify various process parameters and their effect on processes.

CO3: Student should be able to design and analyze various manufacturing processes and tooling.

CO4: Student should be able to figure out application of modernization in machining.

CO5: Students should get the knowledge of Jigs and Fixtures so as to utilize machine capability for variety of operations.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	3	3	3	2					3	3	3	3	3
CO2	3	3	3	3	3	2					3	3	3	3	3
CO3	3	3	3	3	3	2					3	3	3	3	3
CO4	3	3	3	3	3	2					3	3	3	3	3

CO5	3	3	3	3	3	2					3	3	3	3	3

4. Heat Transfer (PCC -ME -213)

CO1: Apply the principles of heat transfer to analyze and solve practical engineering problems.

CO2: Demonstrate proficiency in conducting experiments related to heat transfer.

CO3: Analyze and design heat exchangers and other heat transfer equipment.

CO4: Apply computational tools and software for heat transfer analysis.

CO5: Evaluate and select appropriate heat transfer techniques for specific engineering applications.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	2	2
CO2	3	3	3	3	3						3	3	3	2	2
CO3	3	3	3	3	3						3	3	3	2	2
CO4	3	3	3	3	3						3	3	3	2	2
CO5	3	3	3	3	3						3	3	3	2	2

5. Industrial Engineering (PCC -ME -214)

CO1: Students will be able to understand the Basic Concepts of Industrial Engineering as well as the organization structures of Industry.

CO2: Students will be able to understand the Various Production Systems and Sale Forecasting Methods.

CO3: Students will be able to understand the concept of work study to improve productivity of men, machines and materials.

CO4: Students will be able to understand the Importance of Planning in the Industry

CO5: Students will be able to know the Importance of Inventory Control and Material Handling systems.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2			1	2	3	3	3	3	3
CO2	3	2	3	2	3	2			1	2	3	3	3	3	3
CO3	3	2	3	2	3	2			1	2	3	3	3	3	3
CO4	3	2	3	2	3	2			1	2	3	3	3	3	3

CO5	3	2	3	2	3	2			1	2	3	3	3	3	3

6. Design of Machine Element (PCC -ME -215)

CO1: To understand and apply principles of gear design for Spur, Helical, Bevel and Worm gear

CO2: To understand and analyse the concepts of Mechanical Joints like Riveted Joint, Welded Joints and Screwed Joints

CO3: To develop capability to design and analyse the Shaft diameter and different spring parameters.

CO4: To inculcate an ability to design belt drives and selection of belt, rope and chain drives.

CO5: To achieve an expertise in design of Sliding contact bearing in industrial applications.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (5th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC ME 301	Dynamics of Machines (Major Core)	2	1	THEORY	3	40	60	100
2	PCC	PCC ME 302	Hydraulic Machines (Major Core)	2	1		3	40	60	100
3	PCC	HSMC 301	Principle of Management (Value Added Courses)	3	0		3	40	60	100
4	PCC	PCC ME 303	IC Engines (Major (Core)	2	1		3	40	60	100
5	HSMC	PCC ME 304	Design of Transmission Systems (Major Core)	2	0		2	40	60	100

6	PEC	PCC ME 305	Measurement and Metrology (Multidisciplinary)	2	0		2	40	60	100
7	PCC	PCC ME 306	Hydraulic Machines Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
8	PCC	PCC ME 307	Dynamics of Machines Lab (Major Core)			2	1	60	40	100
9	PCC	PCC ME 308	IC Engine Lab (Minor Core)			2	1	60	40	100
10	PROJ	PROJ ME 301	Industrial Training/ Project Seminar			2	1	60	40	100
TOTAL				**13**	**03**	**10**	**20**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**
***ESE (End Semester Exam)**

1. Dynamics of Machines (PCC-ME-301)

CO1: To equip the student with fundamental knowledge of dynamics of machines so that student can appreciate problems of dynamic force balance, transmissibility of forces, isolation of systems, vibrations.

CO2: Compute frictional losses, torque transmission of mechanical systems.

CO3: Develop knowledge of analytical and graphical methods for calculating balancing of rotary and reciprocating masses.

CO4: Develop understanding of dynamic balancing, gyroscopic forces and moments.

CO5: Understand how to determine the natural frequencies of continuous systems starting from the general equation of displacement.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

2. Hydraulic Machines (PCC-ME -302)

CO1: Work out the hydrodynamic force by liquid jet on plane surface and curved vanes for fixed and moving conditions.

CO2: Apprehend working of impulse and reaction turbine and their components parts.

CO3: Design and analysis performance characteristics of Pelton wheel, Kaplan turbine and Francis turbine

CO4: Comprehend working of different types of pumps and work out the efficiency of Centrifugal pump.

CO5: Compare hydropower plants with other types of power plants and calculate load factor and capacity factor for the hydropower plants.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2							3	3	3	3
CO2	3	3	2	2	2							3	3	2	3
CO3	3	3	2	2	2							3	3	2	3
CO4	3	3	2	2	2							3	3	3	3
CO5	3	3	2	2	2							3	3	2	3

3. Principle of Management (HSMC-301)

CO1: Identify and apply appropriate management techniques for managing business

CO2: Have a conceptual knowledge about the planning and decision making

CO3: Apply the concept of organizing for the effective functioning of a management

CO4: Evaluate leadership style to anticipate the consequences of each leadership style

CO5: Demonstrate the techniques for controlling and coordination

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3
CO2	3	3	3	2	3	2	2	3	3	3	3	3	3	3	3
CO3	3	3	3	2	3	2	2	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3

4. I.C Engines (PCC-ME-303)

CO1: Understand different types of engines, applications, ideal cycles of operation and deviation with actual cycle and performance parameters

CO2: Understand fuel air cycles and deviations with actual cycles, effect of various operating variables of SI and CI engines, value timing diagrams and working of 2-S and 4-S engines.

CO3: Understand combustion phenomena in SI and CI engines and combustion chamber design, Knocking phenomena, fuel additives and different types of fuels.

CO4: Understand fuel supply systems, cooling systems and lubrication systems.

CO5: Apply basic calculations of the engine on performance and understand governing methods.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2						3	3	3	3	3
CO2	3	3	3	3	2						3	3	3	3	3
CO3	3	3	3	3	2						3	3	3	3	3
CO4	3	3	3	3	2						3	3	3	3	3
CO5	3	3	3	3	2						3	3	3	3	3

5. Design of Transmission Systems (PCC-ME-304)

CO1: Apply materials and their elastic constants for composite bar subjected to various loads including thermal load.

CO2: Solve the problems on structural members subjected to Uni-axial load.

CO3: Construct Shear Force, Bending moment and Bending stress distribution in beams subjected to transverse load.

CO4: Able to Determine the deflection of statically determinant beam.

CO5: Able to Design Columns with different end conditions.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

6. Measurement and Metrology (PCC-ME-305)

CO1: Develop a solid understanding of the fundamental principles and concepts of measurement, including units, standards, and measurement systems.

CO2: Gain knowledge about the role of limits, fits, and tolerances in ensuring proper assembly and functionality of mechanical components.

CO3: Gain a comprehensive understanding of various measuring instruments used for dimensional measurement, such as calipers, micrometers, gauges, and dial indicators. Understand their working principles, features, and applications.

CO4: Gain proficiency in using thread gauges, thread micrometers, and other specialized measuring instruments for thread measurement.

CO5: Develop a comprehensive understanding of the geometric principles and concepts related to machine tools.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3		2				3	3	3	3	3
CO2	3	3	3	3	3		2				3	3	3	3	3
CO3	3	3	3	3	3		2				3	3	3	3	3
CO4	3	3	3	3	3		2				3	3	3	3	3
CO5	3	3	3	3	3		2				3	3	3	3	3

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (6th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME 310	Automobile Engineering	3	0	THEORY	3	40	60	100
2	OEC	PCC-ME 311	Mechanical Vibration	3	0		3	40	60	100
3	OEC	PCC-ME 312	Operation Research	3	0		3	40	60	100
4	PCC	PEC ME 302	Professional elective Tribology Elective-1 Multidisciplinary	2	1		3	40	60	100
5	OEC	OEC-302	Open Elective I (TQM) (Multidisciplinary)	2	1		3	40	60	100
6	OEC	OEC-304	Open Elective II (Cyber Law and Security) (Value Added Courses)	2	1		3	40	60	100

7	PCC	PCC-ME 313	Automobile Engineering Lab	PRACTICAL	2	1	60	40	100
8	PCC	PCC-ME 314	Mechanical Vibration Lab		2	1	60	40	100
9	PCC	PCC-ME-315	Robotics Lab		2	1	60	40	100
10	HSMC	HSMC-ME-302	Aanandam (Activity of joy)		4	2			100
TOTAL				**15**	**03**	**08**	**23**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**
***ESE (End Semester Exam)**

1. Automobile Engineering (PCC-ME -310)

CO1: Identify the different parts of the automobile

CO2: Explain the working of various parts like engine, transmission, clutch, Brakes

CO3: Describe how the steering and the suspension systems operate.

CO4: Understand the environmental implications of automobile emissions

CO5: Develop a strong base for understanding future developments in the automobile industry

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1	2				3	3	3	3	3
CO2	3	3	3	3	3	1	2				3	3	3	3	3
CO3	3	2	3	3	3	1	2				3	3	3	3	3
CO4	3	2	3	3	3	1	2				3	3	3	3	3
CO5	3	3	3	3	3	1	2				3	3	3	3	3

2. Mechanical Vibration (PCC-ME -311)

CO1: Obtain equations of motion to understand the behavior of oscillatory systems.

CO2: Understand the fundamentals of various damping systems to reduce vibration.

CO3: Learn various vibration excitations, practical aspects of isolations, and vibration measuring instruments.

CO4: Analyze the mathematical modeling of the two degrees of freedom systems and various vibration-absorbing devices.

CO5: Understand the characteristics of noise, sound, and its relationship with power and intensity.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2				3	3	3	3	3
CO2	3	3	3	3	3	2	2				3	3	3	3	3
CO3	3	3	3	3	3	2	2				3	3	3	3	3
CO4	3	3	3	3	3	2	2				3	3	3	3	3
CO5	3	3	3	3	3	2	2				3	3	3	3	3

3. Operation Research (PCC-ME-312)

CO1: Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.

CO2: Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods, Finding initial basic feasible and optimal solution of the Transportation problems

CO3: Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.

CO4: Model competitive real-world phenomena using concepts from game theory.

CO5: Formulate Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2			2	2	3	3	3	2	3
CO2	3	3	3	3	3	2			2	2	3	3	3	2	3
CO3	3	3	3	3	3	2			2	2	3	3	3	2	3
CO4	3	3	3	3	3	2			2	2	3	3	3	2	3
CO5	3	3	3	3	3	2			2	2	3	3	3	2	3

4. Tribology (PCC-ME-302)

CO1: Understand the different techniques used to solve mechanical engineering problems.

CO2: Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.

CO3: Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.

CO4: Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.

CO5: Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	2	2	3						1	3	3	3	2
CO2	3	3	2	2	3						1	3	3	3	2
CO3	3	3	2	2	3						2	3	3	3	2
CO4	3	3	2	2	3						2	3	3	3	2
CO5	3	3	2	2	3						1	3	3	3	2

5. Total Quality Management (OEC-302)

CO1: To understand and apply the principles of total quality management.

CO2: Choose appropriate statistical techniques for improving processes.

CO3: Develop the organizational, competitive and economic potential of quality.

CO4: Integrate biblical principles with the practice of total quality management.

CO5: Identify requirements of quality improvement programs

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO2	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO3	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO4	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO5	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (7th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-401	Computer Aided Design (Major Core)	3	0	THEORY	3	40	60	100

2	PCC	PCC-ME-402	Refrigeration and Air Conditioning (Major Core)	2	1		3	40	60	100
3	HSMC	HSMC-401	Engineering Economics (Value Added Courses)	2	1		3	40	60	100
4	PEC	PEC-ME 401	Professional Elective (Welding Technology (Skill Enhancement Course)	2	1		3	40	60	100
5	PCC	PCC-ME-403	Refrigeration and Air Conditioning Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
6	PCC	PCC-ME-404	Computer Aided Design Lab			2	1	60	40	100
7	PROJ	PROJ-ME-402	Minor Project-II			12	6	120	80	200
8	PROJ	PROJ-ME-401	Industrial Training / Project Seminar			4	2	120	80	200
TOTAL				**09**	**03**	**18**	**22**	**620**	**380**	**1000**

***CIE (Continues Internal Evaluation)**
***ESE (End Semester Exam)**

1. Computer Aided Design (PCC-ME-401)

CO1: Provide basic foundation in CAD, computer graphics and Coordinate systems etc.

CO2: Understand and develop the Mathematical representations of curves used in geometric construction

CO3: Understand and develop the Mathematical representations of solids used in geometric construction

CO4: Understand the concepts of Scan Conversion, Rendering, Rasterising polygons and Hidden surface removal etc.

CO5: Creation of part drawings and 3D models using CAD techniques.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3				2		2	3	3	3	2
CO2	3	3	3	2	3				2		2	3	3	3	2
CO3	3	3	3	2	3				2		2	3	3	3	2
CO4	3	3	3	2	3				2		2	3	3	3	2
CO5	3	3	3	2	3				2		2	3	3	3	2

2. Refrigeration and Air Conditioning (PCC-ME-402)

CO1: Familiarize you with the terminology associated with refrigeration and air-conditioning.

CO2: To cover the basic principle of psychrometric and applied psychrometric.

CO3: Familiarize you with load calculation and duct design.

CO4: Familiarize you with the refrigerants, vapour compression refrigeration system and multi stage vapour compression system.

CO5: Understand the concept of vapour compression refrigeration system and other cooling system.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2		2				2	3	3	3	3
CO2	3	3	3	3	2		2				2	3	3	3	3
CO3	3	3	3	3	2		2				2	3	3	3	3
CO4	3	3	3	3	2		2				2	3	3	3	3
CO5	3	3	3	3	2		2				2	3	3	3	3

3. Engineering Economics (HSMC-401)

CO1: To understand the core economic terms, concepts and theories.

CO2: Identify the key elements of the demand and supply model and use it to critically analyze the real world examples.

CO3: Compare and contrast economic profits with accounting profits

CO4: Identify economic indicators and utilize them to articulate the state of the economy and prescribe monetary and fiscal policy

CO5: To have a conceptual knowledge about the role of government in countries economical changes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	1	2			2	2				3	3		2	2
CO2	1	1	2			2	2				3	3		2	2
CO3	1	1	2			2	2				3	3		2	2
CO4	1	1	2			2	2				3	3		2	2

CO5	1	1	2			2	2				3	3		2	2

4. Welding Technology (PCC-ME-401)

CO1: Identify the various materials for manufacturing process for a particular application.

CO2: Analyze gating systems and discuss mechanization procedures in foundries.

CO3: Explain various core making processes and special casting processes.

CO4: Select the various types of Fabrication Process for Mechanical applications. CO5: To select and apply knowledge, techniques, skills, and modern tools of the Welding Processes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2			3		2				1	3	3	1	3
CO2	3	2			3		2				2	3	3	1	3
CO3	3	2			3		2				2	3	3	1	3
CO4	3	2			3		2				1	3	3	1	3
CO5	3	2			3		2				1	3	3	1	3

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (8th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-404	Power Plant Engineering (Major Core)	3	1	PRACTICAL	4	40	60	100
2	PCC	PEC-ME-405	CNC Machines and Automation (Skill Enhancement Course)	3	1		4	40	60	100
3	PCC	PCC-ME-407	CNC Machine and Automation Lab (Minor Stream)				2	60	40	100
4	SI	SI-ME-401	Seminar	THEORY		4	2	60	40	100
5	PROJ	PROJ-ME-403	Major Project II (Research Project) and Dissertation)			16	8	360	240	600

TOTAL	**06**	**02**	**20**	**20**	**560**	**440**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Power Plant Engineering (PCC-ME-404)

CO1: Enable students to understand about different types of power plants and boilers and combined power plant

CO2: Identify elements and their functions and operations of steam power plants.

CO3: Identify elements and their functions and operations of nuclear and hydel power plants

CO4: Identify elements and their functions and operations of diesel and gas turbine power plants

CO5: To illustrate the students to get the exposure of different renewable energy resources and to understand the economics of power plants and pollution control techniques.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	3		2		3	3	3	3	3
CO2	3	3	3	2	2	2	3		2		3	3	3	3	3
CO3	3	3	3	2	2	2	3		2		3	3	3	3	3
CO4	3	3	3	2	2	2	3		2		3	3	3	3	3
CO5	3	3	3	2	2	2	3		2		3	3	3	3	3

2. CNC Machines and Automation (PEC-ME-405)

CO1: Able to read and measure part drawings and design callouts correctly without any difficulty.

CO2: Able to Understand fundamentals of NC/CNC Machine for producing quality Product of complexity.

CO3: Able to interpret manually program correctly a CNC machine to reduce waste.

CO4: Capable to use conversation of M & G codes by reading the program and knowing what action the machine intends to take thereby confirming the intended Action.

CO5: Able to use NC Programming through CAD/CAM and able to produce as per Design and proper functioning Maintenance and Trouble Shooting of CNC machine tools to maintained market demand in time.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	3	3	3				1	2	2	3	3	3	3
CO2	3	3	3	3	3				1	2	2	3	3	3	3
CO3	3	3	3	3	3				1	2	2	3	3	3	3
CO4	3	3	3	3	3				1	2	2	3	3	3	3
CO5	3	3	3	3	3				1	2	2	3	3	3	3

B.TECH ELCTRICAL ENGINEERING SCHEME CREDITS CALCULATION

S.No.	Category of Course	Abbreviation Used	Credits
1.	Humanities and Social Sciences including Management Courses	HSMC	13
2.	Basic Sciences Courses	BSC	26
3.	Engineering Sciences Courses including workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc.	ESC	26
4.	Professional Core Courses	PCC	98
5.	Professional Elective C ourses relevant to chosen specialization/ branch	PEC	13
6.	Open Subjects- Electives from other technical and /or emerging subjects	OEC	12
7.	Project Work, Seminar and internship in industry or elsewhere	PROJ	16
8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
Total			**204**

B.TECH ELCTRICAL ENGINEERING SCHEME CREDITS CALCULATION

S.No.	Category of Course	Abbreviation Used	Credits
1.	Humanities and Social Sciences including Management Courses	HSMC	13
2.	Basic Sciences Courses	BSC	26
3.	Engineering Sciences Courses including workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc.	ESC	26
4.	Professional Core Courses	PCC	98
5.	Professional Elective C ourses relevant to chosen specialization/ branch	PEC	13
6.	Open Subjects- Electives from other technical and /or emerging subjects	OEC	12
7.	Project Work, Seminar and internship in industry or elsewhere	PROJ	16
8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
Total			**204**

1	PCC-EE	PCC-EE-201	**Electrical Circuit Analysis**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1. Apply network theorems for the analysis of electrical circuits

CO2. Obtain the transient and steady-state response of electrical circuits

CO3. Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
CO4.Analyze two port circuit behavior

CO5. Synthesize networks and filters

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	**PCC-EE**	**PCC-EE-203**	**Analog Electronics**

UNIT	**CONTENT**

Course Outcomes

At the end of this course, students will demonstrate the ability to:

CO1**.** Understand the working principle of PN junction diode and its applications.

CO2. Understand the working of BJT and its applications.

CO3. Understand the working of JFET and MOSFET

CO4. Analysis and design of Differential, multi-stage and operational amplifiers

CO5. Analysis and design of Linear applications of op-amp. Analysis and design of Nonlinear applications of op-amp.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2

CO1	3	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-205	**Electrical Machines – I**

UNIT	**CONTENT**

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1. Understand the concepts of magnetic circuits

CO2. Understand the operation of DC machines

CO3. Analyse the differences in operation of different DC machine configurations

CO4. Analyse single phase transformers circuits.

CO5. Analyse three phase transformers circuits.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-207	**Electromagnetic Fields**

UNIT	**CONTENT**

Course Outcomes:
At the end of the course, students will demonstrate the ability:

CO1. To understand the basic laws of electromagnetism

CO2. To obtain the electric and magnetic fields for simple configurations under static conditions

CO3. To analyse time varying electric and magnetic fields

CO4. To understand Maxwell's equation in different forms and different media.

CO5. Investigate behavior of EM waves in different medias and to calculate average power density radiated.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

6	ESC	ESC- 201	Engineering Mechanics
UNIT	**CONTENT**	MC	MC-I	Indian Constitution
9			

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Understand the concepts of co-ordinate systems

CO2. Analyse the three-dimensional motion

CO3. Understand the concepts of rigid bodies

CO4. Explain and solve numerical problems on kinematics of particles and rigid bodies

CO5. Explain and apply work-energy principle, impulse-moment principle to solve numerical problems on linear and angular motion and collision.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Syllabus**for B.Tech (Batch 2022-26)**

4th Semester

S No	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PCC-EE	PCC-EE202	Digital Electronics	3	0	0	3	40	60	100
2	PCC-EE	PCC-EE-204	Electrical Machines – II	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-206	Power Electronics	3	1	0	4	40	60	100
4	PCC-EE	PCC-EE-208	Signals and Systems	3	0	0	3	40	60	100
5	BSC	BSC -201	Mathematics–III	3	0	0	3	40	60	100
6	BSC	BSC -202	Biology-medical instrumentation	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE-210	Digital Electronics Laboratory	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-212	Electrical Machines Laboratory – II	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-214	Power Electronics Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

1	PCC-EE	PCC-EE202	Digital Electronics

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Understand number systems, basic logic gates, Boolean algebra and derive digital logic circuits

CO2- Classify various minimization techniques and choose the best for designing logic circuit .

CO3- Define characteristics of logic families and calculate their parameters

CO4- Design combinational logic circuits such as adder, subtractor, multiplexer, decoder.

CO5. Classify the different types of flip flops and design counters, registers using flip flops.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-204	**Electrical Machines – II**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Understand the construction and working of AC machines .

CO2- Understand the generation of rotating magnetic field in AC machines.

CO3- Solve the performance parameters of AC machines.

CO4- Interpret the behavior of AC machines using phasors, equivalent circuits and its characteristics.

CO5- Examine the performance behavior of AC machines under different loading condition.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-206	Power Electronics
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course students will demonstrate the ability to:

CO1-Understand the differences between signal level and power level devices

CO2-Analyse controlled rectifier circuits

CO3-Analyse the operation of DC-DC choppers

CO4-Analyse the operation of voltage source inverters

CO5- Interpret the speed control of DC motors using converters and choppers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-208	Signals and Systems
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1-Understand the concepts of continuous time and discrete time systems.

CO2-Analyse systems in complex frequency domain

CO3-Understand sampling theorem and its implications

CO4- Understand mathematical tools to be able to apply in state variable modeling

CO5- Analyze signal and system properties like stability and causality using Laplace and Z transforms

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO 1	1	3	3	2	1							2	3	2
CO 2	3	3	3	2	1							2	3	2
CO 3	3	3	3	2	2							2	3	2

CO 4	3	3	3	2	2							2	3	2
CO 5	3	3	3	2	2							2	3	2

5	BSC	BSC -201	Advance Mathematics

UNIT	CONTENT

Course Objectives: The objective of this course is to familiarize the student with statistical techniques. It aims to equip he students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline
Course Outcomes: At the end of the course, the student will be able to
CO1-Have basics knowledge about measure of central tendency, kurtosis and moments and their applications in engineering fields.

CO2-Familiarize the student with expectations of discrete and continuous random variable

CO3-Familiarize probability techniques and random variables and detailed knowledge of probability distribution with so as to use it with any date of engineering problem formulation

CO4-Have basic idea about statistics including correlation, regression and then up to advanced level with testing of large samples that is important in solving problems related to engineering

CO5- **Use Z-transform and its applications to solve difference equations**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO 1	1	3	3											2
CO 2	3	3	3											2
CO 3	3	3	3											2
CO 4	3	3	3											2
CO 5	3	3	3											2

6	BSC	BSC -202	Bio-medical instrumentation

UNIT	CONTENT

Course Outcomes
At the end of this course students will demonstrate the ability to
CO 1. understand basic Biomedical Instruments and their functioning
CO2. describe Microelectrodes, Electro conduction systems

CO3. explain ECG, EEG, EMG, ERG, etc. CO4. understand Ventilators and other important Clinical Instruments CO5- Outline medical imaging techniques and equipment for certain diagnosis and therapies.														
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2021-25)

5th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks

1	PCC-EE	PCC-EE-301	Power Systems – I	3	1	0	4	40	60	100
2	PCC-EE	PCC-EE-303	Control Systems	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-305	Microprocessors	3	0	0	3	40	60	100
4	PEC-EE	PEC-EE-301	Program Elective - 1	3	0	0	3	40	60	100
5	OEC-EE	OEC-EE-301	Open Elective-1	3	0	0	3	40	60	100
6	HSMC	HSMC-301	Engineering Economics	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE307	Power Systems Laboratory - I	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-309	Control Systems Laboratory	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-311	Microprocessors Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

1	PCC-EE	PCC-EE-301	Power Systems – I

UNIT	CONTENT	No. Of Hrs.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the concepts of power systems.

CO 2 Understand the various power system components.

CO 3 Evaluate fault currents for different types of faults.

CO 4 Understand the generation of over-voltages and insulation coordination.

CO 5 Understand basic protection schemes.

2	PCC-EE	PCC-EE-303	Control Systems

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the modelling of linear-time-invariant systems using transfer function and state-space representations.

CO 2 Understand the concept of stability and its assessment for linear-time invariant systems. Design simple feedback controllers.

CO3- Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

CO4- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system

CO5- Design simple Lag, Lead, Lag- Lead network & PID controllers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

	PCC-EE	PCC-EE-305	Microprocessors

UNIT	CONTENT

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
CO 1 Study of 8085 and 8086 Microprocessors.
CO 2 Do assembly language programming.
CO 3 Do interfacing design of peripherals like 8255, 8253,8279,8251 etc
CO4: Acquire the knowledge of synchronous and asynchronous communication and interfacing to protocols like blue-tooth, etc.
CO5: Design electrical circuitry to the microcontroller I/O ports in order to interface the processor to exter

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO 1	1	3	3	2	1							2	3	2
CO 2	3	3	3	2	1							2	3	2
CO 3	3	3	3	2	2							2	3	2
CO 4	3	3	3	2	2							2	3	2
CO 5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 a	Wind and solar Energy Systems

Course Outcomes:
At the end of this course, students will demonstrate the ability to
CO1-Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
CO2- Understand the basic physics of wind and solar power generation.
CO3- Understand the power electronic interfaces for wind and solar generation.
CO4- Understand the issues related to the solar technologies and wind topologies.
CO5: Demonstrate the Solar Thermal and PV applications along with its storage systems.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO 1	1	3	3	2	1							2	3	2
CO 2	3	3	3	2	1							2	3	2
CO 3	3	3	3	2	2							2	3	2

CO 4	3	3	3	2	2							2	3	2
CO 5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 b	**Line Commutated and Active PWM Rectifiers**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1-Analyse controlled rectifier circuits.

CO2- Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations.

CO3- Understand the operation of PWM rectifiers –.

CO4- operation in rectification and regeneration modes and lagging, leading and unity power factor mode

CO5-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 c	Electrical Drives

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

(i) Understand the characteristics of dc motors and induction motors.

(ii) Understand the principles of speed-control of dc motors and induction motors.

(iii) Apply the knowledge of power electronics to understand the working of dc-dc converters.
(iv) Apply the knowledge of control system for the speed control of electrical machines.
CO5- Illustrate control of slip ring induction motor (SLIM).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-301a	Electronic Devices

UNIT	**CONTENT**

Course Outcomes

At the end of this course students will demonstrate the ability to:

1. Understand physics of semiconductors and behavior of charge carriers within semiconductors 2. Understand the working of semiconductor diodes supported with mathematical explanation. 3. Understand the working of BJT and MOSFET with their equivalent small signal models.

4. Understand the chemical processes used in fabrication of integrated circuits.

5	OEC-EE	OEC-EE-301b	Data Structures and Algorithms

UNIT	**CONTENT**

Course outcomes

Student will be able to:

CO 1. Understand operations like searching, insertion, deletion, traversing on linear Data Structures and to determine their computational complexities

CO2. Understand operations like searching, insertion, deletion, traversing on various non linear Data Structures and to determine their computational complexities

CO3. Write algorithms for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.

CO4. Apply appropriate Data Structure as per specific problem definition CO5-Identify, model, solve and develop algorithms for real-life problems like shortest path and MST using graph theory.

	PO 1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-301c	Analog and Digital Communication
UNIT	**CONTENT**		

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth

CO2. Analyze the behavior of a communication system in presence of noise

CO3. Investigate pulsed modulation system and analyze their system performance

CO4. Analyze different digital modulation schemes and can compute the bit error performance

CO5-Apply time division multiplexing concepts in different pulse modulation techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1
CO1	1	3	3	2	1							2	3
CO2	3	3	3	2	1							2	3
CO3	3	3	3	2	2							2	3
CO4	3	3	3	2	2							2	3
CO5	3	3	3	2	2							2	3

6	HSMC	HSMC-301	Engineering Economics

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Understand the basic principles, scope and the applications of Engineering Economics

CO2. Understand and apply the knowledge of elasticity of demand and supply on price determination.

CO 3. Apply the knowledge of demand forecasting to make effective demand forecast.

CO4. Understand the complexity of uncertain market structure and be able to take decisions of price determinations.

CO 5. Understand the various management concepts and thoughts and using for better resource management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

1	PCC-EE	PCC-EE-302	Power Systems – II

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Use numerical methods to analyze a power system in steady state.

CO2- Understand stability constraints in a synchronous grid.

CO3- Understand methods to control the voltage, frequency and power flow.

CO4-Understand the monitoring and control of a power system

CO5- Acquire knowledge about the Regulatory framework, ancillary services, power system economics and power management.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-304	**Measurements and Instrumentation**

Course Outcomes

After completion of this course, students will be able to –

CO1-Identify various types instrument suitable for specific measurement.

CO2- Classify various errors present in measuring instruments.

CO3- Understand construction, working principle and types of oscilloscopes.

CO4-Comprehend different types of signal generators and analyzers, their construction and operatio

CO5-Describe the working principle, selection criteria and applications of various transducers used measurement systems.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 a	**Electrical Engineering Materials**

UNIT	**CONTENT**

Course Outcomes:

CO 1 To Understand the basic concepts of materials.

CO 2 To use simplified materials selection concepts for design purposes.

CO 3 To Understand the properties of Materials.

CO4 Acquire knowledge of Conductivity of metals Ohm's law and relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.

CO5: Acquire knowledge of Classification of semiconductors, semiconductor conductivity, temperature dependence, Carrier density and energy gap, Trends in materials used in Electrical Equipment.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 b	**Electrical Machine Design**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the construction and performance characteristics of electrical machines.

CO 2 Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines

CO 3 Understand the principles of electrical machine design and carry out a basic design of an ac machine.

CO 4 Use software tools to do design calculation

CO5 Identify the limitations (assumptions) of traditional designs and need for CAD anal ysis, synthesis and hybrid models.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 c	**Power System Protection**

UNIT	**CONTENT**

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
CO 1 Understand power system protection.
CO 2 Understand the main components used in power system protection for electric machines, transformers.
CO 3 Understand the bus bars, overhead and underground feeders.
CO 4 Understand the earthing protection.

CO5 Explain the simulation of protection schemes by using Electro-Magnetic Transients (EMT) programs.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 b	**Renewable Energy Sources**

UNIT	**CONTENT**

Course Outcomes:
CO 1 To Understand the Need, importance and scope of non-conventional and alternate energy resources.
CO 2 To understand role significance of solar energy and wind energy
CO 3 To understand the role of ocean energy in the Energy Generation.
CO 4 To get the utilization of Biogas plants and geothermal energy

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 c	**High Voltage Engineering**

UNIT	**CONTENT**

Course outcomes:

At the end of the course, the student will demonstrate

CO1-Understand the basic physics related to various breakdown processes in solid, liquid, and gaseous insulating materials.

CO2- Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.

CO3- Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.

CO4- Knowledge of how over-voltages arise in a power system, and protection against these over-voltages.

CO5- Study and understand the nature of faults happening on both the AC and DC sides of the converters and formulate protection schemes for the same.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 a	**Computer Networks**

UNIT	**CONTENT**

Course Outcomes: The student will be able to:

CO1: Explain the functions of the different layer of the OSI Protocol;

CO2:. Describe the function of each block of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs);

CO3: Develop the network programming for a given problem related TCP/IP protocol; &

CO4: Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available

CO5 ***Analyze*** the features and operations of various application layer protocols such as HTTP, DNS and SMTP.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 b	Embedded System

Course Outcomes

After completion of this course, students will be able to –
CO1-Define basic operations of embedded microcontroller cores, processors and memories.
CO2-Describe the concept of Embedded System and its design for real life applications.
CO3-Explain the technological aspects of embedded systems through analog and digital blocks, systems and user interfacing.
CO4-Examine design metrics, design tradeoffs and software aspects of embedded systems.
CO5- Illustrate Real Time Programming Languages and Real Time operating systems.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 c	VLSI Circuits

UNIT	**CONTENT**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. understand the process of VLSI fabrication

2. Investigate the Oxidation processes for VLSI/ULSI device fabrication

3. Learn about the environment for VLSI/ULSI technology

4. Understand Lithography and deposition processes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

6	HSMC	HSMC-302	Personality Development Programme
UNIT	**CONTENT**		

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

7th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PEC-EE	PEC-EE404	Program Elective -4	3	0	0	3	40	60	100
2	PEC-EE	PEC-EE-405	Program Elective -5	3	1	0	4	40	60	100
3	OEC-EE	OEC-EE-403	Open Elective -3	3	0	0	3	40	60	100
4	OEC-EE	OEC-EE-404	Open Elective -4	3	0	0	3	40	60	100
5	PROJ-EE	PROJ-EE01	Project Stage-I	0	0	2	2	180	120	300
6	SI	EE-SI	Summer Internship	0	0	2	2	120	80	200
			Total	**12**	**1**	**4**	**17**			**900**

1	PEC-EE	PEC-EE304a	**Electrical Energy Conservation and Auditing**
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the current energy scenario and importance of energy conservation. Understand the concepts of energy management.

CO 2 Understand the methods of improving energy efficiency in different electrical systems.

CO 3 Understand the concepts of different energy efficient devices.

CO4: To analyze, calculate and improve the energy efficiency and performance of electrical and industrial utilities.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304b	**Industrial Electrical Systems**

UNIT	**CONTENT**

Course Outcomes:

CO1-At the end of this course, students will demonstrate the ability to

CO2- Understand the electrical wiring systems for residential, commercial, and industrial consumers, representing the systems with standard symbols and drawings, SLD.

CO3- Understand various components of industrial electrical systems.

CO4- Analyze and select the proper size of various electrical system components.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304c	**Power System Dynamics and Control**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1- Understand the problem of power system stability and its impact on the system.

CO2- Analyse linear dynamical systems and use of numerical integration methods.

CO3-Model different power system components for the study of stability.

CO4-Understand the need and plan the methods to improve stability.

CO5: Design a mini project on having 2-3 generation sources having 3 generation sources and perform the process of power transfer from source to load with the help of transformers and at least three loads.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305a	**NEURAL NETWORKS**

UNIT	**CONTENT**

Course Outcomes:
At the end of the course, students will demonstrate the ability to

CO1. Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning
CO2. Get the response of an Learning Processes system

CO3 Apply Artificial Neural Network models to handle uncertainty and solve engineering problems.

CO4 Recognize the feasibility of applying a Neuro-model for a particular problem

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305b	**Digital signal Processing**

UNIT	**CONTENT**

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain

2. Get the response of an LSI system to different signals

3. Design of different types of digital filters for vari ous applications

4 Implement Z transform and inverse Z transform of discrete signals

5 Model IIR and FIR filter using window techniques

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305c	**Computer Architecture**

Course Outcomes:

After completion of this course, students will be able to:
CO1: Understand the basics of computer architecture and its organization.
CO2: Recognize processor models based on their organization, addressing modes and instruction set.
CO3: Understand basics of ALU, control unit and computer organization such as memory & I/O.
CO4: Understand various architectures based on performance, cost and applicability.
CO5: Understand impact of modern techniques like pipelining, express buses processor performance.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403a	**Image Processing**

Course Outcomes:

After completion of this course, students will be able to:

CO1- ***Identify*** the fundamental elements of an image and ***Describe*** the need of digital image processing

CO2- ***Understand*** different types of image transformation techniques and their properties.

CO3- ***Use*** various noise models and ***Calculate*** the values for restoration and degradation models.

CO4- ***Analyze*** and ***Evaluate*** various image compression techniques.

CO5- ***Integrate*** and ***Demonstrate*** various Image Transformation and Segmentation Techniques

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403b	**Power Quality and FACTS**

Course Outcomes

After completion of this course, students will be able to:

CO1: Acquire knowledge of the advantage of compensation and will learn several aspects such as description, operation and characteristics of Thyristor-based FACTS devices: Static VAR Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Braking Resistor and Single Pole Single Throw (SPST) Switch.

CO2: Acquire knowledge of the operation and applicability of Voltage Source Converters and their realization details for implementation in FACTS Devices.

CO3: Analyze different possible applications of FACTS devices in order to improve stability and for achieving better voltage regulation along with the applicability of these as a solution provider for power quality problems in distribution networks.

CO4: Acquire the knowledge of custom power device DSTATCOM, classification of DSTATCOM, different topological realizations, operation control of DSTATCOM and reference current extraction paradigm based on Synchronous Reference Frame Theory.

CO5: Acquire the knowledge of custom power devices for voltage power quality problems (DVR, UPQC) and for current power quality problems (UPQC), different topological aspects of DVR and UPQC, principle of operation of these devices along with control paradigms

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403c	GENERATION OF ELECTRICAL POWER

UNIT	**CONTENT**

Course Outcomes:

At the end of the course, students will demonstrate the ability to

CO1- Understand the load curves, load-duration Curve.

CO2-Understand the power plant economics and tariff

CO3- Explore the significance of economic operation of steam plants

CO4- Apply techniques to evaluate generation cost, depreciation reserve and Acquire knowledge of different method of energy cost reduction.

CO5- Apply techniques to evaluate tariff and comparative study of various power plants.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

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Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

8th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	**T**	**P**	**C**	I.A Marks	ESE Marks	**Total Marks**
1	PEC-EE	PEC-EE-406	Program Elective -6	3	0	0	3	40	60	100
2	OEC-EE	OEC-EE-405	Open Elective -5	3	0	0	3	40	60	100
3	OEC-EE	OEC-EE-406	Open Elective -6	3	1	0	4	40	60	100
4	PROJ-EE	PROJ-EE-02	Project Stage-II	0	0	2	2	360	240	600
			Total	**9**	**1**	**2**	**12**			**900**

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1	PEC-EE	PEC-EE-306a	**MODERN CONTROL THEORY**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand various design specifications.

CO 2 Design controllers to satisfy the desired design specifications using simple controller structures
(P, PI, PID, compensators).

CO 3 Design controllers using the state space approach.

CO 4-Understand various design Adaptive control sysem

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306b	**Smart grid technology**

UNIT	**CONTENT**

Course Outcomes :

At the end of this course, students will demonstrate the ability to:

CO 1 Understand technologies for smart grid.

CO 2 Appreciate the smart transmission as well distributionsystems.

CO 3 Realize the distribution generation and smart consumption.

CO 4 Know the regulations and market models for smart grid.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306c	**Artificial intelligence techniques**

UNIT	**CONTENT**

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
CO 1 Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.
CO 2 Develop intelligent algorithms for constraint satisfaction problems and also design intelligent
systems for Game Playing
CO 3 Attain the capability to represent various real life problem domains using logic based techniques
and use this to perform inference or planning.
CO4 Classify different learning paradigms and its application in Neural Network
CO5 Explain concepts of Natural Language processing and discuss Expert System

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405b	**Power System Engineering**

course Outcomes

CO1: Understand power stability problems and the basic concepts of modeling and analysis of dynamical systems.
CO2: Analyze the behavior of Steady State, Dynamic and transient stability on power systems.
CO3: Analyze stability of single machine and multi-machine systems.
CO4: Analyze the stability of power system by Modified Euler's and Runge – Kutta method.
CO5: Comprehend various factors affecting steady state and transient stabilities.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405a	Testing & Commissioning of Electrical Equipments

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
CO1-Describe the method procurement process and state of the art global practices in maintenance of electrical equipment .
CO2- Analyze and explaining of the requirement common to all equipment
CO3- Analyze and explaining the installation of synchronous machines
CO4-understand the specification and testing of transformer

2	OEC-EE	OEC-EE-405c	**Power System Planning**

Course Outcomes:

After completion of this course, students will be able to:

CO1: Gain information about basic building blocks of Power System planning.

CO2: Understand the basic concept of Power system reliability at generation, transmission and distribution level.

CO3: Analyze the effect of various parameters involved in Generation, Transmission and Distribution systems.

CO4: Understand the impact of demand side planning in deregulated market environment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406a	**Computer Aided Power System Analysis**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 To introduce computer applications in the analysis of power systems.

CO 2 To understand the solution methods and techniques used in power system studies.

CO 3 To solve numerically the complex IEEE bus networks and the energy flow

Co4- **CO3:** Elaborate the concept of digital protection and signal conditioning

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406b	**Advanced Power Electronics** **Power System Transients**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the operation of power electronic converters and their control strategies.

CO 2 Understand the vector control strategies for ac motor drives

CO 3 Understand the implementation of the control strategies using digital signal processors.

CO4: Acquire knowledge about different AC voltage controllers and their control.

OEC-EE OEC-EE-406c

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3

CO1- To explain the sources and effects of lightning, switching and temporary over voltages.
CO2 -To model and estimate the over voltages in power system
CO3- To develop travelling wave equation and to analyze travelling wave.
CO4- To analyze the insulation coordination of power system and protective devices.
CO5- To develop the modeling of power system for transient over voltages using Electromagnetic Transient Program (EMTP)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	Project Stage-II		Credit
No of Practical	PROJ-EE	PROJ-EE-02	Max. Marks: 600 (IA:360, TE:240) (0L+0T+2P 1)

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

(i) Apply and verify basic scientific principals and technologies.

(ii) Identify the scope of interdisciplinary knowledge

(iii) Make and design a prototype which is preferably a working model

Guidelines

1) A group of 3-4 students under the mentorship of a teacher to make a minor project. Interdisciplinary projects to be encouraged.

2) The project title and scope to be decided and presented in first 2nd/3rd weeks of the semester.

3) The progress of the project to be evaluated (internal) in 8th/9th week of the semester.

4) A draft of the project report to be prepared and the project to be evaluated (internal) 12th/13th week of the semester.

5) The project report and the project to be submitted in the department at the time of external evaluation.

SCHOOL OF ENGINEERING & TECHNOLOGY (SOET)

RAFFELS UNIVERSITY, NEEMRAN

BTECH (4 Years Degree Program)

2022-23

PROGRAM B. TECH(CSE)

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1) Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.

2) Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3) Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

4) Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

5) Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6) The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

7) Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9) Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

10) Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

11) Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12) Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.

CBCS Scheme for B.Tech (3rd Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 201	Data structure & algorithm using C	3	1	0	20	20	60	100	4
2	PCC	PCC-CSE 202	Object ori-ented pro-gramming through C++	3	1	0	20	20	60	100	4
3	PCC	PCC-CSE 203	Database Management System	3	1	0	20	20	60	100	4
4	PCC	PCC-CSE 204	Unix & Shell Programming	3	1	0	20	20	60	100	4

5	BSC	BSC 201	Mathematics –III	3	1	0	20	20	60	100	4
6	HSMC	HSMC 201	Human Values	3	1	0	20	20	60	100	4
7	PCC	PCC-CSE 205	Data structure & algorithm Using C Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 206	Object oriented programming through C++ Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE 207	Database Management System Lab	0	0	2	30	30	40	100	1
10	PCC	PCC-CSE 208	Unix & Shell Programming Lab	0	0	2	30	30	40	100	1
			Total	**18**	**6**	**8**				**1000**	**28**

SUBJECT NAME: -DATA STRUCTURE & ALGORITHM USING C

SUBJECT CODE: -PCC-CSE 201

Course outcomes:

CO1. Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented and used them and their common applications.

CO2. Discuss the efficiency of the sorting and searching algorithms

CO3. Implementation of Trees and Graphs and perform various operations on these data structures.

CO4. Understanding the concept of recursion, application of recursion and its implementation.

CO5. Identify the alternative implementations of data structures with respect to its performance to solve a real-world problem.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	

SUBJECT NAME: -OBJECT ORIENTED PROGRAMMING USING C++

SUBJECT CODE: -PCC-CSE-202

Course outcomes:

CO1. Able to develop programs with reusability.

CO2. Develop programs for file handling.

CO3. Handle exceptions in programming.

CO4. Develop applications for a range of problems using OOP techniques

CO5. Demonstrate the use of various OOPs concepts with the help of programs.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2									3		2
CO2	3	2	2									3		2
CO3	3	3	2									2		3
CO4	3	3	3	2	2	1			2		2	3	2	2
CO5	3											2		2

SUBJECT NAME: -DATABASE MANAGEMENT SYSTEM

SUBJECT CODE: -PCC-CSE-203

Course Outcomes:

CO 1. Describe the fundamental elements of relational database management systems.

CO 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO 3. Design ER-models to represent simple database application scenarios

CO 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

CO 5. Improve the database design by normalization.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3										1	2		
CO2	3	2	3								2	2	3	3
CO3	3	3	3	2	2	1	1		2	1	2	2	2	2
CO4	3	2		1								1		
CO5	3		2									2	1	

SUBJECT NAME: -UNIX & SHELL PROGRAMMING

SUBJECT CODE: - PCC-CSE-204

Course Outcomes:

CO1: Understand the basic concepts of UNIX Architecture and basic Command.

CO2: Understand the commands related to Shell basics, vi editor and regular expression commands.

CO3: Understand the concepts of advance file concepts, commands related to Shell script and filter commands.

CO4: Understand the concepts in Korn Shell and Interactive C Shell.

CO5: Understand different types of Files, File system and basic file system commands.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1									1		2
CO2	3	2	1									1		2
CO3	3	1	1									1		2

CO4	3	1			1							1		2
CO5	3		1									1		2

SUBJECT NAME: -Mathematics III

SUBJECT CODE: - BSC - 201

Course Outcomes:

CO1: To explore the fundamental knowledge of transforms and their types.

CO2: Laplace Transform and their applications.

CO3: Develop knowledge of double integration.

CO4: Explore the distribution in different situations.

CO5: Use Analytic functions

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2

SUBJECT NAME: -HUMAN VALUES

SUBJECT CODE: - HSMC 201

Course outcomes:

CO1. CO1: Understand and analyse the essentials of human values and skills, self-exploration, happiness and prosperity.

CO2: Evaluate coexistence of the “I” with the body.

CO3: Identify and evaluate the role of harmony in family, society and universal order.

CO4: Understand and associate the holistic perception of harmony at all levels of existence.

CO5: Develop appropriate technologies and management patterns to create harmony in professional and personal lives.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3

CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

CBCS Scheme for B.Tech (4th Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 209	Digital Electronics	4	1	0	20	20	60	100	5
2	PCC	PCC-CSE 210	Discrete Mathematics	3	1	0	20	20	60	100	4
3	PCC	PCC-CSE 211	Computer Organization & Architecture	3	0	0	20	20	60	100	3
4	PCC	PCC-CSE 212	Design & Analysis of Algorithm	4	0	0	20	20	60	100	4
5	PCC	PCC-CSE 213	Operating Systems	4	0	0	20	20	60	100	4
6	HSMC	HSMC 401	Organizational Behaviour	3	0	0	20	20	60	100	3
7	PCC	PCC-CSE 214	Computer Organization & Architecture Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 215	Operating Systems Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE	Design & Analysis of Algorithm	0	0	2	30	30	40	100	1

		216	Lab								
10	MC	MC-III	Constitutional Law	0	0	0	0	0	100	100	0
			Total	**21**	**2**	**6**				**1000**	**26**

SUBJECT NAME: - Digital Electronics

SUBJECT CODE: - PCC-CSE-209

Course outcomes:

CO1: Identify and enumerate different electronic components.

CO2: Illustrate reduction of logical expressions using boolean algebra and implement the functions using logic gates. Design and analyse synchronous and asynchronous sequential circuits using flip-flops.

CO3: Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.

CO4: Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

CO5: Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	2	3		2	2		3		1	1	1	1		
CO3	1	2	2	2	2	2		3		2		2		
CO4		2		2		2		2			1			
CO5	2		1	1	1		2	1	1	1	1	1		2

SUBJECT NAME: -Discrete Mathematics

SUBJECT CODE: - PCC-CSE-210

Course outcomes:

CO1: Explore the knowledge of set theory in relation, function and partially ordered relation.

CO2: define the concepts of truth table and modulus form to explore the universal quantification.

CO3: Develop the knowledge of generating function for recurrence relation.

CO4: Explore the knowledge of prime group, cyclic group and concept of ring.

CO5: Use graph theory to find the shortest path between any to vertices.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	1	2	1		2	2	1	2	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO4	3	3	3	3	3	2	2		2	1	1	1	2	3
CO5	3	2	1	1	3	3	2		1	1	1	2	2	3

SUBJECT NAME: -Computer Organization and Architecture

SUBJECT CODE: - PCC-CSE-211

Course outcomes:

CO1: Understand the theory and architecture of central processing unit.

CO2: Analyze some of the design issues in terms of speed, technology, cost, performance.

CO3: Design a simple CPU with applying the theory concepts.

CO4: Use appropriate tools to design verify and test the CPU architecture.

CO5: Learn the concepts of parallel processing, pipelining and interprocessor communication.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	2	1	1	1								2	2	2
CO3	2	2	2		2							2		
CO4	3	2	2	1	3							3		
CO5	3	1							1	1		2		

SUBJECT NAME: - DESIGN AND ANALYSIS OF ALGORITHM

SUBJECT CODE: - PCC-CSE-212

Course Outcomes:

CO1.Students will be introduced with algorithm.

CO2.Students will learn to design algorithms.

CO3.Students will learn to implement algorithm for coding.

CO4. Argue the correctness of algorithms using inductive proofs and invariants.

CO5. Analyze worst-case running times of algorithms using asymptotic analysis.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1							1	3	1
CO2	2	1	1	1	1							1	1	1
CO3	2	2	2	1	1							1	3	1
CO4	2	2	2	1	1							1	3	1
CO5	2	1	1	1	1							1	1	2

SUBJECT NAME: - OPERATING SYSTEM

SUBJECT CODE: - PCC-CSE-213

Course Outcomes:

CO 1. Identify the role of Operating System. To understand the design of control unit.

CO2. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.

CO3. Describe the role of paging, segmentation and virtual memory in operating systems.

CO4. Description of protection and security and also the Comparison of UNIX and Windows based OS.

CO5. Defining I/O systems, Device Management Policies and Secondary Storage Structure.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	3	2			2							3	2	2
CO3	3	2										2		
CO4	2				2							2		
CO5	2											1		

SUBJECT NAME: - ORGANIZATIONAL BEHAVIOUR

SUBJECT CODE: - HSMC- 401

Course Outcomes:

CO 1: Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organization behavior.

CO 2: Critically evaluate the potential effects of important developments in the external environment on organizational behavior.

CO 3: Analyze organizational behavioral issues in the context of organizational behavior theories, models, and concepts.

CO 4: Manage conflict in organizational context and deal with stress.

CO 5: Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

CBCS Scheme for B.Tech (5th Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 301	Data Communication	4	0	0	20	20	60	100	4
2	PCC	PCC-CSE 302	Software Engineering	4	0	0	20	20	60	100	4
3	PCC	PCC-CSE 303	Formal Language & Automata Theory	3	1	0	20	20	60	100	4
4	PCC	PCC-CSE 304	Java Programming	3	0	0	20	20	60	100	3
5	HSMC	HSMC-CSE-301	Human Resource Management	3	0	0	20	20	60	100	3
	PEC	PEC-CSE		4	0	0	20	20	60	100	4

6		301-303	Elective – I								
7	PCC	PCC-CSE 305	Software Engineering Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 306	Java Programming Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE 307	Data Communication Lab	0	0	2	30	30	40	100	1
10	PROJ	PROJ-CSE 301	Industrial Training/ Project Seminar	0	0	4	0	0	100	100	2
			Total	**21**	**1**	**10**				**1000**	**27**

SUBJECT NAME: - DATA COMMUNICATION NETWORK

SUBJECT CODE: - PCC-CSE-301

Course Outcomes:

CO1 Student will be able to understand network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model.

CO2 Student will be able to understand various types of transmission media, network devices; and parameters of evaluation of performance for each media and device.

CO3 Student will be able to understand the concept of flow control, error control and LAN protocols; to explain the design of, and algorithms used in, the physical, data link layers

CO 4 Student will understand the working principles of LAN and the concepts behind physical and logical addressing, subnetting and supernetting

CO5 Student shall understand the functions performed by a Network Management System and to analyze connection establishment and congestion control with respect to TCP Protocol.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

SUBJECT NAME: - SOFTWARE ENGINEERING

SUBJECT CODE: - PCC-CSE-302

Course Outcomes:

CO 1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO 2. An ability to work in one or more significant application domains.

CO 3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO 4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO 5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2								3	2	2
CO2	3		1	1								2		
CO3	2	2	3	2	2	1	1		3	2	2	3	3	3
CO4	3				2							2		
CO5	3				3	2	1					2		

SUBJECT NAME: -FORMAL LANGUAGE AND AUTOMATA THEORY

SUBJECT CODE: - PCC-CSE 303

Course Outcomes:

CO 1 Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.

CO 2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics .

CO 3 Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.

CO 4. Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language

CO 5. Attitude- Develop a view on the importance of computational theory.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3	2	3	2								3	2	2
CO3	3	2	3	2								2	2	2
CO4	2	3	3	3								2	2	1
CO5	2											1		

SUBJECT NAME: - Java Programming

SUBJECT CODE: - PCC-CSE 304

Course Outcomes:

CO 1. Learn to apply object-oriented programming features and concepts for solving given problem.

CO2. Learn to use java standard API library to write complex programs

CO 3. Learn implementation of object-oriented programming concepts using java

CO 4. Able to develop interactive programs using applets and swings.

CO 5. Develop advanced skills for programming in Java.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											3		
CO2	2	2	2	2	3				2			2	2	2
CO3	3											2		
CO4	2											2		
CO5	3	2	2	2	2	2			2	2	2	3	2	3

SUBJECT NAME: - EMBEDDED SYSTEM

SUBJECT CODE: - PCC-CSE 304

Course Outcomes:

CO 1. Understand the microprocessor architecture and its components used in embedded systems

CO 2. Write the 8051-assembly language code for specific purposes

CO 3. Implement code for interfacing various devices.

CO 4. Develop simple embedded systems for real time operations

CO 5. Compose simple embedded system with error free software to obtain target system.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

SUBJECT NAME: - HUMAN RESOURCE MANAGEMENT

SUBJECT CODE: - HSMC-CSE-301

Course Outcomes:

CO 1. To develop the understanding of the concept of human resource management and to understand its relevance in organizations.

CO 2. To develop necessary skill set for application of various HR issues.

CO 3. To analyze the strategic issues and strategies required to select and develop manpower resources.

CO 4. To integrate the knowledge of HR concepts to take correct business decisions.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

Scheme for B.Tech (6th Seme) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 308	Compiler Design	3	1	0	20	20	60	100	4
	PCC	PCC-CSE 309	Data Mining & Ware-	3	0	0	20	20	60	100	3

2			housing								
3	PCC	PCC-CSE 310	Computer Network	3	0	0	20	20	60	100	3
4	PEC	PEC-CSE 304-306	Elective-II	4	0	0	20	20	60	100	4
5	PEC	PEC-CSE 307-309	Elective-III	4	0	0	20	20	60	100	4
6	OEC	OEC-CSE 301-303	Open Elec-tive-I	3	0	0	20	20	60	100	3
7	PCC	PCC-CSE 311	Compiler Design Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 312	Computer Network Lab	0	0	2	30	30	40	100	1
9	PROJ	PROJ-CSE 302	Minor Pro-ject- I	0	0	4	50	50	100	200	2
			Total	**20**	**1**	**8**				**1000**	**25**

SUBJECT NAME: - Compiler Design

SUBJECT CODE: - PCC-CSE 308

Course Outcomes:

CO1. To realize basics of compiler design and apply for real time applications.

CO 2. To introduce different translation languages

CO 3. To understand the importance of code optimization

CO 4. To know about compiler generation tools and techniques

CO 5. To learn working of compiler and non-compiler applications and design of compiler for simple programming language.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1									2		
CO2	2											1		
CO3	3	3	2	2	3							2		

CO4	2				3							2		
CO5	3	2	3	2	2							3	3	3

SUBJECT NAME: - Data Mining & Ware-housing

SUBJECT CODE: - PCC-CSE 309

Course Outcomes:

CO 1. Understand the functionality of the various data mining and data warehousing component.

CO 2. Appreciate the strengths and limitations of various data mining and data warehousing models.

CO 3. Explain the analyzing techniques of various data.

CO 4. Describe different methodologies used in data mining and data ware housing.

CO 5. Compare different approaches of data ware housing and data mining with various technologies.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3				2							2		
CO3	2	2										2	2	
CO4	3				3							3		
CO5	2	2		1	2							2	2	

SUBJECT NAME: - Computer Network

SUBJECT CODE: - PCC-CSE 310

Course Outcomes:

CO 1. Students will be aware about computer networking.

CO 2. Students will know about various layers of OSI Model.

CO 3. Students will learn about wired & wireless technologies.

CO 4. Students will learn about the services of different layers.

CO 5. Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3											2		
CO3	3				1					1		2		
CO4	3	2		2	2							3		
CO5	3	3		2	2							2	1	

SUBJECT NAME: - Elective-II (Theory of Computation-305)

SUBJECT CODE: - PEC-CSE 304-306

Course Outcomes:

CO1. Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.

CO2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics - Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.

CO3 Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language

CO4 Attitude- Develop a view on the importance of computational theory.

CO5. Describing the limitations of a computing machine.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3	2	3	2								3	2	2
CO3	3	2	3	2								2	2	2
CO4	2	3	3	3								2	2	1
CO5	2											1		

SUBJECT NAME: - Elective III (Web and Internet Technology-309)

SUBJECT CODE: -PEC-CSE 307-309

Course Outcomes:

CO 1. Students will be familiar with Internet.

CO 2. Students will be familiar with different protocols of internet.

CO 3. Students will learn different services of internet.

CO 4. Analyze a web page and identify its elements and attributes.

CO 5. Students will learn HTML, CSS, JAVA Scripts for web designing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

CO1	3				3	2	2	3	2	3		3	3	
CO2	3											2		
CO3	3											2		
CO4	3				3	2	2	3		3	2	3	3	2
CO5	3				3	3	2	3	2	2		3	3	2

SUBJECT NAME: - Open Elective-I Cyber Laws and Ethics-302)

SUBJECT CODE: - OEC-CSE 301-303

Course Outcomes:

CO 1. Make learner conversant with the social and intellectual property issues emerging from cyberspace.

CO 2. Explore the legal and policy developments in various countries to regulate cyberspace.

CO 3. Develop the understanding of relationship between commerce and cyberspace.

CO 4. Give learners in depth knowledge of information technology act and legal framework of right to privacy, data security and data protection.

CO 5. Make study on various case studies on real time crimes.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					2		3				3		
CO2	3					2		3				3		
CO3	3					3		3				3		
CO4	3					2		3				3		
CO5	3					3		3				3		

CBCS Scheme for B.Tech (7th Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 401	Network Security & Cryptography	3	1	0	20	20	60	100	4
2	PEC	PEC-CSE	Elective- IV	4	0	0	20	20	60	100	4

		401-403									
3	PEC	PEC-CSE 404-406	Elective- V	3	1	0	20	20	60	100	4
4	OEC	OEC-CSE 401-403	Open Elective- II	3	0	0	20	20	60	100	3
5	PCC	PCC-CSE 401	Network Security & Cryptography Lab	0	0	2	30	30	40	100	1
6	PROJ	PROJ-CSE-401	Minor Project-II	0	0	16	50	50	400	500	8
			Total	**13**	**1**	**18**				**1000**	**24**

SUBJECT NAME: - Network Security & Cryptography

SUBJECT CODE: - PCC-CSE-401

Course Outcomes:

CO 1. Understand basic cryptographic algorithms, message and web authentication and security.

CO 2. Identify information system requirements for both of them such as client and server.

CO 3. Understand the current legal issues towards information

CO 4. Distinguish and explain different protocol like SSL, TLS Visà-vis their applications.

CO 5. Comprehend and explain security services and mechanisms.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					3						3		
CO2	2	2				2		2				2	2	
CO3	3					2		3				2		
CO4	3					3						3		
CO5	3				2	3		3				3	3	2

SUBJECT NAME: - Parallel and Distributed Algorithm

SUBJECT CODE: - PEC-CSE-402

Course Outcomes:

CO 1. Understand the requirements for programming parallel systems and how they can be used to facilitate the programming of concurrent systems.

CO 2. To learn and apply knowledge of parallel and distributed computing techniques and methodologies.

CO 3. To learn the architecture and parallel programming in graphics processing units (GPUs).

CO 4. Understand the memory hierarchy and cost-performance tradeoffs.

CO 5. To gain experience in the design, development, and performance analysis of parallel and distributed applications.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3		2	2	2			2	2		1	2	3	2
CO3	3											2		
CO4	2											2		
CO5	3	2	3	2	3	2	2		2	2	2	3	3	3

SUBJECT NAME: -Cloud Computing

SUBJECT CODE: - PEC-CSE-406

Course Outcomes:

CO1. Able to understand basic concepts, principles and paradigm of Cloud Computing

CO2. Able to interpret various Cloud computing models and services.

CO3. Able to identify the significance of implementing virtualization techniques.

CO4. Able to understand the need of security in Cloud computing.

CO5. Understand the concept SOA and cloud based storage in Cloud computing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1			1	1		1			1	2		
CO2	1	2	1	3	1		1					2		
CO3		1	3	1	2	1		1				3		
CO4	2	1	2	1		2	1					2		
CO5		1	1	2	1	2		1				3		

CBCS Scheme for B.Tech (8th Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 403	Advanced Computer Architecture	3	1	0	20	20	60	100	4
2	PCC	PCC-CSE 404	Artificial Intelligence & Expert Systems	3	0	0	20	20	60	100	3
3	PEC	PEC-CSE 407- 409	Elective- VI Optimization Techniques	3	1	0	20	20	60	100	4
4	OEC	OEC-CSE 404-406	Open Elective- III Industrial Relations	3	0	0	20	20	60	100	3
5	PCC	PCC-CSE 405	Artificial Intelligence & Expert Systems Lab	0	0	4	30	30	40	100	2
6	PROJ	PROJ-CSE-402	Major Project	0	0	16	50	150	400	600	8
			Total	**12**	**2**	**20**				**1100**	**24**

SUBJECT NAME: -Advanced Computer Architecture

SUBJECT CODE: - PEC-CSE-403

Course Outcomes:

CO1.Demonstrate concepts of parallelism in hardware/software.

CO2.Discuss memory organization and mapping techniques.

CO3.Describe architectural features of advanced processors.

CO4.Interpret performance of different pipelined processors.

CO5.Explain data flow in arithmetic algorithms.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3											3		
CO3	3											3		
CO4	3	3			2							3	2	
CO5	3											3		

SUBJECT NAME: -Artificial Intelligence & Expert System

SUBJECT CODE: - PEC-CSE-404

Course Outcomes:

CO1 Study the concepts of AI and related searching algorithms.

CO2 Develop the knowledge skills and it's representational structure in AI.

CO3 Study the concepts of natural language processing in AI.

CO4 Study the concepts of supervised/unsupervised machine learning and game technique.

CO5 Study how design the programming skill in PROLOG, and concepts of pattern recognition approaches.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1					3		
CO2	1	2	3	1	2		1					2		
CO3	1	1		1	1		3					2		
CO4	2	1	2	3	1		1					2		
CO5	1	2	3	3	2		1					3	2	2

SUBJECT NAME: -Optimization Technique

SUBJECT CODE: - PEC-CSE 407

Course Outcomes:

CO1: Formulate the engineering problems as an optimization problem.

CO2: Apply necessary and sufficient conditions for a given optimization problem for optimality

CO3: Select appropriate solution methods and strategies for solving an optimization problem and interpret and analyze the solution obtained by optimization algorithms

CO4: Justify and apply the use of modern heuristic algorithms for solving optimization problems

CO5: Solve Engineering Design and Manufacturing related optimization problem using software tools.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	1	1				1	1		1	1	
CO2	1	3	2	1						1			1	
CO3	1	3	2	1	1				2	1				
CO4	2	2	2	2	2				2	1				
CO5	1	3	3	2	3				2	2		1		

SUBJECT NAME: - INDUSTRIAL RELATIONS

SUBJECT CODE: - OEC-CSE – 406

Course Outcomes:

CO 1. Students should able to elaborate the concept of Industrial Relations.

CO 2. The students should able to illustrate the role of trade union in the industrial setup.

CO 3. Students should able to outline the important causes & impact of industrial disputes.

CO 4. Students should able to elaborate Industrial Dispute settlement procedures.

CO 5. Student should be able to summarize the important provisions of Wage Legislations, in reference to Payment of Wages Act 1936, Minimum Wages Act 1948 & Payment of Bonus Act 1965.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							1		2		2	2		
CO2							1				1	2	2	
CO3							1				2	2		2
CO4							1				2	2		2
CO5							1		1		1	2		

Semester III (Second year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 201	Data structure & algorithm using C	3	1	0	4

Total Hrs:45

Unit I: Arrays, Records and Pointers (7Hr**)**

Introduction to Linear Arrays, Arrays ADT, Representation Linear in Memory, Traversing Array

Inserting and deleting, Sorting; Bubble Sort, Searching; Linear Search, Binary Search, Multidimensional Arrays, Representation of Polynomials Using Arrays, Pointers; Pointer Arrays, Dynamic Memory Management, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, Sparse Matrices.

Unit II: Linked List (9Hrs)

Introduction Linked Lists, Representation of Linked Lists in Memory Traversing a Linked List Searching a Linked List, Memory Allocation; Garbage Collection, Insertion into a Linked List, Deletion from a Linked List, Header Linked List, Circularly Linked Lists, Two-Way Lists (or Doubly Linked Lists), Josephus Problem and its Solution, Buddy Systems.

Unit III: Stacks, Queue and Recursion (9Hrs)

Introduction Stacks, Array Representation of Stacks, Linked Representation of Stacks, Stack as ADT, Arithmetic Expression; Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of Recursive Procedures by Stacks, Queue, Linked Representation of Queues, Queues as ADT, Circular of Queues, Deques, Priority Queues, Applications of Queues.

Unit IV: Trees (10Hrs)

Introduction Binary Trees ,Representing Binary Tree in Memory ,Traversing Binary Trees, Traversal Algorithms Using Stacks, Header Nodes; Threads, Threaded Binary Trees ,Binary Search Trees ,Searching and Inserting in Binary Search Trees ,Deleting in a Binary Search Tree, Balanced Binary Trees, AVL Search Trees ,Insertion in an AVL Search Tree ,Deletion in an AVL Search Tree, m-way Search Trees ,Searching, Insertion and Deletion in an m-way Search tree, B-Trees ,Searching, Insertion and Deletion in a B-tree, B+-Trees.

Unit V: Graphs and their Applications (6Hrs)

Introduction, Graph Theory Terminology, Sequential Representation of Graphs; Adjacency Matrix; Path Matrix, Warshall ‟s Algorithm; Shortest Paths, Linked Representation of a Graph, Operations on Graphs, traversing a Graph, Topological Sorting, Spanning Trees

Unit VI: Sorting and Searching (4Hrs)

Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort, Radix Sort, Searching and Data Modification, Hashing.

Text Books: 1. Seymour Lipschutz, Schaums Outlines, „Data Structures with C‟,Tata Mc Graw Hill

Reference Books: 1. S. Sahani, „Data Structures in C‟

2. D.Samantha, „Classic Data Structure‟, PHI Publications

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 202	Object oriented programming through C++	3	1	0	4

Total Hrs:45

Unit-I: Principles of Object Oriented Programming (8 Hrs)

Differences between C and C++.A look at procedure Oriented programming, object oriented programming paradigm, basic concepts of OOP, Benefits of OOP, OO languages, A sample program, structure of C++ program. Introduction to OOPS: The origins of C++, What is Object Oriented Programming? Some C++ fundamentals, Headers & Name Spaces, Introducing C++ Classes & Object.

Unit-II: Overloading (10Hrs)

Introduction of overloading, Function overloading, Operator overloading, Inheritance, Constructors & Destructors,Function & Operator Overloading constructor functions, Localizing variables, Function overloading & Ambiguity, Finding the address of an overloaded function, this Pointer, References, Using reference to overload a unary operator, overriding.

Unit-III: Inheritance, Virtual Functions and polymorphism (7 Hrs)

Inheritance and the access specifies, Constructors and Destructors in derived classes, Multiple Inheritance, Passing parameters to a basic class, Pointers and references to derived types, Virtual Functions, Why virtual functions?, Pure virtual functions and abstract types, Early Vs Latebinding.

Unit-IV: Static & Dynamic memory allocation (10 Hrs)

Static & Dynamic allocation using new and delete, static class members, Virtual base classes, const member functions and mutable, volatile member functions, Using the as keyword, linkage specification, The .* and ->* operators, Creating conversion functions, Copy constructors, Granting access, namespaces, Explicit constructors, type name and export.

Unit-V: Exceptions Handling (10 Hrs)

Exception Handling, fundamentals, options the uncaught exception ( ), Applying exception Handling, and RTTI, casting operators, Recent trends in Object Oriented Programming in C++ , Advanced topics & its Application.

Templates : Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters.

Text Books:

1. Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications
2. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH

Reference Books:

1. Y. Kanetkar, „Let‟s C++‟, BPB publications
2. E Balagurusamy, „Object oriented programming with C++‟, 4th edition, TMH
3. Sourav Sahay , „Object-Oriented Programming with C++‟ , Oxford University Press, 2006.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 203	Database Management System	3	1	0	4

Total hrs: 45

UNIT – I: Database System Applications: (8 Hrs)

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

Unit-II: Database Design Theory (9 Hrs)

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

Unit-III: Physical Database Design and Memory Management in database (9 Hrs)
SQL: Queries, Constraints, Triggers: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases. Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

Unit -IV: Query Optimization and Performance Tuning (9 Hrs)
Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

Unit-V: Transaction Management (10Hrs)

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Text Books:

1. Fundamentals of Database Systems – Emissary ,Navathe & Gupta, Pearson Education
2. Database System Concepts by Henry Korth

Reference Books:

1. Database Systems by S. K. Singh, Pearson Education.
2. Principles of Database Systems – Ullman, Golgotia Publications 1998.
3. Database Systems by Connolly, 3rd edition, Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 204	Unix & Shell Programming	3	1	0	4

Total Hrs:45

UNIT-I INTRODUCTION (8Hrs)

Introduction to Unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

UNIT-II INTRODUCTION TO FILE (7Hrs)

The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions-I,Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

UNIT-III REGULAR EXPRESSIONS: (8Hrs)

Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

UNIT-IV KORN SHELL: (7Hrs)

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

UNIT-V INTERACTIVE C SHELL (7Hrs)

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The Read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

UNIT-VI FILE MANAGEMENT (8Hrs)

The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control.

Text Book: 1.UNIX and Shell Programming Richard F. Gilberg

Reference Books: 1. Mastering UNIX Shell Scripting: Bash, Bourne, and Korn Shell.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
BSC	BSC 201	Mathematics - III	3	1	0	4

Unit –I (9Hours)

Fourier transform: Discrete and Fast Fourier transform Complex form of Fourier transform and its inverse, Fourier sine and cosine transform and their inversion. Properties of F-transform, Convolution theorem for F-transform, Parse Val‟s identity of for F-transforms Applications of Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation.

Unit –II (9Hours)

Laplace transform, Inverse transform, properties, Transforms of derivatives and integrals, Unit step function, Dirac‟s delta function, Differentiation and integration of transforms, Applications to differential equations.

Unit –III (9Hours)

Statistical Techniques: Discrete and Continuous random variables–Moments–Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions, Moments, Moment generating functions, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non –linear

Unit –IV (9Hours)

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Unit –V (9Hours)

Cauchy-Riemann equations: Necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions.

Text and Reference books:

1. Chandrika Prasad, Mathematics for Engineers, Prasad Mudralaya
2. Jeffrey, Advanced Engineering Mathematics , ELSEVIER
3. Chandrika Prasad , Advanced Mathematics for Engineers, Prasad Mudralaya
4. Grewal B. S., Higher engineering Mathematics, Khanna Publication, New Delhi
5. Keyszig E., Advanced Engineering Mathematics, Wiley Eastern Publication
6. Peter V. O. Neil, Advanced Engineering mathematics, Thomson Publication
7. Gerald, C.F., and Wheatley, P.O., Applied Numerical Analysis, Addison Wesley.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
HSMC	HSMC 201	Human Values	3	1	0	4

Total Hrs:45

UNIT-I: Course Introduction (9Hrs)

Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self-Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self -exploration. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-II: Harmony in the Human Being (9Hrs)

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT-III: Relationship and Goals (9Hrs)

Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in thesociety (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT-IV: Nature and Values (9Hrs)

Understanding Harmony in the nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT-V: Ethics and Ability (9Hrs)

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems.

Text books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

Reference books:

1. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 205	Data structure & algorithm using C lab	0	0	2	1

Total Hrs: 20

List of Practical's-

1. Write and execute a program in C to implement stack using arrays
2. Write and execute a program in C to implement queue using arrays
3. Write and execute a program in C to implement simple linked list
4. Write and execute a program in C to implement stack using linked list
5. Write and execute a program in C to implement queue using linked list
6. Write and execute a program in C to implement doubly linked list
7. Write and execute a program in C to implement circular linked list.
8. Write and execute a program in C to reverse a singly and doubly linked list
9. Write and execute a program in C to insert a node in a linked list in a sorted fashion 154
10. Write and execute a program in C to implement binary tree, finding the depth of a tree
11. Write and execute a program in C to implement in order, preorder and post order traversals
12. Write and execute a program in C to find if two trees are identical

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 206	Object oriented programming through C++ lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. Write a C++ program to find the sum of individual digits of a positive integer.
2. Write a C++ program to generate the first n terms of the sequence
3. Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C++ program to find both the largest and smallest number in a list of integers.
5. Write a C++ program to sort a list of numbers in ascending order.
6. Write a Program to illustrate New and Delete Keywords for dynamic memory allocation
7. Write a program Illustrating Class Declarations, Definition, and Accessing Class Members.
8. Program to illustrate default constructor, parameterized constructor and copy constructors
9. Write a Program to Demonstrate the i)Operator Overloading.ii) Function Overloading.
10. Write a Program to Demonstrate Friend Function and Friend Class.
11. Write a Program to Access Members of a STUDENT Class Using Pointer to Object Members.
12. Write a Program to Generate Fibonacci Series use Constructor to Initialize the Data Members.
13. Write C++ programs that illustrate how the following forms of inheritance are supported:
    a. Single inheritance b)Multiple inheritance c)Multi level inheritance d)Hierarchical inheritance
14. Write a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class.
15. Write a Program to Invoking Derived Class Member Through Base Class Pointer
16. Write a Program Containing a Possible Exception. Use a Try Block to Throw it and a Catch Block to Handle it Properly.
17. Write a Program to Demonstrate the Catching of All Exceptions.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 207	Database Management System Lab	0	0	2	1

Total Hrs: 20

List of Practicals:

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Study of PL/SQL block.
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.
9. Creation of Procedures.
10. Creation of database triggers and functions.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 208	Unix & Shell Programming Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. Write a shell script to write your user name as a banner to the front of the file being sent to the printer
2. Write a shell script to print the first five arguments in reverse order
3. Write a shell script to append a line to the file. Both the file name and line have to be specified to the script at the command line. Ensure that it runs the sh shell script. Print the number of lines in the file after you done.
4. Write a shell script that tests and print outs the name of all the files in a directory that are executable. Do not print any other file or directory names. If there are subdirectories, go down recursively. How would you change this script to not go down recursively?
5. Write a shell script that given a person‟s UID, tells you how many times that person is logged on
6. Write a shell script called lsdirs which lists just the directories in the current directory
7. Write a shell script called see taking a filename name as argument which uses ls if the file is a directory and more if file is otherwise
8. Write a shell script that asks a user to type w word in, then tells the user how long that wordis.
9. In many versions of UNIX there us a –i argument for cp so that you will be prompted for confirmation if you are about to overwrite a file. Write a script called cpi which will prompt if necessary without using the –i argument.
10. Write a shell script that takes a uid as an argument and prints out that person‟s name, home directory, shell and group number, and other groups that person may belong to.
11. Sort /etc/passwd using the uid as the key.
12.
    a. Write a program to generate Machine OpCode Table, Symbol Table and Pseudo OpCode table during First Pass Assembler.
    b. Write a program to generate Machine Opcode table using two pass Assembler.

Semester IV (Second year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 209	Digital Electronics	4	1	0	5

Total Hrs:45

Unit –I

Overview of electronics: Electronic Components-Resistor, capacitor and Inductors, Semiconductor devices: Diodes, transistors (BJT and FET). Integrated circuits, Popular IC packages, Analog vs digital electronics, Transistor as a switch.
Boolean algebra: Representation of values and complements, De'Morgans theorem-simplifying expressions.

Unit –II

Logic gates: AND, OR, NOT, XOR, XNOR, NAND, NOR gates and their truth tables, combining logic circuits for expressions using NAND and NOR gates, Logic circuit families and characteristics, SSI, MSI,LSI and VLSI circuits. Combinational and sequential circuits: (Simple block diagrams, truth tables and IC packages only required).
Adders, decoders, multiplexers, encoder circuits , Flip-flops: RS, clocked RS, JK, D and T flip flops, Master-slave flip flops, edge and level triggering, Multivibrators - A stable, Bistable, Monostable,counters-ripple and decade. Registers, latches and Tristate buffers.

Unit –III

Building blocks of a computer system: Basic building blocks-I/O, memory, ALU, Control and their interconnections, Control unit and its functions- Instruction-word, Instruction execution cycle, organizational sequence of operation of control registers; controlling of arithmetic operations; branch, skip, jump and shift instructions, ALU-its components.

Unit –IV

Addressing techniques and registers: Addressing Techniques-Direct, immediate addressing; paging, relative, Indirect and indexed addressing. Memory buffer register; accumulators; Registers-Indexed,General purpose, Special purpose; overflow, carry, shift, scratch registers; stack pointers; floating point; status information and buffer registers

Unit –V

Memory: Main, RAM, static and Dynamic, ROM, EPROM, EAROM, EEPROM, Cache and Virtual memory. Interconnecting System components: Buses, Interfacing buses, Bus formats-address, data and control,Interfacing keyboard, display, auxiliary storage devices, and printers. I/O cards in personal computers. Development of Indian Super Computer 'PARAM': History, Characteristics, Strengths, Weakness and basic Architecture.

Text / Reference Books

1. A.S.Tannenbaum : Structured Computer Organization, Pearson
2. Thomas C. Bartee : Digital Computer Fundamentals, McGraw-Hill
3. Duglus V Hall : Microprocessors and Interfacing: programming and Hardware, McGraw-Hill, 1986.
4. Introduction to Computer Architecture, Stone S.Galgotia Publicatons 1996.
5. Microprocessor Architecture Programming & Applications, R. Gaonkar, Wiley Eastern-1987.
6. Computer Architecture and Organization by N.P. Carter, 4th Edition, McGraw-Hill, 2014.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 210	Discrete Mathematics	3	1	0	4

UNIT-I: Set Theory, Relation: Definition, Function: (10Hrs)

Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and count ability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle. Types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. Definition and types of function, composition of functions, recursively defined functions.

UNIT-II: Propositional logic: (8Hrs)

Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicatelogic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.

UNIT-III: Combinatories: (8Hrs)

Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)

Unit-IV: Algebraic Structure: (9Hrs)

Binary composition and its properties definition of algebraic structure; Groyas Semi group, Monoid Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).

UNIT-V: Graphs: (10Hrs)

Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number. Tree: Definition, types of tree(rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder,

postorder). Finite Automata: Basic concepts of Automation theory, Deterministic finite Automation(DFA), transition function, transition table, Non Deterministic Finite Automata (NDFA), Mealy and Moore Machine, Minimization of finite Automation.

Text/Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.
2. J.P.Tremblay & R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science" Mc.Graw Hill, 1975.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 211	Computer Organization & Architecture	3	0	0	3

Unit I: Basic Structure of Computers (7 Hrs)

Functional Units, Basic operational concepts, Bus structures Addressing modes, subroutines: parameter passing, Instruction formats, expanding op codes method.

Unit II: Basic Processing Unit (8 Hrs)

Bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format, Bit slice concept.

Unit III: Arithmetic Unit (7 Hrs)

Number representations and their operations, Design of Fast Adders, Signed multiplication, Booth‟s Algorithm, bit pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding.

Unit IV: The Memory System (8 Hrs)

Various technologies used in memory design, higher order memory design, multimodal memories and interleaving, Associative Memory, Cache memory, Virtual Memory.

Unit V: Input /Output Organization (7Hrs)

I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access COMPUTER PERIPHERALS: I/O devices such as magnetic disk, magnetic tape, CDROM systems.

Unit VI: RISC (8 Hrs)

Pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, influence of pipelining on instruction set design, multiple execution Units, performance considerations, Basic concepts in parallel processing & classification of parallel architectures. Vector Processing0, Array Processors. Recent trends in Computer Architecture & Organization.

Text Books:

1. V.C.Hamacher,Z.G.Vranesic and S.G.Zaky, „Computer Organization‟, McGraw Hill,5th edition ,2002.

References Books:

1.A.S.Tanenbaum, “Structured Computer Organization” 4th Edition, Pearson Education.
2.M Mano, “Computer System and Architecture”, Pearson Education
3.W. Stallings, “Computer Organization & Architecture”, Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 212	Design & Analysis of Algorithm	4	0	0	4

Unit – I: Introduction **(8 Hrs)**

INTRODUCTION: Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation, recurrences, probabilistic analysis, disjoint set operations, union and find algorithms.

Unit – II: Asymptotic notations (8 Hrs)

DIVIDE AND CONQUER: General method, applications-analysis of binary search, quick sort, merge sort, AND OR Graphs. GREEDY METHOD: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.

Unit – III: Advanced data structures (9 Hrs)

GRAPHS (Algorithm and Analysis): Breadth first search and traversal, Depth first search and traversal, Spanning trees, connected components and bi-connected components, Articulation points. DYNAMIC PROGRAMMING: General method, applications - optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design

Unit – IV: Greedy Method & Dynamic Programming (10Hrs)

BACKTRACKING: General method, Applications- n-queen problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles. BRANCH AND BOUND: General method, applications - travelling sales person problem, 0/1 knapsack problem- LC branch and bound solution, FIFO branch and bound solution.

Unit-V: Traversal and Search Techniques (9 Hrs)

NP-HARD AND NP-COMPLETE PROBLEMS: Basic concepts, non-deterministic algorithms, NP-hard and NP-complete classes, Cook‘s theorem

Text Books:

1. Thomas H. Cormen et. al. “Introduction to Algorithms”, Prentice Hall of India.
2. Design & Analysis of Computer Algorithms by Aho,. Horowitz, Sahani, Rajsekharam, Pearsoneducation

Reference Books:

1. “Computer Algorithms”, Galgotia Publications Pvt. Ltd. Brassard, Bratley, “Fundamentals ofAlgorithms”, Prentice Hall
2. 2. Computer Algorithms: Introduction to Design and analysis, 3rd Edition, By Sara Baase & A. V. Gelder Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 213	Operating Systems	4	0	0	4

Total Hrs:45

Unit-I: Introduction (6 Hrs)

Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation.

Unit-II: File Systems (8Hrs)

File systems: File concept, Access methods, Disk space management and space allocation strategies, directory structures, Recovery, Log-structured File System, disk arm scheduling strategies.

Unit-III: Process and Its Scheduling (7Hrs)

Process concept, process control block, Types of scheduler, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms.

Unit-IV: Memory Management (8Hrs)

Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging , Virtual Memory Concepts, page faults and instruction restart , page replacement algorithms , working sets ,Locality of reference, Thrashing, Garbage Collection.

Unit-V: Process management and synchronization (8Hrs)

Concurrency conditions, Critical section problem, software and hardware solution, semaphores, conditional critical regions and monitors, classical inter process communication problems

Unit-VI: Deadlocks detection & avoidance (8Hrs)

Deadlock definitions, Prevention, Avoidance, detection and Recovery, Goals of Protection, access matrix, Deadlock implementation.

Text Books:

1. Operating System concepts – Silberchatz & Galvin, Addison Wesley, 6th Edn.
2. Modern Operating Systems – Tanenbaum, Pearson Edn. 2ndedn.

Reference Books:

1. Operating Systems – S R Sathe, Macmillan Publishers, India, 2008
2. Operating System –Milan Milenkovik, McGraw-Hill, 1987

Category	Code	Course Title	Hours PerWeek			Credit
			L	T	P	
HSMC	HSMC 401	Organizational Behavior	3	0	0	3

Total Hrs: 45

Unit-l: OrganizationalBehavior (9 Hrs)

Definition - Importance - Historical Background - Fundamental concepts of OB - 21st Century corporate - Different models of OB i.e. autocratic, custodial, supportive, collegial and SOBC.

Unit II: Perception Process & Personality & Attitudes (9 Hrs)

Nature & Importance - Perceptual Selectivity - Perceptual Organization - Social Perception – Impression Management Meaning of personality - Development of personality - Nature and dimensions of attitude - Job Satisfaction - Organizational Commitment.

Unit III: Learning & Motivation (9 Hrs)

Process of Learning - Principles of Learning - Organizational Reward Systems - Behavioral Management Motives - Characteristics - Classification of motives - Primary Motives - Secondary motives - Morale - Definition and relationship with productivity - Morale Indicators Theories of Work Motivation - Maslow's theory of need hierarchy - Herzberg's theory of job loading.

Unit IV: Leadership & Organizational Design (9Hrs)

Definition - Importance - Leadership Styles - Models and Theories of Leadership Styles Various organizational structures and their effects on human behaviour - Organizational Climate - Organizational Culture - Organizational Effectiveness.

Unit V: Conflict Management (9 Hrs)

Modern view of conflict - Constructive and Destructive conflict - Conflict Process - Strategies for encouraging constructive conflict - Strategies for resolving destructive conflict. Stress Management - Concept of stress - Sources of stress - Effects of stress on humans - Managementof Stress.

Text Books:

1. Organizational Behaviour, 9th Ed. - Stephen Robbins

2. Human Behaviour at work - Davis and Newstorm

3. Organizational Behaviour - Uma Sekaran

Reference Books:

4. Organizational Behaviour - Fred Luthans
5. Organizational Behaviour - K.Aswathappa
6. Human Behaviour at Work - Keith Davis

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 214	Computer Organization & Architecture Lab	0	0	2	1

Total Hrs: 20

List of practicals -

1. Machine and assembly languages (generic)
2. The process of assembly and linking
3. Special assembly language programming issues
4. Parameter passing: assembly language and "external"a.Return addresses and co-routines

b.Traps and interrupts: mechanism and handling

c. Worms and viruses: malicious code and defending against it

5. Special miscellaneous topics
6. Operating system interface: traps and interrupts

a.Access to IO devices: display, keyboard, real-time clocks, DMA

b.Communications (serial and parallel), simple error detection and correction codes (parity, Hamming),

7. Low level programming in C. This includes all sorts of "tricks" that emphasize the power of low-level computing, as an aid to understanding computing systems in depth: Pointers tofunctions and their applications for self modifying code and applications.
8. Write the working of 8085 simulators GNUsim8085 and basic architecture of 8085 along with small introduction.
9. Study the complete instruction set of CPU and write the instructions in the instruction set of8085 along with examples.
10. Write an assembly language code in GNUsim8085 to implement data transferinstruction.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 215	Operating Systems Lab	0	0	2	1

Total Hrs:20

List of practical's -

1. Basics of UNIX commands.
2. Shell programming
3. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
5. Implement Semaphores
6. Implement File Organization Techniques
7. Implement Bankers algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique f memory management.
12. Implement Threading & Synchronization Applications

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 216	Design & Analysis of Algorithm Lab	0	0	2	1

Total Hrs: 20

List of practicals -

1. To find HCF and LCM of two numbers
2. Code and analyses to find median element in an array of integers.
3. Code and analyse to find majority element in an array of integers.
4. Code and analyse to sort an array of integers using merge sort
5. Code and analyse to sort an array of integers using quick sort
6. To implement maximum and minimum problem using divide and conquer strategy
7. To implement binary search using divide and conquer strategy
8. To implement program of Heap Sort.
9. WAP of minimum spanning tree using Kruskal algorithm.
10. WAP of minimum spanning tree using Prim‟s algorithm.
11. WAP to implement matrix chain multiplication
12. Code to find the shortest path in graph using Dijkstra‟s algorithm.
13. Code to find the shortest path using Bellman-Ford algorithm.
14. To implement LCS problem using Dynamic Programming.
15. To implement matrix chain multiplication problem using dynamic programming.
16. Code and analyze to find the minimum spanning tree in a weighted, undirected graph.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	MC-III	Constitutional Law	3	0	0	0

Unit – I (9 Hrs)

Salient features of the Indian constitution. Preamble Definition of State (Art. 12) Doctrines of Ultra-virus, severability, eclipse, waiver (Art, 13)

Unit – II (9 Hrs)

Right to equality (Art. 14) Prohibition of discrimination, Rights to equality of opportUNITy (Art. 15-16) Right to freedom under Article 19: Freedom of association; Freedom of movement; Freedom of residence; Freedom of assembly; Freedom of association; Freedom of movement; Freedom of residence; Freedom of occupation, trade and business; Right to take out processions; Right of the State to impose reasonable restrictions

Unit – III (9 Hrs)

Protection in respect of Conviction under Article 20, Ex-post-facto law; Double jeopardy; Self-incrimination; Right of Life and Personal Liberty (Act. 21), Protection in respect of arrest and detention Right to freedom of Religion (Articles 25-28)

Unit – IV (9 Hrs)

Cultural and Education Rights (Articles 29-30) Enforcement of Fundamental Right, Writ Jurisdiction of the Supreme Court and High Court (Article 32, 226) Right to property before and after the Constitution 42nd Amendment Act, 1976 Abolition of Untouchability, Titles (Articles 17-18) Right against exploitation (Articles 23, 24)

Reference Books:

1. Austin Granville: Constitution of India: Cornerstone of a Nation and Working A Democraticconstitution
2. Narender Kumar : Constitutional Law of India.
3. Basu D. D : Shorter Constitution of India
4. Jain, M.P.: Constitutional Law of India,
5. Seervai, H.M. : Constitutional Law of India, Vols. I-III
6. Shukla, V.N. : Constitutional of India (ed. M.P.Singh)
7. B.R. Sharma : Constitutional Law and judicial Activism

Semester V (Third Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 301	Data Communication	4	0	0	4

Total Hrs: 45

Unit-l: Signals (8Hrs)

ANALOG AND DIGITAL: Analog and digital data, Analog and digital signals; PERIODIC AND APERIODIC SIGNALS, ANALOG SIGNALS: Simple analog signals; TIME AND FREQUENCY
DOMAINS; COMPOSITE SIGNALS: Frequency spectrum and Bandwidth; DIGITAL SIGNALS: Decomposition of digital signal; TRANSMISSION MODES: Serial and Parallel transmission, Asynchronous and Synchronous Transmission, Simplex, Half-Duplex and Full-Duplex communication.

Unit II: Encoding And Modulation (8Hrs)

DIGITAL-TO-DIGITAL CONVERSION: Unipolar, Polar, Bipolar; ANALOG-TO-DIGITAL CONVERSION: Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM), Sampling Rate, How many Bits per Sample? Bit rate; DIGITAL-TO-ANALOG CONVERSION: Aspects of Digital-to-Analog conversion, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase shift Keying (PSK), Quadrature Amplitude modulation (QAM), Bit / Baud comparison; ANALOG-TO-ANALOG CONVERSION: amplitude modulation (AM), Frequency Modulation (FM), Phase Modulation(PM).

Unit III: Interfaces and Modems (8Hrs)

DIGITAL DATA TRANSMISSION: Parallel transmission, Serial Transmission; DTE-DCE INTERFACE: Data Terminal Equipment (DTE), Data Circuit-Terminating Equipment (DEC), Standards, EIA-232 Interface; OTHER INTERFACE STANDARDS: EIA-449, EIA-530.

Unit IV: Communication Media (7Hrs)

GUIDED MEDIA: Twisted pair cable, Coaxial cable, Optical Fiber cable; UNGUIDED MEDIA: Radio frequency allocation, Propagation of Radio waves, Terrestrial microwave, Satellite communication, Cellular Telephony; TRANSMISSION IMPAIRMENTS: Attenuation, Distortion, Noise; PERFORMANCE: Throughput, Propagation Speed, Propagation time.

Unit V: MULTIPLEXING (7Hrs)

FREQUENCY DIVISION MULTIPLEXING (FDM), TIME DIVISION MULTIPLEXING (TDM): Inverse Multiplexing, WAVE-DIVISION MULTIPLEXING, MULTIPLEXING APPLICATIONS: THE TELEPHONE SYSTEM: Common carrier services and hierarchies, Analog services, Digital Services.

Unit VI: Data Compression (7Hrs)

Huffman code, Run-Length Encoding, Relative Encoding, Lempel-Ziv Encoding, Image Compression, PEG, MPEG.

Text Book:

1. Behrouz A. Forouzan , „Data Communications and 161 Networking“, 4th edition, Tata McGraw Hill.

Reference Book:

1. William A.Shay,„Understanding Data Communications and Networks“, 2nd Edition,Vikas publication

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 302	Software Engineering	4	0	0	4

Total Hrs: 45

Unit-I: Introduction (5 Hrs)

An Introduction to Software Engineering, Software Myths, Software Engineering- A Layered Technology, Software Process Framework, Software Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Process Model, Agile Process Models.

Unit-II: Software Planning (5 Hrs)

Software Engineering Practice An overview, Communication Practices, Planning Practices, Modeling Practices, Construction Practice & Deployment, System Engineering Hierarchy, Business Process Engineering, Product Engineering, System Modeling, Requirements Engineering.

Unit-III : Software Analysis And Design (9 Hrs)

Software Engineering Analysis & Design An overview, Requirements Analysis, Analysis Modeling Approaches, Data Modeling, Object-Oriented Analysis, Scenario Based Modeling, Flow-Oriented Modeling, Class-based Modeling, Behavioral Model. Design Engineering Concepts, DesignModel, Pattern-Based Software Design.

Unit-IV: Software Testing (9 Hrs)

Testing Strategies and Tactics An overview, level of testing: Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging techniques. Software Testing Fundamentals, Black-Box Testing, White-Box Testing.

Unit-V: Software Metrics And Software Quality Management (8 Hrs)

Product Metrics An overview, Software Quality, A Framework for Product Metrics, Metrics for Analysis & Design Models, Metrics for Source Code, Metrics for Testing & Maintenance, Software Project Management An overview, Software Measurements, Metrics for Software Quality, Software Project Estimation Techniques, Project Scheduling, Risk Management, Quality Management, Change Management, Software Reengineering.

Unit-VI: Trends in Software Engineering And Project Management (9 Hrs)

Software project management (PERT/CPM): Developing a network plan, overview of PERT /CPM, basic rules for developing network, basic rules for developing project network. Recent trends in Software Engineering and Project.

Text Book:

1. Software Engineering- A Practitioner‟s Approach (Sixth Edition) - Roger Pressman (TMH)

Reference Books:

1. Software Engineering (Seventh Edition)- Ian Summerville, Pearson Education.
2. Software Engineering Theory and Practice by Pfleeger, Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 303	Formal Language & Automata Theory	3	1	0	4

Total Hrs: 45

Unit-I: Fundamentals (9Hrs)

Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and nondeterministic finite automaton, transition diagrams and Language recognizers.

Unit-II: Finite Automata & Regular Languages (8Hrs)

NFA with Î transitions – Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without Î transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM"s, Finite Automata with output- Moore and Melay machines. Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

Unit-III: Context Free Grammars & Grammar Formalism (9Hrs)

Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted).Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings.

UNIT-IV: Push Down Automata & Turing Machine (9Hrs)

Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA. Turing Machine: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church"s hypothesis, counter machine, types of Turing machines (proofs not required).

UNIT-V: Computability Theory (10Hrs)

Chomsky hierarchy of languages, linear bounded automata and context sensitive language,LR(0) grammar, decidability of, problems, Universal Turing Machine, undecidability of posts. Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

Text Book:

1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.

Reference Book:

1. Introduction to languages and the Theory of Computation ,John C Martin, TMH

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 304	Java Programming	3	0	0	3

Total Hrs: 45

UNIT-I: (9Hrs)

Introduction to OOP, procedural programming language and object-oriented language, principles of OOP, applications of OOP, history of java, java features, JVM, program structure. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control.

UNIT-II: (8Hrs)

Classes and objects, class declaration, creating objects, methods, constructors and constructor overloading, garbage collector, the importance of static keyword and examples, this keyword, arrays, command line arguments, nested classes.

UNIT-III: (8Hrs)

Inheritance, types of inheritance, super keyword, final keyword, overriding an abstract class. Interfaces, creating the packages, using packages, the importance of CLASSPATH and java.lang package. Exception handling, the importance of try, catch, throw throws and finally block, user-defined exceptions, Assertions.

UNIT-IV: (8Hrs)

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data to files, random access file,

UNIT-V: (6Hrs)

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

UNIT-VI: (6Hrs)

AWT: introduction, components and containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Container class, Layouts, Menu and Scrollbar.

TEXT BOOK:

1. Cay S. Horstmann and Gary Cornell, “Core Java: Volume I – Fundamentals”, Eighth Edition, Sun Microsystems Press, 2008.

REFERENCES Books:

1. K. Arnold and J. Gosling, “The JAVA programming language”, Third edition, Pearson Education, 2000.
2. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
HSMC	HSMC-CSE-301	Human Resource Management	3	0	0	3

Total Hrs: 45

Unit-I:INTRODUCTION (9Hrs)

Overview of Human Resources, Historical evolution, Integrated HR function, Corporate and HR environment, Strategic environment, Strategic Management

UNIT-II: PLANNING (9Hrs)

HR planning at Enterprise level, Need for systematic planning, Planning process, Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supplyforecasting. Retention-Redeployment and Exit strategies

UNIT-III:SKILLES DEVELOPMENT (9Hrs)

Career management-Recruitment and Selection, Employee Induction Programme, Employee training, Training needs & objective setting, Methods of training, Development & Development needs, Human Resource Development, Development process

UNIT-IV: PERFORMANCE PLANNING (9Hrs)

Performance planning – Performance appraisal, Measures of appraisal, System components appraisal methods, Ethics of appraisal, Problems & issues

UNIT-V: HUMAN RESOURCE (9Hrs)

Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level

Text Book:

1. Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia

Reference Books

1. John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A
   Reader, SAGE Publications, 1998
2. Christopher Mabey, Rosemary Thomson (2011): Developing Human Resources,Routledge, Taylor and francis group, New York, USA.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 301	Soft Computing	4	0	0	4

Total Hrs: 45

UNIT-I: NEURAL NETWORKS (9 hours)

Fundamentals of Neural Networks – History- Architectures- Learning methods XOR problem-Delta rule-derivation-Back propagation- applications- parameters in BPN- Associative memory – Hetero associative- BAM-energy function problems-applications of associative memories- ART1-ART2- applications of adaptive networks.

UNIT-II: FUZZY LOGIC (9 hours)

Fuzzy set theory – crisp sets – fuzzy sets – crisp relations – Fuzzy relations – Fuzzy systems- Crisp logic – predicate logic – fuzzy logic- fuzzy based systems Defuzzification methods – applications.

UNIT-III: GENETIC ALGORITHMS (9 hours)

Fundamentals of GA – creation of offspring‟s – encoding – fitness function reproduction – crossover- insertioo & deletion- mutation- bitwise operators – applications.

UNIT-IV: HYBRID SYSTEMS (9 hours)

Hybrid systems – Neuro Fuzzy – Neuro Genetic – fuzzy Genetic hybrids- GA based weight determination and applications- fuzzy BPN – simplified fuzzy ARTMAP.

UNIT-V: PROGRAMMING USING MATLAB (9 hours)

Using Neural Network toolbox – Using Fuzzy Logic toolbox- Using Genetic Algorithm & directedsearch toolbox.

TEXT BOOKS:

1. Rajasekaran S. and VijayalakshmiPai G.A, “Neural Networks, Fuzzy Logic and GeneticAlgorithms”, PHI, 2011.
2. Timothy J.Ross, “Fuzzy Logic with Engineering applications”, John Wiley and Sons, 2010.

REFERENCES

1. Jang J.S.R, Sun C.T, Mizutani E, “Neuro fuzzy and Soft Computing”, PHI Learning Pvt. Ltd., 2012.
2. Davis E. Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y.,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 302	Image Processing	4	0	0	4

Total Hrs: 45

Unit-I: Introduction (8Hrs)

Origins of digital image processing, Various Imaging techniques, components of an image processing system, Image sensing and acquisition, Image sampling and quantization, neighbors of a pixel, Adjacency, Connectivity, Regions and boundaries.

Unit-II: Filtering (8Hrs)

Basic intensity transformation and spatial filtering, Image negatives, log transforms power-law transformations, median filtering, Histogram equalization, Histogram matching spatial correlation and convolutions

Unit-III: Transformation (8Hrs)

Two-dimensional orthogonal and Unitary Transforms, properties of unitary transforms 2D-DFT, Cosine transforms, Sine transforms, Hadamard transform, Haar transforms, Slant transforms.

Unit-IV: Image Degradation /Restoration Process (7Hrs)

Model of image Degradation/Restorations process, Noise models, Restoration in the presenceof noise only, periodic noise reduction by Frequency domain filtering, Image reconstructionfrom Projections, Image compression models, Huffman coding, LZW coding, Run length coding,Bit-plane coding.

Unit-V: Image Morphology (7Hrs)

Some basic algorithms, Boundary extraction, convex hull, thinning, morphological Reconstruction. Colorimage color models. skeletons, morphological processing, color models, RGB color models, CMY and CMYK color models the HIS.

Unit-VI: Image Segmentation (7Hrs)

Image segmentation, Fundamentals, Point, Line and edge detection, of segmentation, Thresholding, Regionbased segmentation, watershed segmentation algorithm Applications of segmentation.

Text Book:

1. Digital image processing by Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson PHIPublication.

Reference Books:

1. Fundamental of Digital Image Processing by A. K. Jain, P. H. I. Publication.
2. Digital image processing by S. Jayaraman, S. Esakkirajan, T. Virakumar, McGraw Hill.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 303	Embedded System	4	0	0	4

Total Hrs: 45

Unit- I: Microcontrollers (10Hrs)

Microprocessors and Micro-controllers, Types of Microcontrollers, External memory, Processor Architecture – Harvard v/s Van Neumann; CISC v/s RISC, Microcontroller, Memory types, Software development tools like assembler, cross- compiler, emulator, and 173 simulator, 8051 controller, Block Diagram &Architecture.

Unit-II: Device and Communication Bus for Devices Network (10Hrs)

IO Types and examples, Serial communication devices, Parallel Device ports, Sophisticated Interfacing Feature in Devices Ports, Wireless Devices, Timer and Counting Devices, Watch dog timer, Real time clock, Network Embedded Systems, Serial Bus Communication Protocols, parallel Bus Devices protocol Parallel communication Network using ISA, PCI, PCI-X and advanced buses, Internet Enabled Systems- Network protocols, Wireless and mobile system protocol.

Unit-III: Device Drivers and Interrupt Services Mechanism (10Hrs)

Programmed-I/O Busy-wait Approach without Interrupt Services Mechanism, ISR Concept, Interrupt Sources, Interrupt Servicing (Handling) Mechanism, Multiple Interrupts, Context and the Periods for Context Switching, Interrupt Latency and Deadline, Classification of Processor Interrupt Service Mechanism from Context-Saving Angle, Direct Memory Access, Device Driver Programming.

Unit-IV: Inter process Communication and Synchronization (8Hrs)

Multiple process in an application, Multiple Threads in an application, Task and Task state, Task and Data, Clear-cut Distinction between Functions, ISRS and Tasks by their Characteristics, Concept of Semaphores, Shared Data, Inter process Communication, Signal Function, Semaphore Functions, Message Queue Functions, Mailbox Functions, Pipe Functions, Socket Functions, RPC Functions.

Unit-V: Interfacing Buses (7Hrs)

Industrial Interfacing Buses (10 Hrs) PCI, ESA, EISA, I2C, USB, RS232. Advance topics on embedded system.

Text Book

1. Myke Predko, “Programming and Customizing The 8051 Micro-controller”, Tata McGrawHill edition.

2. John B. Peatman, “Design with PIC Microcontrollers”, Low Price Edition, Pearson Education Asia.

Reference Books:

1. Embedded System :Architecture, programming and design by Rajkamal,TMH

2. ARM Assembly Language: Fundamentals and Techniques, William Hohl, CRC Press

3. ARM Architecture Reference Manual / Edition 2, by David Seal.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 305	Software Engineering lab	0	0	2	1

List of Practical's-

1. Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements. For a set of about 20 sample problems
2. Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem(Use of a CASE tool required). (1 class)
3. Develop structured design for the DFD model developed. (1 class)
4. Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose,Argo UML, or Visual Paradigm etc. is required)
5. Develop Sequence Diagrams
6. Develop Class diagrams.
7. Develop code for the developed class model using Java
8. Use testing tool such as Joint.
9. Use configuration management tool
10. Use any one project management tool such as Microsoft Project or Gantt Project, etc.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 306	Java Programming Lab	0	0	2	1

Total Hrs:20

List of Practical's:

1. Create a java program to implement stack and queue concept.
2. Write a java package to show dynamic polymorphism and interfaces.
3. Write a java program to show multithreaded producer and consumer application.
4. Create a customized exception and also make use of all the exception keywords.
5. Convert the content of a given file into the uppercase content of the same file.
6. Develop an analog clock using applet.
7. Develop a scientific calculator using swings.
8. Create an editor like MS-word using swings.
9. Create a servlet that uses Cookies to store the number of times a user has visited your servlet.
10. Create a simple java bean having bound and constrained properties.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 307	Data Communication Lab	0	0	2	1

Total Hrs: 20

List of Practical's:

1. Study of basic data communication system.
2. Demonstrate Analog and digital signals.
3. To Convert Analog signal into digital signal.
4. To Convert digital signal into Analog signal.
5. Study of Amplitude modulation.
6. Study of Frequency modulation.
7. Study of Phase modulation.
8. Study of Amplitude shift keying.
9. Study of Frequency shift keying.
10. Study of Binary Phase shift keying.
11. Study of Quadrature amplitude shift keying.
12. Study of Frequency division Multiplexing (FDM)
13. Study of Time division Multiplexing (TDM)
14. Study of various interface standards.
15. Study of Twisted pair cable, Coaxial cable and Optical Fiber cable

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ- CSE 301	Industrial Training/ Project Seminar	0	0	2	2

Objective of Industrial Training: The objective of industrial training is to provide work experience so that students engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineeringproblem and possibly an industry guide for their Major Project in final semester.

Scheme of Studies: Duration 4 weeks in summer break after IV semester, assessment to be done in V semester practical examination. During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of Faculty of the concern Department of mechanical engineering. Then they will present a seminar on their training and present it in the institute in front of the committee headed by the HOD/Faculty Member.

Learning through Industrial Training: During industrial training students must observe followingto enrich their learning:

- Industrial environment and work culture.
- Organizational structure and inter personal communication. Hardware
- / Software configuration knowledge and specifications.Project
- Planning, development and maintenance.
- Problems related to various areas of work etc.
- Students are supposed to acquire the knowledge on above by Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- Hands on" experience Undertaking/assisting project work. Solving problems at the work place.
- Presenting a seminar participating in group meeting/discussion.
- Consulting current technical journals and periodicals in the library.

Semester VI (Third Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 308	Compiler Design	3	1	0	4

Total Hrs: 45

Unit-I: INTRODUCTION TO COMPILERS (8Hrs)

Translators-Compilation and Interpretation-Language processors -The Phases of Compiler-Errors Encountered in

Different Phases-The Grouping of Phases-Compiler Construction Tools - Programming Language basics.

Unit-II: LEXICAL ANALYSIS (8Hrs)

Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language.

Unit-III: SYNTAX ANALYSIS (10Hrs)

Need and Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies-Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item-Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language .

Unit-IV: SYNTAX DIRECTED TRANSLATION & RUN TIME ENVIRONMENT (10Hrs)

Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type checker-Equivalence of Type Expressions-Type Conversions. RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables-Dynamic Storage Allocation-Storage Allocation in FORTAN.

Unit-V: CODE OPTIMIZATION AND CODE GENERATION (9Hrs)

Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis- Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm.

Text Book:

1. A Retarget able C Compiler: Design and Implementation Fraser and Hansen, Benjamin-Cummings, 1995.

References Books:

1. Advanced Compiler Design and Implementation, Much nick, Morgan and Kaufmann,1998.
2. Crafting a Compiler, Fischer and LeBlanc, Benjamin-Cummings, 1988.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 309	Data Mining & Warehousing	3	4	0	3

Total Hrs: 45

UNIT-I (9Hrs)

Data warehouse: Introduction to Data warehouse, Difference between operational database systems and data warehouses, Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction-Transformation-Loading, Logical(Multi-Dimensional), Data Modeling, Schema Design, Star and Snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non Addictive Measures; Fact-Less-Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

UNIT-II (9Hrs)

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration &Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT-III (9Hrs)

Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set-Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT-IV (9Hrs)

Classification: Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers , Classification techniques, Decision Trees-Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction ; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics. Prediction: Accuracy and Error measures, Evaluating the accuracy of classifier or a predictor, Ensemble methods.

UNIT-V (9Hrs)

Clustering: Clustering Overview, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, , Partitioning Clustering-K-Means Algorithm, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Key Issues in Hierarchical Clustering, Strengths and Weakness, Outlier Detection.

Text Book:

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 310	Computer Network	3	0	0	3

Total Hrs:45

UNIT – I (9Hrs)

INTRODUCTION: Network applications, network hardware, network software, reference models: OSI, TCP/IP, Internet, Connection oriented network - X.25, frame relay. THE PHYSICAL LAYER: Theoretical basis for communication, guided transmission media, wireless transmission, the public switched telephone networks, mobile telephone system.

UNIT – II (9Hrs)

THE DATA LINK LAYER: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless Bluetooth.

UNIT – III (9Hrs)

THE NETWORK LAYER: Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.

UNIT – IV (9Hrs)

THE TRANSPORT LAYER: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP.

UNIT – V (9Hrs)

THE APPLICATION LAYER: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet..

Text Books:

1. Data Communication & Networking by Behrouz A. Forouzan McGraw Hill

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 304	Distributed System	4	0	0	4

Total Hrs:45

UNIT – I (9Hrs)

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT – II (9Hrs)

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture.

UNIT – III (9Hrs)

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, Ocean Store.

Time and Global States-Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT – IV (9Hrs)

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT – V (9Hrs)

Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

Distributed shared memory, Design and Implementation issues, Consistency models.

Text Books:

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill

2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill

Reference Books:

1. Vijay K.Garg Elements of Distributed Compuitng , Wiley

2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education

3. Tenanuanbaum, Steen," Distributed Systems", PHI.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 305	Theory of computation	4	0	0	4

Total Hrs:45

Unit I: Mathematicalpreliminaries (7Hrs)

Sets, operations, relations, strings, transitive closure, count ability and diagonalisation, induction and proof methods-pigeon-hole principle and simple applications – concept of language – grammars and production rules –Chomsky hierarchy.

Unit II: Finite automata & regular expressions (8Hrs)

Finite State machine, regular languages, deterministic finite automata, conversion to deterministic automata, E-closures – regular expressions, finite automata, and minimization of automata, Moore and Mealy machine and their equivalence.

Unit III: Regular grammar & context free grammar (9Hrs)

Pumping lemma for regular sets- closure properties of regular sets- decision properties for regular sets, equivalence between regular language and regular grammar. Context – freelanguages – parse trees and ambiguity, reduction of CFGS ,Chomsky and Griebach normalforms.

Unit IV: Push – down Automata (PDA) (9Hrs)

Non Determinism – acceptance by two methods and their equivalence, conversion of PDA to CFG CFLs and PDAs-closure and decision properties of CFLs.

Unit V: Turing machines (12Hrs)

Variants – recursively enumerable (r.e.) set – recursive sets ,TM as computer of function – decidability and solvability – Halting Problem – reductions – Post correspondence Problem (PCP) and un solvability of ambiguity problem of CFGs, Church‟s hypothesis, Introduction to recursive function theory – primitive recursive and partial recursive functions.

Text Books

1. Introduction Of Automata Theory, Languages and computation- J.E. Hopcroft , J.D.Ulman, Pearson education.

Reference Books

1. John Martin, „Introduction Of Automata Theory, Languages and computation‟
2. Peter Linz , „Introduction to formal languages and automata‟,Norasa,2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 306	Speech and Natural Language Processing	4	0	0	4

Total Hrs: 45

UNIT-I: INTRODUCTION (9Hrs)

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT-II: WORD LEVEL ANALYSIS (9Hrs)

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT-III: SYNTACTIC ANALYSIS (9Hrs)

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures,Unification of feature structures.

UNIT-IV: SEMANTICS AND PRAGMATICS (9Hrs)

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT-V: DISCOURSE ANALYSIS AND LEXICAL RESOURCES (9Hrs)

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Co reference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill‟s Tagger, WorldNet, Prop Bank, Frame Net, Brown Corpus, British National Corpus (BNC).

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction toNatural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition,
OReilly Media, 2009.

REFERENCES:

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java, OReilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford
University Press,
2008.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 307	Advance Operating System	4	0	0	4

Total Hrs: 45

UNIT-I: FUNDAMENTALS OF OPERATING SYSTEMS (9 Hrs)

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

UNIT-II: DISTRIBUTED OPERATING SYSTEM (9 Hrs)

Issues in Distributed Operating System – Architecture – Communication Primitives –Lamport‟s Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT-III: DISTRIBUTED RESOURCE MANAGEMENT (9 Hrs)

Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol – Security and Protection.

UNIT-IV: REAL TIME AND MOBILE OPERATING SYSTEMS (9 Hrs)

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems –Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

UNIT-V: CASE STUDIES (9 Hrs)

Linux System: Design Principles - Kernel Modules - Process Management Scheduling -Memory Management - Input-Output Management - File System - Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer -Services Layer - Core OS Layer - File System.

REFERENCES BOOKS:

1. Mukesh Singhal and Niranjan G. Shivaratri, “Advanced Concepts in Operating SystemsDistributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 308	Real Time Operating System	4	0	0	4

Total Hrs:45

Unit-I: Introduction (9Hrs)

Real-time Versus Conventional Software, Computer Hardware for Monitoring and Control, Software Engineering Issues. SOFTWARE ARCHITECTURES: Process and State-based Systems model, Periodic and Sporadic Process, Cyclic Executives, CE definitions and Properties, Foreground-Background Organizations, Standard OS and Concurrency, Systems Objects and Object-Oriented Structures, Abstract Data Types, General Object Classes.

Unit-II: Requirements And Design Specifications (9Hrs)

Classification of Notations, Data Flow Diagrams, Tabular Languages, State Machine, Communicating Real Time State Machine- Basic features, Timing and clocks, Semantics Tools and Extensions, State chartsConcepts and Graphical Syntax, Semantics and Tools.

Unit-III: Declarative Specifications And Deterministic Scheduling (9Hrs)

DECLARATIVE SPECIFICATIONS Regular Expressions and Extensions, Traditional Logics-Propositional Logic, Predicates, Temporal logic, Real time Logic. DETERMINISTIC SCHEDULING Assumptions and Candidate Algorithms, Basic RM and EDF Results, Process Interactions-Priority Inversion and Inheritance.

Unit-IV: Execution Time Specification (9Hrs)

Measurement of Software by software, Program Analysis with Timing Schema, Schema Concepts, Basic Blocks, Statements and Control, Schema Practice, Prediction by optimization, System Interference and Architectural Complexities Timer Application, Prosperities of Real and ideal clocks, Clock Servers – Lamport ‟s Logical clocks, Monotonic Clock service, A software Clock server, Clock Synchronization Centralized Synchronization, Distributed Synchronization.

Unit-V: Programming Language (9Hrs)

PROGRAMMING LANGUAGES: Real Time Language Features, Ada-Core Language, Annex Mechanism for Real Time Programming, Ada and Software Fault Tolerance, Java and Real-time Extensions, CSP and Occam.

Text Book:

Real – Time Systems and software by Alan C. Shaw ; John Wiley & Sons Inc, 2001.

Reference Book:

1. Real-Time Systems, Jane W.S. Liu, Prentice Hall, 2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 309	Web and Internet	4	0	0	4

Total Hrs: 45

UNIT I: (9Hrs)

Web Basics and Overview: Introduction to Internet, World Wide Web, Web Browsers, URL, MIME, HTTP, Web Programmers Toolbox. HTML Common tags: List, Tables, images, forms, frames, Cascading Style Sheets (CSS) & its Types. Introduction to Java Script, Declaring variables, functions, Event handlers (onclick, on submit, etc.,) and Form Validation.

UNIT II: (9Hrs)

Introduction to XML: Document type definition, XML Schemas, Presenting XML , Introduction to XHTML, Using XML Processors: DOM and SAX. PHP: Declaring Variables, Data types, Operators, Control structures, Functions.

UNIT III: (9Hrs)

Web Servers and Servlets: Introduction to Servlets, Lifecycle of a Servlet, JSDK, Deploying Servlet, The Servlet API, The javax. Servlet Package, Reading Servlet parameters, Reading Initialization parameters. The javax. servlet HTTP package, Handling Http Request & Responses, Cookies and Session Tracking.

UNIT IV: (9Hrs)

Database Access: Database Programming using JDBC, JDBC drivers, Studying Javax.sql.* package, Connecting to database in PHP, Execute Simple Queries, Accessing a Database from a Servlet. Introduction to struts frameworks.

UNIT V: (9Hrs)

JSP Application Development: The Anatomy of a JSP Page, JSP Processing. JSP Application Design and JSP Environment, JSP Declarations, Directives, Expressions, Scripting Elements, implicit objects. Java Beans: Introduction to Beans, Deploying java Beans in a JSP page.

Reference Book

1. Greenlaw R and Hepp E "Fundamentals of Internet and www" 2nd EL, Tata McGrawHill,2007.

2. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", 3rd Edition, BPB Publications.

3.D. Comer, "The Internet Book", Pearson Education, 2009.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 301	Management & employee performance	3	0	0	3

Total Hrs: 45

Unit I: Performance Management (PM) Conceptual FrameWork (9 Hrs)

Introduction to Performance Management, Definition, nature, scope, importance, Business and sub functional Performance Management, Performance Management as a management Tool, Performance objectives and standards, Standards of Performance. Performance Domains and dimensions.

Unit II: Performance Planning (9 Hrs)

Performance Planning Process, Contents of Performance Plan, 8 Step Model, Individual and Group Performance Planning, Role clarity and Job description, Meaning of Performance appraisal, methods and approaches to performance appraisal, Obstacles in appraisal, Designing appraisal for better results, Performance Appraisal Interview, Potential Appraisal.

Unit III: Performance Appraisal (9 Hrs)

Introduction, Definition, Purpose and Role of appraisal in Performance Management, Methods and Steps in Performance Appraisal. Why Appraisal Fail, Types of Appraisal, Approaches and Design, MBO, 360*, Potential Appraisal, Performance Review, Performance counseling/ Mentoring. Team Performance Appraisal.

Unit IV: Performance Management System (9Hrs)

Introduction to PMS, Importance, Features, Process of Building PMS, PMS Dimensions, Conceptual Framework. 4 pillars of PMS, PMS Prism, Strategic Performance Management, Performance and Strategy linkage, Components of SPM, SPM- Balanced Score Card, SPM and Metrix, SPM Environment teatre and Risks.

Unit V: Latest trends in Performance Management (9 Hrs)

Competency Based Performance Management System, Performance Measurement, Performance Measurement through BSC, Performance and Succession Plan/ Career Development, International Performance Management, Performance Audit, Human Resource Valuation accounting andAudit.

Recommended Book:

D. K. Bhattacharya, Performance Management Systems and Strategies- Text book, Pearson.

Reference Books:

- Aquinis, Performance Management, Pearson.
- Chadha, Performance Management, Macmillan.
- Armstrong, Michael, Baron, Jaico, Performance Management.
- Cardy, Performance Management, PHI.
- Kohli, Deb, Performance Management, Oxford.
- D Sharma, Performance Management, HPH.
- R.K. Sahu, Performance Management System, EB.
- TV Rao, Performance Management and Appraisal, Sage.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 302	Cyber law & ethics	3	0	0	3

Total Hrs:45

Unit-I: Introduction (9 Hrs)

Concepts of Technology and Law Understanding Technology, Basic Concepts ofTechnology and Law Understanding the Technology of Internet, Scope of Cyber Laws, CyberJurisprudence.

Unit-II: Law of Digital Contracts (9 Hrs)

The Essence of Digital Contracts, the System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography.

Unit-III: Intellectual Property Issues in Cyber Space (9 Hrs)

Domain Names and Related issues, Copyright in the Digital Media, Patents in the Cyber World, Rights of Netizens and E-Governance ,Privacy and Freedom Issues in the Cyber World, E-Governance E-Governance, Cyber Crimes and Cyber Laws.

Unit-IV: International Scenario in Cyber Laws (9Hrs)

Data Protection Laws in EU and USA ,Child Abuse Protection Laws in EU and USA, Cyber Laws - the Malaysian Approach.

Unit-V: Cyber law Issues For Management (9Hrs)

Cyber Law Issues in E-Business Management, Major issues in Cyber Evidence Management ,Cyber Law Compliancy Audit

Text Book:

1. “The Law of the Internet” by J. Rosenoer, Cyber Law (Springer Verlag).

Reference Books:

1. "Cyber Laws in India.. ITA-2000 and Beyond" by Navvi
2. “Handbook of Cyber Laws” By Sharma Vakul.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 303	Non- Conventional Energy Sources	3	0	0	3

Total Hours: 45

Unit-I (9 Hrs)

Global and National scenarios, Form and characteristics of renewable energy sources.

Solar Energy: Solar radiation, its measurements and prediction, Solar thermal collectors, flat plate collectors, concentrating collectors, Basic theory of flat plate collectors, solar heating of buildings, solar still, solar water heaters, solar driers, conversion of heat energy in to mechanicalenergy, solar thermal power generation systems.

Solar Photovoltaic: Principle of photovoltaic conversion of solar energy, types of solar cells and fabrication, Photovoltaic applications: battery charger, domestic lighting, street lighting, water pumping, power generation schemes.

Unit-II (9 Hrs)

Wind Energy: Atmospheric circulations, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS- classification, characteristics and applications.

Unit-III (9 Hrs)

Ocean Energy: Ocean energy resources, ocean energy routes, Principles of ocean thermal energy conversion systems, ocean thermal power plants, Principles of ocean wave energy conversion and tidal energy conversion.

Unit-IV (9 Hrs)

Other Sources: Nuclear fission and fusion, Geothermal energy- Origin, types of geothermal energy sites, site selection, geothermal power plants, Magneto-hydro-dynamic (MHD) energy conversion, Formation of biomass, photosynthesis, Biomass resources and their classification, Chemical constituents and physicochemical characteristics of biomass, Biomass conversion processes.

Unit-V (9 Hrs)

Fuel Cells: Thermodynamics and electrochemical principles, Basic design, types, applications.
Hydrogen Energy:
Economics of hydrogen, Production methods.

References Books:

1. Power Generation through Renewable Source of Energy, Rai and Ram Prasad, Tata McGraw-Hill,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 311	Compiler Design Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1 & 2 implement a lexical analyzer in "C".

3. Use LEX tool to implement a lexical analyzer.

4. Implement a recursive descent parser for an expression grammar that generates arithmetic expressions with digits, + and *.

5. Use YACC and LEX to implement a parser for the same grammar as given in problem

6. Write semantic rules to the YACC program in problem 5 and implement a calculator that takes an expression with digits, + and * and computes and prints its value.

7 & 8. Implement the front end of a compiler that generates the three address code for a simple language with: one data type integer, arithmetic operators, relational operators, variable declaration statement, one conditional construct, one iterative construct and assignment statement.

9 &10. Implement the back end of the compiler which takes the three address code generatedin problems 7 and 8, and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assemblies instructions can be simple move, add, sub, and jump. Also simple addressing modes are used.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 312	Computer Network Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. To demonstrate the operation of the Ethernet – network using OPNET IT Guru
2. To demonstrate the implementation of the token ring network using OPNET IT Guru
3. To demonstrate the implementation of the Switched local area network using OPNET IT Guru
4. To demonstrate the basics of designing a network using OPNET IT Guru
5. To examine the effect of ATM adaptation layers and service classes on the performance of network using OPNET IT Guru.
6. To Configure & analyze the performance of routing information protocol (RIP) model using OPNET IT Guru
7. To configure & analyze the performance of open shortest path first (OSPF) routing protocol using OPNET IT Guru
8. To demonstrate the congestion control algorithm implemented by the TCP using OPNET ITGuru
9. To create a network cable using RJ-45 connectors. 10. To install a network interface card
10. Simulation of Dijkstra Algorithm in C
11. Simulation of Spanning tree algorithm in C
12. To configure a Wireless access point in a local network
13. To install and configure wireless LAN card in the computer
14. To understand the working of layer-3 switch for address sub netting in the network.

Semester VII (Fourth Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE401	Cyber Security & Cryptography	3	1	0	4

Total Hrs: 45

UNIT– I: Security Concepts (9 Hrs)

Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT– II: Symmetric key Ciphers (9 Hrs)

Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT– III: Cryptographic Hash Functions (9 Hrs)

Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastruct ure

UNIT – IV: Transport-level Security (9 Hrs)

Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH) Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE

802.11i Wireless LAN Security

UNIT – V: E-Mail Security (9 Hrs)

Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange Case Studies on Cryptography and security: Secure Multiparty

Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Crosssite Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practice: William Stallings, PearsonEducation, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, WileyIndia, 1st Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3rdEdition.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE401	Data Analytics	4	0	0	4

Total Hrs: 45

UNIT-I: INTRODUCTION TO BIG DATA [9 hours]

Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis v/s reporting – Modern data analytic tools, Statical concepts: Sampling distributions, re-sampling, statistical inference, prediction error.

UNIT-II: DATA ANALYSIS [9 hours]

Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesiannetworks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics – Rule induction – Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

UNIT-III: MINING DATA STREAMS [9 hours]

Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream –Estimating moments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions.

UNIT-IV :FREQUENT ITEMSETS AND CLUSTERING [9 hours]

Mining Frequent item sets – Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means

– Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

UNIT-V: FRAMEWORKS AND VISUALIZATION [9 hours]

Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed file systems –

Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications:

TEXT BOOKS:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets,CambridgeUniversity Press, 2012.

REFERENCES:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streamswith advanced analystics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big DataGlossary,
   O‟Reilly, 2011.
3. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier,
   Reprinted 2008.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE402	Parallel and Distributed Algorithm	4	0	0	4

Total Hrs: 45

Unit - I: Fundamentals: (9 Hrs)

Introduction to distributed systems, synchronous / asynchronous network models, leader election problem in ring and general networks; Type of faults, fail safe systems, Byzantine faults, distributed consensus with link and process failures.

Unit- ll: The PRAM Model: (9 Hrs)

Balancing, divide and conquer, parallel prefix computation, pointer jumping, symmetry breaking, list ranking, sorting and searching, graph algorithms, parallel complexity and complexity classes, lower bounds.

Unit - lll: Interconnection Networks: (9 Hrs)

Topologies (arrays and mesh networks, trees, systolic networks, hyper cubes, butterfly) and fundamental algorithms, matrix algorithms, sorting, graph algorithms, routing, and relationship with PRAM models; Asynchronous Parallel Computation; Distributed Models and Algorithms.

Unit- IV: Concepts of Distributed Computation: (9Hrs)

Termination; Failure tolerance; Network topology. Distributed Search: Algorithms for BFS, DFS,shortest paths and spanning trees in distributed systems.

Unit - V: Distributed Networks: (9 Hrs)

Broadcasting; Robust distributed networks. Processor organizations such as mesh andhypercube, embedding of problem graphs into processor graphs.

REFERENCES BOOK:

1. V. Kumar, A. Grama, A. Gupta, G. Kaarypis, Introduction to Parallel Computing, AddisonWesley Press

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE403	Neural Networks and Deep Learning	4	0	0	4

Total Hrs: 45

Unit - I: Introduction: Neuro Computing andNeuroscience (9 Hrs)

Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

Unit - II: Data processing (9 Hrs)

Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, Eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit - III: Multilayered network architecture (9 Hrs)

Back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.

Unit - IV: Deep Learning (9 Hrs)

Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network. Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing.

Unit - V: Deep Learning Search and tools (9 Hrs)

Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network. Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing.Deep Learning Tools: Caffe, Theano,Torch.

REFERENCE BOOKS:

1.J.A. Anderson, An Introduction to Neural Networks, MIT

2.Hagen Demuth Beale, Neural Network Design, Cengage Learning

TEXT BOOKS:

T1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press,

2016.T2. Bishop, C.,M., Pattern Recognition and Machine Learning, Springer,

2006

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 404	Multi-agent Intelligent	3	0	0	3

Total Hrs: 45

Unit I:- **Introduction to Agents** (9 Hrs)

Agents and Environment; Performance measure; Nature of Environment; Abstract and Concrete Architecture for intelligent agents; Problem solving and planning: Result sharing, Task sharing and Distributed planning

Unit - II: The design of Intelligent Agents (9 Hrs)

Deductive reasoning agents: AgentO, Practical Reasoning Agents: HOMER architecture; Reactive agents: Subsumption architecture; Hybrid agents: Touring Machines, InteRRaP.

Unit - III: Agent Communication and Interaction Protocols (9 Hrs)

Agent Communications: Knowledge Query and manipulation Language (KQML), Knowledge Interchange Format (KIF), Ontology, Coordination protocols, Cooperation Protocols, Contract Net, Blackboard Systems, Negotiation, Multi-agent Belief Maintenance, Market Mechanisms.

Unit - IV: Multi-Agent System Interactions & Agreements (9 Hrs)

Classifying multi-agent interactions: Multi-agent Encounters - Dominant Strategies and Nash Equilibria - Competitive and zero-sum and other interactions; Cooperation: the Prisoner's dilemma and Axelrod's experiments; Reaching Agreements: Interactions between self-interested agentsauctions & voting systems – negotiation - Argumentation; Interactions between benevolent agents: Cooperative Distributed Problem Solving (CDPS), partial global planning; coherence and coordination

Unit -V: Multi-agent Methodologies and Applications (9 Hrs)

Agent Methodologies- Mobile agents; Typical application areas of agent systems: Business Process Management, Distributed Sensing, Information Retrieval and Management, Electronic Commerce, Human-Computer Interfaces, Social Simulation etc.

REFERENCE BOOKS:

1.M. Wooldridge, An Introduction to Multiagent Systems; John Wiley & Sons, New York, NY, 2002.

2.J.M. Vidal, Fundamentals of Multiagent Systems with NetLogo Examples; Lecture Notes, University of South Car olina, Columbia, SC, 2007.

3.St. Preitl, R.-E. Precup, Regulatoare pentru servosisteme: metode de proiectare; Editura Orizonturi Universitare, T imisoara, 2007 (in Romanian + slides in English).

TEXT BOOKS:

1.K.-H. Dietsche, M. Klingebiel, Automotive Handbook; Robert Bosch GmbH, Plochingen, 2007.

2.N.P. Padhy, Artificial Intelligence and Intelligent Systems; Oxford University Press, Oxford,2005.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE405	Internet of Things	3	0	0	3

Total Hrs: 45

UNIT-I: FUNDAMENTALS OF IoT (9Hrs)

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT-II: IoT PROTOCOLS (9Hrs)

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e,
1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks –
Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application
Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT-III:DESIGN AND DEVELOPMENT (9Hrs)

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

UNIT-IV: DATA ANALYTICS AND SUPPORTING SERVICES (9 Hrs)

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning
– No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge StreamingAnalytics and Network Analytics
– Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with
NETCONF-YANG

UNIT-V: CASE STUDIES/INDUSTRIAL APPLICATIONS (9Hrs)

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide EthernetModel (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected

Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control Analyze applications of IoT in real time scenario.

TEXTBOOK:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals:
   Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press,2017

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach,Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Keyapplications and Protocols, Wiley, 2012 (for Unit 2).

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 406	Cloud Computing	3	0	0	3

Total Hrs: 45

Unit-l: Introduction to Cloud Computing (9Hrs)

Virtualization Concepts, Cloud Computing Fundamental: Overview of Computing Paradigm, Evolution of cloud computing, Defining cloud computing, Components of a computing cloud, Essential Characteristics of Cloud Computing, Cloud Taxonomy.

Unit-II: Cloud Computing Architectural Framework (10Hrs)

Cloud architectural principles, Role of Networks in Cloud computing, Role of Web services, Benefits and challenges to Cloud architecture, Cloud Service Models, cloud computing vendors. Cloud Services Management, Performance and scalability of services, tools and technologies used to manage cloud services deployment.

Unit-III: Exploiting Cloud Services (9Hrs)

Software as a Service(SaaS): Introduction to SaaS, Inspecting SaaS technologies, Implementing web services, Deploying Infrastructure as a Service(IaaS): Introduction to IaaS, Scalable server clusters, Machine Image, Virtual Machine (VM). Elastic storage devices, Data storage in cloud computing, Delivering Platform as a Service(PaaS): Introduction to PaaS, Service Oriented Architecture (SOA), Cloud Platform and Management, Hardware-as-a-service: HaaS.

Unit-IV: Cloud Application Development (9 Hrs)

Role of business analyst, Technical architecture considerations, Service creation environmentsto develop cloud based applications, Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages, Cloud Economics.

Unit-V: Cloud Security and Risk Management (9Hrs)

Cloud Security: Understanding cloud based security issues and threats, Data security and Storage, Identity & Access Management, Risk Management in cloud, Governance and Enterprise Risk Management.

TEXT BOOKS:

1. Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet by KaiHwang, Jack Dongarra & Geoffrey C. Fox., Morgan Kaufmann Publishers, 2012.

2. Cloud Computing Bible, Barrie Sosinsky, WileyIndia, 2010

3. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011

4. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, LeeGillam, Springer, 2012

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 401	Economics Policy in India	3	0	0	3

Total Hrs: 45

Unit – I: Economic Development and its Determinants (9 Hrs)

Approaches to economic development and its measurement – sustainable development; Role of State, market and other institutions; Indicators of development – PQLI, Human Development Index (HDI), gender development indices.

Unit-II: Planning in India (9 Hrs)

Objectives and strategy of planning; Failures and achievements of Plans; Developing grass-root organizations for development – Panchayats, NGOs and pressure groups.Demographic Features, Poverty and Inequality. Broad demographic features of Indian population; rural-urbanmigration; Urbanization and civic amenities; Poverty and

Unit-III: Inequality (9 Hrs)

Resource Base and Infrastructure**.** Energy; social infrastructure – education and health; Environment; Regional imbalance; Issues and policies in financing

Unit-IV: Infrastructure development and Polices (9 Hrs)

The Agricultural Sector, Institutional Structure – land reforms in India; Technological change in agriculture – pricing of agricultural inputs and output; industry; Agricultural finance policy; Agricultural Marketing and Warehousing; Issues Terms of trade between agriculture and in food security – policies for sustainable agriculture. Industrial policy; Public Sector enterprises and their performance; Problem of sick units in India; Privatization and policy – issues in labour market reforms; approaches for employment generation.

Unit-V: Public Finances (9 Hrs)

Fiscal federalism – Centre-State financial relations; Finances of central government; Finances of state governments; Parallel economy; Problems relating to fiscal policy; Fiscal sector reforms in India. Money, Banking and Prices. Analysis of price behavior in India; Financial sector reforms; Interest rate policy; Review of monetary policy of RBI; Money and capital markets; Working of SEBI in India. External Sector Structure and direction of foreign trade; Balance of payments; Issues in export-import policy and FEMA; Exchange rate.

REFERENCE BOOKS:

1. Ahluwalia, I. J. and I. M. D Little (Eds.) (1999), India's Economic Reforms and Development (Essays in honour of Manmohan Singh), Oxford University Press, NewDelhi.
2. Bardhan, P. K. (9th Edition) (1999), The Political Economy of Development in India,Oxford University Press, New Delhi.
3. Bawa, R. s. and P. S. Raikhy (Ed.) (1997), Structural Changes in Indian Economy, GuruNanak Dev University Press.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 402	Reliability & Maintenance engineering	3	0	0	3

Total Hrs: 45

Unit-I Introduction: (9Hrs)

Maintenance Objectives and Functions, Maintenance Systems, Need of planned maintenance, Maintenance policies, Breakdown, time based maintenance, Block replacement, age replacement and periodic replacement policy, Corrective and preventive maintenance, Maintenance planning, Scheduled maintenance, Costof maintenance versus Cost of equipment and production delays.

Inspection: Inspection intervals, Inspection reports, card history system.

Unit-II Predictive Maintenance: (9Hrs)

Equipment wear records, standards, Equipment used in predictive maintenance. Computerized maintenance, Total Productive Maintenance, Methods of conditionmonitoring, Non-destructive testing, Liquid Penetrate, Magnetic particles, Ultrasonic testing, and Vibration analysis, Oil analysis, Radiographic testing.

Unit-III Reliability: (9Hrs)

Definition, failure data analysis, Mean failure rate, mean time to failure(MTTF), mean time between failures (MTBF), hazard rate, Bathtub curve, Use of Weibull probability chart foe assessing characteristics life, guarantee period etc.

Unit-IV System Reliability Improvement: (9Hrs)

Series, parallel and mixed configuration, Simple problems. Techniques, use of Pareto analysis-Design for reliability, redundancy unit and stand by redundancy, Optimization of reliability.

Unit-V Spare Parts Management: (9Hrs)

Spare parts, features and categorization of spares, cost considerations, Techniques of cost reduction, Selective controls used in spare parts control, ABCanalysis, FSN, XYZ, VED and other approaches, Inventory control of spares.

Reference Books

1. Reliability Engineering, Srinath L.S., Affiliated East West Press.
2. Maintainability Principles and Practices, Blanchand, B.S., McGraw Hill

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 403	Management training & development	3	0	0	3

Total Hours: 45

Unit-I: Training (9 Hrs)

Training: Introduction - Conceptual framework of training - approaches on training – Difference between Training and Development - Training and applied psychology - principles of training - Learning and skills acquisition - Transfer and retention of skills.

Unit-II: Need for Training (9 Hrs)

Methods of Identification of Training needs - Training policy - Planning and organizing the training programmes - Methods of Training - – on the job training – off the job training – choosing optimum method – the lecture –panel discussion – behavior modeling – interactive demonstrations – brain storming – case studies, incident process, in- transactional analysis, exception analysis.

Unit-III: Management Development (9 Hrs)

Management Development (MD) and Organizational Development (OD) - Difference between MD and OD - Aims and objectives of MD and OD - Methods of MD -OD interventions – Succession Planning and Career development.

Unit-IV: Evaluation of training (9 Hrs)

Evaluation of training-need for evaluation, Principles of evaluation, Criterion and Approaches: Return on investment in training, Process of calculating ROI in training; emerging trends in training and development; new perspectives on training- Cross culture training.

Unit-V: Technology in training (9 Hrs)

Technology in training: CBT, Multimedia training, e-learning/Online learning,Distance learn.

TEXT BOOK

1. B.L.Gupta(2011), Management Training and Development, Vrinda Publication, New Delhi.

REFRENCE BOOKS

1. Alan M. Saks, Robert R. Haccoun (2010): Managing Performance Through Training andDevelopment, 5e, Nelson Education ltd. USA.
2. Craig Eric Schneier, Craig J. Russell (1994): The Training and Development Sourcebook
3. 2e, Human Resource Development Press Inc, USA.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE-402	Network Security & Cryptography lab	0	0	2	1

Total Hrs: 20

List of Practical's-

1. Write a program to implement the Caesar Cipher
2. Write a program to implement the Play air Cipher
3. Write a program to implement the Hill Cipher
4. Write a program to implement the Vigenere Cipher
5. Write a program to implement the Rail fence row & Column Transformation
6. Write a program to implement the DES algorithms
7. Write a program to implement the RSA Algorithm
8. Write a program to implement the Diffiee-Hellman algorithms
9. Write a program to implement the MD5 algorithms
10. Write a program to implement the SHA-1 algorithms
11. Implement the SIGNATURE SCHEME -Digital Signature Standard
12. Demonstrate how to provide secure data storage, secure data transmission

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ-CSE-401	Minor Project	0	0	16	8

The minor project work can be a design project, experimental fabrication project or software development project on any of the topics of mechanical engineering interest - it can be allotted as a group project with groups consisting of three or four students The assessment of all the minor projects should be done by a committee consisting of three or four faculty members specialized in the various fields of Mechanical Engineering - the students will present their project work and give a seminar on that topic for about thirty minutes - a committee consisting of at least three faculty members (preferably specialized in different fields of mechanical engineering) will assess the presentation of the seminars before the committee - the relative grading and group average marks for the various projects will be fixed by the committee - the guide will award the marks for the individual students in the project maintaining the group average - each group will prepare the project report and submit one copy of a write up of his minor project to the department through the guide - the Head of the Department will certify the copies and keep them in the departmental library

INSTRUCTIONS FOR PROJECT REPORT/ DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of B.E. (Computer Science engineering).

1. Prepare one spiral Bound Copies of your manuscript
2. Limit your Dissertation report to 50– 60 pages (preferably)
3. The footer must include the following: Institute Name, B.E. (CSE) Times New Roman 10 pt.and centrally aligned.
4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.
5. Print the manuscript using

I. Letter quality computer printing.
II. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.
III. Use 1.5 line spacing.

Semester VIII (Fourth Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE-403	Advanced Computer Architecture	3	1	0	4

Total Hrs: 45

UNIT-I: FUNDAMENTALS OF COMPUTER DESIGN [9 hours]

Review of Fundamentals of CPU, Memory and IO – Trends in technology, power, energy and cost, Dependability – Performance Evaluation

UNIT-II : INSTRUCTION LEVEL PARALLELISM [9 hours]

ILP concepts – Pipelining overview – Compiler Techniques for Exposing ILP – Dynamic Branch Prediction – Dynamic Scheduling – Multiple instruction Issue – Hardware Based Speculation – Static scheduling – Multi-threading – Limitations of ILP – Case Studies.

UNIT- III : DATA-LEVEL PARALLELISM [9 hours]

Vector architecture – SIMD extensions- Graphics Processing units – Loop level parallelism

UNIT-IV : THREAD LEVEL PARALLELISM [9 hours]

Symmetric and Distributed Shared Memory Architectures – Performance Issues –Synchronization –

Models of Memory Consistency – Case studies: Intel i7 Processor, SMT & CMP Processors

UNIT-V : MEMORY AND I/O [9 hours]

Cache Performance – Reducing Cache Miss Penalty and Miss Rate – Reducing Hit Time – Main Memory and Performance – Memory Technology. Types of Storage Devices – Buses – RAID – Reliability, Availability and Dependability – I/O Performance Measures.

TEXT BOOK:

John L Hennessey and David A Patterson, “Computer Architecture A Quantitative Approach”, Morgan Kaufmann/ Elsevier, Fifth Edition, 2012.

REFERENCES:

Kai Hwang and Faye Briggs, “Computer Architecture and Parallel Processing”, Mc Graw-Hill International Edition, 2000.

Sima D, Fountain T and Kacsuk P, ”Advanced Computer Architectures: A Design Space Approach”, Addison Wesley, 2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 404	Artificial Intelligence & Expert System	3	0	0	3

Total Hrs:45

Unit-I: Introduction (9Hrs)

Introduction: Aim and objective of AI, AI problems, AI technique, Production system Characteristics, Basics of problem solving: problem representation paradigms defining problem as a state space representation. Intelligent Agents, Performance Measure, Rationality, Structure of Agents, Problem solving agents, Problem Formulation.

Unit-II: Search Techniques (9Hrs)

Search Techniques: Uninformed Search Strategies Problem size, complexity, approximation and search; depth, breadth and best search; Informed Heuristic Based Search: Informed (Heuristic) Search and Exploration, Greedy best first search, Memory bounded heuristic search, Heuristic functions, inventing admissible heuristic functions, Hill climbing, best-first search, branch and bound And OR Graph: A* algorithm and AO* Algorithm. Simulated Annealing, Online search.

Unit-III: A.I Problems (9Hrs)

Constraint Satisfaction Problems, Backtracking Search, variable and value ordering, constraint propagation, intelligent backtracking, local search for CSPs, Adversarial Search, Games, The minimax algorithm, Alpha-Beta pruning, Imperfect Real-Time Decisions, Games that include an Element of Chance

Unit-IV Structured Knowledge Representation (9Hrs)

Structured Knowledge Representation: Semantic Nets, Frames, and Scripts. Learning: Block architecture of learning system, Types of learning, performance Measures First order logic, Unification, and Resolution in Predicate Logic Uncertainty Treatment: formal and empirical approaches including Exact and Approximate inference in Bayesian Networks, Bayesian theory, belief functions, certainty factors

Unit-V: Inference Techniques (9Hrs)

Inference Techniques: Types of reasoning deductive, inductive, abductive, analogical, common-sense and non-monotonic, types of inference forward and backward chaining, inference using full joint distributions, fuzzy logic. Recent advances in Artificial Intelligence, Algorithms for artificial intelligence, Genetic algorithms. Tools for development of Artificial Intelligence: Open Neural network library. Applications of artificial Intelligence.

Text Books:

1. Artificial Intelligence a Modern Approach: Russel and Norvig , Pearson Education, 2nd
2. 2. Artificial Intelligence – A Practical Approach: Patterson, Tata McGraw Hill, 3rd

Reference Books:

1. Maus, R. and Keyes, J., “Handbook of Expert Systems in Manufacturing”, McGraw Hill, 1991
2. Robert Levine, “A comprehensive guide to artificial intelligence and expert systems",
3. Elain Rich ,”Artificial Intelligence”, PHI Publication
4. Introduction to Artifitial Intelligence by E.Charniack and D. Mcdermott, Pearson Education.
5. Artifitial Intelligence structures and strategies for complex problem solving, 4 th edition, Pearson education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE407	Optimization Techniques	3	1	0	4

Total Hours: 40

UNIT- I: LINEAR PROGRAMMING (10 Hrs)

Introduction – formulation of linear programming model-Graphical solution–solving LPP using simplex algorithm – Revised Simplex Method.

UNIT- II: ADVANCES IN LPP (10 Hrs)

Duality theory- Dual simplex method – Sensitivity analysis–-Transportation problems Assignment problems-Traveling sales man problem -Data Envelopment Analysis.

UNIT- III: NON LINEAR PROGRAMMING (10 Hrs)

Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions– Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.

UNIT- lV: DYNAMIC PROGRAMMING (10 Hrs)

Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming–Backward and Forward recursion–Computational procedure– Conversion offinal value problem in to Initial value problem.

TEXT BOOKS:

1.Hillier and Lieberman “Introduction to Operations Research”, TMH, 2000.

2.R.Panneerselvam, “Operations Research”, PHI, 2006

3.Hamdy ATaha, “Operations Research –An Introduction”, Prentice Hall India, 2003.

REFERENCES:

1. Philips, Ravindran and Solberg, “Operations Research”, John Wiley, 2002.
2. Ronald L.Rardin, “Optimization in Operation Research” Pearson Education Pvt. Ltd. New Delhi, 2005.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE408	Human Computer Interaction	3	1	0	4

Total Hours:45

UNIT- I: FOUNDATIONS OF HCI (9Hrs)

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity-Paradigms.

UNIT- II: DESIGN & SOFTWARE PROCESS (9Hrs)

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

UNIT- III: MODELS AND THEORIES (9Hrs)

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT- IV: MOBILE HCI (9Hrs)

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of MobileDesign, Tools.

UNIT- V: WEB INTERFACE DESIGN (9Hrs)

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition,
   Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009 (UNIT –IV)

3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O‟Reilly, 2009.(UNIT-V)

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE409	Digital Signal Processing	3	1	0	4

Total Hours: 45

UNIT-I: SIGNALS AND SYSTEMS (9 Hrs)

Basic elements of DSP – concepts of frequency in Analog and Digital Signals – sampling theorem – Discrete – time signals, systems – Analysis of discrete time LTI systems – Z transform – Convolution – Correlation.

UNIT – II: FREQUENCY TRANSFORMATIONS (9 Hrs)

Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms - Decimation – in – time Algorithms, Decimation – in – frequency Algorithms – Use of FFT in Linear Filtering – DCT – Use and Application of DCT.

UNIT – III: IIR FILTER DESIGN (9 Hrs)

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF,BPF, BRF) filter design using frequency translation.

UNIT – IV: FIR FILTER DESIGN (9 Hrs)

Structures of FIR – Linear phase FIR filter – Fourier series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques.

UNIT-V: FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS (9 Hrs)

Binary fixed point and floating point number representations – Comparison - Quantization noise – truncation and rounding – quantization noise power- input quantization error- coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling.

REFRENCES:

1. Emmanuel C..Ifeachor, & Barrie.W.Jervis, “Digital Signal Processing”, Second Edition, Pearson
   Education / Prentice Hall, 2002.

2. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata Mc Graw Hill, 2007.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE404	Human Resources Management	3	0	0	3

Total Hours:45

Unit-I: Overview (9 Hours)

Overview of Human Resources, Historical evolution, Integrated HR function, Corporate and HR environment, Strategic environment, Strategic Management

Unit-II: Planning (9 Hours)

HR planning at Enterprise level, Need for systematic planning, Planning process, Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supplyforecasting. Retention-Redeployment and Exit strategies

Unit-III: Career management (9 Hours)

Career management-Recruitment and Selection, Employee Induction Programme, Employee training, Training needs & objective setting, Methods of training, Development & Development needs, Human Resource Development, Development process

Unit-IV: Performance Policies (9 Hours)

Performance planning – Performance appraisal, Measures of appraisal, System components appraisal methods, Ethics of appraisal, Problems & issues

Unit-V: Human Resource Information System (9 Hours)

Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level

Recommended Book

1. Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia

Reference Books

1. John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A Reader, SAGE Publications, 1998
2. Christopher Mabey, Rosemary Thomson (2011): Developing Human Resources,Routledge, Taylor and francis group, New York, USA.
3. Dessler & Varkkey, (2010): Human Resource Management 11e, India, Prentice Hall
4. Richard D. Johnson, Michael J. Kavanagh, Mohan Thite (2011): Human ResourceInformation System 2e, SAGE Publications, 2011.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE405	Total Quality Management	3	0	0	3

Total Hours:45

Unit-I (9 Hours)

Quality Concepts Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.
Control on Purchased Product Procurement of various products, evaluation of supplies,capacity verification, Development of sources, procurement procedure.
Manufacturing Quality Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

Unit-II (9 Hours)

Quality Management Organization structure and design, Quality function,decentralization, Designing and fitting

organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.
Human Factor in Quality Attitude of top management, co-operation, of groups, operatorsattitude, responsibility, causes of operators error and corrective methods.

Unit-III (9 Hours)
Control Charts Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.
Attributes of Control Charts Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

Unit-IV (9 Hours)
Defects Diagnosis and Prevention Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

Unit-V (9 Hours)

IS0-9000 and its concept of Quality Management: ISO 9000 series, Taguchi method, JIT in some details.

Text and References Books:

1. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990. .
2. Greg Bounds. “Beyond Total Quality Management”. McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE406	Industrial Relations	3	0	0	3

Total Hours:45

Unit - I: Industrial Relations (9 Hours)

Industrial Relations- Concept and scope, Stake holders; Approaches to Industrial Relations; Labor Market, Demand and Supply of Labor, Nature and composition of Indian labor, Employment and Unemployment Scenarios.

Unit - II: History (9 Hours)

History: Evolution of Industrial Relations UK), Emergence of Industrial relations/ Trade Union movement in India, Government initiatives, Industrial relations machineries, ILO and its impact on Indian IR scenarios.

Unit - III: Industrial Disputes resolutions (9 Hours)

Industrial Disputes resolutions: Sources – Wages, service conditions and discipline, Concept of wages, Wage theories, wage differentials, Regulations for protection of wages, service conditions and Work discipline. Law of natural justice and domestic enquiries; Workers participation in Management, Works committees, Joint Councils.

Unit - IV: Industrial Conflict (9 Hours)

Industrial Conflict: Negotiation, Mediation/ Conciliation, Arbitration, Adjudication- Labor court, Industrial Tribunal, National Tribunal; Special reference to Pay Commissions.

Unit - V: Trends (9 Hours)

Trends: Globalization and its impact on Industrial Relations, Employee Engagement practices, current trends in Industrial Relations in India, Industrial Relations bill- ifs and buts, Ethics, governance and Industrial Relations.

TEXT BOOKS

1. P. N. Singh, Neeraj Kumar, Employee Relations Management, Pearson.
2. Personnel Management and Industrial Relations, P.C. Tripathi, Sultan chand and sons.

REFERENCE BOOKS

1. Arun Monappa, Industrial Relations, Tata Mc Graw Hill.
2. Michael V P, HRM and Human Relations, Himalaya publications.
3. Mamoria and Mamoria, Dynamics of Industrial Relations in India, Himalaya publications.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 405	Artificial Intelligence & Expert system Lab	0	0	4	2

Total Hours: 20

List of Practical's-

1. Study of facts, objects, predicates and variables in PROLOG
2. Study of Rules and Unification in PROLOG
3. Study of "cut" and "fail" predicate in PROLOG
4. Study of arithmetic operators, simple input/output and compound goals in PROLOG
5. Study of recursion in PROLOG. 6 Study of Lists in PROLOG
6. Study of dynamic database in PROLOG
7. Implement string operations like substring, string position, palindrome etc.)
8. Write a prolog program to maintain family tree.
9. Write a prolog program to implement all set operations (Union, intersection, complement etc.)
10. Write a prolog program to solve "Water Jug Problem".

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ-CSE-402	Major Project	0	0	16	8

The major project work can be a Modeling and Simulation, Case study, Design or Experiments in the field of Mechanical Engineering. It can be allotted as a group project with groups consisting of 3 to 4 students. The major project work started in the seventh semester (minor project) may be continued in this semester - the students should complete the project work in this semester and present it before the assessment committee The assessment committee will assess the various projects, fix the relative grading and group average marks - the guides will award the marks for the individual students in a project maintaining the group average - each group should submit three copies of a write up of his major project of the completed project report signed by the department (in the format prescribed by the department) through the guide - the Head of the Department-Dean of School of engineering and Technology will certify the copies and one copy return them to the students - other copy will be kept in the departmental and university library

INSTRUCTIONS FOR PROJECT REPORT/ DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of B.E. (Mechanical Engineering).

1. Prepare Three Hard Bound Copies of your manuscript and if possible publish at least one international journal paper by each group for value addition of your project.

2. Limit your Dissertation report to 80 – 120 pages (preferably)

3. The footer must include the following: Institute Name, B.E. (Mechanical) Times New Roman10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using

a. Letter quality computer printing.

b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.

c. Use 1.5 line spacing.

d. Entire report shall be of 5- 7 chapters.

6.Use the paper size 8.5,,,,× 11,,,,or A4 (210 × 197 mm).

Margin Location	Paper 8.5,,,,× 11,,,,	Paper A4 (210 × 197 mm)
Top	1,,,,	25.4 mm
Left	1.5,,,,	37 mm
Bottom	1.25,,,,	32 mm
Right	1,,,,	25.4mm

7.All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.

8.Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.

9.Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the firstletter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, black and white. Illustrations downloaded from internet are not acceptable.

1. Illustrations should not be more than two per page. One could be ideal
2. Figure No. and Title at bottom with 12 pt
3. Legends below the title in 10 pt
4. Leave proper margin in all sides
5. Illustrations as far as possible should not be photo copied.

11. Photographs if any should of glossy prints

12. Please use SI system of units only.

13. Please number the pages on the front side, centrally below the footer

14. References should be either in order as they appear in the thesis or in alphabetical order bylast name of first author

15. Symbols and notations if any should be included in nomenclature section only

16. Following will be the order of report

i. Cover page and Front page as per the specimen on separate sheet
ii. Certificate from the Institute as per the specimen on separate sheet
iii. Acknowledgements
iv. List of Figures

v. List of Tables
vi. Nomenclature vii. Contents
vii. Abstract

(A brief abstract of the report not more than 150 words. The heading of abstract i.e. word ―Abstract‖ should be bold, Times New Roman, 12 pt and should be typed at the centre. The contents of abstract should be typed on new line without space between heading and contents.

Try to include one or two sentences each on motive, method, key-results and conclusions in bstract

1) Introduction (2-3 pages) (TNR – 14 Bold) Problem statement (TNR – 12)
1.1 Objectives
1.2 Scope
1.3 Methodology
1.4 Organization of Dissertation

2) Literature Review (20-30 pages) Discuss the work done so far by researchers in the domain area and their significant conclusions. No derivations, figures, tables, graphs are expected.

3)This chapter shall be based on your own simulation work (Analytical/ Numerical/FEM/CFD)(15- 20 pages)
4) Experimental Validation - This chapter shall be based on your own experimental work (15-20 pages)
5) Concluding Remarks and Scope for the Future Work (2-3 pages) References ANNEXURE (ifany) (Put all mathematical derivations, Simulation program as Annexure)
17. All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, …. and for subheadings 1.1, 1.2, …. etc and section subheadings 2.1.1, 2.1.2, …. etc.

18. References should be given in the body of the text and well spread. No verbatim copy orexcessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it.

Please follow the following procedure for references / Reference Books/ Patent/ Internet

- Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press, UK, 1996, pp. 110 – 112.
- 2. Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, ASHRAE Trans, 1991, 97 (1), pp. 90 – 98.
- Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillarytubes, Int. Journal of Refrigeration, 1996, 19 (8), pp.497 – 505.
- Papers from Conference Proceedings Colbourne, D. and Ritter, T. J., Quantitative assessment of flammable refrigerants in room air conditioners, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002,

pp. 34 – 40.

Reports, Handbooks etc.

- United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent

- Patent no., Country (in parenthesis), date of application, title, year.

Internet

- www.(Site) [Give full length URL]

School of Engineering and Technology

Program: B.TECH Electrical Engineering

(4 Years Course)

Programme Educational Objective (PEO)Programme Outcomes (POs) Programme Specific Outcomes (PSOs) Course Outcomes (COs)

RAFFLES UNIVERSITY

RAFFLES UNIVERSITY, NEEMRANA, ALWAR, RAJASTHAN

ABOUT THE PROGRAMMME

Raffles University, Neemrana established in 2011, to produce highly practical oriented personnel in fields of engineering to meet specific manpower requirements of industries. Electrical Engineering Department was started in 2011 and has been conducting B.Tech Course in Electrical Engineering of 4-Years duration since 2011. Students are admitted through university entrance or direct counselling nominated by university management in 1st Year and 2nd year through lateral entry entrance test. The total intake for the programme is 60. The Electrical Engineering Department has been well known for its track record of employment of the pass out students since its inception. The Department has well managed class rooms andfully equipped laboratories and Conference Room. It has excellent and distinguished faculty. The syllabi of programme in Electrical Engineering Department, has been prepared by subject experts with active participation from Industry. The Department is organizing number of expert lectures from industry experts for students in every semester. Summer training/ Industry Internship is mandatory for every student after completion of second year and third year (Two times in 4 years). Emphasis has been given on project work, workshop and Lab Course for skill enhancement of students. Choice based credit system allows students to study the subjects of his/her choice from a number of elective courses /audit courses.

PROGRAMMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To train students with practical skills and experimental practices related to core and applied areas of Electrical Engineering to expand their knowledge horizon beyond books.

PEO-2: To enable students to design, develop and maintain Electrical equipments which are useful for the society.

PEO-3: To improve team building, team working and leadership skills of the students with high regard for ethical values and social responsibilities.

PEO- 4: To enable students to communicate effectively and demonstrate the knowledge of project management and independent research.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

1) Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and Electrical engineering to the solution of engineering problems.

2) Problem Analysis: Identify, formulate, review literature and analyse Electrical engineering problems to design, conduct experiments, analyse data and interpret data.

3) Design /Development of Solutions: Design solution for Electrical engineering problems and design system component of processes that meet the desired needs with appropriate consideration for the public health and safety, and the cultural, societal and the environmental considerations.

4) Conduct Investigations of Complex Problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions in Electrical engineering.

5) Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to mechanical engineering activities with an understanding of the limitations.

6) The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to Electrical engineering practice.

7) Environment and Sustainability: Understand the impact of the Electrical engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Electrical engineering practice.

9) Individual and Team Work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in Electrical engineering.

10) Communication: Communicate effectively on complex engineering activities with the engineering committee and with society at large, such as, being able to comprehend and write affective reports and design documentation, make effective presentations in Electrical engineering.

11) Project Management and Finance: Demonstrate knowledge & understanding of the Electrical engineering principles and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments in Electrical engineering.

12) Life - Long Learning: Recognize the need for, and the preparation and ability to engage in independent research and lifelong learning in the broadest contest of technological changes in Electrical engineering.

PROGRAM SPECIFIC OUTCOMES (PSOs):

1) To apply practical skills, knowledge of engineering fundamentals and Electrical engineering, to industries and institutions.

2) To explore, create and develop innovations in various aspects of engineering. The student will be ready to take-up career or to pursue higher studies with high regard to ethical values and social responsibilities.

B.TECH ELCTRICAL ENGINEERING SCHEME CREDITS CALCULATION

S.No.	Category of Course	Abbreviation Used	Credits
1.	Humanities and Social Sciences including Management Courses	HSMC	13
2.	Basic Sciences Courses	BSC	26
3.	Engineering Sciences Courses including workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc.	ESC	26
4.	Professional Core Courses	PCC	98
5.	Professional Elective C ourses relevant to chosen specialization/ branch	PEC	13
6.	Open Subjects- Electives from other technical and /or emerging subjects	OEC	12
7.	Project Work, Seminar and internship in industry or elsewhere	PROJ	16
8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
Total			**204**

Abbreviations Used:

L -Lectuer

T - Tutorial

P - Practical

IA - Internal Assessment

EA - External Assessment

TA - Teacher's Assessment

MTA - Mid Tern Assessment

ETA - End Term Assessment

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9) Individual and Team Work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in Electrical engineering.

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PROGRAM SPECIFIC OUTCOMES (PSOs):

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2) To explore, create and develop innovations in various aspects of engineering.

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6.	Open Subjects- Electives from other technical and /or emerging subjects	OEC	12
7.	Project Work, Seminar and internship in industry or elsewhere	PROJ	16
8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
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L -Lectuer

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TA - Teacher's Assessment

MTA - Mid Tern Assessment

ETA - End Term Assessment

1	PCC-EE	PCC-EE-201	**Electrical Circuit Analysis**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1. Apply network theorems for the analysis of electrical circuits

CO2. Obtain the transient and steady-state response of electrical circuits

CO3. Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
CO4.Analyze two port circuit behavior

CO5. Synthesize networks and filters

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	**PCC-EE**	**PCC-EE-203**	**Analog Electronics**

UNIT	**CONTENT**

Course Outcomes

At the end of this course, students will demonstrate the ability to:

CO1. Understand the working principle of PN junction diode and its applications.

CO2. Understand the working of BJT and its applications.

CO3. Understand the working of JFET and MOSFET

CO4. Analysis and design of Differential, multi-stage and operational amplifiers

CO5. Analysis and design of Linear applications of op-amp. Analysis and design of Nonlinear applications of op-

amp.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-205	**Electrical Machines – I**

UNIT	**CONTENT**

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1. Understand the concepts of magnetic circuits

CO2. Understand the operation of DC machines

CO3. Analyse the differences in operation of different DC machine configurations

CO4. Analyse single phase transformers circuits.

CO5. Analyse three phase transformers circuits.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-207	**Electromagnetic Fields**

UNIT	**CONTENT**

Course Outcomes:

At the end of the course, students will demonstrate the ability:

CO1. To understand the basic laws of electromagnetism

CO2. To obtain the electric and magnetic fields for simple configurations under static conditions

CO3. To analyse time varying electric and magnetic fields

CO4. To understand Maxwell's equation in different forms and different media.

CO5. Investigate behavior of EM waves in different medias and to calculate average power density radiated.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

6	ESC	ESC- 201	Engineering Mechanics
UNIT 9	MC	MC-I	Indian Constitution

CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Understand the concepts of co-ordinate systems

CO2. Analyse the three-dimensional motion

CO3. Understand the concepts of rigid bodies

CO4. Explain and solve numerical problems on kinematics of particles and rigid bodies

CO5. Explain and apply work-energy principle, impulse-moment principle to solve numerical problems on linear and angular motion and collision.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Syllabus**for B.Tech (Batch 2022-26)**

4th Semester

S No	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PCC-EE	PCC-EE202	Digital Electronics	3	0	0	3	40	60	100
2	PCC-EE	PCC-EE-204	Electrical Machines – II	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-206	Power Electronics	3	1	0	4	40	60	100
4	PCC-EE	PCC-EE-208	Signals and Systems	3	0	0	3	40	60	100
5	BSC	BSC -201	Mathematics–III	3	0	0	3	40	60	100
6	BSC	BSC -202	Biology-medical instrumentation	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE-210	Digital Electronics Laboratory	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-212	Electrical Machines Laboratory – II	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-214	Power Electronics Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

1	PCC-EE	PCC-EE202	Digital Electronics

UNIT	CONTENT

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1- Understand number systems, basic logic gates, Boolean algebra and derive digital logic circuits

CO2- Classify various minimization techniques and choose the best for designing logic circuit .

CO3- Define characteristics of logic families and calculate their parameters

CO4- Design combinational logic circuits such as adder, subtractor, multiplexer, decoder.

CO5. Classify the different types of flip flops and design counters, registers using flip flops.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-204	**Electrical Machines – II**

UNIT	CONTENT

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1- Understand the construction and working of AC machines .

CO2- Understand the generation of rotating magnetic field in AC machines.

CO3- Solve the performance parameters of AC machines.

CO4- Interpret the behavior of AC machines using phasors, equivalent circuits and its characteristics.

CO5- Examine the performance behavior of AC machines under different loading condition.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2

CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-206	Power Electronics
UNIT	**CONTENT**		

Course Outcomes:
At the end of this course students will demonstrate the ability to:

CO1-Understand the differences between signal level and power level devices

CO2-Analyse controlled rectifier circuits

CO3-Analyse the operation of DC-DC choppers

CO4-Analyse the operation of voltage source inverters

CO5- Interpret the speed control of DC motors using converters and choppers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-208	Signals and Systems
UNIT	**CONTENT**		

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1-Understand the concepts of continuous time and discrete time systems.

CO2-Analyse systems in complex frequency domain

CO3-Understand sampling theorem and its implications

CO4- Understand mathematical tools to be able to apply in state variable modeling

CO5- Analyze signal and system properties like stability and causality using Laplace and Z transforms.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2

CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	BSC	BSC -201	Advance Mathematics

UNIT **CONTENT**

Course Objectives: The objective of this course is to familiarize the student with statistical techniques. It aims to equip he students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline

Course Outcomes: At the end of the course, the student will be able to

CO1-Have basics knowledge about measure of central tendency, kurtosis and moments and their applications in engineering fields.

CO2-Familiarize the student with expectations of discrete and continuous random variable

CO3-Familiarize probability techniques and random variables and detailed knowledge of probability distribution with so as to use it with any date of engineering problem formulation

CO4-Have basic idea about statistics including correlation, regression and then up to advanced level with testing of large samples that is important in solving problems related to engineering

CO5- **Use Z-transform and its applications to solve difference equations**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3											2
CO2	3	3	3											2
CO3	3	3	3											2
CO4	3	3	3											2
CO5	3	3	3											2

6	BSC	BSC -202	Bio-medical instrumentation

UNIT **CONTENT**

Course Outcomes

At the end of this course students will demonstrate the ability to

CO 1. understand basic Biomedical Instruments and their functioning

CO2. describe Microelectrodes, Electro conduction systems

CO3. explain ECG, EEG, EMG, ERG, etc.

CO4. understand Ventilators and other important Clinical Instruments

CO5- Outline medical imaging techniques and equipment for certain diagnosis and therapies.														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2021-25)

5th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PCC-EE	PCC-EE-301	Power Systems – I	3	1	0	4	40	60	100
2	PCC-EE	PCC-EE-303	Control Systems	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-305	Microprocessors	3	0	0	3	40	60	100
4	PEC-EE	PEC-EE-301	Program Elective - 1	3	0	0	3	40	60	100
5	OEC-EE	OEC-EE-301	Open Elective-1	3	0	0	3	40	60	100
6	HSMC	HSMC-301	Engineering Economics	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE307	Power Systems Laboratory - I	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-309	Control Systems Laboratory	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-311	Microprocessors Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

1	PCC-EE	PCC-EE-301	Power Systems – I

UNIT	CONTENT	No. Of Hrs.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the concepts of power systems.

CO 2 Understand the various power system components.

CO 3 Evaluate fault currents for different types of faults.

CO 4 Understand the generation of over-voltages and insulation coordination.

CO 5 Understand basic protection schemes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-303	Control Systems

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the modelling of linear-time-invariant systems using transfer function and state-space representations.

CO 2 Understand the concept of stability and its assessment for linear-time invariant systems. Design simple feedback controllers.

CO3- Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

CO4- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system

CO5- Design simple Lag, Lead, Lag- Lead network & PID controllers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

	PCC-EE	PCC-EE-305	Microprocessors
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Study of 8085 and 8086 Microprocessors.

CO 2 Do assembly language programming.

CO 3 Do interfacing design of peripherals like 8255, 8253,8279,8251 etc

CO4: Acquire the knowledge of synchronous and asynchronous communication and interfacing to protocols like blue-tooth, etc.

CO5: Design electrical circuitry to the microcontroller I/O ports in order to interface the processor to exter

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2

4	PEC-EE	PEC-EE-301 a	Wind and solar Energy Systems

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1-Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.

CO2- Understand the basic physics of wind and solar power generation.

CO3- Understand the power electronic interfaces for wind and solar generation.

CO4- Understand the issues related to the solar technologies and wind topologies.

CO5: Demonstrate the Solar Thermal and PV applications along with its storage systems.

CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 b	**Line Commutated and Active PWM Rectifiers**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1-Analyse controlled rectifier circuits.

CO2- Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations.

CO3- Understand the operation of PWM rectifiers –.

CO4- operation in rectification and regeneration modes and lagging, leading and unity power factor mode

CO5-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	
CO1	1	3	3	2	1							2	3	2	
CO2	3	3	3	2	1							2	3	2	
CO3	3	3	3	2	2							2	3	2	
CO4	3	3	3	2	2							2	3	2	
CO5	3	3	3	2	2							2	3	2	

4	PEC-EE	PEC-EE-301 c	Electrical Drives

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

(i) Understand the characteristics of dc motors and induction motors.

(ii) Understand the principles of speed-control of dc motors and induction motors.

(iii) Apply the knowledge of power electronics to understand the working of dc-dc converters.

(iv) Apply the knowledge of control system for the speed control of electrical machines.

CO5- Illustrate control of slip ring induction motor (SLIM).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2

CO2	3	3	3	2	1							2	3	2	
CO3	3	3	3	2	2							2	3	2	
CO4	3	3	3	2	2							2	3	2	
CO5	3	3	3	2	2							2	3	2	

5	OEC-EE	OEC-EE-301a	Electronic Devices
UNIT	**CONTENT**		

Course Outcomes

At the end of this course students will demonstrate the ability to:

1. Understand physics of semiconductors and behavior of charge carriers within semiconductors 2. Understand the working of semiconductor diodes supported with mathematical explanation. 3. Understand the working of BJT and MOSFET with their equivalent small signal models.

4. Understand the chemical processes used in fabrication of integrated circuits.

5	OEC-EE	OEC-EE-301b	Data Structures and Algorithms
UNIT	**CONTENT**		

Course outcomes

Student will be able to:

CO 1. Understand operations like searching, insertion, deletion, traversing on linear Data Structures and to determine their computational complexities

CO2. Understand operations like searching, insertion, deletion, traversing on various non linear Data Structures and to determine their computational complexities

CO3. Write algorithms for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.

CO4. Apply appropriate Data Structure as per specific problem definition CO5-Identify, model, solve and develop algorithms for real-life problems like shortest path and MST using graph theory.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-301c	Analog and Digital Communication

UNIT	CONTENT

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth

CO2. Analyze the behavior of a communication system in presence of noise

CO3. Investigate pulsed modulation system and analyze their system performance

CO4. Analyze different digital modulation schemes and can compute the bit error performance

CO5-Apply time division multiplexing concepts in different pulse modulation techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

6	HSMC	HSMC-301	Engineering Economics

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Understand the basic principles, scope and the applications of Engineering Economics

CO2. Understand and apply the knowledge of elasticity of demand and supply on price determination.

CO 3. Apply the knowledge of demand forecasting to make effective demand forecast.

CO4. Understand the complexity of uncertain market structure and be able to take decisions of price determinations.

CO 5. Understand the various management concepts and thoughts and using for better resource management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

1	PCC-EE	PCC-EE-302	Power Systems – II

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Use numerical methods to analyze a power system in steady state.

CO2- Understand stability constraints in a synchronous grid.

CO3- Understand methods to control the voltage, frequency and power flow.

CO4-Understand the monitoring and control of a power system

CO5- Acquire knowledge about the Regulatory framework, ancillary services, power system economics and power management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-304	**Measurements and Instrumentation**

Course Outcomes

After completion of this course, students will be able to –
CO1-Identify various types instrument suitable for specific measurement.
CO2- Classify various errors present in measuring instruments.
CO3- Understand construction, working principle and types of oscilloscopes.
CO4-Comprehend different types of signal generators and analyzers, their construction and operation.
CO5-Describe the working principle, selection criteria and applications of various transducers used in measurem systems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 a	**Electrical Engineering Materials**

UNIT	**CONTENT**

Course Outcomes:
CO 1 To Understand the basic concepts of materials.
CO 2 To use simplified materials selection concepts for design purposes.
CO 3 To Understand the properties of Materials.

CO4 Acquire knowledge of Conductivity of metals Ohm's law and relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.
CO5: Acquire knowledge of Classification of semiconductors, semiconductor conductivity, temperature dependence, Carrier density and energy gap, Trends in materials used in Electrical Equipment.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 b	**Electrical Machine Design**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the construction and performance characteristics of electrical machines.

CO 2 Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines

CO 3 Understand the principles of electrical machine design and carry out a basic design of an ac machine.

CO 4 Use software tools to do design calculation

CO5 Identify the limitations (assumptions) of traditional designs and need for CAD analysis, synthesis and hybrid models.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 c	**Power System Protection**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand power system protection.

CO 2 Understand the main components used in power system protection for electric machines, transformers.

CO 3 Understand the bus bars, overhead and underground feeders.

CO 4 Understand the earthing protection.

CO5 Explain the simulation of protection schemes by using Electro-Magnetic Transients (EMT) programs.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 b	**Renewable Energy Sources**

UNIT	**CONTENT**

Course Outcomes:

CO 1 To Understand the Need, importance and scope of non-conventional and alternate energy resources.

CO 2 To understand role significance of solar energy and wind energy

CO 3 To understand the role of ocean energy in the Energy Generation.

CO 4 To get the utilization of Biogas plants and geothermal energy

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 c	**High Voltage Engineering**

UNIT	**CONTENT**

Course outcomes:

At the end of the course, the student will demonstrate

CO1-Understand the basic physics related to various breakdown processes in solid, liquid, and gaseous insulating materials.

CO2- Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.

CO3- Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.

CO4- Knowledge of how over-voltages arise in a power system, and protection against these over-voltages.

CO5- Study and understand the nature of faults happening on both the AC and DC sides of the converters and formulate protection schemes for the same.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 a	**Computer Networks**

UNIT	**CONTENT**

Course Outcomes: The student will be able to:

CO1: Explain the functions of the different layer of the OSI Protocol;

CO2:. Describe the function of each block of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs);

CO3: Develop the network programming for a given problem related TCP/IP protocol; &

CO4: Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available

CO5 ***Analyze*** the features and operations of various application layer protocols such as HTTP, DNS and SMTP.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS(
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 b	Embedded System

Course Outcomes

After completion of this course, students will be able to –
CO1-Define basic operations of embedded microcontroller cores, processors and memories.
CO2-Describe the concept of Embedded System and its design for real life applications.
CO3-Explain the technological aspects of embedded systems through analog and digital blocks, sub systems user interfacing.
CO4-Examine design metrics, design tradeoffs and software aspects of embedded systems.
CO5- Illustrate Real Time Programming Languages and Real Time operating systems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS(
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 c	VLSI Circuits

UNIT	CONTENT

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. understand the process of VLSI fabrication

2. Investigate the Oxidation processes for VLSI/ULSI device fabrication

3. Learn about the environment for VLSI/ULSI technology

4. Understand Lithography and deposition processes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

6	HSMC	HSMC-302	Personality Development Programme

UNIT	CONTENT

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

7th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PEC-EE	PEC-EE404	Program Elective -4	3	0	0	3	40	60	100
2	PEC-EE	PEC-EE-405	Program Elective -5	3	1	0	4	40	60	100
3	OEC-EE	OEC-EE-403	Open Elective -3	3	0	0	3	40	60	100
4	OEC-EE	OEC-EE-404	Open Elective -4	3	0	0	3	40	60	100
5	PROJ-EE	PROJ-EE01	Project Stage-I	0	0	2	2	180	120	300
6	SI	EE-SI	Summer Internship	0	0	2	2	120	80	200
			Total	**12**	**1**	**4**	**17**			**900**

1	PEC-EE	PEC-EE304a	**Electrical Energy Conservation and Auditing**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the current energy scenario and importance of energy conservation. Understand the concepts of energy management.

CO 2 Understand the methods of improving energy efficiency in different electrical systems.

CO 3 Understand the concepts of different energy efficient devices.

CO4: To analyze, calculate and improve the energy efficiency and performance of electrical and industrial utilities.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304b	**Industrial Electrical Systems**

UNIT	**CONTENT**

Course Outcomes:

CO1-At the end of this course, students will demonstrate the ability to

CO2- Understand the electrical wiring systems for residential, commercial, and industrial consumers, representing the systems with standard symbols and drawings, SLD.

CO3- Understand various components of industrial electrical systems.

CO4- Analyze and select the proper size of various electrical system components.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304c	**Power System Dynamics and Control**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1- Understand the problem of power system stability and its impact on the system.

CO2- Analyse linear dynamical systems and use of numerical integration methods.

CO3-Model different power system components for the study of stability.

CO4-Understand the need and plan the methods to improve stability.

CO5: Design a mini project on having 2-3 generation sources having 3 generation sources and perform the process of power transfer from source to load with the help of transformers and at least three loads.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305a	**NEURAL NETWORKS**

UNIT	**CONTENT**

Course Outcomes:

At the end of the course, students will demonstrate the ability to

CO1. Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning

CO2. Get the response of an Learning Processes system

CO3 Apply Artificial Neural Network models to handle uncertainty and solve engineering problems.

CO4 Recognize the feasibility of applying a Neuro-model for a particular problem

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305b	**Digital signal Processing**

UNIT	**CONTENT**

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain

2. Get the response of an LSI system to different signals

3. Design of different types of digital filters for vari ous applications

4 Implement Z transform and inverse Z transform of discrete signals

5 Model IIR and FIR filter using window techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305c	**Computer Architecture**

Course Outcomes:

After completion of this course, students will be able to:
CO1: Understand the basics of computer architecture and its organization.
CO2: Recognize processor models based on their organization, addressing modes and instruction set.
CO3: Understand basics of ALU, control unit and computer organization such as memory & I/O.
CO4: Understand various architectures based on performance, cost and applicability.
CO5: Understand impact of modern techniques like pipelining, express buses processor performance.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403a	**Image Processing**

Course Outcomes:

After completion of this course, students will be able to:

CO1- ***Identify*** the fundamental elements of an image and ***Describe*** the need of digital image processing

CO2- ***Understand*** different types of image transformation techniques and their properties.

CO3- ***Use*** various noise models and ***Calculate*** the values for restoration and degradation models.

CO4- ***Analyze*** and ***Evaluate*** various image compression techniques.

CO5- ***Integrate*** and ***Demonstrate*** various Image Transformation and Segmentation Techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403b	**Power Quality and FACTS**

Course Outcomes

After completion of this course, students will be able to:

CO1: Acquire knowledge of the advantage of compensation and will learn several aspects such as description, operation and characteristics of Thyristor-based FACTS devices: Static VAR Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Braking Resistor and Single Pole Single Throw (SPST) Switch.

CO2: Acquire knowledge of the operation and applicability of Voltage Source Converters and their realization details for implementation in FACTS Devices.

CO3: Analyze different possible applications of FACTS devices in order to improve stability and for achieving better voltage regulation along with the applicability of these as a solution provider for power quality problems in distribution networks.

CO4: Acquire the knowledge of custom power device DSTATCOM, classification of DSTATCOM, different topological realizations, operation control of DSTATCOM and reference current extraction paradigm based on Synchronous Reference Frame Theory.

CO5: Acquire the knowledge of custom power devices for voltage power quality problems (DVR, UPQC) and for current power quality problems (UPQC), different topological aspects of DVR and UPQC, principle of operation of these devices along with control paradigms

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2

CO2	3	3	3	2	1							2	3	2	
CO3	3	3	3	2	2							2	3	2	
CO4	3	3	3	2	2							2	3	2	
CO5	3	3	3	2	2							2	3	2	

3	OEC-EE	OEC-EE-403c	GENERATION OF ELECTRICAL POWER

UNIT	CONTENT

Course Outcomes:

At the end of the course, students will demonstrate the ability to

CO1- Understand the load curves, load-duration Curve.

CO2-Understand the power plant economics and tariff

CO3- Explore the significance of economic operation of steam plants

CO4- Apply techniques to evaluate generation cost, depreciation reserve and Acquire knowledge of different method of energy cost reduction.

CO5- Apply techniques to evaluate tariff and comparative study of various power plants.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

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Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

8th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PEC-EE	PEC-EE-406	Program Elective -6	3	0	0	3	40	60	100
2	OEC-EE	OEC-EE-405	Open Elective -5	3	0	0	3	40	60	100
3	OEC-EE	OEC-EE-406	Open Elective -6	3	1	0	4	40	60	100
4	PROJ-EE	PROJ-EE-02	Project Stage-II	0	0	2	2	360	240	600
			Total	**9**	**1**	**2**	**12**			**900**

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1	PEC-EE	PEC-EE-306a	**MODERN CONTROL THEORY**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand various design specifications.

CO 2 Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).

CO 3 Design controllers using the state space approach.

CO 4-Understand various design Adaptive control sysem

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306b	**Smart grid technology**

UNIT	**CONTENT**

Course Outcomes :

At the end of this course, students will demonstrate the ability to:

CO 1 Understand technologies for smart grid.

CO 2 Appreciate the smart transmission as well distributionsystems.

CO 3 Realize the distribution generation and smart consumption.

CO 4 Know the regulations and market models for smart grid.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306c	**Artificial intelligence techniques**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.

CO 2 Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing

CO 3 Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.

CO4 Classify different learning paradigms and its application in Neural Network

CO5 Explain concepts of Natural Language processing and discuss Expert System

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405b	**Power System Engineering**

course Outcomes

CO1: Understand power stability problems and the basic concepts of modeling and analysis of dynamical systems.
CO2: Analyze the behavior of Steady State, Dynamic and transient stability on power systems.
CO3: Analyze stability of single machine and multi-machine systems.
CO4: Analyze the stability of power system by Modified Euler's and Runge – Kutta method.
CO5: Comprehend various factors affecting steady state and transient stabilities.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405a	Testing & Commissioning of Electrical Equipments

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
CO1-Describe the method procurement process and state of the art global practices in maintenance of electrical equipment .
CO2- Analyze and explaining of the requirement common to all equipment
CO3- Analyze and explaining the installation of synchronous machines
CO4-understand the specification and testing of transformer

2	OEC-EE	OEC-EE-405c	**Power System Planning**

Course Outcomes:

After completion of this course, students will be able to:

CO1: Gain information about basic building blocks of Power System planning.

CO2: Understand the basic concept of Power system reliability at generation, transmission and distribution level.

CO3: Analyze the effect of various parameters involved in Generation, Transmission and Distribution systems.

CO4: Understand the impact of demand side planning in deregulated market environment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406a	**Computer Aided Power System Analysis**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 To introduce computer applications in the analysis of power systems.

CO 2 To understand the solution methods and techniques used in power system studies.

CO 3 To solve numerically the complex IEEE bus networks and the energy flow

Co4- **CO3:** Elaborate the concept of digital protection and signal conditioning

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406b	**Advanced Power Electronics**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the operation of power electronic converters and their control strategies.

CO 2 Understand the vector control strategies for ac motor drives

CO 3 Understand the implementation of the control strategies using digital signal processors.

CO4: Acquire knowledge about different AC voltage controllers and their control.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406c	**Power System Transients**

CO1- To explain the sources and effects of lightning, switching and temporary over voltages.

CO2 -To model and estimate the over voltages in power system

CO3- To develop travelling wave equation and to analyze travelling wave.

CO4- To analyze the insulation coordination of power system and protective devices.
CO5- To develop the modeling of power system for transient over voltages using Electromagnetic Transient Program (EMTP)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	Project Stage-II		Credit
No of Practical	PROJ-EE	PROJ-EE-02	Max. Marks: 600 (IA:360, TE:240) (0L+0T+2P 1)

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
(i) Apply and verify basic scientific principals and technologies.
(ii) Identify the scope of interdisciplinary knowledge
(iii) Make and design a prototype which is preferably a working model

Guidelines
1) A group of 3-4 students under the mentorship of a teacher to make a minor project. Interdisciplinary projects to be encouraged.
2) The project title and scope to be decided and presented in first 2nd/3rd weeks of the semester.
3) The progress of the project to be evaluated (internal) in 8th/9th week of the semester.
4) A draft of the project report to be prepared and the project to be evaluated (internal) 12th/13th week of the semester.
5) The project report and the project to be submitted in the department at the time of external evaluation.

School of Engineering and Technology

Program: BCA (3 Years Course)

Programme Educational Objective
(PEO)Programme Outcomes (POs)
Programme Specific Outcomes
(PSOs) Course Outcomes (COs)

RAFFLES
UNIVERSITY

RAFFLES UNIVERSITY, NEEMRANA, ALWAR, RAJASTHAN

Graduates will be able to:

1) Knowledge: Apply knowledge of mathematics, science, fundamentals and computer application to the solution of engineering problems.

2) Problem Analysis: Identify, formulate, research literature and analyse complex problems reaching substantiated conclusions using first principles of mathematics, natural sciences.

3) Design /Development of Solutions: Design solutions for complex problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

4) Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

5) Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex activities with an understanding of the limitations.

6) Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional practice.

7) Environment and Sustainability: Understand the impact of the professional computer application solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the computer application practice.

9) Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

10) Communication: Communicate effectively on complex computer application activities with the community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

11) Project Management and Finance: Demonstrate knowledge and understanding of computer application and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12) Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.

Program Specific Objective

1) To collect requirements, analyze, design, implement and test software Systems.

2) To analyze the errors and debug them within minimal time.

SUBJECT NAME: -Basics of Mathematics

SUBJECT CODE: -BCA-101

CO-1: Use the fundamental knowledge of matrix and determinants.

CO-2: Use logical operation and algebra of proposition.

CO-3: Develop knowledge of the fundamental theorem of Arithmetic.

CO-4: Understand how to determine the natural of set and its types.

CO-5: Understand how to determine the nature of use relation and function.

Course Outcome	**Program Outcome**												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO-1	3	3	2	3	1	2	1		2	2	1	2	3	3
CO-2	3	3	3	3	2	2	1		1	1	1	1	3	3
CO-3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO-4	3	3	3	3	3	2	2		2	1	1	1	3	2
CO-5	3	2	1	1	3	3	2		1	1	1	2	3	2

SUBJECT NAME: - COMPUTER FUNDAMENTALS

SUBJECT CODE: -BCA-103

CO 1. Understanding the concept of input and output devices of Computers

CO 2. Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices.

CO 3. Understand an operating system and its working, and solve common problems related to operating systems.

CO 4. Learn basic word processing, Spreadsheet and Presentation Graphics Software skills.

CO 5. Study to use the Internet safely, legally, and responsibly.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	2	1		3	1							2	3	2
CO2	3	2	1	3	3					2	2	3	3	3
CO3	3	3	2	2	3					2	3	3	2	3
CO4	3	3		3	3				2	1	2	3	3	3
CO5	2	2	3	2	3	3	1	3		2	2	3	3	2

SUBJECT NAME: - Programming with C

SUBJECT CODE: -BCA-105

CO1. Demonstrate knowledge on C Programming constructs learn to develop simple applications in C using basic constructs.

CO2. Design and implement applications using arrays and string.

CO3. Develop and implement modular applications in C using functions.

CO4. Develop applications in C using structures and pointers.

CO5.Design applications using sequential and random-access file processing.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3	2	2					2	3	3	3	3
CO2	2	3	2	3	3	2				1	3	3	2	3
CO3	3	2	3	2	3	2	2		1	3	3	3	3	3
CO4	3	3	3	2	3	3				2	3	3	3	2
CO5	2	3	3	3	3	2					3	2	3	3

SUBJECT NAME: - Communicative English

SUBJECT CODE: - BCA-107

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								3		3		3			2
CO2								3	2	3		3			2
CO3								3	2	3		3			2
CO4								3		3		3			2
CO5								3		3		3			2

SUBJECT NAME: - DATA STRUCTURE

SUBJECT CODE: - BCA-102

Course Outcomes:

CO1: Ability to analyse algorithms and algorithm correctness.

CO2: Ability to summarize searching and sorting techniques.

CO3: Ability to describe stack, queue and linked list operation.

CO4: Ability to have knowledge of tree and graphs concepts.

Course Outcome	**Program Outcome**												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	

SUBJECT NAME: - COMPUTER NETWORK

SUBJECT CODE: - BCA-104

Course Outcomes:

CO1: Students will be aware about computer networking.

CO2: Students will know about various layers of OSI Model.

CO3: Students will learn about wired & wireless technologies.

CO4: Students will learn about the services of different layers.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3				3	1			3			3	3	3
CO2	3	2	3		3				3			3	3	3
CO3	3	2	3		3	2			3			3	3	3
CO4	3	2			3				3			3	3	3
CO5	3	2	3	3	3				3			3	3	3

SUBJECT NAME: - OOPs through C++

SUBJECT CODE: - BCA-106

Course Outcomes:

CO1: Able to develop programs with reusability.

CO2: Develop programs for file handling.

CO3: Handle exceptions in programming.

CO4: Develop applications for a range of problems using OOP techniques.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2	2									3		2
CO2	3	2	2									3		2
CO3	3	3	2									2		3
CO4	3	3	3	2	2	1			2		2	3	2	2
CO5	3											2		2

SUBJECT NAME: - Basic Physics

SUBJECT CODE: - BCA-108

Course Outcomes:

CO1: Understand and apply Maxwell's equations, which describe the fundamental laws of electromagnetism, including Gauss's law for electricity, Gauss's law for magnetism, Faraday's law of electromagnetic induction, and Ampère's law with Maxwell's addition.

CO2: Understand, apply, and manipulate Maxwell's equations to describe and analyze electromagnetic phenomena in both static and dynamic situations.

CO3: Understand and describe the impact of solid-state device capabilities and limitation on electronic circuit performance.

CO4: Understand the concepts of X-Rays and Ultrasonics.

CO5: Understand the basic concepts such as Nuclear Detectors, Characteristics of gas filled detectors and properties of Ionization chamber, proportional counter, G. M. Counter and Scintillation Counter.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2	2		1			3				3	3	3
CO2	3	2	1		1			3	2			3	3	3
CO3	3	2	2		1		2	3	1		3	3	3	3

CO4	3	2	1		1		2	3	2			3	3	3
CO5	3	2	3		1			3	2		3	3	3	3

SUBJECT NAME: - Operating System

SUBJECT CODE: - BCA-201

Course Outcomes:

CO1. Identify the role of Operating System. To understand the design of control unit.

CO2. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.

CO3. Describe the role of paging, segmentation and virtual memory in operating systems.

CO4. Description of protection and security and also the Comparison of UNIX and Windows based OS.

CO5. Defining I/O systems, Device Management Policies and Secondary Storage Structure and Evaluation of various Disk Scheduling Algorithms.

Course Outcome	Program Outcome												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2	1
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3	2

SUBJECT NAME: - Software Engineering

SUBJECT CODE: - BCA-203

Course Outcomes:

CO 1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO 2. An ability to work in one or more significant application domains.

CO 3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO 4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO 5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	1	3	1								3	3	3
CO2	3								2			3	3	3
CO3	3								2			3	3	3
CO4	3	3	2	1								3	3	3
CO5	3	2	2	3								3	3	3

SUBJECT NAME: - Management Information System

SUBJECT CODE: - BCA-205

Course Outcomes:

1. Understand basic concept and technologies used in the field of Management Information System.
2. Have the knowledge about the Information. And its role in the organization.
3. Have the knowledge of system, and its elements, objective and type.
4. Understand the importance of planning and decision making in an organization.

Course Outcome	Program Outcome												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	1	1	3	2	2		1	2	1	2	3	2
CO2	3	1				2			3	1	2	3		
CO3	3	1	1				2			1		2		
CO4	2	3	3	2	3	2	2		2	3	2	3	3	2
CO5	3	2	2	2	3	3	3	2	3	2	3	3	3	3

SUBJECT NAME: - DIGITAL ELECTRONICS

SUBJECT CODE: - BCA-207

Course Outcomes:

CO1: Identify and enumerate different electronic components.

CO2: Illustrate reduction of logical expressions using boolean algebra and implement the functions using logic gates. Design and analyse synchronous and asynchronous sequential circuits using flip-flops.

CO3: Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.

CO4: Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

CO5: Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances**.**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	2											2		
CO2	2	3		2	2		3		1	1	1	1		
CO3	1	2	2	2	2	2		3		2		2		
CO4		2		2		2		2			1			
CO5	2		1	1	1		2	1	1	1	1	1		2

SUBJECT NAME: - Unix & Shell Programming

SUBJECT CODE: BCA-202

Course Outcomes:

CO 1. Documentation will demonstrate good organization and readability.

CO 2. File processing projects will require data organization, problem solving and research.

CO 3. Scripts and programs will demonstrate simple effective user interfaces.

CO 4. Scripts and programs will demonstrate effective use of structured programming.

CO 5. Scripts and programs will be accompanied by printed output demonstrating completion of a test plan.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2	1									1		2
CO2	3	2	1									1		2
CO3	3	1	1									1		2
CO4	3	1			1							1		2
CO5	3		1									1		2

SUBJECT NAME: -Database Management System

SUBJECT CODE: - BCA-204

Course Outcomes:

CO 1. Describe the fundamental elements of relational database management systems.

CO 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO 3. Design ER-models to represent simple database application scenarios

CO 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

CO 5. Improve the database design by normalization.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3										1	2		
CO2	3	2	3								2	2	3	3
CO3	3	3	3	2	2	1	1		2	1	2	2	2	2
CO4	3	2		1								1		
CO5	3		2									2	1	

SUBJECT NAME: - Data Communication

SUBJECT CODE: - BCA-206

Course Outcomes:

CO1: Understand the basics of data communication, networking, internet and their importance

CO2: Analyse the services and features of various protocol layers in data networks.

CO3: Differentiate wired and wireless computer networks

CO4: Analyse TCP/IP and their protocols.

CO5: Recognize the different internet devices and their functions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3											2		
CO2	3	2	3	2								3	2	2
CO3	3	2	3	2								2	2	2
CO4	2	3	3	3								2	2	1
CO5	2											1		

SUBJECT NAME: - Programming in Python

SUBJECT CODE: - BCA-208

Course Outcomes:

CO1: Create your first program in Python IDLE

CO2: Implement OOPs concepts in your programming.

CO3: Use Arrays, and Data structures

CO4: Create an application with the support of graphics in Python.

CO5: Implement error handling.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2	3	2			2			2	3	3	3
CO2	3	3	2		2			2			2	3	3	3
CO3	3	3	2		2			2			2	3	3	3
CO4	3	3	3	3	2			2			2	3	3	3
CO5	3	2	3	3	2			2	3		2	3	3	3

SUBJECT NAME: - Design & Analysis of Algorithm

SUBJECT CODE: BCA-301

Course Outcomes:

CO1.Students will be introduced with algorithm.

CO2.Students will learn to design algorithms.

CO3.Students will learn to implement algorithm for coding.

CO4. Argue the correctness of algorithms using inductive proofs and invariants.

CO5. Analyze worst-case running times of algorithms using asymptotic analysis.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	2	2	2	1	1							1	3	1
CO2	2	1	1	1	1							1	1	1
CO3	2	2	2	1	1							1	3	1
CO4	2	2	2	1	1							1	3	1
CO5	2	1	1	1	1							1	1	2

SUBJECT NAME: - Data warehousing &Mining

SUBJECT CODE: - BCA-303(b)

Course Outcomes:

CO 1 Understand the functionality of the various data mining and data warehousing component.

CO 2. Appreciate the strengths and limitations of various data mining and data warehousing models.

CO 3. Explain the analyzing techniques of various data.

CO 4. Describe different methodologies used in data mining and data ware housing.

CO 5. Compare different approaches of data ware housing and data mining with various technologies.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2		3				3			3	3	2
CO2	3	3	3	2	3				3			3	3	3
CO3	3	3	2	2	3				3			3	3	2
CO4	3	3	2	2	3				3			3	3	2
CO5	3	3	3	2	3				3		3	3	3	3

SUBJECT NAME: - Java Programming

SUBJECT CODE: -BCA-305

Course Outcomes:

CO 1. Learn to apply object-oriented programming features and concepts for solving given problem.

CO2. Learn to use java standard API library to write complex programs.

CO 3. Learn implementation of object-oriented programming concepts using java

CO 4. Able to develop interactive programs using applets and swings.

CO 5. Develop advanced skills for programming in Java.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3						3			3	3	
CO2	3	2	3	2	2				3			3	3	3
CO3	3	1	3	2	2				3			3	3	3
CO4	3	1	3	2	2				3			3	3	3
CO5	3	3	3	2	2				3			3	3	3

SUBJECT NAME: - Organizational Behaviour

SUBJECT CODE: -BCA-307

Course Outcomes:

CO 1. Demonstrate knowledge and skills in the logical foundations of informatics, data representation, models, structures and informatics-centric management.

CO 2. Document experience of their participation in professional organizations that promote responsible computing and service to society.

CO 3. Demonstrate a personal learning strategy for continuing education and lifelong learning that is independent of employer sponsorship.

CO 4. Define terms and explain basic principles, concepts and theories from another domain or discipline in which IT resources will be deployed.

CO 5. Evaluate how legal and ethical technology issues impact business activities including such areas as data access, privacy, confidentiality, security, and intellectual property standards and policies..

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2										3	3	3
CO2	3							2			2	3	3	3
CO3	3	2						2				3	3	3
CO4	3										2	3	3	3
CO5	3	2						1				3	3	3

SUBJECT NAME: - Machine Learning

SUBJECT CODE: -BCA-302

Course Outcomes:

CO1. Develop mathematical thinking and problem-solving skills associated with research and writing proofs.

CO2 Get exposure to a wide variety of mathematical concepts used in computer science discipline like probability.

CO3 Use Graph Theory for solving problems.

CO4 Acquire basic knowledge of sampling and estimation.

CO5 Understand basic concepts of hypothesis.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		2	2								3	3	
CO2	3	3		3								3	3	3

CO3	3	3										3	3	2
CO4	3	3	3	1					3			3	3	2
CO5	3	3	3	2	3				3			3	3	3

SUBJECT NAME: - (WEB & INTERNET TECHNOLOGY (Elective Paper)

SUBJECT CODE: -BCA-304(a)

Course Outcomes:

CO 1. Students will be familiar with Internet.

CO 2. Students will be familiar with different protocols of internet.

CO 3. Students will learn different services of internet.

CO 4. Analyze a web page and identify its elements and attributes.

CO 5. Students will learn HTML, CSS, JAVA Scripts for web designing.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3					2			1			3	3	
CO2	3		2	2					3			3	3	3
CO3	3		2	2		1			3			3	3	3
CO4	3	3			2				3			3	3	2
CO5	3	3	3	2	2				3			3	3	3

SUBJECT NAME: - Artificial Intelligence

SUBJECT CODE: - BCA-306(a)

Course Outcomes:

CO 1. Design user interfaces to improve human–AI interaction and real-time decision-making.

CO 2. Evaluate the advantages, disadvantages, challenges, and ramifications of human–AI augmentation.

CO 3. Design and develop symbiotic human–AI systems that balance the information processing power of computational systems with human intelligence and decision making.

CO 4. Explain the benefits, limitations, and tradeoffs of designing engaging and ethical conversational user interactions, including those supported by chatbots, smart speakers, and other

AI-driven, voice- based technologies.

CO 5. Design and evaluate conversational interfaces for different users and contexts of use.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO	PSO	PSO
CO1	3	2	3	2	2						3	2	2	3	1
CO2	2	3	2												
CO3	3		3	2	3	1					2	2	3	3	3
CO4		3												3	2
CO5			3	2	3									2	3

SCHOOL OF ENGINEERING & TECHNOLOGY (SOET)

RAFFELS UNIVERSITY,

NEEMRANA

MCA (2 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
UNIVERSITY

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Vision

To be a centre of excellence by producing high calibre, competent and self-reliant computer Science engineers, who possess scientific temperament and would engage in activities relevant to industries with ethical values and flair to research.

Mission

- To provide efficient engineers for global requirements by imparting quality education.
- To explore, create and develop innovations in various aspects of engineering through industries and institutions.
- To emphasize on practical skills and socially relevant technology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To train students with practical skills and experimental practices related to core and applied areas of Computer Science & Engineering to expand their knowledge horizon beyond books.

PEO-2: Graduate will establish himself/herself as effective professionals by solving real world problems using investigative and analytical skills along with the knowledge acquired in the field of Computer Science and Engineering.

PEO-3: To improve team building, team working and leadership skills of the students with high regard for ethical values and social responsibilities.

PEO- 4: Graduate will embrace professional code of ethics in the profession while deliberately being part of projects which contributes to the society at large without disturbing the ecological balance.

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.
PO 2	Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO 5	Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO 11	Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO 12	Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1	To collect requirements, analyze, design, implement and test software Systems.
PSO 2	To analyze the errors and debug them within minimal time.

MCA 1ST YEAR

Scheme for MCA (2 Years Course) (2022-24)

Department of Computer Science & Engineering

1st Semester

S. No.	Subject Code	Subject	Teaching Hours			IA	ETE	Total	Credit
			L	T	P				
1	MCA-101	Computer Architecture	3	0	0	40	60	100	3
2	MCA-103	Object Oriented Programming with C++	3	0	0	40	60	100	3
3	MCA-105	Database Systems	3	0	0	40	60	100	3
4	MCA-107	Operating System	3	0	0	40	60	100	3
5	MCA-109	Discrete Mathematics	3	0	0	40	60	100	3
6	MCA-111	Web Technologies	3	0	0	40	60	100	3
7	MCA-P-101	Database Systems Lab	0	0	2	60	40	100	1
8	MCA-P-103	Object-Oriented Programming Lab	0	0	2	60	40	100	1
9	MCA-P-111	Web Technologies Lab	0	0	2	60	40	100	1
Grand Total			18	0	6	420	480	900	21

SUBJECT NAME:-COMPUTER ARCHITECTURE

SUBJECT CODE:-MCA 101

Course Outcomes:

CO1.Demonstrate concepts of parallelism in hardware/software.

CO2.Discuss memory organization and mapping techniques.

CO3.Describe architectural features of advanced processors.

CO4.Interpret performance of different pipelined processors.

CO5.Explain data flow in arithmetic algorithms.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3		2				3		2	3	3	3
CO2	3	3	3		2				3		2	3	3	3
CO3	3	3	2		2				3		2	3	3	3
CO4	3	3	3		2				3		2	3	3	3
CO5	3	3	3		2				3		2	3	3	3

SUBJECT NAME:-OBJECT ORIENTED PROGRAMMING IN C++

SUBJECT CODE:-MCA 103

Course Outcomes:

CO1. Able to develop programs with reusability.

CO2. Develop programs for file handling.

CO3. Handle exceptions in programming.

CO4. Develop applications for a range of problems using OOP techniques

CO5. Demonstrate the use of various OOPs concepts with the help of programs.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2	3	2			2			2	3	3	3
CO2	3	3	2		2			2			2	3	3	3
CO3	3	3	2		2			2			2	3	3	3
CO4	3	3	3	3	2			2			2	3	3	3
CO5	3	2	3	3	2			2	3		2	3	3	3

SUBJECT NAME:-DATABASE MANAGEMENT

SUBJECT CODE:-MCA 105

Course Outcomes:

CO 1. Describe the fundamental elements of relational database management systems.

CO 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO 3. Design ER-models to represent simple database application scenarios

CO 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

CO 5. Improve the database design by normalization.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	2		1			3				3	3	3	3
CO2	3	2	1		1			3	2			3	3	3	2
CO3	3	2	2		1		2	3	1		3	3	3	3	2
CO4	3	2	1		1		2	3	2			3	3	3	2
CO5	3	2	3		1			3	2		3	3	3	3	3

SUBJECT NAME:-OPEARTING SYSTEM

SUBJECT CODE: -MCA 107

Course Outcomes:

CO 1. Identify the role of Operating System. To understand the design of control unit.

CO 2. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.

CO 3. Describe the role of paging, segmentation and virtual memory in operating systems.

CO 4. Description of protection and security and also the Comparison of UNIX and Windows based OS.

CO 5. Defining I/O systems, Device Management Policies and Secondary Storage Structure.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		3	2	2				2			3	3	3
CO2	3	3	3	2	2				3			3	3	3
CO3	3	3	3	2	2				2			3	3	3
CO4	3		3	2	2				3			3	3	3
CO5	3		3	2	2				2			3	3	3

SUBJECT NAME:-DISCRETE MATHMETICS

SUBJECT CODE: -MCA - 109

Course Outcomes:

CO 1. Able to use analogy and abstraction.

CO 2. Able to use set, types of set and relation and function.

CO 3. Able to solve problems using permutation, combination, sequence, series and lattice.

CO 4. Able to use Eulerian graph and Hamiltonian graphs.

CO 5. Able to use normal subgroup and homomorphism of group.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		3	2	2				2			3	3	3
CO2	3	3	3	2	2				3			3	3	3
CO3	3	3	3	2	2				2			3	3	3
CO4	3		3	2	2				3			3	3	3
CO5	3		3	2	2				2			3	3	3

SUBJECT NAME:-WEB TECHNOLOGY

UBJECT CODE: -MCA - 111

Course Outcomes:

CO 1. Students will be familiar with Internet.

CO 2. Students will be familiar with different protocols of internet.

CO 3. Students will learn different services of internet.

CO 4. Analyze a web page and identify its elements and attributes.

CO 5. Students will learn HTML, CSS, JAVA Scripts for web designing.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3					2			1			3	3	
CO2	3		2	2					3			3	3	3
CO3	3		2	2		1			3			3	3	3

CO4	3	3			2				3			3	3	2
CO5	3	3	3	2	2				3			3	3	3

SUBJECT NAME:- OBJECT ORIENTED PROGRAMMING IN C++

SUBJECT CODE: -MCA -P -103

Course Outcomes:

CO 1. Create and explain Basic C++ Program using i/o variables and structures.

CO 2. Apply object oriented programming concepts using class and objects

CO 3. Design and assess the classes for code reuse

CO 4. Analyse and apply the generic classes concepts in programming problem

CO 5. Illustrate and evaluate the file Input Output mechanisms

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3					2			1			3	3	
CO2	3		2	2					3			3	3	3
CO3	3		2	2		1			3			3	3	3
CO4	3	3			2				3			3	3	2
CO5	3	3	3	2	2				3			3	3	3

MCA 1ST YEAR

School of Engineering and Technology

Scheme for MCA (2 Years Course) (2022-24)

Department of Computer Science & Engineering

2nd Semester

S.No.	Subject Code	Subject	Teaching Hours			IA	ETE	Total	Credit
			L	T	P				
1	MCA-102	Java Technologies	3	0	0	40	60	100	3
2	MCA-104	Computer Networks	3	0	0	40	60	100	3
3	MCA-106	Data Structures	3	0	0	40	60	100	3
4	MCA-108	Software Engineering	3	0	0	40	60	100	3
5	MCA-110	Python Programming	3	0	0	40	60	100	3
6	MCA-112	Business Informatics	3	0	0	40	60	100	3
7	MCA-P-102	Java Technologies Lab	0	0	2	60	40	100	1
8	MCA-P-106	Data Structures Lab	0	0	2	60	40	100	1
9	MCA-P-110	Python Programming Lab	0	0	2	60	40	100	1
Grand Total			18	0	6	420	480	900	21

SUBJECT NAME:-JAVA PROGRAMMING

SUBJECT CODE: -MCA 102

Course Outcomes:

CO 1. Learn to apply object oriented programming features and concepts for solving given problem.

CO2. Learn to use java standard API library to write complex programs

CO 3. Learn implementation of object oriented programming concepts using java

CO 4. Able to develop interactive programs using applets and swings.

CO 5. Develop advanced skills for programming in Java

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3						3			3	3	
CO2	3	2	3	2	2				3			3	3	3
CO3	3	1	3	2	2				3			3	3	3
CO4	3	1	3	2	2				3			3	3	3
CO5	3	3	3	2	2				3			3	3	3

SUBJECT NAME:-COMPUTER NETWORK

SUBJECT CODE: -MCA 104

Course Outcomes:

CO 1. Students will be aware about computer networking.

CO 2. Students will know about various layers of OSI Model.

CO 3. Students will learn about wired & wireless technologies.

CO 4. Students will learn about the services of different layers.

CO 5. Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3				3	1			3			3	3	3
CO2	3	2	3		3				3			3	3	3
CO3	3	2	3		3	2			3			3	3	3
CO4	3	2			3				3			3	3	3
CO5	3	2	3	3	3				3			3	3	3

SUBJECT NAME:-DATA STRUCTURE

SUBJECT CODE:-MCA 106

Course Outcomes:

CO1. Ability to analyse algorithms and algorithm correctness.

CO2. Ability to summarize searching and sorting techniques

CO3. Ability to describe stack, queue and linked list operation.

CO4. Ability to have knowledge of tree and graphs concepts

CO5. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2	2	2				2			3	3	3
CO2	3	2	2	2	2				1			3	3	3
CO3	3	2	2	2	1				1			3	3	3
CO4	3	2	2	2	1				2			3	3	3
CO5	3	2	2	2	1				3			3	3	3

SUBJECT NAME:-SOFTWARE ENGINEERING

SUBJECT CODE: -MCA 108

Course Outcomes:

CO 1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO 2. An ability to work in one or more significant application domains.

CO 3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO 4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO 5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	1	3	1								3	3	3
CO2	3								2			3	3	3
CO3	3								2			3	3	3
CO4	3	3	2	1								3	3	3
CO5	3	2	2	3								3	3	3

SUBJECT NAME: - PYTHON PROGRAMMING

SUBJECT CODE: -MCA 110

Course Outcomes:

CO1 Create your first program in Python IDLE.

CO2 Implement OOPs concepts in your programming.

CO3 Use Arrays, and Data structures.

CO4 Create an application with the support of graphics in Python.

CO5 Implement error handling.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		2	1	3				1			3	3	3
CO2	3	1	2	1					1			3	3	3
CO3	3		3	1					1			3	3	3
CO4	3	2	2	3	2				3			3	3	3
CO5	3	3	2	3	2				3			3	3	3

SUBJECT NAME:-BUSINESS INFORMATICS

SUBJECT CODE: -MCA 112

Course Outcomes:

CO 1. Demonstrate knowledge and skills in the logical foundations of informatics, data representation, models, structures and informatics-centric management.

CO 2. Document experience of their participation in professional organizations that promote responsible computing and service to society.

CO 3. Demonstrate a personal learning strategy for continuing education and lifelong learning that is independent of employer sponsorship.

CO 4. Define terms and explain basic principles, concepts and theories from another domain or discipline in which IT resources will be deployed.

CO 5. Evaluate how legal and ethical technology issues impact business activities including such areas as data access, privacy, confidentiality, security, and intellectual property standards and policies..

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2										3	3	3
CO2	3							2			2	3	3	3
CO3	3	2						2				3	3	3
CO4	3										2	3	3	3
CO5	3	2						1				3	3	3

MCA 2ND YEAR

School of Engineering and Technology

Scheme for MCA (2 Years Course)(2022-24)

Department of Computer Science & Engineering

3rd Semester

S. No.	Subject Code	Subject	Teaching Hours			IA	ETE	Total	Credit
			L	T	P				
1	MCA-201	Computer Graphics	3	0	0	40	60	100	3
2	MCA-203	Theory of Computation	3	0	0	40	60	100	3
3	MCA-205	Advanced Database System	3	0	0	40	60	100	3
4	MCA-207	Cyber Security and Cryptography	3	0	0	40	60	100	3
5	MCA-209	Mobile Application Development	3	0	0	40	60	100	3
6	MCA-211	Elective 1	3	0	0	40	60	100	3
7	MCA-P-201	Computer Graphics Lab	0	0	2	60	40	100	1
8	MCA-P-209	Mobile Application Development Lab	0	0	2	60	40	100	1
9	MCA-213	Summer Industrial Training Presentation	0	0	4	60	40	100	2
Grand Total			18	0	8	420	480	900	22

Elective I

Code	Title
MCA-211 (a)	Data Mining and Warehousing
MCA-211 (b)	Information Protection and Security
MCA-211 (c)	Soft Computing

SUBJECT NAME: - COMPUTER GRAPHICS

SUBJECT CODE: -MCA-201

Course Outcomes:

CO 1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.

CO 2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.

CO 3. Use of geometric transformations on graphics objects and their application in composite form.

CO 4. Extract scene with different clipping methods and its transformation to graphics display device.

CO 5. Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	2		2		2				2			3	3	3
CO2	2	3	1		2				2			3	3	3
CO3	2		2		2				2			3	3	3
CO4	2	2	1		2				2			3	3	3
CO5	2	1	3		2				2			3	3	3

SUBJECT NAME: - THEORY OF COMPUTATION

SUBJECT CODE: -MCA-203

Course Outcomes:

CO 1. Will apply knowledge of computing and mathematics appropriate to the discipline.

CO 2. Learn about Automata theory and its application in Language Design.

CO 3. Learn about Turing Machines and Pushdown Automata and understand Linear Bound Automata and its Applications.

CO 4. Discuss key notions of computation, such as algorithm, computability, decidability, reducibility, and complexity, through problem solving.

CO 5. Solve computational problems regarding their computability and complexity and prove the basic results of the theory of computation.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		3	2					1			3	3	3
CO2	3		3	2	2				1			3	3	3
CO3	3		3	2	2				1			3	3	3
CO4	3	2	3	2					1			3	3	3
CO5	3	3	3	2					1			3	3	3

SUBJECT NAME: - ADVANCED DATABASE SYSTEM

SUBJECT CODE: -MCA-205

Course Outcomes:

CO 1. Understand the basic principles of database management systems.

CO 2. Draw Entity-Relationship diagrams to represent simple database application scenarios

CO 3. write SQL queries for a given context in relational database.

CO 4. Discuss normalization techniques with simple examples.

CO 5. Describe transaction processing and concurrency control concepts.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	1	3						3			3	3	
CO2	3	1	3	2	2				3			3	3	3
CO3	3	1	3	2	2				3			3	3	2
CO4	3	1	3	2	2				3			3	3	2
CO5	3	1	3	2	3				3			3	3	3

SUBJECT NAME: - CYBER SECURITY AND CRYPTOGRAPHY

SUBJECT CODE: -MCA-207

Course Outcomes:

CO 1**.** Understand cryptography basics, algorithms and mathematical background for cryptography.

CO 2. Analyze the important cryptographic algorithms.

CO 3. Understand key management issues and algorithms.

CO 4. Understand security issues in Wireless LAN and web.

CO 5. Understand cyber security and need of cyber-Laws.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	1	3						3			3	3	
CO2	3	1	3	2	2				3			3	3	3
CO3	3	1	3	2	2				3			3	3	2
CO4	3	1	3	2	2				3			3	3	2
CO5	3	1	3	2	3				3			3	3	3

SUBJECT NAME: - MOBILE APPLICATION DEVELOPMENT

SUBJECT CODE: -MCA-207

Course Outcomes:

CO 1**.** Identify various concepts of mobile programming that make it unique from programming for other platforms.

CO 2. Critique mobile applications on their design pros and cons.

CO 3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.

CO 4. Program mobile applications for the Android operating system that use basic and advanced phone features.

CO 5. Deploy applications to the Android marketplace for distribution.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	1	3						3			3	3	
CO2	3	1	3	2	2				3			3	3	3
CO3	3	1	3	2	2				3			3	3	2
CO4	3	1	3	2	2				3			3	3	2
CO5	3	1	3	2	3				3			3	3	3

SUBJECT NAME: - DATA MINING AND WAREHOUSING

SUBJECT CODE: -MCA-211 (a)

Course Outcomes:

CO 1**.** Understand what Is Data Mining, what kinds of data can be mined, what kinds of patterns can be mined, and what kinds of applications are targeted.

CO 2. Explain major Issues in data mining.

CO 3. Apply machine learning, pattern recognition, statistics, visualization, algorithm, database

technology and high-performance computing in data mining applications.

CO 4. Identify what kinds of technologies are used for different application.

CO 5. Manipulate data preprocessing, data Warehouse and OLAP technology, data cube technology; mining frequent patterns and association, classification, clustering, and outlier detection.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2		3				3			3	3	2
CO2	3	3	3	2	3				3			3	3	3
CO3	3	3	2	2	3				3			3	3	2
CO4	3	3	2	2	3				3			3	3	2
CO5	3	3	3	2	3				3		3	3	3	3

MCA 2ND YEAR

School of Engineering and Technology

Scheme for MCA (2 Years Course)(2022-24)

Department of Computer Science & Engineering

4th Semester

S. No.	Subject Code	Subject	Teaching Hours			IA	ETE	Total	Credit
			L	T	P				
1	MCA-202	Software Project Management	3	1	0	40	60	100	4
2	MCA-204	Elective II	3	1	0	40	60	100	4
3	MCA-P-202	Seminar -I/ Group Discussion	0	0	4	40	60	100	4
4	MCA-P-206	Major Project and Dissertation	0	0	8	400	200	600	4
Grand Total			6	2	10	520	380	900	16

Elective II

Code	Title
MCA-204 (a)	Principles of Management and Information System
MCA-204 (b)	Machine Learning
MCA-204 (c)	Data Science with R

SUBJECT NAME: - SOFTWARE PROJECT MANAGEMENT

SUBJECT CODE: -MCA-202

Course Outcomes:

CO 1**.** Apply project management concepts and techniques to an IT project.

CO 2. Identify issues that could lead to IT project success or failure.

CO 3. Explain project management in terms of the software development process.

CO 4. Describe the responsibilities of IT project managers.

CO 5. Apply project management concepts through working in a group as team leader.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2		3						2	3	3	2
CO2	3	3	3	2	3				3		1	3	3	3
CO3	3	3	2	2	3				3		2	3	3	2
CO4	3	3	2	2	3						1	3	3	2
CO5	3	3	3	2	3				3		3	3	3	3

SUBJECT NAME: MACHINE LEARNING

SUBJECT CODE: -MCA-204 (b)

Course Outcomes:

CO 1**.** Learn the basics of learning problems with hypothesis and version spaces.

CO 2. Understand the features of machine learning to apply on real world problems.

CO 3. Characterize the machine learning algorithms as supervised learning and unsupervised learning and apply and analyze the various algorithms of supervised and unsupervised learning.

CO 4. Analyze the concept of neural networks for learning linear and non-linear activation functions. CO 5. Learn the concepts in Bayesian analysis from probability models and methods.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		2	2								3	3	
CO2	3	3		3								3	3	3
CO3	3	3										3	3	2
CO4	3	3	3	1					3			3	3	2
CO5	3	3	3	2	3				3			3	3	3

SYLLABUS

Semester I

COMPUTER ARCHITECTURE

Paper Code: MCA-101

Unit 1 Combinational Circuit

Combinational Digital Circuits: Gates, Boolean Functions and Expressions, Designing Gate Networks, Useful Combinational Parts, Programmable Combinational Parts, Timing and Control Latches, Flip- Flops and Registers, Sequential Circuits, Useful Sequential Parts, Programmable Sequential Parts, Clocks and Timing of Events.

Unit 2 I/O Peripheral Device

Computer System Technology: Components to Applications, Computer Systems and their Parts, Generations, Processor and Memory Technologies, Peripherals I/O and Communications, Software Systems and Applications. Instruction and addressing, instruction formats, types, addressing modes.

Unit 3 Assembly Language

Assembly Language Programs, Assembler Directives, Pseudo Instructions, Macroinstructions, Linking and Loading, 8085 Instruction Set. Arithmetic/Logic Unit: Number Representation, Arithmetic Operations, Floating-Point Arithmetic.

Unit 4 Memory System

Memory System Design: Main Memory Concepts, Cache Memory Organization, Mass Memory Concepts, Virtual Memory and Paging. Input/Output and Interfacing,

Unit 5 Input/Output Device

Input/Output Devices, Input/Output Programming, Interrupts. Vector And Array Processing, Shared-Memory, Multiprocessing, Distributed Multi Computing. Programming in 8085 Microprocessor.

Suggested readings –

1.	Computer System Architecture	Mano	Pearson
2.	Digital logic & Computer Design	Mano	Pearson

Object Oriented Programming with C++

Paper Code: MCA-103

Unit 1 OOP Paradigm:

Characteristics of OOP, Comparison between functional programming and OOP approach, characteristics of object-oriented language - objects, classes, inheritance,reusability user-defined data types, polymorphism, overloading

Unit 2 Introduction to C++:

Identifier and keywords, constants, C++ operators, type conversion, Variable declaration, statements, expressions, input and output, conditional expression loopstatements, break control statements, Classes, member functions, objects, arrays of class objects, pointers and classes, nested classes, constructors, destructors Inline member functions, static class member, friend functions, and dynamic memoryallocation.

Unit 3 Polymorphism and Inheritance:

Function overloading, operator overloading, polymorphism, early binding, polymorphism with pointers, virtual functions, late binding, pure virtual functions.Single inheritance, types of inheritance, types of base classes, types of derivations, multiple inheritances, container classes, member access control

Unit 4 Exception & Templates

Exception Syntax, Multiple Exceptions, Function Templates, Function Templates with multiple argument, templates

Unit 5 File Handling in C++:

C++ Streams, Console Stream Classes, Formatted And Unformatted Console I/OOperations, manipulators, File Streams, Classes File Modes, File Pointers and
Manipulations File I/O

Text Books:

1. K.R. Venugopal, Raj Kumar Buyya, “Mastering C++", McGraw-Hill, 2017.
2. Rajaram R, Object Oriented Programming and C++”, 2nd Edition, New Age International, 2013.
3. E Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill, 2006

Yahwant Kanetkar, ”C++ Programming”, BPB Publication

DATABASE MANAGEMENT SYSTEM

Paper Code: MCA-105

Unit 1:Introduction

Overview of DBMS, Basic DBMS terminology, data base system v/s file system, data independence. Architecture of a DBMS Introduction to data 0models: entity relationship model, hierarchal model: from network to hierarchical, relational model, comparison of network, hierarchal and relational models.

Unit 2 Data Modelling

Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to , extended ER model,relationships of higher degree. Relational model: storage organizations for relations, relational algebra, and relational calculus.

Unit 3 Normalization

Normalization Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD and JDs, alternative approaches to database design.

Unit 4 SQL

Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their
procedure, ,

Unit 5 Views & Indexes

Views and indexes, Queries and sub queries, Aggregate functions, insert, update and delete operations, Joins, Unions, Intersection,
Minus in SQL

Suggested readings –

1.	Database System Concepts	Korth, Sudarshan	TMH
2.	Database Concepts	Elmasri, Nawathe	Pearson

3. Database Management Systems Raghuramakrishan

4. SQL, PL/SQL, Bayross BPB The Programming language Oracle

5. Introduction to Kahate Pearson Database Management Systems

Operating System

Paper Code: MCA-107

Unit 1 Introduction

Introduction: Definition and types of operating systems, Batch Systems, multi programming, timesharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.

Unit 2 Process Management

Process Management: Process concept, Process scheduling, Cooperating processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Real-time scheduling and Algorithm evaluation.

Unit 3 Deadlocks

Process Synchronization and Deadlocks: The Critical- Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

Unit 4 Storage Management

Storage management: Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation,

File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure

Unit 5 Disk Scheduling

Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability. Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.

Case study : Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface.

Suggested readings –

1.	Operating System Principles	Galvin,Gagne	John Willey & sons
2.	Modern Operating Systems	Tanenbaum	Pearson
3.	Operating Systems	Dhamdhere	MGH
4.	Operating System concepts	Manish k. Sah	Ashirwad, Jaipur

DISCRETE MATHEMATICS

Paper Code: MCA-109

Unit 1 Introduction

Introduction to Discrete Mathematical Structures, Formal Methods: Introduction and Analogy,Abstraction. Fundamentals: Sets & Relations- Sets, Types of Sets, Multi Sets, Operations on Sets.

Unit 2 Relations

Relations and Properties of Relations, Representation of Relations, Equivalence Relation, Closers of Relations, Methods of Proof-Direct Proofs, Indirect Proofs, Mathematical Induction, Method of Contradiction.

Unit 3 Permutation and Combinations

Combinatory: Permutations and Combinations, Pigeon Hole Principle, Principle of Inclusion and Exclusion, Sequence and Series, Generating Functions. Mathematical Logic, Posets and Lattices: Partial Order Set, Bounding Elements, Well-Ordered Set, Topological Sorting, Lattices, Principle of Duality, Bounded, Distributed, and Complemented Lattices, Proposition and Prepositional Calculus.

Unit 4 Graph Theory

Graphs and Group Theory: Basic Introduction of Graphs- Types of Graphs, Path and Circuits, Eulerian Path and Circuits, Hamiltonian Path and Circuits, Shortest Path Algorithms, Group, Definitions and Properties, Coset & Subgroup, Normal subgroup, Homomorphism of groups, Cyclic Group, Permutation Group.

Unit 5 Grammer

Finite State Machines and Languages: Grammar and Languages- Phrase structure Grammar, Types of Grammars and Languages, Finite State Machines and Languages, Minimization of Finite State Machines.

Suggested readings –

1. Discrete Mathematical Structures Kolman, Busby, Ross PHI
2. Discrete Mathematical Structures Chourasiya, Srivastava Genius Publication, Jaipur
3. Discrete Mathematics Olympia Nicodemi CBS, Delhi
4. Discrete Mathematics Akerkar Pearson/PHI

WEB TECHNOLOGIES

Paper Code: MCA-111

Unit 1 Introduction to HTML

The internet: history of the World Wide Web, hardware and software trend, objecttechnology – java script object, scripting for the web-browser portability.

Introduction of HTML: introduction, markup language, editing HTML : common tags, headers, text styles, linking, images, formatting text, horizontal rules and moreline breaks, unordered lists, nested and ordered lists, basic HTML tables : intermediate HTML tables and formatting : basic HTML forms, more complex HTML forms, HTML5: Input Types & Attributes, internal linking, creating and using image maps

Unit 2 Java Script

Introduction to scripting: introduction- memory concepts- arithmetic- decision making. Java script

control structures, Java script functions: introduction – program Units in java script - function definitions, duration of identifiers, scope rules, recursion, java script global functions.
Java script arrays: introduction, array-declaring and allocating arrays, references
and reference parameters – passing arrays to functions, multiple subscripted arrays.Java script objects: introduction, math, string, date, Boolean and number objects

Unit 3 Dynamic HTML

CSS: introduction – inline styles, creating style sheets with the style element, conflicting styles, linking external style sheets, positioning elements, backgrounds,element dimensions, text flow and the CSS box model, user style sheets, Filter andTransitions, HTML DOM, Browser BOM
Event model : introduction, event ON CLICK, event ON LOAD – error handlingwith ON ERROR, tracking the mouse with event, more DHTML events

Unit 4 Introduction to PHP &Web Server Architecture

Overview of PHP Capabilities, PHP HTML embedding tags & syntax, Simple script examples, PHP & HTTP Environment variables. PHP Language Core- Variables, Constants, Data Types, PHP: Operators, Flow Control & Loops, Arrays,String, Functions Include & require statements, Simple File & Directory Access Operations

Unit 5 Error handling

Error handling, Processing HTML form using GET, POST, REQUEST, SESSION,COOKIE variables, Sending E-mail, Database Operations with PHP, Connecting to My-SQL (or any other database), Selecting a db, building & Sending Query, retrieving, updating & inserting data, CMS: Wordpress. Note: XAMMP is used for PHP

Text Books:

1. Jennifer Robbins , “Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Webgraphics”,O’reilly, 2018
2. Adrian W. West ,” Practical Web Design for Absolute Beginners”, 2016
3. Harvey M. Dietel, Paul Dietel& Tem R. Nieto, “, Internet& World Wide Web How to Program”, Pearson,
2011
4. Ivan Bayross. “Web enabled commercial application development using HTML, DHTML,

JavaScript,

PERL-CGI", BPB Publications, 2010

Database Management System Lab

Paper Code: MCA-P-101

Student can use My Sql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) VB/JAVA at front end.

1. (a) Write a C++ program to store students records (roll no, name, father name) of a class using file handling. (Using C++ and File handling).

(b) Re-write program 1, using any DBMS and any compatible language.(C++/MySQL) (VB and MS-Access)

2. Database creation/ deletion, table creation/ deletion.

Write a program to take a string as input from user. Create a database of same name. Now ask user to input two more string, create two tables of these names in above database.

Write a program, which ask user to enter database name and table name to delete. If database exist and table exist then delete that table.

3. Write a program, which ask user to enter a valid SQL query and display the result of that query.

4. Write a program in C++ to parse the user entered query and check the validity of query. (Only SELECT query with WHERE clause)

5 - 6. Create a database db1, having two tables t1 (id, name, age) and t2 (id, subject, marks).

(a) Write a query to display name and age of given id (id should be asked as input).

(b) Write a query to display average age of all students.

(c) Write a query to display mark-sheet of any student (whose id is given as input).

(d) Display list of all students sorted by the total marks in all subjects.

7 - 8. Design a Loan Approval and Repayment System to handle Customer's Application for Loan and handle loan repayments by depositing installments and reducing balances.

9 -10. Design a Video Library Management System for managing issue and return of Video tapes/CD and manage customer's queries.

Programming In C Lab

Paper Code: MCA-P-103

1. Write a program to calculate simple and compound interest.
2. Write a program to swap values of two variables with and without using third variable.
3. Write a program to display the size of every data type using "sizeof" operator.
4. Write a program to illustrate the use of unary prefix and postfix increment and decrement operators.
5. Write a program to input two numbers and display the maximum number.
6. Write a program to find the largest of three numbers using ternary operators.
7. Write a program to find the roots of quadratic equation.
8. Write a program to input name, marks of 5 subjects of a student and display the name of the student, the total marks scored, percentage scored and the class of result.

Web Technologies Lab
Paper Code: MCA-P-111

HTML:
- Basics Elements & Attributes, HTML Formatting tags, Links,
- Images, Tables, Forms Elements
- HTML5 Audio and Video, HTML5 Input Types & Attributes
- CSS Syntax, CSS Attribute Selectors
- CSS properties: Fonts, Background, Colors, Links, Lists,
- CSS Box Model, Display, Opacity, Float, Clear
- CSS Layout, CSS Navigation Bar,
  CSS Rounded Corners, CSS Border Images, CSS Animations

JavaScript:
- Displaying Output, Declaring Variables, Operators, Arithmetic, Data Types, Assignment
- JavaScript Functions, Booleans, Comparisons, Conditional ,
- JavaScript Switch, Loops, Break, Type,
- JavaScript Objects, Scope,
- Strings and String Methods
- Numbers and Number Methods, Math, JavaScript Dates: Formats and Methods
- JavaScript Events, JavaScript, JavaScript Forms (API and Validation), Objects, JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM

PHP:
- Installing XAMMP
- Variables, Data Types, Constants, Operators, Programming Loops,
- PHP Functions,
- Arrays
- Strings Functions
- PHP Form Handling, Require & Include PHP with MySQL

Semester II

JAVA TECHNOLOGIES

Paper Code: MCA-102

Unit 1 Introduction to Java Enterprise

Introduction to Java Enterprise APIs, JDBC fundamentals, Multitier architecture, WebApplications in JEE. Introduction to RMI, EJB's and JavaFx.

Unit 2 Servlets

Servlets fundamentals, architecture, life cycle of a servlet, initialization, threads, servlets and HTML, retrieving data in servlet, servicing the GET and POST requests, servlet sessions session tracking, cookies. Inter servlet communication and servlet security.

JDBC and Inter servlet

JDBC and Inter servlet communications JDBC, Driver types, JDBC servlet, JDBCconnection pooling. Introduction to Java Frameworks-Hibernate and Struts.

JSP

JSP fundamentals, architecture, implicit objects, standard actions, JSP errors. Differentpackages of JSP and servlets. Java Mail using JSP.

Introduction to Spring

Introduction to Spring Web MVC, The Dispatcher Servlet , A Simple View Page, Adding a View Resolver, Adding a message bundle, Using JDBC with Spring.

Text Books:

1. "Advanced Java 2 Platform HOW TO PROGRAM" by H. M.Deitel, P. J. Deitel, S. E.Santry, Prentice Hall, 2001
2. "Beginning Java™ EE 6 Platform with GlassFish 3 From Novice to Professional" byAntonio Goncalves – Apress publication, 2009
3. "Beginning Spring" by Mert Caliskan, Kenan Sevindik, Wrox Publication, 2015

References:

1. Perroud, Thierry, Inversini, Reto , "Enterprise Architecture Patterns :Practical Solutions for Recurring IT-Architecture Problems", Springer, 2013

2. Dustine R Callway , "Inside Servlets:Server Side Programming for Java ", Addison-Wesley,1999

3. Kogent Solutions Inc., "Java 6 Programming Black Book", Dreamtech Press, 2007

4. David Flangan, "Java in a Nutshell", Oreilly Publications, 2005

COMPUTER NETWORK

Paper Code: MCA-104

Networking Fundamentals

Introduction, Data & Information, Data Communication-Characteristics of Data Communication, Components of Data Communication, Data Representation, DataFlow- Simplex, Half Duplex, Full Duplex, Computer Network- Categories of a network, Protocol- Elements of a Protocol, Networking Standards, Reference Models- OSI Model, TCP/IP Model, Comparison of OSI and TCP/IP Model

The Physical Layer

Transmission Media- Guided & Unguided, PSTN: Structure of the Telephone System, Data & Signals Data types, Signal types- Analog & Digital, ModulationTechniques, Modem, Cable Modem, Protocols: DSL, ISDN.

The Data Link Layer Design Issues

Framing, Error Control-Error Detection and Correction, Flow Control, Protocols:FDDI, CDDI, Frame Relay, ATM, 802.11, PPP, HDLC.

The Network Layer

Design Issues, Routing Algorithms: Link State Routing, Distance Vector Routing,Flooding, Routing Protocols: RIP, IGRP, EIGRP, OSPF, Internetworking: Tunneling, Fragmentation, IPV4, IPV6 Basics, BGP. The Transport Layer
Protocols: UDP, TCP, Headers

The Application Layer

DNS: The DNS Name Space, Name Servers-Mail: SMTP, POP3, HTTP, FTP, Telnet, Network Management: SNMP.

Network Security

Cryptography: Encryption, Decryption, Private/Public Key, Digital Signatures, SSL, Firewalls, PGP, S/MIME.

Text Books:

1. Andrew S.Tanenbaum, "Computer Networks", Prentice Hall, 5th Edition, January, 2013.
2. A. BehrouzForouzan, "Data Comm. & Netw.5e Global Ed (English)" , McGraw Hill Education (India) Private Limited, 5thEdition, 2013.

DATA STRUCTURE

Paper Code: MCA-106

DATA STRUCTURE: Basic data structures such as arrays, stack and queues and their Applications, linked and sequential representation. Linked list, representation of linked list, multi linked structures. Trees: definitions and basic concepts, linked tree representation, representations in contiguous storage, binary trees, binary tree traversal, searching insertion and deletion in binary trees, heap tree and heap sort algorithm, AVL trees. Graphs and their application, sequential and linked representation of graph adjacency matrix, operations on graph, traversing a graph, Dijkstra's algorithm for shortest distance, DFS and BFS, Hashing. Searching and sorting, use of various data structures for searching and sorting, Linear and Binary search, Insertion sort, Selection sort, Merge sort, Radix sort, Bubble sort, Quick sort, Heap Sort.

Suggested readings –

1. Data Structures Lipschutz Schaum's Outline, TMH
2. Data Structure & program design Kruse Pearson/PHI
3. Data Structures & Algorithms Trivedi, Gupta Ashirwad, Jaipur
4. Data Structures & Algorithms Khanna, Tulli, Chaturvedi Genius, Jaipur using C

Software engineering

Paper Code: MCA-108

Unit 1

Software Engineering Fundamentals Software Engineering - A layered Technology, The importance of software, software myths, software engineering paradigms, Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model Evolutionary Software Process Models: Incremental Model, Spiral Model Component Assembly Model, Formal Methods, Fourth-Generation Techniques

Unit 2

Analysis Concepts and Principles Analysis Concepts and Principles, the Elements of the Analysis Model Data Modifying, Functional Modeling and Information Flow and Behavior Modeling, Mechanics of Structured Analysis, Data Dictionary. Requirement analysis, tasks, analyst, software prototyping, specification principles, representation and the software requirements specification.

Unit 3.

Software Project Planning Software Project Planning, Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, The Putnam Resource Allocation Model, Risk Identification and Projection: RMMM, Project scheduling and Tracking. Software Design Process, Design Principles, and Design Concepts: Effective ModularDesign, Design Heuristics, Design Documentation, Design Methods: Data Design, Architectural Design, Interface Design, Human Computer Interface Design, Procedural Design. Case Study for Design of any Application Project.

Unit 4

Software Testing S/W Testing Fundamentals, White Box Testing, Black Box Testing, software testing strategies, verification and Validation, System Testing, Unit testing, Integration testing and Debugging. Software Maintenance Maintainability – maintenance Tasks, Characteristics of a good quality software. Case Study for Testing Techniques

Reference Books:

1. Grady Booch, James Rumbaugh, IvarJacobson.," The Unified Modeling Language User Guide", 2nd Edition, 2017.

2. James Rumbaugh. MichealBlaha "Object oriented Modeling and Design with UML", 2011.

3. Ali Behforooz, Hudson, "Software Engineering Fundamentals", Oxford, 2009. 4. Charles Ritcher, "Designing

PYTHON PROGRAMMING

Paper Code: MCA-110

Introduction and Overview

Introduction, What is Python, Origin, Comparison, Comments, Variables and Assignment, Identifiers, Basic Style Guidelines, Python Objects, Standard Types, Other Built-in Types, Internal Types, Operators, Built-in Functions, Numbers and Strings. Introduction to Numbers, Integers, Floating Point Real Numbers, ComplexNumbers, Sequences: Strings, Sequences, Strings, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings, Memory Management, Python Application Examples.

Lists and Dictionaries

Built-in Functions, List type built in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples, Introduction toDictionaries, Built-in Functions, Built-in Methods, Dictionary Keys, Conditionals

and Loops: if statement, else Statement, elif Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement

Object, Classes and Files

Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, Class variables, Inheritance, Polymorphism, Type Identification, File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, PersistentStorage Units

Regular Expression and Exception Handling

Regular Expression: Introduction/Motivation, Special Symbols and Characters forREs, REs and Python. What Are Exceptions? Exceptions in Python, Detecting andHandling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions

Database Interaction

SQL Database Connection using Python, Creating and Searching Tables, Reading and storing config information on database, Programming using database connections, Python Multithreading: Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading

Text Books:

1. R. NageswaraRao, "Core Python Programming", Dreamtech Press, 2nd Edition, 2018
2. Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, "Python Programming" , Notion Press, 1stEdition, 2020

Martin C. Brown, "The Complete Reference Python", McGraw Hill Education, 4thEdition, 2018

Business Informatics

Paper Code: MCA-112

Business Environment and Dependence on IT

Introduction to Business Informatics, Organizational Structure and Design, Dependence on Technology, Integrating Technology with Business Environment, IT and Corporate Strategy, Sustaining a Competitive Edge through application of ITin Management Functions.

E-Commerce

Definition, Objectives, Components, Advantages and disadvantages, Scope, E- Commerce Models, E-Commerce Opportunities for Industries, Growth of E- Commerce, e-Commerce Applications- E-Marketing, E-Customer Relationship Management, E-Supply Chain Management, E-Governance, E-Buying, E-Selling, E-Banking, E-Retailing.

E-Payments and Security issues in E-Commerce

Introductions, Special features, Types of E-Payment Systems (EFT, E-Cash, E-Cheque, Credit/Debit Card, Smart Card, Digital Tokens and Electronic Purses/

Wallets), Security risk of E-Commerce, Types of threats, Security Tools, CyberLaws, Business Ethics

ERP

Introduction, Needs and Evolution of ERP Systems, ERP Domain, ERP Benefits, ERP and Related Technologies, Relevance to Data Warehousing and Data Mining,ERP Drivers, Evaluation Criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement Phases, ERP Units, ERP Success & Failure Factors

Information Systems

Introduction, Categories of System: Open, Closed, Physical, Abstract, Dynamic, Static etc., Types of Information Systems: TPS, MIS, DSS, OLAP, OLTP, Expert

System, Internet Based Systems, Learning Management Systems, Business Process Re-Engineering.

Text Books:

1. Ravi Kalakota, “Electronic Commerce: A Manager's Guide”, Addison-Wesley Professional, Edition
2012.
2. Henry C. Lucas, Information Technology for Management, McGraw Hill, International Edition, July 2001.
3. Kenneth C. Laudon& Jane P. Laudon, Management Information System, Global Edition, Pearson Education, 2009.

ERP: A Managerial Perspective Book Description, Sadagopan S, Tata McGraw Hill, 2013

Java Technologies Lab

Paper Code: MCA-P-102

1. Simple java applications for understanding references to an instant of a class
2. Handling strings in JAVA
3. Package creation
4. Developing user defined packages in java
5. Use of Interfaces
6. Threads, Multithreading
7. Exception Handling
8. Dynamic HTML using Servlet
9. Use of get() and Post() methods
10. Cookies in Servlet
11. Session tracking and Management
12. JDBC
13. JSP Actions elements
14. Directives elements in JSP
15. JSP Tags
16. Implement JDBC with JSP
17. Implement JDBC with Servlet

Applications using Spring Web MVC

Data Structures Lab

Paper Code: MCA-P-106

Lab Experiments

1. Array implementation of Stack and Queue
2. Linked list implementation of List, Stack Queue
3. Array implementation of QUEUE
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues.
9. Graph representation and Traversal algorithms
10. Applications of Graphs

Implementation of searching and sorting algorithms

PYTHON PROGRAMMING Lab

Paper Code: MCA-P-110

Lab Experiments

1. Implement a sequential search
2. Create a calculator program
3. Explore String Functions
4. Implement Selection Sort
5. Implement Stack
6. Read and Write into a file
7. Demonstrate usage of basic regular expression
8. Demonstrate use of advanced regular expressions for data validation
9. Demonstrate use of List
10. Demonstrate use of Dictionaries
11. Create Comma separate files(CSV), Load CSV files into internal data structure

Write script to work like a SQL SELECT statement for internal data structure

III Semester

COMPUTER GRAPHICS

Paper Code: MCA-201

Introduction

Elements of graphics workstation. Video Display Devices.Raster Scan Systems. Random Scan systems. Input devices. Graphics Software Coordinate Representations, Fundamental Problems in Geometry.

Algorithms

Line drawing algorithms- DDA Algorithm. Bresenham's Line Algorithm. Frame buffers. Circle and Eclipse generating algorithms. Midpoint Circle Algorithm. Sean-line polygon fill algorithm. Inside-Outside tests. Sean- Line fill of curved Boundary Areas. Boundary fill Algorithm. Flood fill Algorithm. Character generation. Attributes of lines, curves, filling, characters. etc.

Graphics Primitives

Primitive Operations, The display file interpreter-Normalized Device Coordinates. Display- File structure. Display – file algorithm. Display control and Polygons- polygon representation.

Attributes of output primitives

Line attributes - Line type. Line width. Pen and Brush options. Line Color. Color and gray scale levels. Color-tables. Gray scale. Area- Fill Attributes- Fill styles. Pattern fill. Soft fill. Character Attributes. Text attributes

Geometric Transformations

Matrices. Scaling Transformations. Sin and Cos Rotation. Homogeneous Co-ordinates and Translation. Co-ordinate Translations. Rotation about an arbitrary point. Inverse Transformations, Transformations Routines.

2-D Viewing

The viewing pipeline. Viewing co-ordinate, Reference Frame. Windows to view ports . co- ordinate transformation 2-D Viewing functions. Clipping operations point clipping. Line clipping. Cohen-Sutherland. Line Clipping. Polygon clipping. Sutherland Hodge man clipping.

3-D concepts

Three dimensional Display Methods Parallel projection. Perspective projection. Visible line and surface identification. Surface rendering. Three Dimensional Object representations.Bezier curves and surfaces. B-Spline curves and surfaces. Visibility, Image and object precision Z- buffer algorithm.

Floating horizons.

Computer Animation

Design of Animation Sequences. General Computer Animation Functions-Raster Animations. Key Frame Systems. Morphing Simulating Accelerations. Motion Specifications. Kinematicsand Dynamics.

Text Books:

1. Donald Hearn & M. Pauline Baker, “Computer Graphics”, Pearson , 2008
2. James D. Foley, Andries van Dam, Steven K. Feiner & John F. Hughes, “ Computer Graphics: Principles and Practice”, 1997

References:

1. Jeffrey J. McConnell, “Computer Graphics: Theory and Practice”, Jones and Bartlett Publishers, 2006
2. John DiMarco, “Computer Graphics and Multimedia Applications, Problems and Solutions”, Idea Group Publishing, 2004

Theory of Computation

Paper Code: MCA-203

Review of basic concepts

Graphs, Trees, Strings, Mathematical Induction, finite State Machine, types of languages and Grammars. Overview of Theoretical Computer Science (including computationally intractable problems) , Introduction to System software including various phases / Modules inthe design of a typical compiler , Chomsky Classification.

Finite Automata

Finite Automata, Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA),statement of Kleen's Theorem, Regular Expressions, Equivalence of DFAs, NFAs and Regular Expressions, Closure properties of Regular Language, Non-Regular Languages,Pumping Lemma. Myhill Nerode Theorem, Use of Regular expressions in the Design of scanner (lexical analyzer). Introduction to JFLAP Simulation.

Context Free Languages

Context Free Grammar (CFG), Parse Trees, Push Down Automata (deterministic and nondeterministic) (PDA), Equivalence of CFGs and PDAs, Closure properties of CFLs,Pumping Lemma, Parsing (including LL(1) , SLR and LR(1) Parsing Method).

Turing Machines and Computability Theory

Definition of Turing Machine, Extensions of Turing machines, Non – deterministic Turing machines, Equivalence of various Turing Machine Formalisms, Church – Turing Thesis, Decidability, Halting Problem, Reducibility, Recursion Theorem.

Complexity Theory

Time and Space measures, Hierarchy theorems, Complexity classes P, NP, space complexity ,Savich theorem , L, NL, PSPACE complexity , Post correspondence problem, Probabilistic computation.

Text Books:

1. John C. Martin, “Introduction to Languages and the Theory of Computation”,McGraw-Hill, 2003
Michael Sipser, “Introduction to the Theory of Computation”, Cengage Publication,2003
2. Wayne Goddard, “Introducing the Theory of Computation”, Jones & Bartlett India Pvt.Ltd, 2009.

Advanced Database System

Paper Code: MCA-205

Object Oriented Database Management System

Introduction, Object-Oriented Data Model, Object Oriented Languages, Persistent Programming Languages. Object-Relational Databases: Nested Relations, Complex Types, Inheritance, Reference Types, Querying with Complex Types, Functions and Procedures Storage for Object Databases.

Distributed Databases
Introduction, Advantages, Architecture, Homogeneous & Heterogeneous DDBMS, Distributed Data Storage (Fragmentation & Replication), Distributed Transactions, Commit protocol, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing

Parallel Databases
Introduction,Architecture, I/O Parallelism and Skew, Interquery Parallelism, IntraqueryParallelism, Intraoperation Parallelism (Parallel Sort, Parallel Join), Interoperation Parallelism, Design of Parallel Systems

PL/SQL
PL/SQL basics, blocks, architecture, variables, constants, attributes, character set, PL/SQL control structure, data types, precompiler, conditional and sequential control statements,cursors, exceptions, triggers, procedures and packages.

Introduction to Advanced Database Concepts
Spatial Data Management, Web Based Systems, Multimedia databases, Mobile Database, Deductive Database and Recursive Queries, Information Retrieval and Indexing for Text Search, XML Database, XML Data Model, Xquery, Efficient Evaluation of XML Queries

Text Books:

1. Raghu Ramkrishnan, Johannes Gehrke , "Database Management Systems", McGraw Hill International, 2007
2. Abraham Silberschatz, Henry Korth, S, Sudarshan,, "Database System Concepts", McGraw Hill International, 2005
3. C.J.Date, Longman, "An Introduction to Database System", Pearson Education, 2003

References:

2. Elmasri R and Navathe SB, "Fundamentals of Database Systems", Addison Wesley, 2000.
3. Thomas Connolly, Carolyan Begg,, "Database Systems,: A Practical Approach to Design, Implementation and Management, Addison Wesley, 2014

Cyber Security and Cryptography

Paper Code: MCA-207

Cyber Security Program at Post Graduate Level			
Module	**Module Name**	**Module Contents**	**Learning Outcome**
Practical	1. Platforms for reporting cyber crimes. 2. Checklist for reporting cyber crimes online.		
Module-III	Cyber Law	Cyber crime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies.	Students after completing this module will be able to understand the legal framework that exist in Indiafor cyber crimes and penalties and punishments for such crimes, It will also expose students to limitations of existing IT Act,2000 legal framework that is followed in other countries and legal and ethical aspects related to new technologies.
Module IV	Data Privacy and Data Security	Defining data, meta-data, big data, non-personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues.	After completing this module ,students will understand the aspects relate d to personal data privacy and security. They will also get insight into the Data Protection Bill,2019 and data privacy and security issues relate

			dto Social media platforms.
Practical	1. Setting privacy settings on social media platforms. 2. Do's and Don'ts for posting content on Social media platforms. 3. Registering complaints on a Social media platform.		

Cyber Security Program at Post Graduate Level			
Module	**Module Name**	**Module Contents**	**Learning Outcome**
Module V	Cyber security Management, Compliance and Governance	Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.	Students after completing this module will understand the main components of cyber security plan. They will also get insights into risk-based assessment, requirement of security controls and need for cyber security audit and compliance.
Practical	1. Prepare password policy for computer and mobile device. 2. List out security controls for computer and implement technical security controls inthe personal computer. 3. List out security controls for mobile phone and implement technical security controlsin the personal mobile phone. 4. Log into computer system as an administrator and check the security policies in thesystem.		
References	1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. 2. Information Warfare and Security by Dorothy F. Denning, Addison Wesley. 3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities byHenry A. Oliver, Create Space Independent Publishing Platform. 4. Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram,CRC Press. 5. Information Security Governance, Guidance for Information Security Managers by W. KragBrothy, 1st Edition, Wiley Publication. 6. Auditing IT Infrastructures for Compliance By Martin Weiss, Michael G. Solomon,2nd Edition, Jones Bartlett Learning.		

Mobile Application on Development

Paper Code: MCA-209

INTRODUCTION

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications, Basics of embedded systems design –Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures.

ADVANCED DESIGN

Designing applications with multimedia and web access capabilities Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications – Achieving quality constraints – performance, usability, security, availability and modifiability.

TECHNOLOGY I ANDROID

Establishing the development environment, Android architecture, Android Application structure, Emulator- Android virtual device, UI design, Fragments, Activity, Services, broadcast Receiver, Intents/Filters, Content provider- SQlite Programming , SQlite Open Helper, SQlite Database, Interaction with server side applications.

Advanced ANDROID

Using Google Maps, GPS and Wi-Fi Integration, Android Notification, Audio manager, Bluetooth ,Camera and Sensor integration, Sending SMS, Phone Calls. Publishing Android Application.

TECHNOLOGY II IOS

Introduction to Objective C, iOS features UI implementation Touch frameworks Data persistence using Core Data and SQLite, Action and Outlets, Delegates, Storyboard, Location aware applications using Core Location and Map Kit , Integrating calendar and address book with social media application Using Wifi iPhone marketplace.

Text Books:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
2. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”,DreamTech, 2012

References:

1. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.
James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
2. Paul Deitel ,Harvey Deitel, Abbey Deitel and Michael Morgano “Android for Programmers An App- Driven Approach” ,Pearson, 2013

Data Mining and Warehousing (elective paper)

Paper Code: MCA-211A

Data Warehousing: Introduction, Definition, Multidimensional data transformation, OLAP operations, Ware house schema, Ware house Server, Other features. Data Mining: Introduction, Definition, KDD vs. DM, DBMS vs. DM, DM Techniques, Issues and Challenges in DM, DM Applications. Association Rules: A Prior Algorithm, Partition, Pincer search, Incremental, Border, FP-tree growth algorithms, Generalized association rule.

Classification: Parametric and non-parametric technology: Bayesian classification, two class and generalized class classification, classification error, Decision boundary, Discriminate functions, Non-parametric methods for classification.

Clustering: Hierarchical and non-hierarchical techniques, K-MEDOID Algorithm, Partitioning, Clara, Clarans. Advanced Hierarchical algorithms

Decision Trees: Decision tree induction, Tree pruning, Extracting classification rules fromdecision trees, Decision tree construction algorithms, Decision tree construction withpresorting.

Techniques for Data mining: Introduction, Learning, Neural Networks, Data mining using neural networks, Genetic algorithms. Web Mining: Web mining, Text mining, Content mining, Web structure mining. Searching Techniques: Optimal, non-optimal, Min-max, α –β pruning.

Text Books:

1. Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP,McGrawHill, 2004
2. D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press, 2011
3. Jiawei Han, MichelineKamber, Data Mining: Concepts and Techniques, HarcourtIndia Pvt., 2011

References:

1. W. H. Innmon, Building the Data Warehouse, Wiley Computer Publishing, 2005

Information Protection and Security (elective Paper)

Paper Code: MCA-211B

Introduction

Introduction to Cryptography: Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, Security Services. Conventional Encryption: Classical Techniques, Conventional Encryption Model, and Stenography, Classical Encryption Techniques.

Modern Techniques:

Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation

Conventional Encryption Algorithms

Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, RC2 Placement & Encryption Function, Key Distribution, Random Number Generation, Placement Of Encryption Function. Public Key Encryption: Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm, Key Management, Fermat's & Euler's Theorem, Primality, The Chinese Remainder Theorem.

Hash Functions

Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.

Network & System Security

Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime, Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles,Trusted Systems.

Text Books:

1. Kaufman, c., Perlman, R., and Speciner, M., Network Security, PrivateCommunication in a public world, 2nd ed., Prentice Hall, 2002
2. Stallings, W., Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR, 2002

References:

1. Pieprzyk Josef and et.al; Fundamentals of Computer Security, Springer-Verlag, 2008.
2. Trappe & Washington, Introduction to Cryptography, 2nd Ed. Pearson.,2006

Soft Computing (Elective Paper)

Paper Code: MCA-211

Overview of Crisp sets and fuzzy sets : Basic concepts of crisp sets and fuzzy sets, Basic types of fuzzy sets, Fuzzy sets verses crisp sets, Representation and extension principle for fuzzy sets, Operations on Fuzzy sets

Fuzzy Relations and Fuzzy Logic: Crisp versus Fuzzy relations, Binary relations on fuzzy sets, Equivalence, compatibility and ordering relations, Morphisms and compositions of relations, Fuzzy relations equations, Fuzzy measures and possibility theory, Classical logic and multivalued logics, Fuzzy propositions and approximate reasoning

Fuzzy systems and neuro fuzzy systems : Relevance of integration between fuzzy sets and neural networks – pros and cons, Fuzzy neurons, Fuzzy neural networks, Neuro fuzzy systems, Fuzzy associative memories

Introduction to Genetic Algorithms : What are genetic algorithms?, Robustness of traditional optimisation and search methods, The Goals of optimisation, How are genetic algorithms different from traditional methods?, A simple genetic algorithm, Genetic algorithms at work – a Simulation by hand, Grist for the Search Mill – Important Similarities, Similarity Templates (Schemata), Learning the Lingo.

Genetic Algorithms Revisited : Mathematical Foundations, Who shall live and who shall die? The fundamental Theorem, Schema processing at work: An example by hand revisited. The two-armed and k-armed bandit problem, How many schemata are processedusefully?, The building block hypothesis, Another perspective: The minimal deceptive problem, Schemata revisited: similarity templates as hyper planes.

Computer Implementation of A Genetic Algorithm : Data Structures, Reproduction, Crossover, and mutation, A Time to reproduce, a time to cross, Get with the main program, How well does it work?, Mapping objective functions to fitness form, Fitness scaling, Codings, A multiparameter, Mapped, Fixed-Point coding, Discretization, Constraints

Introduction To Genetic-Based Machine Learning : Genetics-Based machine learning: whence it came, What is a classifier system?, Rule and message system, Apportionment of credit: The bucket brigade, Genetic algorithm, A simple classifier system in Pascal, Results using the simple classifier system

Text Books:

1. G. Klir and B. Yuan “Fuzzy Sets and Fuzzy Logic: Theory and Applications”, Prentice Hall of India, 1997.
2. B. Kosko “Neural Networks and Fuzzy Systems” A Dynamical Systems Approach

Computer Graphics Lab

Paper Code: MCA-P- 201

Objectives of the Laboratory

- The objective of this course is to get hands-on experience with graphics programming andimplementing the techniques learnt in the theory course.
- Students acquire knowledge about the basic concepts of 2D and 3D graphic functions. Theyalso learn various transformation and clipping techniques.

List of Experiments

1. Implementation of algorithms on line (DDA,Bresenham), circle (Mid-point)
2. Two Dimensional transformations- Translation, Rotation, Scaling, Reflection
3. Composite 2D Transformation
4. 2D Line Clipping- Cohen Sutherland
5. 3D Transformation- Translation, Rotation, Scaling
6. Color Fill Algorithms – Flood Fill, Boundary Fill
7. Drawing 2D & 3D objects
8. Generating images
9. Implementation of programs using following functions. Instructors will instruct students touse different given graphics functions in making graphics programs:
   circle, cleardevice, closegraph, drawpoly, fillpoly, imagesize, line, lineto, linerel, moveto, moverel, outtext, outtextxy, putimage, putpixel, rectangle, sector, setbkcolor, setcolor, setfillstyle, setlinestyle, getarccords, getbkcolor, getcolor, getdrivername, getimage, getmaxcolor, getmaxx, getmaxy, getpixel.

Mobile Application Development Lab

Paper Code: MCA-P- 209

LIST OF EXPERIMENTS

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Write an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of databases.
5. Develop an application that makes use of Notification Manager
6. Implement an application that uses Multi-threading
7. Develop a native application that uses GPS location information
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that makes use of RSS feed
11. Develop a mobile application to send an email.
12. Develop a Mobile application for simple needs (Mini Project)

IV Semester

Software Project Management
Paper Code-MCA -202

1. Introduction
a. What is project?
b. What is project Management
c. The role of project Manager
d. The project Management Profession
e. Project life cycle
2. Technology Context
a. A system view of project management
b. Understanding organizations
c. Stakeholder management
d. Project phases and the project life cycle
e. The context of information technology projects
3. Introduction
a. Developing the project schedule
b. Project management software tools
c. Developing the project budget
d. Finalizing the project schedule and budget
e. Monitoring and controlling the project
f. The project communications plan
g. Project metrics
h. Reporting performance and progress
i. Information distribution
4. The importance of project risk management
a. Risk management planning
b. Common sources of risk on information technology projects
c. Risk identification
d. Qualitative risk analysis
e. Quantitative risk analysis
f. Risk response planning
g. Risk monitoring and control
h. Using software to assist in project risk management
5. The importance of project procurement management
a. Planning purchase and acquisitions
b. Planning contracting

c. Requesting seller responses
d. Selecting sellers
e. Administering the contract
f. Closing the contract
g. Using software to assist in project management
h. Outsourcing
6. Change management
2
a. The nature of change
b. The change management plan
c. Dealing with resistance and conflict
7. Leadership & Ethics in Projects
a. Project leadership
b. Ethics in projects
c. Multicultural projects
8. Introduction
a. Project implementation
b. Administrative closure
c. Project evaluation

References:

1. Information Technology Project Management: Kathy Schwalbe Thomson Publication.
2. Information Technology Project Management providing measurable organizational value Jack Marchewka Wiley India.
3. Applied software project management Stellman & Greene SPD.
4. Software Engineering Project Management by Richard Thayer, Edward Yourdon WILEY INDIA

Elective paper

Principles of management and information system

Paper Code-MCA -204(a)

Block 1: Management Systems

Unit 1: Organisational Overview

- Oraganisation Types
  - Service, Business, Government, Social
  - Industry Types
- Organisational Structure
- Organisational Characteristics
  - Size
  - Location
  - Others
- Organisation functions
- Life cycle of organisation
- Vertical and horizontal organisations

Unit 2: Management Functions and Business Processes

- Overview of management Levels
- Business Processes
  - Sale and orders
  - Finance
  - Human resource
  - Production
  - Marketing
- Information systems requirements
- Requirement analysis
- Tools and methods for requirement analysis

Unit 3: Management Systems

- Management Systems Types
- Management Systems Requirements

- Levels of management activities
- Strategic level
- Management level
- Middle Management Level

Unit 4: Business values of Information System

- Impact of Information Systems
- Empirical studies
- Cost Value Performance
- Total cost of ownership
- Culture for Information Systems
- Decision management with Information Systems

Block 2: Information Systems

Unit 5: Portfolio Management and IT applications

- What is portfolio management
- Portfolio management methods
- Design and implementation of portfolio management
- Risk Management
- Disaster Management
- Portfolio management issues and challenges
- Tools and techniques
- Emerging technologies

Unit 6: Enterprise Information Systems

- Evolution of enterprise information Systems
- Enterprise Resource Planning
- Resource planning management
- ERP Market
- Supply Chain Management
- Customer Relationship Management
- E-CRM Systems

- Emerging technologies

Unit 7: Intelligence Information Systems

- Knowledge Management in organization
- Creating, developing & sharing Knowledge
- Artificial intelligence in business
- Business Analytics
- Business Intelligence
- Role of Business Intelligence
  - Sale and orders
  - Finance
  - Human resource
  - Marketing
- Business Intelligence Tools
- Business Intelligence reports

Unit 8: Social, Ethical and Legal Aspects

- Society in information age
- Moral dimensions and information age
- Technology trends and ethical issues
- Ethical principal and dilemma
- Responsibility, accountability and liability

Information right and acts

Machine Learning (Elective Paper)

Paper Code-MCA -204(b)

Unit-I:

Introduction-Towards Intelligent Machines, Well posed Problems, Example of

Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.

Unit-II:

Supervised Learning- Rationale and Basics: Learning from Observations, Bias and

Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metris for assessing classification.

Unit-III:

Statistical Learning- Machine Learning and Inferential Statistical Analysis,

Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.

Unit-IV:

Support Vector Machines (SVM)- Introduction, Linear Discriminant Functions for

Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly seperable data,Linear Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, Regression by Support vector Machines.

Learning with Neural Networks: Towards Cognitive Machine, Neuron Models, Network

Architectures, Perceptrons, Linear neuron and the Widrow-Hoff Learning Rule, The error

DATA SCIENCE WITH R (Elective Paper)

Paper Code-MCA -204(c)

Unit Details

1. Introduction to R Environment

 History and development of R Statistical computing programming language.

 Installing R and R studio.

 Getting started with R.

 Creating new working directory.

 Changing existing working directory.

 Installing the available packages.

 Calling the installed packages,

 Variable definition in R.

 Simple functions, vector definition and logical expressions

 Matrix calculation and manipulation using matrix data types.

2.Data Structures and Control Statements

 Introduction to different data types, vectors, atomic vectors, types and tests, coercion, lists, list indexing,

 Function applying on the lists, adding and deleting the elements of lists, attributes, name and factors, matrices and arrays,

 Matrix indexing, filtering on matrix, generating a covariance matrix.

 lapply( ) and sapply( ) on data frames,

 Control statements.

3.I/O operations and String Manipulations

Introduction to I/O functions in R • Using of scan( ), readline ( ) function,

Comparison and usage of scan and readline function, • Reading different format files into R: text file, CSV file • Statistical package files, xls and xlsx files. • Converting from one format to another using in built function, • Writing different file format in to the local machine directory, • Basics of string manipulations – grep ( ), nchar ( ), paste( ), sprintf( ), substr( ), regexpr( ), strsplit( ), • Testing of file name with given suffix

4. R for Summary Statistics and Parametric Tests

Descriptive statistics – summary statistics for vectors, making contingency tables, creating contingency tables from vectors. • Testing tables and flat table objects, cross tables, testing cross tabulation, recreating original data from contingency tables, switching class, mean (arithmetic, geometric and harmonic), • Median, mode for raw and grouped data, measure of dispersion – range, standard deviation, variance, coefficient of variation, testing of hypothesis – small sample test, large sample test – for comparing mean, proportion, variance (dependent and independent samples

5. Testing of Hypothesis: Non - Parametric Test

Introduction to graphs,

- Box-Whisker Plot, Scatter plots, pairs plots, line chart, Pie Chart,
- Bar Charts
- Non-parametric test: The Wilcoxon U-Test (Mann-Whitney): One and Two-Sample U-Test, Tests for

association: Chi Square Tests,

- Yates Correction for 2X2 Tables, single category goodness of fit tests,
- Analysis of Variance for one-way variation and two variation

RECOMMENDED STUDY MATERIAL:

Sr. No Book Author Publication

1. Beginning R: The statistical
Programming Language Dr. Mark Gardener John Wiley & Sons, Inc.
2. The art of R programming Norman Matloff no starch Press, San Francisco
3. Introduction to Probability and
Statistics for Engineers and Scientists
Owen Jones, Robert
Maillardet and
Andrew Robinson
CRC Press
4. The R Book Hadley Wickham CRC Press
5. Advanced R Ken Black Sixth Edition, John Wiley & Sons, Inc.

Paper Code-MCA -P-202

Seminar Presentation-I

Objective: To get in depth knowledge of the upcoming trends in the field of Computer Science. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his / her specialization.

Term Paper Presentation:

- Research work / Technical Learning must be done individually.
- Final Evaluation will be done by evaluating the electronic Presentation and the printed report
- The semester end assessment of Seminar Presentation shall be on the basis of Presentation/Seminar Report and Viva Voice.

General Instructions for Preparation of Seminar Presentation Report

The Report should broadly include the following heads / subheads

1. Introduction

1.1 Cover Page
1.2 Title Page
1.3 Certificate
1.4 Acknowledgement
1.5 Table of Contents

2. Research / Technology Description

2.1 Overview/ Introduction
2.2 Objective & Scope of the study
2.3 Description of the Technology

3. Drawbacks and Limitations
4. Proposed Enhancements
5. Conclusion
6. Bibliography

SCHOOL OF HUMANITIES & SOCIAL SCIENCES

(SOHSS)RAFFELS UNIVERSITY, NEEMRANA

B.A. (GENERAL) (3 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
UNIVERSITY

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Vision: To evolve as an Institution of Excellence, where scholars develop informed and inquiring minds and broaden the frontiers of pure and applied knowledge.

Mission: In graining the capacity to us usher in change by discovering nurturing and expanding individual skills talents and interests while standing forth as leader and path breaker in their future carrier.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 To providing subjective and practical knowledge as well as developing practical solutions and connections between theory.

PEO 2 Hearten individual growth among the students and enhance their confidence by providing them an opportunity to become a part of science-industry.

PEO 3 To make Science subjects interesting through technically, scientifically and experimentally.

PEO 4 To develop problem-solving skills through practical applications and research

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduateswillbe able to

PO 1	Realizing human values.
PO 2	Becoming a responsible and dutiful citizen.
PO 3	Acquiring critical temper.
PO 4	Inculcating creative ability.
PO 5	Getting well acquainted with the historical events happened in India as well as in the world.
PO 6	Getting acquainted with social transactions, social relations, social formations, social control, social values and culture

PO 7	Working in NGOs and preparing for competitive exams
PO 8	Creating interest in basic Knowledge and major Knowledge in literature.
PO 9	Developing reading, writing, speaking and listening skills in language.
PO 10	To develop better understanding of societal norms and values.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The School of Humanities and Social Sciences, offers Three Year (comprising 6 semesters) Undergraduate Program in B A (Genral) with objective of empowering students to acquire all- inclusive understanding of Society, Literature, Political System and Economy. The students shall acquire the following skills and competencies.

Programme Specific Outcomes (PSO): B. A. (English)

PSO 1	Basic Knowledge of English as a language.
PSO 2	Major knowledge of English as Literature.
PSO 3	Advanced knowledge of English Grammar

PSO 4	Critical study of English literary studies
PSO 5	Relation between literature and real life.

Programme Specific Outcomes (PSO): B. A. (Geography)

PSO 1	Serving as a Geographer and Work as a teacher in colleges, schools and high schools.
PSO 2	Serving as conserver in forest, Soil, Agricultural Departments and Work in disaster and water resources management.
PSO 3	Serving in cargrapher in map making divisions of government.

Programme Specific Outcomes (PSO): B. A.(Economics)

PSO 1	Understanding how different degrees of competition in a market affect pricing and output.
PSO 2	Understanding the efficiency and equity implications of market interference, including government policy.
PSO 3	Developing research Knowledge in economics and also Developing the skill of data collection & use of sampling techniques in research.

Programme Specific Outcomes (PSO): B.A. (PoliticalScience)

PSO 1	Getting knowledge about political system of the nation.
PSO 2	Studying national and international political affairs.
PSO 3	Studying, from competitive examination point of view.

PSO 4	Understanding the government mechanism, its functions, duties and responsibilities.
PSO 5	Creating appropriate and efficient political leaders.

Programme Specific Outcomes (PSO): B. A.(Sociology)

PSO 1	Knowing the significance of social institution, caste system, religion, nationalism, integrity, equality and justice.
PSO 2	Getting the Knowledge of the works of social reformers all over the nation.
PSO 3	Ability to follow new stream of thoughts and theories of social thinkers.
PSO 4	Getting the deep Knowledge about various social groups like tribal community, women bulk etc.

PSO-PO Mapping

	PO										
PSO		1	2	3	4	5	6	7	8	9	10
	1	√	√	√							
	2	√	√		√	√			√	√	
	3	√	√	√	√	√			√	√	
	4	√	√	√	√	√			√	√	√
	5			√	√	√	√	√	√		√

Raffles University, Neemrana

School of Humanities and Social Sciences

Bachelor of Arts (B.A.)(General)

(For the Session 2021-2024)

First Semester

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
PS-101	Core Discipline	Principles of Political Science	06	20	20	60	100
ENG-101	Core Discipline	English Literature- Poetry & Short Stories	06	20	20	60	100

Compulsory Subjects

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
AE101	Ability Enhancement(Compulsory)	General English-1	02	20	20	60	100
AE102	Ability Enhancement(Compulsory)	Environmental Studies	02	20	20	60	100

Elective Subject

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
SOC-101/ECO-101	Elective	Introduction to Sociology/ Micro Economics	06	20	20	60	100

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

First Semester

I- Principles of Political Science (PS-101)

Course Outcomes:

1- To enumerate the concepts associated with Political Science.

2- To conceptualize the associated concepts of Political Science.

3- To Trace Origin of State concepts.

4- To understand different ideologies of political Science.

II- English Literature- Poetry & Short Stories (ENG- 101)

Course Outcomes:

1. Students will have exposure to the different forms of poetry.
2. Students will be able to understand Shakespearian sonnet and Petrarchan sonnet.
3. Students will gain insight into the development of British poetry.
4. Students will understand the socio political context of Elizabethan age to Modern age.

III- General English-1 (AE-101) (Ability Enhancement)

Course Outcomes:

1- Describe importance of Legal Language.

2- Identify the correct usage of grammar in legal drafting.

3- Draft documents for legal correspondence.

4- Analyse characters of literary texts.

5- Apply skills of interpreting poetry.

IV- Environmental Studies (AE- 102) (Ability Enhancement)

Course Outcome:

1. Learn how to use resources sustainably
2. Develop awareness towards resources conservation and take initiative towards conservation process.
3. Understand the importance of resources in our life.
4. Learn the importance of proper use of resources for sustainable development.

V-Introduction to Sociology (SOC-101)

Course Outcomes:

1. Students will have gained a solid understanding of the nature and scope of sociology as a discipline.
2. Students will recognize sociology as a scientific field of study and be able to distinguish it from common-sense thinking.
3. Students will develop a critical sociological perspective, enabling them to approach social phenomena scientifically and analytically.
4. Students will comprehensively understand the interrelationship between sociology and other social sciences, including social anthropology, psychology, and history.
5. Students will appreciate how sociology draws insights from and contributes to these related disciplines, fostering an interdisciplinary approach to the study of society.

VI-**Micro Economics (ECO-101)**

Course Outcomes:

1. Understand the demand and supply of goods in the market.
2. Understand the attitude of consumer and producer towards demand, supply and price structure of the market.
3. Learn about the different types of market structure and determination of price and output in different markets.
4. Able to understand the impacts of price and output structure of different markets.
5. Able to understand the concept of cost and revenue and its impact on the economy

CO-PO MAPPING

PS-101	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

ENG-101	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	3	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	3	2	2	1

AE-101	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	1	2	2	1

AE-102	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1
	CO6	2	2	1	2	1	2	1	2	1	2

SOC-101	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	√	2	2	1
	CO6	2	1	2	1	3	2	2	2	1	2

ECO-101	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

PSO-PO Mapping

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment Level*	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

(II semester)

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
PS-201	Core Discipline	Principles of Public Administration and Governance	06	20	20	60	100
ENG-201	Core Discipline	British Poetry, Prose and Drama from 16th to 18th Century	06	20	20	60	100

Compulsory Subjects

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
AE-201	Ability Enhancement(Compulsory)	General English-1	02	20	20	60	100

AE-202	Ability Enhancement(Compulsory)	Environmental Studies	02	20	20	60	100

Elective Subject

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
SOC-201/EC0-201	Elective	Sociology of Indian Society/ Macro Economics	06	20	20	60	100

I- Principles of Public Administration and Governance (PS-201)

Course Outcomes:

1. To enumerate the concepts associated with Public Administration.
2. To understand public and private administration.
3. To conceptualize the associated concepts of Public Administration and Governance.
4. To Trace Origin of the discipline public administration,
5. To understand different concepts of governance.

II- British Poetry, Prose and drama from 16th to 18th Century (ENG-201)

Course Outcomes:

1. Students will be able to differentiate between various forms of poetry, analyze poems in each, and understand how the choice of form influences British poetry's thematic and stylistic elements.
2. Students will have gained a deep understanding of William Shakespeare's "Hamlet," including its complex characters, themes, and historical context. They will be able to critically analyze and interpret the play, recognizing its enduring significance in British drama and world literature.
3. Students will have honed their analytical skills to interpret and appreciate short stories, as demonstrated in Charlotte Perkins Gilman's "The Yellow Wallpaper" and Katherine Mansfield's "Bliss."

III- General English- 1 (AE-201) (Ability Enhancement)

Course Outcomes:

1. Students can read and understand any text in English listening to the inputs given by the teacher in the classroom.

2. Students imbibe the rules of language unconsciously and tune to deduce language structure and usage.

3. Students write paragraphs, essays, and letters.

4. Students decipher the mechanism of language and use it for success in competitive examinations and job related speaking and writing tasks.

IV- Environmental Studies (AE 202) (Ability Enhancement)

Course outcomes:

1. Create awareness about preserving the environment
2. Define the basic rules and concepts of the ecology science.
3. Define the ecology of individual, population, community and ecosystem

V-**Sociology of Indian Society (SOC-201)**

Course Outcomes:

1. Students will understand about the Ancient concepts like Varna, Ashram system, Theory of Karma etc.
2. They will also learn about the cultural diversity prevalent in India, social institutions related with different religions and tribes, changes occurring in the Indian society through the process of Globalization, Liberalization etc. and some social issues and problems of the state of Chhattisgarh.
3. Develop a sociological imagination to make sense of the reality in a more comprehensive manner.
4. Provide basic knowledge of sociological concepts and methods and developing ability to identify the challenges in Sociological field of enquiry.

VI- Macro Economics (ECO-201)

Course Outcomes:

1. Understand the calculation of national income and its aggregates
2. Understand the forms and functions of RBI and commercial banking
3. Learn about the macroeconomic policies and their impact on the economy
4. Able to understand the impacts of changes in money supply

CO-PO MAPPING

PS-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ENG-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-202	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SOC-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ECO-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

(III semester)

Third Semester

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
PS-301	Core Discipline	International Relations	06	20	20	60	100
ENG-301	Core Discipline	British Prose and Novel from 19th to 20th Century	06	20	20	60	100

Compulsory Subject

Subject Code	Course Type	Subject	Credits	Marks 1A	MT	ET	Total
AE-301	Ability Enhancement(Compulsory)	Art of Communication	02	20	20	60	100
AE-302	Ability Enhancement(Compulsory)	Fundamentals of Computers	02	20	20	60	100

Elective Subject

Subject	Course Type	Subject	Credits	Marks

Code				1 A 20	M T 20	E T 60	Tota l 100
SOC-301/ECO-301	Elective	Classical Sociological Theory/ Public Finance and International Economics	06	20	20	60	100

I- International Relations (PS-301)

Course Outcome:

1. To equip students with study of international relations and understand about approaches, methods of International Relations
2. To give glimpse of important actors in international relations
3. To understand concepts of power and diplomacy for understanding international law
4. To give them idea about International Organizations.

II- British Prose and Novel from 19th to 20th Century (ENG-301)

Course outcome:

1. Students would have widened their idea about prose and novels of 19th an 20th century.
2. Students would have grasped the major theme of prose and novels that belong to 19th and 20th century.
3. Students would have understood the socio-political context of the period from 19th -20th century with particular reference to prose and novel.

III- Art of Communication (AE-301) (Ability Enhancement)

Course outcome:

1. The role of Business Communication in running a business and managing an organization.
2. Effective Communication is very important for the successful working of an organization.

3. Communication is both oral and written.
4. Students will be able to develop good and effective communication skills.

IV- Fundamentals of Computers (AE-302) (Ability Enhancement)

Course Outcome:

1. Understanding the concept of input and output devices of Computers
2. Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices.
3. Understand an operating system and its working, and solve common problems related to operating systems
4. Learn basic word processing, Spreadsheet and Presentation Graphics Software skills.
5. Study to use the Internet safely, legally, and responsibly

V- Classical Sociological Theory (SOC- 301)

Course Outcome:

1. Students understood history of social theory, social and political understanding of the society, thoughts of Karl Marx, Emile Durkheim, Max Weber, August Comte, Herbert Spencer
2. To make the student understand the sociological thoughts of Karl Marx, Emile Durkheim, Max Weber, August Comte, Herbert Spencer.
3. Students will be able to understand the history of social theory.

VI- Public Finance and International Economics (ECO- 301)

Course Outcome:

1. Understand working of financial system in an economy
2. Understand the types and effect of public expenditure and public revenue in an economy.
3. Learn about taxation system in India.
4. Able to understand the operation of international trade. Different theories of international trade.
5. Able to understand the concept of balance of trade

CO and PO Mapping

PS-301		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ENG-301		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-301		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-302	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SOC-301	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ECO-301	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	3	2	1	1	1	2	2	2	1

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

(IV semester)

Fourth Semester

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
PS-401	Core Discipline	Contemporary Models of Government	06	20	20	60	100
ENG-401	Core Discipline	British Poetry and Drama from 19th to 20th Century	06	20	20	60	100

Compulsory Subject

Subject Code	Course Type	Subject	Credits	Marks 1A	MT	ET	Total
AE-401	Ability Enhancement(Compulsory)	Art of Communication-1	02	20	20	60	100

AE-402	Ability Enhancement(Compulsory)	Fundamental of Computers-1	02	20	20	60	100

Elective Subject

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
SOC-401/EC0-401	Elective	Indian Social Problems/ Indian Economy	06	20	20	60	100

I- Contemporary Models of Government(PS-401)

Course Outcome:

1. Student will be able to compare different constitutions.
2. Student will be able to compare different governments.
3. Student will understand major Constitution.
4. Student will know about Indian Constitution.
5. Student will be able to understand salient features of world Major constitution.

II- British Poetry and Drama from 19th to 20th Century (ENG-401)

Course Outcome:

1. Students will have exposure to the different forms of poetry and drama.
2. Students will be able to understand dramatic monologue and war poetry
3. Students will gain insight into the development of British poetry.

III-Art of Communication-1 (AE-401) (Ability Enhancement)

Course Outcome:

1. Understanding different approaches to development, its problems and issues
2. Knowledge about characteristics of developing societies and finding gaps between developed and developing societies
3. Knowledge about meaning, concept, definition about several paradigms
4. Understanding the role of developmental and rural extension agencies in development
5. Understanding the role of media in development

IV- Fundamental of Computers-1 (AE-402)

e:

1. Converse in basic computer terminology
2. Formulate opinions about the impact of computers on society
3. Possess the knowledge of basic hardware peripherals
4. Know and use different number systems and the basics of programming
5. Solve basic computational problems with C language

V-I ndian Social Problems (SOC-401)

Course Outcome:

1. It enables students to understand various social problems that prevail in the Indian society.
2. The major problems like family disorganization, crime, juvenile delinquency, child labour and problems of aged possible are discussed and possible solutions are suggested
3. Students are able to understand concepts and theories underlying social problems in India and social problems.

VI-I ndian Economy (ECO-401)

Course Outcome:

1. Understand working of an economy
2. Understand the features and trends of Indian economy.
3. Learn about importance of agriculture, industries and services etc. in India.
4. Able to understand the operation of credit system in Indian agriculture.

CO-PO MAPPING

PS-401	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ENG-401	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-401	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-402	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SOC-401	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ECO-401	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

(V semester)

Fifth Semester

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
PS-501	Core Discipline	Western Political Thought	04	20	20	60	100
ENG-501	Core Discipline	Indian English Literature	04	20	20	60	100
ECO-501/SOC-501	Core Discipline	Statistics/ Classical Sociological Theories	04	20	20	60	100
RM-501	Core Discipline	Research Methodology	04	20	20	60	100

Compulsory Subject

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
AE-501	Compulsory	Ethics and Human Values	02	20	20	60	100

I- Western Political Thought (PS-501)

Course Outcome:

1. To understand the salient features of Greek and Medieval Political thought.
2. Evaluate Plato's theory of education, communism and justice. Analyse Aristotle's Classification of governments and his concept of State.
3. To learn about the Machiavellian theory of State-Craft.
4. To Describe the Social Contract Theory, utilitarianism and Marxism.

I- ndian English Literature (ENG-501)

Course Outcome:

1. Students would have widened their idea about different genres of Indian English Literature.
2. Students would have grasped the major theme of poetry, novel, short story and novellas that belong to Indian Writings in English.
3. Analyse how the sociological, historical, cultural and political context impacted the texts selected for study.
4. Evaluate critically the contributions of major Indian English poets, dramatists, and novelists.

III- Statistics (ECO-501)

Course Outcome:

1. Understand basic calculation of different statistical measures.
2. Understand the use of different methods of statistics in real world.
3. Students will summarize data visually and numerically.
4. Students will build and assess data-based models.
5. Students will learn and apply the tools of formal inference.
6. Students will execute statistical analyses with professional software.

IV- Classical Sociological Theories (SOC-501)

Course Outcome:

1. It enables the learners to understand social thought and sociological theories.
2. The founding fathers of sociology and their contribution for the development of sociology as an independent science
3. Students understood Major Sociological Perspectives.

V- Research Methodology (RM-501)

Course Outcome:

1. Students who complete this course will be able to understand and comprehend the basics in research methodology and applying them in research/ project work.
2. This course will help them to select an appropriate research design.
3. With the help of this course, students will be able to take up and implement a research project/ study.
4. The course will also enable them to collect the data, edit it properly and analyse it accordingly. Thus, it will facilitate students' prosperity in higher education.
5. The Students will develop skills in qualitative and quantitative data analysis and presentation.
6. Students will be able to demonstrate the ability to choose methods appropriate to research objectives.

VI- Ethics and Human Values (AE- 501)

Course Outcome:

1. Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
2. Identify the multiple ethical interests at stake in a real-world situation or practice
3. Articulate what makes a particular course of action ethically defensible
4. Assess their own ethical values and the social context of problems
5. Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
6. Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work

CO-PO MAPPING

PS-501	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ENG-501	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-501	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-502	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SOC-501	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ECO-501	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

(VI semester)

Sixth Semester

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
PS-601	Core Discipline	Indian Social and Political Thinkers	04	20	20	60	100
ENG-601	Core Discipline	Literary and Critical Movements, Critical Terms and Practical Criticism	04	20	20	60	100
SOC-601/ECO-601	Core Discipline	Mathematical Economics/Classical Sociological Thinkers	04	20	20	60	100
DSOHSS	Core Discipline	Dissertation (Inter-disciplinary topic)	04	20	20	60	100

Compulsory Subject

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
AE-601	Compulsory	Gender Studies	02	20	20	60	100

I-Indian Social and Political Thinkers (PS-601)

Course Outcome:

1. To develop a general understanding of Indian Political Thinkers.
2. To discuss the basic concepts of state, sovereignty, liberty, equality, rights and justice which are summarise and explained by Indian Political and Social Thinkers.
3. To assess the applications and practices of thought of Indian Political Thinkers.
4. To compare traditional idea of state with modern political system in day-to-day life.

II- Literary and Critical Movements, Critical terms and Practical Criticism (ENG-601)

Course Outcome:

1. Students would have widened their idea about American Literature
2. Students would have grasped the major theme of works of American Literature

III Classical Sociological Thinkers (SOC- 601)

Course Outcome:

1. It enables the learners to understand social thought and sociological theories.
2. The founding fathers of sociology and their contribution for the development of sociology as an independent science
3. Students understood Major Sociological Perspectives.

IV- Mathematical Economics(ECO-601)

Course Outcome:

1. Understand basic calculation of different mathematical measures.
2. Students will able to understand economics better and numerically.
3. Students will build and assess data-based models.

I- Dissertation (Interdisciplinary)(DOSSHS)

Course Outcome:

1. Research Proficiency: Students will demonstrate a high level of proficiency in conducting independent research, including the ability to formulate research questions, design appropriate

methodologies, and collect and analyze data effectively.

2. Critical Thinking and Analysis: Students will develop advanced critical thinking skills, enabling them to critically evaluate existing literature, synthesize information from multiple sources, and offer well-founded arguments and insights within their chosen field of study.
3. Writing and Communication Skills: Through the process of dissertation writing, students will refine their academic writing and communication skills, ensuring the ability to articulate complex ideas and findings clearly and concisely, adhering to academic conventions and standards.
4. Original Contribution: Students will be able to make an original contribution to knowledge within their chosen subject area, either by extending existing research or by addressing a previously unexplored aspect of their field.

II- Gender Studies (AE 601)

Course Outcome:

1. Identify and analyze the links among gender, sexuality, identity, power, and social justice
2. Identify and analyze intersections among gender and sexuality and other categories of difference, such as class, race, religion, nationality, and physical ability
3. Situate gender and sexuality in broader historical and geopolitical contexts
4. Write or otherwise present (depending on field of study) analyses of gender and sexuality in specific works (visual, literary, theoretical)
5. Design and execute a senior project that demonstrates these competencies within a theoretical framework of gender and sexuality

CO-PO MAPPING

PS-601	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ENG-601	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SOC-601	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	2	2	2	1

ECO-601	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	2	2	2	1

AE-601	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	2	2	2	1

DOHSS-601	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	2	2	2	1

B.A General Syllabus

(2022-2025)



Department of Humanities and Social Sciences

RAFFLES UNIVERSITY
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RAFFLES UNIVERSITY

B.A (General)
POLITICAL SCIENCE
1st Semester

Unit-I: Introduction
Political Science: meaning Definition Nature and Scope
Relationship of Political Science with History, Economics and Sociology
Methods of Political Science: Historical, Comparative and Philosophical
Modern Approach to Study of Political Science: Behavioral and System

Unit-II: The Concept of State
The State: Meaning, Definition and Elements
Theories of Origin of State: Social Contract (Hobbes, Locke, Rousseau) and Evolution Theory
Sovereignty: Meaning Characteristics and Theories (Monistic and Pluralist)
Law: Meaning, Definition, Sources and Kinds

Unit-III: Concepts of Political Theory
Liberty: Meaning and Dimentions (Negative and Positive)
Equality: Meaning, Dimension and Kinds
Justice: Meaning and Dimensions: Procedural and Substances
Right: Meaning and Kinds for Natural Rights Political Rights and Legal Rights

Unit-IV: Post-Modern Theory
Feminism
Ecologism
Communalism
Post-Modernism

Reading list

1. A. Leftwich, *what is politics: the Activity and Its Study*, Polity, 2004.
2. John Hoffman and Paul Graham, *Introduction to Political Theory*, Pearson (latest edition).
3. Barrie Axford et. al., *Politics: An Introduction*, Routledge (latest edition)
4. Ernest Barker, *Principles of Political and Social Theory*
5. Harold A. Laski, *Grammar of Politics*
6. J.W. Garner, Political Science and Government
7. Catriona McKinnon, Issues in Political Theory, Oxford 2008.
8. Sushila Ramaswamy, Political Theory: Ideas and Practices, Macmillan (latest edition).
9. O.P. Gauba, *An Introduction to Political Theory*, 5th edition, Macmillan.

English (ENG-101)
Semester- 1st
Introduction to British Poetry
UNIT-1
Forms of Poetry- Sonnet, Elegy, Epic, Ballad, Lyric, Ode
UNIT-2
Stanza Forms- The Heroic Couplet, The Blank Verse, The Spenserian Stanza, Terza Rhyme
UNIT-3
William Shakespeare: Sonnet no. 116 John Donne: Canonization Michael Drayton: Since There's No Help Left
UNIT-4
William Blake: A Poison Tree William Wordsworth: The World is Too Much With Us P.B. Shelley: Ozymandias
Recommended
Readings:
1) Blamires, Harry. A Short History of English Literature. Routledge,2003. 2) Bradbury, Malcolm and James McFarlane. Modernism: A Guide to European Literature (1890-1930). Penguin, 1978. 3) Ellman Richard and C. Fidelson, eds. The Modern Tradition: Background of Modern Literature. OUP, 1965. 4) Fraser, G.S. The Modern Writer and His World. Penguin Books, 1964

RAFFLES UNIVERSITY

Micro Economics (ECO 101)

Semester- I

Micro Economics

UNIT-I –

Introduction Nature and Scope of economics. Methodology- micro and macroeconomics, Positive and normative, static and dynamic, Problem of scarcity and choice: scarcity, choice and opportunity cost; production possibility frontier; economic systems.

UNIT-II – Demand and Supply Demand, Law of Demand, Demand Function, Determinant of Demand, Individual and Market Demand, Elasticity of Demand: Price, Income and Cross Elasticity od Demand. Supply, Law of Supply, Individual and Market Supply, Determinants of Supply, Elasticity of Supply. Factors Affecting Price Elasticity of Demand, Substitute and Complementary Goods.

UNIT-III – Theory of Consumer Behaviour Utility Analysis: Cardinal and Ordinal (Indifference Curves, Budget Line, Consumer's Equilibrium, Price Effect, Substitution Effect, Income Effect, Normal, Inferior and Giffin Goods), Consumer's Equilibrium.

UNIT-IV – Theory of Production, Cost and Market Structure Production Function, Law of Variable Proportion, Three Stages of Production Function. Law of Returns to Scale, Iso-Quant and Iso-Cost, Optimum Factor Combination Theory. Theory of Cost, Short Run and Long Run Cost Curves. Market Structure; Perfect Competition (Basic Features, Short Run and Long Run Equilibrium), Monopoly; (Basic Features, Short Run and Long Run Equilibrium, Comparison with Perfect Competition), Price Discrimination, Monopolistic Competition (Basic Features, Short Run and Long Run Equilibrium)

References:

1. Principles of Microeconomics by Gregory Mankiw

2. Salvatore, D. 2003. Microeconomics; Theory and Applications. Oxford University Press, New Delhi.

3. Principles of Microeconomics by H.L.Ahuja., S.Chand Publication. Latest Edition.

RAFFLES UNIVERSITY

SOCIOLOGY (SOC-101)

SEMESTER-1st

Introduction to Sociology

1. *Sociology: Discipline and Perspective*
   - Nature and Scope of Sociology
   - Sociology as a science
   - Sociology and Common Sense

2. *Sociology and Other Social Sciences*
   - Sociology and Social Anthropology
   - Sociology &Psychology
   - Sociology &History

3. *Basic Concepts*
   - Individual and Group
   - Associations and Institutions
   - Culture and Society
   - Social Change

Readings:

1. A. Beteille : Sociology—Essays on Approach and Method (OUP)
2. Alex Inkeles: What Is Sociology?
3. Alex Thio: Sociology
4. Andre, Beteille, 2009, *Sociology: Essays in Approach and Method,* Delhi: OxfordUniversity Press, Chapter 1, 'Sociology and Common Sense', Pp. 13-27
5. Anthony Giddens : Sociology
6. G. Rocher: A General Introduction to Sociology
7. George Ritzer : Encyclopaedia of sociology
8. Gilles Ferreol& Jean-Pierre Noreck: An Introduction to Sociology(PHI Learning)
9. Gordon Marshal : Dictionary of Sociology (OUP)
10. Harry M. Johnson : Sociology
11. Henry Tischler: Introduction to Sociology
12. J Ross Eshleman& B.G. Cashion: Sociology an Introduction
13. M. Haralambas&R. M. Heald: Sociology Themes and Perspectives.
14. P. Worsely: New Introducing Sociology
15. T. Bottomore : Sociology—A Guide to Problems and Literature

RAFFLES UNIVERSITY

Geography (GEO-101)

Semester- 1st

PHYSICAL GEOGRAPHY

UNIT-I:

PHYSICAL GEOGRAPHY Definition and Scope; Components of Earth System.

UNIT-II:

ATMOSPHERE Heat Balance; Global Circulation Pattern; Tropical Cyclones; Monsoon; Climatic Classification (Koppen).

UNIT-III:

LITHOSPHERE Internal Structure of Earth based on Seismic Evidence; Plate Tectonics and its Associated Features.

UNIT-IV:

FLUVIAL CYCLE OF EROSION Davis and Penck.

UNIT-V: HYDROSPHERE Hydrological Cycle; Ocean Bottom Relief Features; Tides and Currents.

REFERENCE:

1. Conserva H. T., 2004: Illustrated Dictionary of Physical Geography, Author House, USA.

2. Gabler R. E., Petersen J. F. and Trapasso, L. M., 2007: Essentials of Physical Geography (8th Edition), Thompson, Brooks/Cole, USA.

3. Garrett N., 2000: Advanced Geography, Oxford University Press.

4. Goudie, A., 1984: The Nature of the Environment: An Advanced Physical Geography, Basil Blackwell Publishers, Oxford.

5. Hamblin, W. K., 1995: Earth's Dynamic System, Prentice Hall, N.J.

6. Husain M., 2002: Fundamentals of Physical Geography, Rawat Publications, Jaipur.

7. Monkhouse, F. J. 2009: Principles of Physical Geography, Platinum Publishers, Kolkata.

8. Strahler A. N. and Strahler A. H., 2008: Modern Physical Geography, John Wiley & Sons, New York.

RAFFLES UNIVERSITY

POLITICAL SCIENCE

2nd Semester

Principles of Public Administration and Government

Unit-I: FOUNDATION OF PUBLIC ADMINISTRATION

Meaning, Nature Scope and Significance of Public Administration;
Evolution of the Discipline and its present status; Difference between Public and Private Administration
New Public Administration and its characteristics; New Public Management and its characteristics. New Public Services and Good Governance
Relationship of Public Administration with Political Science, Law, Economics, Sociology and Psychology

Unit-II: ORGANISATION PF PUBLIC ADMINISTRATION AND ADMINISTRATIVE BEHAVIOUR

Principles of Hierarchy Unity of Command, Span of Control Division of Labor and Centralization or Decentralization;
Line,Staff and Auxiliary agencies: Definition and Distinction.
Decision Making: Meaning, Process, Types and Conditions Decision Making.
Communication: Meaning, Process, Channels and Barriers of Communication

Unit-III: The Concept of Government

Government: Definitional Characteristic
Legislature: Meaning and Types
Executive: Meaning and Functions
Judiciary: Importance and Functions

Unit-III: THEORIES OF ORGANISATION (Classical or Neo-Classical)

Scientific Management theory of F.W. Taylor
Bureaucratic Theory of Max Weber
Administrative theory or Classical Theory
Herbert Simon's Decision Making Theory

Unit-IV: GOVERNANCE: CONCEPTAND DEVELOPMENT

Role of State in the Era of Globalisation
State, Market and Civil Society
Changing Dimensions of Development Strengthening Democracy through Good Governance
Democratic Decentralisation People's Participation in Governance

English (ENG-201)

Semester- 2nd

Introduction to British Drama

UNIT-1

Forms of Drama- Tragedy, Comedy, History, Romance

UNIT-2

William Shakespeare: Hamlet

UNIT-3

GB Shaw: Pigmalion

UNIT-4

Harold Pinter: Birthday Party Recommended

Readings:

1) Bradley, AC. Shakespearean Tragedy: Lectures on Hamlet, Othello, King Lear, Macbeth. Penguin, 1991.

2) Elam, Keir. The Semiotics of Theatre and Drama. Routledge, 2002.

3) Evans, G. Blakemore, ed. Elizabethan-Jacobean Drama: The Theatre in Its Time. New Amsterdam Books, 1998.

4) Sanger, Keith. The Language of Drama. Routledge, 2001

Macro Economics (ECO 201)

Semester- II

Macro Economics

UNIT-I –

Introduction Introduction, nature and scope, Difference between Micro and Macro Economics, Various macroeconomics Concepts: Stock, Flow, Endogenous and Exogenous variables.

UNIT-II –

Aggregates of National Income Circular Flow of Income, Concepts of GDP and National Income; measurement of national income and related aggregates; nominal and real income;

UNIT-III –

Output, Employment and Money Aggregate Demand, Aggregate Supply, Classical Theory of Income, Output and Employment, Consumption Function- APC, MPC; Investment Analysis- Meaning, Types, Factors Determining Investment, Factors Affecting MPC. Keynesian Theory of Income and Employment, Concept of Multiplies and Accelerator.

UNIT-IV –

Money and Banking Functions of Money, Reserve Bank of India: Organizational Set-up and Functions of RBI, Qualitative and Quantitative measures to control Credit creation by RBI, Commercial Bank: Functions. Monetary Policy: Objectives, Targets and Indicators.

References:

1. Shapiro.E. 2005. Macro-economic Analysis (5th Edition). Galgotia Publications. New Delhi.

2. Mankiw, N. (2016). Macroeconomics, 9th ed. Worth Publishers.

3. Dornbusch, R., Fischer, S., Startz, R. (2018). Macroeconomics, 12th ed. McGraw-Hill.

4. H.L Ahuja, Macroeconomics, Theory and Policy. S.Chand & Co. ltd. New Delhi.

RAFFLES UNIVERSITY

Geography (GEO-201)

Semester- 2nd

HUMAN GEOGRAPHY

UNIT-I: INTRODUCTION

Definition; Nature; Major Subfields; Contemporary Relevance.

UNIT-II: SPACE AND SOCIETY

Cultural Regions; Race; Religion and Language

UNIT-III: POPULATION AND DEMOGRAPHY

Population Growth and Demographic Transition Theory; World Population Distribution and Composition (Age, Gender and Literacy).

UNIT-IV: SETTLEMENTS

Types and Patterns of Rural Settlements; Classification of Urban Settlements; Trends and Patterns of World Urbanization

REFERENCE:

1. Chandna, R.C. (2010) Population Geography, Kalyani Publisher.

2. Daniel, P.A. and Hopkinson, M.F. (1989) The Geography of Settlement, Oliver & Boyd, London.

3. Johnston R; Gregory D, Pratt G. et al. (2008) The Dictionary of Human Geography, Blackwell Publication.

4. Jordan-Bychkov et al. (2006) The Human Mosaic: A Thematic Introduction to Cultural Geography. W. H. Freeman and Company, New York.

5. Kaushik, S.D. (2010) Manav Bhugol, Rastogi Publication, Meerut.

6. Maurya, S.D. (2012) Manav Bhugol, Sharda Pustak Bhawan. Allahabad.

7. Ghosh, S. (2015) Introduction to settlement geography. Orient Black Swan Private Ltd., Kolkata

8. Hussain, Majid (2012) Manav Bhugol. Rawat Publications, Jaipur

RAFFLES UNIVERSITY

SEMESTER-II[nd]

SOCIOLOGY (SOC-201)

Introductory Sociology

1. *On the Plurality of Sociological Perspective*

2. **Functionalism**
   General arguments;
   Contributions of Parsons and Merton;
   Critical overview.

3 *Interpretive Sociology*
   General arguments;
   Contributions of Weber

4 *Conflict Perspective*
   General arguments;
   Contributions of Dahrendorf and Coser;
   Critical overview

5 *Structuralism*
   General arguments;
   Contributions of Levi-Strauss

6 *Feminist Perspective*
   General arguments;
   Stages of development of feminism;
   Varieties of feminist sociology**.**

Readings:

1. Anthony Elliot and Charles Lemert, 2014. Introduction to Contemporary Social theory, Routledge.
2. Bert N. Adams and R.A. Sydie. 2002. Sociological Theory. Sage, Vistara
3. Baert, Patrick. 1998. Social Theory in the Twentieth Century. New York. NYU Press.
4. Bottomore, T. B. 1971. *Sociology: A Guide to Problems and Literature*, London:Allen and Unwin, Chapter 2, Pp. 29-47
5. Bottomore, Tom and Nisbet, Robert. 2004. A History of Sociological Analysis. Jaipur: Rawat
6. Bottomore, Tom. 2002. The Frankfurt School. London: Routledge
7. Collins, Randall. 1994. Four Sociological Traditions. New York. OUP

RAFFLES UNIVERSITY

POLITICAL SCIENCE

3rd Semester

International Relations

Unit: INTRODUCTION TO INTERNATIONALR
Meaning, Nature and Scope of International Relations
History and IR: Emergence of International State System
Pre-Westphalia, Westphalia and Post-Westphalia
Unit-II: THEORIES OF IR
Classical Realism & Neo-Realism
Liberalism & Neo-liberalism
Marxism Approaches/Dependency Theory
Feminist Perspectives
Euro-centrism and Perspective from the Global South
Unit-III: HISTORY IN MODERN ERA OF IR
World War I & II: Causes and Consequences.
Significance of the Bolshevik Revolution and Rise of Fascism/Nazism.
Cold War: Different Phase and Collapse of the USSR and the End of Cold War.
Emergence of the Third World: Uni-Polar, Multi-Polar or Bi-Polar
Unit-IV: FOREIGN POLITICS IN IR
Power Management: Diplomacy
Balance of Power and Collective Security
Foreign Policy: Meaning, Kinds & Methods
National Power: Meaning, Nature and Determinates

English (ENG-301)
Semester- 3rd
British Prose and Novel
UNIT-1
Personal Essay, Modern Essay, Types of Novel, Short Stories
UNIT-2
Charles Lamb: New Year's Eve William Hazlitt: On the Pleasure of Hating
UNIT-3
Jane Austen: Pride and Prejudice William Golding: Lord of the Flies
UNIT-4
Charlotte Perkins Gilman: The Yellow Wallpaper Katherine Mansfield: Bliss
Recommended Readings:
1. Raymond Williams, 'Introduction', in The English Novel from Dickens to Lawrence (London: Hogarth Press, 1984) pp. 9–27.
2. Virginia Woolf, A Room of One's Own (New York: Harcourt, 1957) chaps. 1 and 6.
3. Showalter, Elaine. The Female Malady: Women, Madness, and English Culture, 1830-1980, 1st ed., New York: Pantheon Books, 1985
4. Deirdre David ed. Companion to the Victorian Novel. New York: CUP,2001

Geography (GEO-301)

Semester- 3rd

GEOGRAPHY OF INDIA

UNIT-I: PHYSICAL

Relief; Drainage; Climate; Vegetation

UNIT-II:

MINERAL AND POWER RESOURCES

Distribution and production: iron ore, manganese; Distribution and production: coal and petroleum; Multipurpose projects: DVC; Mahanadi, Bhakra Nangal;

UNIT-III:

AGRICULTURE

Major agricultural types; Distribution and production of rice, wheat, cotton, tea; Green revolution, white revolution; Agricultural regions.

UNIT-IV:

TRANSPORT SYSTEM

Road; Railways; Water ways; Air

UNIT-V:

POPULATION

Growth; Distribution and density; Population growth and related problems; Population policy of India

REFERENCE:

a. Nag, P., & Sengupta, S. (1992). Geography of India. Concept Publishing Company.

b. R,Tirtha and Gopal Krishan 2002: Geogrpagy of India, Rawat Publication, new Delhi

c. Singh R L: Regional Geography of India

d. Pal, Saroj K. (1998) Physical Geography of India. Orient BlackSwan,

e. Qazi, Shaz Sharqi Qazi (2007): Natural Resource Conservation. APH Publishing

f. Shovan Ray (2007): Handbook of Agriculture in India. Oxford University Press,

RAFFLES UNIVERSITY

SEMESTER-III[rd]

SOCIOLOGY (SOC-301)

Sociology of India – I

1. *India: An Object of Knowledge*

The Colonial Discourse

The Nationalist Discourse

The Subaltern Critique

2. *Indian Society: Concepts and Institutions*

Caste: Concept and Critique

Varna & Jati; Dominant Caste

Jajmani System; Caste Mobility: Sanskritization

Agrarian Classes

Nature of Agrarian Class

Tribe: Profile and Location

Features

Regional Distribution

Village: Structure and Change

Village Solidarity

Internal Regulation

Kinship: Principle and Pattern

Religion and Society

Role of Religion

Readings:

1. A. R. Desai. Bharatiya Jatiatabader SamajikPatabhumi (Social Background of IndianNationalism).
2. A. R. Desai. Rural sociology
3. A. Beteille. Caste, Class and Power: Changing Patterns
4. Amartya Sen. Argumentative India (Chs. 10, 11)
5. Bernard Cohn, Colonialism and its forms of knowledge, Princeton University Press
6. Aniruddha Choudhury. 2016. "Bharater Samaj Prasange"Chatterjee Publishers.
7. David Mandelbaum – Society in India

RAFFLES UNIVERSITY

POLITICAL SCIENCE

4th Semester

MAJOR CONSTITUTION(S)

Unit-I:

INDIA

Salient features of Indian Constitution
Preamble
Citizenship
Fundamental Rights and Duties
Directive Principles of State Policy
President, Prime Minister, Council Of Ministers
Parliament
Judiciary

Unit-II:

THE UNITED KINGDOM

Salient Features of the Constitution: Conventions, Parliamentary Government, Sovereignty of Parliament, Unitary Government, Rule of Law
Parliament: The House of Commons and the House of Lords- Composition and Powers
Executive: Monarchy-Functions and Position
Prime Minister and the Cabinet: Powers and Position

Unit-III:

The United State of America

Salient Feature of the Constitution: Supremacy of the Constitution, Presidential System, Federalism, Separation of Powers and Checks and Balances, Judicial Review
The Congress – The Senate and the house of representative – Composition and Powers
Executive - The President – Methods of Election, Powers and Position
Judiciary – The Supreme Court: Composition, Jurisdictions and Role

Unit-IV:

THE SWITZERLAND

Salient Feature of the Constitution: Federalism Direct Democracy
Federal Legislature: The National Council and Council of State: Composition and Powers
Plural Executive- Composition and Functions
Federal Tribunal- Compositions Jurisdictions

English (ENG-401)

Semester- 4th

British Poetry and Drama: 19th and 20th Century

UNIT-1

Forms of Poetry: Dramatic Monologue Forms of Drama: Problem Play

UNIT-2

Robert Browning: My Last Duchess Lord Alfred Tennyson: Ulysses

UNIT-3

W.B.Yeats: The Second Coming Philip Larkin: Deception

UNIT-4

Henrik Ibsen: A Dolls House John Osborne: Look Back in Anger

Recommended Readings:

1. Karl Marx and Friedrich Engels, 'Mode of Production: The Basis of Social Life', 'The Social Nature of Consciousness', and 'Classes and Ideology', in A Reader in Marxist Philosophy, ed. Howard Selsam and Harry Martel (New York: International Publishers,1963) pp. 186–8, 190–1, 199–201.

2. Charles Darwin, 'Natural Selection and Sexual Selection', in The Descent of Man in The Norton Anthology of English Literature, 8th edn, vol. 2, ed. Stephen Greenblatt (New York: Northon, 2006) pp. 1545–9.

3. John Stuart Mill, The Subjection of Women in Norton Anthology of English Literature, 8th edn, vol. 2, ed. Stephen Greenblatt (New York: Norton, 2006) chap. 1, pp. 1061–9.

4. T.S. Eliot, 'Tradition and the Individual Talent', in Norton Anthology of English Literature, 8th edn, vol. 2, ed. Stephen Greenblatt (New York: Norton, 2006) pp. 2319–25

Geography (GEO-401)

Semester- 4th

ECOLOGY AND ENVIRONMENT

UNIT-I:

ENVIRONMENTAL GEOGRAPHY: CONCEPTS AND APPROACHES; ECOSYSTEM Concept and Structure; Ecosystem Functions.

UNIT-II:

HUMAN Environment Relationship in Equatorial; Desert, Mountain and Coastal Regions.

UNIT-III:

ENVIRONMENTAL PROBLEMS AND MANAGEMENT Air Pollution; Biodiversity Loss; Solid and Liquid Waste. UNIT-IV:

ENVIRONMENTAL PROGRAMMES AND POLICIES Countries; Developing Countries. New Environmental Policy of India; Government Initiatives.

REFERENCE:

1. Casper J.K. (2010) Changing Ecosystems: Effects of Global Warming. Infobase Pub. New York.

2. Hudson, T. (2011) Living with Earth: An Introduction to Environmental Geology, PHI Learning Private Limited, New Delhi.

3. Miller, G.T. (2007) Living in the Environment: Principles, Connections, and Solutions, Brooks/ Cole Cengage Learning, Belmont.

4. Singh, R.B. (1993) Environmental Geography, Heritage Publishers, New Delhi.

5. UNEP (2007) Global Environment Outlook: GEO4: Environment For Development, United Nations Environment Programme. University Press, Cambridge.

Indian Economy (ECO 401)

Semester- IV

Indian Economy

UNIT-I

Basic Features of Indian Economy, Demographic Features and Major Trends, Human Resource Development. Agriculture: Role and Importance of Agriculture in India, Institutional and Structural reforms in Agriculture in India. Agriculture Financing: Institutional Credit, Microfinance. Flagship schemes of government for Agriculture.

UNIT-II

Industry: Role, Strategy and Challenges, Growth of MSMEs, Industrial Policy 1991, New Economic Policy and Disinvestment. Service Sector in India: IT, Education and Health.

UNIT-III

Poverty and Unemployment: occupational structure in the organised and unorganised sectors; open-, under- and disguised- unemployment (rural and urban); employment schemes and their impact.

UNIT-IV

Planning in India: Objectives and Achievements. Macroeconomic policies and their impact: fiscal policy; financial and monetary policies. NITI Ayog, Rural Development Programmes and Policy in India.

References:

1. Mishra & Puri. Indian Economy, Himalaya Publication House, 38th revised and Updated Edition.
2. Datt and Sundaram. Indian Economy, S.Chand, 65th Edition (2020)
3. Indian Economy since Independence by Uma Kapila Published by Academic Foundation, New Delhi
4. The Indian Economy by Sanjiv Verma Published by Unique Publishers, New Delhi.

SOCIOLOGY (SOC-401)

Sociology of India – II

1. *Ideas of India*

Gandhi and Ambedkar
Gandhi on Harijan
Ambedkar: Dalit &Hindu Society
Indological and Ethnographic Approaches

2. *Resistance, Mobilization, Change*

Dalit Politics
Mobility and Change
Women's Movement
Peasant Movements
Ethnic Movements
Middle Class Phenomenon

3. *Challenges to Civilization, State and Society*

Communalism: Factors and Control measures
Secularism: Significance, Issues and Challenges
Nationalism: Concept and Growth Factors

Readings:

1. Aniruddha Chaudhury. ed. "Bharater Samajtatta"2016, Chatterjee publishers
2. Deshpande, S., 2003, Contemporary India: A Sociological View, New Delhi: PenguinBooks
3. Dhanagare, D. N. (1993). Themes and Perspectives in Indian Sociology.RawatPublication, Jaipu
4. Ganguly, Ramanuj. Tatwa O Chintadarshe Samakalin Samajtatwa, Bani/ReenaPrakashan, Kolkata
5. Ganguly, Ramanuj and S. A. H. Moinuddin. 2008. SamakaleenBharatiyaSamaj. PHI.Learning.

POLITICAL SCIENCE

5th Semester

WESTERN POLITICAL THOUGHT

Unit-I:

NATURAL-RATIONAL TRADITION OF THE GREEKS

Salient features of Greek Political Thought
Plato's Ideal State: Justice, Philosopher King, Education and Communism
Aristotle's Polity: Classification of Governments, Revolution, The Best Practicable State.

Unit-II:

MEDIEVAL-CHRISTIAN TRADITION

Salient Features of Medieval Political Thought
St. Thomas Aquinas: Theory of Law, Relationship between Church and State
Machiavelli: Separation of Ethics and Politics, Theories of State-Craft

Unit-III:

SOCIAL CONTRACTUALISTS

Thomas Hobbes: State of Nature, Social Contract, Sovereignty
John Locke: State of Nature, Social Contract, Natural Rights, Limited Government
Rousseau: State of Nature, Social Contract, General Will.

Unit-IV:

UTILITARIANISM AND MARXISM

Jeremy Bentham: Utilitarianism, Political and Legal Reforms
J.S. Mill: Utilitarianism, Liberty, Representative Government.
T.H. Green- Theory of State, Rights and Political Obligation
Immanuel Kant: Theory of Moral Freedom, the Civil State
George Wilhelm Fredrick Hegel: Dialectical Methods, theory of State,
Karl Marx: Dialectical Materialism, Historical Materialism, Theory of Class-Struggle.

RAFFLES UNIVERSITY

English (ENG-501)

Semester- 5th

Indian English Literature

UNIT-1

Nissim Ezekiel: Background Causally Kamala Das: My Grandmother's House Jayant Mahapatra: Dhauli Tabish Khair: Amma

UNIT-2

Gandhi: As a School Master Ruskin Bond: The Blue Umbrella

UNIT-3

Mulk Raj Anand: Untouchable

UNIT-4

Anita Desai: Fire on the Mountain Recommended

Readings:

1. Salman Rushdie, 'Commonwealth Literature does not exist', in Imaginary Homelands (London: Granta Books, 1991) pp. 61–70.

2. Meenakshi Mukherjee, 'Divided by a Common Language', in The Perishable Empire (New Delhi: OUP, 2000) pp.187–203.

3. Bruce King, 'Introduction', in Modern Indian Poetry in English (New Delhi: OUP, 2nd edn, 2005) pp. 1–10.

Geography (GEO-501)

Semester- 5th

DISASTER MANAGEMENT

UNIT-I:

INTRODUCTION Disasters: Definition and Concepts: Hazards, Disasters; Risk and Vulnerability; Classification

UNIT-II:

DISASTERS IN INDIA Flood: Causes, Impact, Distribution and Mapping; Landslide: Causes, Impact, Distribution and Mapping; Drought: Causes, Impact, Distribution and Mapping.

UNIT-III:

DISASTERS IN INDIA Earthquake and Tsunami: Causes, Impact, Distribution and Mapping; Cyclone: Causes, Impact, Distribution and Mapping.

UNIT-IV:

MANMADE DISASTERS Manmade disasters: Causes, Impact, Distribution and Mapping

UNIT-V:

RESPONSE AND MITIGATION TO DISASTERS Response and Mitigation to Disasters: Mitigation and Preparedness, NDMA and NIDM; Indigenous Knowledge and Community-Based Disaster Management; Do's and Don'ts During and Post Disasters

REFERENCE:

1. Government of India. (1997) Vulnerability Atlas of India. New Delhi, Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India.

2. Kapur, A. (2010) Vulnerable India: A Geographical Study of Disasters, Sage Publication, New Delhi.

3. Modh, S. (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.

4. Singh, R.B. (2005) Risk Assessment and Vulnerability Analysis, IGNOU, New Delhi. Chapter 1, 2 and 3

5. Singh, R. B. (ed.), (2006) Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi.

RAFFLES UNIVERSITY

Statistics (ECO 501)

Semester- V

UNIT-I

Meaning, Nature and Importance of Statistics, Census and Sample Survey, Collection of Data, Tabulation, Diagrammatic and Graphical Representation of Data, Measure of Central Tendency: Arithmetic Mean, Mode, Median, Geometric Mean, Harmonic Mean. Measure of Dispersion (Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation) and Skewness (Karl Pearson's Coefficient).

UNIT-II

Probability – Basic concepts and calculation. Sampling Theory: probability and Non probability sampling.

UNIT-III

Simple Correlation: Karl Pearson and Ranks Correlation. Regression analysis. Analysis of Time Series (Components and determination of Seasonal variations), Index Numbers (Cost of Living Index, Fisher's Ideal Index, and Test of Ideal).

References:

1. S.C. Gupta. Statistical Method. S. Chand & Sons. New Delhi.
2. K.N. Nagar. Funadamental of Economics. Latest Edition.
3. S.C. Gupta and V.K. Kapoor. Fundamentals of Applied Economics. S. Chand, New Delhi.

SOCIOLOGY

SEMESTER-Vth

Classical Sociological Theories

Unit-I: AUGUSTE COMTE

1. Positivism
2. Hierarchy of Sciences
3. Statics and Dynamics

Unit-II: KARL MARX

1. Historical Materialism
2. Dialectical Materialism
3. Class and Class Struggle

Unit-III: EMILE DURKHEM

1. Social Fact
2. Division of Labour
3. Collective Conscience (Theory of Religion)
4. Theory of Suicide

Unit-IV: MAX WEBER

1. Ideal Types and Social Action
2. Types of Authority, Status and Role
3. Bureaucracy

Reading(s):

Calhoun, J. Craig, 2007, Classical Sociological Theories, 2nd Edition Blackwell, pp. 73-130.
Jayapalan, N. 2001. Sociological Theories, Atlantic Publisher, pp. 35-69.

RAFFLES UNIVERSITY

POLITICAL SCIENCE

6th Semester

INDIAN SOCIAL AND POLITICAL THINKER

Unit-I:
PRE-COLONIAL POLITICAL THOUGHT

Kautilya-Theory of State
Barani-Ideal Polity
Abu Fazal-Monarchy
Kabir-Syncretism

Unit-II:
POLITICAL COHESIVE AND SEPARATIST THOUGHT
Sir Syad Ahmed Khan- Muslim Uplift and Political Views
Genesis of Muslim League and Separatism
Mohammad Ali Jinnah- Political Views and Role in Indian national Movement

Unit-III:
SOCIO-ECONOMIC AND POLITICAL THOUGHT
Mahatma Gandhi- Social, Economic, and Politicall Thought
Jawahar Lal Nehru- Economic and Political Ideas
B.R. Ambedkar- Social and PoliticalIdeas

Unit-IV:
SOCIAL REFORM AND THOUGHT
Aurobindo Ghosh- Social and Political Ideas
Ranade-
Political Ideas, Theory of Social Reforms
Jay Prakash Narayan-The Concept of Sarvodaya, Total Revolution and Social Thought

English (ENG-601)

Semester- 6th

Introduction to American Literature

UNIT-1

Walt Whitman: O Captain My Captain Robert Frost: Mending Walls

UNIT-2

Edgar Allan Poe: The Purloined Letter William Faulkner: Dry September

UNIT-3

Arthur Miller: Death of a Salesman

UNIT-4

Ernest Hemingway: The Old Man and the Sea Recommended

Readings:

1. Howard, Zinn. A People's History of the United States: 1492 to Present, New York: Harpercollins,1980.

2. Stephen A. Black. Eugene O'Neill: Beyond Mourning and Tragedy, New Haven: Yale University Press, 2002.

3. Russ Castronovo (ed.), The Oxford Handbook of Nineteenth-Century American Literature, Oxford: Oxford Handbooks, 2012

4. Malcolm Bradbury and Richard Ruland. From Puritanism to Postmodernism: A History of American Literature, New York: Penguin Group (USA) , 1992

RAFFLES UNIVERSITY

Geography (GEO-601)

Semester- 6th

SUSTAINABLE DEVELOPMENT

UNIT-I:

INTRODUCTION Definition, Components, Historical Background and Scope; The role of higher education in sustainable development.

UNIT-II:

THE MILLENNIUM DEVELOPMENT GOALS National Strategies and International Experiences.

UNIT-III:

SUSTAINABLE REGIONAL DEVELOPMENT Need and examples from Cities and Mountains; The human right to health; Poverty and disease; The Challenges of Health Coverage in High-Income Countries.

UNIT-IV:

INCLUSIVE DEVELOPMENT Education, Health; Climate Change: Policies and Global Cooperation for Climate Change; Sustainable Development Policies and Programmes: The proposal for SDGs at Rio+20; Illustrative SDGs; Goal-Based Development; Financing for Sustainable Development; Principles of Good Governance; National Environmental Policy.

REFERENCE:

1. Ayers, Jessica and David Dodman, “Climate change adaptation and development I: The state of the debate”, in Progress in Development Studies 10 (2): 161-168.

2. Baker, Susan, Sustainable Development, Milton Park, Abingdon, Oxon; New York, N.Y.: Routledge.

3. Brosius, Peter, “Endangered forest, endangered people: Environmentalist representations of indigenous knowledge”, Human Ecology 25: 47-69.

4. Lohman, Larry, “Re-imagining the population debate”. Corner House Briefing 28.

Mathematical Economics (ECO 601)

Semester- VI

UNIT-I

Differentiation – Simple and Partial, Simple Integration. Theory of Consumer behaviour- utility Function, Maximization of utility. Elasticity of Demand.

UNIT-II

Production Function- A well Behaved Production Function, Cobb Douglas Production Function, Homogeneous Production Function. Optimization Behaviour of a Firm – Profit Maximization and Output maximization.

UNIT-III

Perfect Competition- Market Demand and Supply Function, Determination of price and Output. Monopoly: Profit Maximization and Sales Revenue Maximization.

UNIT-IV

Macro - Economic Model, Keynesian Theory of Income Determination, Derivation of IS-LM Functions.

References:

1. S.C. Gupta. Statistical Method. S. Chand & Sons. New Delhi.

2. K.N. Nagar. Fundamental of Economics. Latest Edition.

3. S.C. Gupta and V.K. Kapoor. Fundamentals of Applied Economics. S. Chand, New Delhi.

SOCIOLOGY
Classical Social Thinkers
Semester- VIth

UNIT – I – VILFREDO PARETO:
Vilfredo Pareto: Logico-Experimental Method. Logical and Non-Logical Actions. Residues and Derivations. Circulation of Elites.

UNIT – II – GEROGE SIMMEL:
George Simmel: Formal Sociology. Sociology of Conflict. Theory of Domination. Concept of Social Mobility.

UNIT – III – PITIRIM A SOROIKIN:
Pitirim A Sorokin: Integralist Sociology. Theory of Socio-Cultural Dynamics. Theory of Social Revolution. Concept of Social Mobility.

UNIT – IV – TALCOTT PARSONS:
Talcott Parsons: Theory of Action. Pattern Variables. Theory of Social System.

UNIT – V – ROBERT K. MERTON:
Robert K. Merton: Role Set Theory. Reference group theory. Social structure and anomie. Functional analysis: Manifest and Latent Functions. Dysfunctions

Reading(s):
1. Coser, Lewis A. Masters of Sociological Thought: Ideas in Historical and Social context 2 nd Ed. New York: Harcourt Brace Jovanovich, 1997.
2. Wallace, Ruth A and Wolf Alison. Contemporary Sociological Theory, Englewood Cliffs New jercy, Prentice Hall, 1980
3. Timasheff, Nicholoas S.Sociological Theory: Its Nature and Growth, 3rd Ed. New York: Random house,1967.
4. Nisbet, Robert A. The Sociological Tradition, London: Heinemann, 1967.
5. Abraham Francis, M. and Morgan, John Henry, Sociological Thought. Madras: Macmillan India, 1985. 6. Merton, Robert k., Sociological Theory and Social Structure.Indian Ed. New Delhi: Ameirnd Publishing co., 1968.

M.A. (English Literature)
Semester I
Paper I: English Society, Literature and Thought
(Chaucer to 16th Century)
Course Outcome:

1. To enhance the social and intellectual background of classical writers.
2. To inculcate the understanding of poetry and to widen the area of knowledge.
3. To Increase the comprehensive study of literature and to develop critical thinking.
4. To have an ethical study of human behavior through different plays.
5. Uplifting writing skills and developing the flare for creative writing.

Program Outcome:

1. Cultural and ethical understanding which would help the student to develop in all the spheres.
2. Writing proficiency will increase with the new courses and literary devices.
3. English language would be enhanced by following the structural learning of LSRW.
4. Advanced level of literary understanding which develops through different literary analysis and critical theory.
5. The program would help to deliver the speech in effective way and would help in communicative English.
6. Strong research will be developed which would further contribute to literary studies.
7. Comprehensive knowledge of criticism and literary movements.
8. The program would prepare different academic writing and publishing research articles.
9. The analytical and communication skill will develop to enhance the comprehensive understanding of stylistics.

Paper II: English Society, Literature and Thought
(17th and 18th Century)

Course Outcome:

1. To have a comprehensive understanding knowledge of literary works from various periods.
2. To develop students' ability to analyze and interpret literature.
3. To think critically about themes, characters and literary techniques.
4. To develop historical and cultural context which helped the students to appreciate the influence of literature.
5. To foster appreciation for authors from various backgrounds and perspectives.

Paper III: English Society, Literature and Thought
(19th Century)

Course Outcome:

1. To be well-acquainted with significant authors of the 19th century authors and their major works.
2. To understand historical and cultural context which influences literary production.

3. To develop the ability to analyze and interpret including exploration of themes, characters and narrative techniques.
4. To enhance critical thinking skill and the ideas are expressed effectively.
5. To study the development of the novel as a literary form during 19th century.

Paper IV:
Introduction to Linguistics and Phonetics
Course Outcome:

1. To develop a fundamental linguistic concept such as phonetics and phonology.
2. An Understanding of the articulation and acoustic properties of speech sounds.
3. To analyze and describe the sound system of different languages.
4. To explore regional, social and stylistic variation in language.
5. To develop research skills in linguistics including data collection analysis.

Semester II:
Paper I : English Society, Literature and Thought
(20th Century)
Course Outcome:
Develop a deep understanding of significant British authors and their major literary works from 20th century.

1. To understand the historical, social and cultural context of major events.
2. To explore major literary movements of 20th century and shape the literary creativity.
3. To compare different authors for understanding of common themes and different styles.
4. To enhance critical thinking skills and ability to conduct research on 20th century literary topics.

Paper II: Readings in Literary Criticism
Course Outcome:

1. To familiarize students with major literary theories and critical approaches.
2. To develop the ability to analyze and interpret literary texts from various genres using different critical lenses.
3. To analyze specific literary works and gain insights into their narrative techniques and cultural significance.
4. To enhance critical writing skills and enabling students to articulate their interpretations and argumenta effectively.
5. To explore the importance of diverse voice in literary criticism.

Paper III: Language Acquisition and Language Learning

1. To increase fluency and accuracy for effective communication in target language.
2. Students should acquire broader vocabulary to express wider range of ideas.
3. A deeper understanding of the target language's grammar and syntax rule.
4. Improve ability to understand spoken language, media and real-life situations.
5. The ability to continue learning and improve language skills independently as language acquisition is an ongoing process.

Paper IV: Literature and Gender
Paper I:

1. A deeper understanding of how gender roles, identities and power dynamics are represented in literature.
2. Insight into the historical and cultural context of literary works.
3. Empowering to engage in discussions about gender equality, diversity and social justice.
4. Development of research and analytical skills in exploring gender-related topics in literature.
5. Enhancing ability to see literature from different viewpoints and consider how gender influences interpretation.

Semester III
Paper I: American Literature
Course Outcome:

1. To improve skills in analyzing and interpreting American literary works including poetry, essay and plays.
2. Understanding the historical, cultural and social contexts of American literature.
3. Familiarity of key literary movements in American literature.
4. Cultivating an appreciation for the richness and diversity of American literary traditions.
5. The ability to engage in the thoughtful discussions and debates about American literature.

Paper II: New Literatures in English
Course Outcome:

1. Enhanced understanding of cultures from around the world though exposure to literature.
2. Improved skills in analyzing and interpreting literary works from different parts of the world.
3. The ability to compare literary themes, styles and techniques across different cultures.
4. Encouraging critical thinking by examining the cultural, political and social contexts.

Paper III: Forms of Popular Literature
Course Outcome:

1. Better understanding of its cultural and societal significance.
2. Enhancing critical evaluation of popular literature and its impact.
3. Exploring complexities and nuances within popular literature.
4. Exploring creative writing and encouraging study of popular literature.

Paper IV: Indian Literature in English
Course Outcome:

1. Comprehensive understanding of the rich and diverse literary traditions within India.
2. Analyse how the sociological, historical, cultural and political context impacted the texts selected for study.
3. Analyse the strength and constraints of Indian English as a literary medium.

4. Evaluate critically the contributions of major Indian English poets and
5. Dramatists.

Semester IV:
Paper I : Stylistics and Discourse Analysis
Course Outcome:

1. To understand the concept of style in literature.
2. To understand the linguistic basis of literary criticism (stylistics as an input to literary criticism).
3. To understand the concept of discourse and the principles of discourse analysis .
4. To understand the use of stylistic approach in teaching literature.
5. To understand the impact of stylistic analysis on academic writing.

Paper II: Colonial and Post-Colonial Literature

Course Outcome:

1. Identify key questions, authors, and literary forms in postcolonial literature
2. Think critically about these texts in relation to postcolonial theory
3. Situate these works in their larger cultural contexts
4. Develop interpretative skills of close reading
5. Offer nuanced interpretations, articulate coherent arguments, and develop research skills through your written essays

Paper III: African and Caribbean Literature:

Course Outcome:

1. Identify and discuss important literary figures and texts from the Caribbean and its diaspora.
2. Understand, identify, and analyse different definitions of Caribbean identity and culture.
3. Understand Caribbean history, culture, and identities and how they are represented in literary canons using academic texts, cultural texts, and other sources.
4. Distinguish the strengths, weaknesses, and point of view in sources and texts of the course.

Paper IV:

Translation: Theory and Practice

Course Outcome:

1. Evolution of Translation in global perspective and its development in the domain of Urdu
2. language and literature.
3. Exposure to some basic concepts related to Translation.
4. Introduction of some Important Institutions of Urdu Translation and their contributions.

5. Introduction of Translation Studies.

M.A. POLITICAL SCIENCE

PROGRAMME OUTCOME:
The two years M.A. in Political Science programme is designed to enable the students to:
PO1: Develop conceptual clarity of major theories and concepts of Political Science and related sub-fields.
PO2: Comprehend how power operates at different levels: personal/social/domestic and international and their inter-connectedness.
PO3: Analyse public policy formulations, implementation, problems and available public policy choices.
PO4: Develop critical thinking, articulate arguments on key issues of public policy and politics.
PO5: Demonstrate competency in basic social science research techniques and methods including qualitative and quantitative methods of research design and techniques

PROGRAMME SPECIFIC OUTCOME:
The two year M.A. in Political Science programme is specifically designed to cater to the following needs of the students:
PSO1: Prepare the students to understand the working of the Indian constitution and its operation at the central and state level
PSO2: Make students understand and analyze the operation of power politics at state, national, regional and global levels
PSO3: Give the students career options in higher studies in fields related to public policy, international politics and law, gender studies, development studies, Environmental and sustainable development, law and survey research.
PSO4: The programme prepares the students the undertake research projects/surveys.
PSO5: Formulate socially relevant research proposals and presentations.
PSO6: Provides opportunities to undergo various competitive exams of administrative services, law, and public policy.

SEMESTER – I
(DEBATES IN POLITICAL THEORY)

Course Outcomes
On completion of the course the student will be able to:
CO1: Understand the development of political theories.
CO2: Discern and comprehend various democratic virtues
CO3: Understand political values with respect to current democratic scenario.

CO4: Analyse the political theories present in the contemporary political debates

SEMESTER – I
COMPARATIVE POLITICAL ANALYSIS
.**Course Outcome**
On completion of the course the students will be able to:
CO1: Compare the different nation states and their working.
CO2: Understand the concept of State.

CO3: Identify the historical origin of various states.
CO4: Discern and comprehend the concept and theories of State and its various features

SEMESTER – I
POLITICS IN INDIA
Course Outcome
On completion of the course the students will be able to:
CO1: Understand the basic concept of state politics in India.
CO2: Analyze the functioning and interrelationship between various socio-political dynamics of India
CO3: Discuss the nature of Indian politics
CO4: Comprehend the party-politics in India.

SEMESTER – I
THEORIES OF INTERNATIONAL RELATIONS
Course Outcome
On completion of the course the students will be able to:
CO1: Identify comprehensive paradigm of multi-disciplinary nature of international relations

CO2: Interpret the external and internal dynamics of foreign policy decision-making processes

CO3: Discuss the nature of International relations
CO4: Understand comparative theories of International relation.

SEMESTER – I
(Ability Enhancement Compulsory Course) Course Outcome
On completion of the course the students will be able to:
CO1: Identify the ways of promoting sustainable development.
CO2: Understand the idea of clean and healthy environment.
CO3: Promote the idea of Swachch bharat through practicing the same.
CO4: Analyse the relationship between Environment, ethics and development.

SEMESTER – II
ADMINISTRATIVE THEORY
Course Outcomes:
On completion of the course the student will be able to:
CO1: Understand the core concepts of Public Administration.
CO2: Discern and comprehend various theories and paradigms of Public Administration.
CO3: Understand the basics of Public Policy Process and Governance.
CO4: Analyze the major approaches and recent trends in Public Administration.

SEMESTER – II
THEMES IN INDIAN POLITICAL THOUGHT
Course Outcomes:
On completion of the course a student will able to:
CO1: Understand several theories of Indian political thought

CO2: Analyze the evolution and nature of Indian state and its principles
CO3: Discuss and debate about the theories pertaining to modern India through its evolution.
CO4: Identify the role Indian political thought and their contribution in shaping the contemporary idea of India.

SEMESTER – II
KEY CONCEPTS IN POLITICAL PHILOSOPHY Course Outcomes:
On completion of the course a student will able to:
CO1: Understand several classical political philosophies.
CO2: Analyze the evolution and nature of political philosophy.

CO3: Discuss the various ideologies as given by the thinkers.

CO4: Compare several classical and modern political philosophies.

SEMESTER – II
(COMPARATIVE GOVERNMENT AND POLITICS-(UK, USA, China, Nigeria)
Course Outcomes:
On completion of the course a student will able to:
CO1: Understand governmental institutions of the countries.
CO2: Compare the working of the governmental machineries.
CO3: Discuss ways of building better relations of the countries.
CO4: Comprehend the diversity of political structure of different countries.

SEMESTER – II
POLITICAL SOCIOLOGY
Course Outcomes:
On completion of the course a student will able to:
CO1: Discern major theoretical perspectives and debates in the study of political sociology.
CO2: Elaborate on the primary concepts of- political culture, socialisation and political mobility.
CO3: Comprehend ways to use sociological theories and empirical research to analyze socio- political phenomena.
CO4: Establish the relationship between social movements, political parties, and voting and social change.

SEMESTER – II
On completion of the course a student will able to:
CO1: Understand several ways of developing an opinion about features of Indian constitution.
CO2: Comprehend the Parliamentary debates and ethics.
CO3: Understand the evolution of several constitutional principles through constituent Assembly debates.
CO4: Analyse the rules and procedures of Parliamentary debates.

SEMESTER – III
INTRODUCTION TO INTERNATIONAL LAW

Course Outcomes
On completion of the course the student will be able to:
CO1: Understand the origin, development and codification of the International Laws
CO2: Discern and comprehend various laws related to Statelessness and recognition.
CO3: Analyze the major international laws in case of different warfare.
CO4: Understand international laws related to savagery and war-crimes.

SEMESTER – III
DEMOCRACY AND POLITICAL INSTITUTIONS IN INDIA
Course Outcome
On completion of the course the students will be able to:
CO1: Identify the historical origin and the development of Indian Constitution.
CO2: Understand the concept of constitutionalism.
CO3: Analyze the functioning and interrelationship between judiciary, executive and legislature in India.
CO4: Discuss the nature of Federalism in India and how it affects the Centre-State relationship.

SEMESTER – III
Democracy and Human Rights in India
Course Outcomes:
On completion of the course the student will be able to:
CO1: Understand the core concept of Human Rights in Western as well as Indian context.
CO2: Comprehend the contribution of various constitutional frameworks like Fundamental Rights and Directive Principles in assuring human rights in India.
CO3: Discuss the issue of Human Rights with Disables, Women, and Castes etc.
CO4: Identify various roles of State and Civil Societies in solving the issue of Human Rights.

SEMESTER – III
INDIA AND THE WORLD

Course Outcomes:
On completion of the course the student will be able to:
CO1: Understand the domestic determinants of the Indian Foreign Policy.
CO2: Identify the changing perspective of security from traditional and non-traditional security in context of India.
CO3: Analyze the India's relationship with the neighboring countries and regional blocks.
CO4: Comprehend India's relationship with the U.S.A and Russia post- Cold war.

SEMESTER – III
PARTIES, ELECTIONS AND POLITICAL PROCESS IN INDIA Course Outcomes:
On completion of the course a student will able to:
CO1: Discuss about the party system in India and impact of coalitional politics on the party system.

CO2: Understand the changing nature of national party and the regional parties.
CO3: Analyze the role of gender, caste, religion etc on the voting behavior in

particular and on electoral politics in general.

CO4: Identify the impact of several non-party movements and Non-governmental Organizations on the party system in India.

Gender Sensitization
Course Outcomes:
On completion of the course a student will able to:
CO1: Understand several principles of Ethics and Morality like integrity, empathy, self- confidence etc.
CO2: Analyze the evolution and nature of corporate and professional ethics.

CO3: Comprehend the definition and evolution of “gender”.

CO4: Identify the concept of Corporate Ethics and Professional Ethics.

SEMESTER – IV
RESEARCH WRITING SKILLS AND ACTIVITIES Course Outcomes:
On completion of the course a student will able to:
CO1: Understand and apply the knowledge about research design and methods gained from the taught components to develop the dissertation project.
CO2: Discuss the ethical dimensions of research and obtain appropriate ethical approval if needed
CO3: Synthesize knowledge and skills previously gained and apply these to an in-depth study
CO4: Establish links between theory and methods within your field of study

PAPER: Internship /Dissertation/ Project/ Seminar
Course Outcome
On completion of the course the students will able to:

CO1: Comprehend the detailed analysis, critical evaluations and discussion of concepts, theories and ideas.
CO2: Develop certain qualities that will help them in the working of real world such as problem-solving, communication, specialist information etc.

CO3: Understand the ways of asking questions through research questions. 33
CO4: Emphasize on the empirical study.

SEMESTER – IV
Generic Elective Course (GE)
Social Movements and Revolutions

Course Course Outcome :
On completion of the course the student will be able to:
CO1: Identify the difference between Revolution and Social Movement.
CO2: Understand the ideology, strategy and social base used by different

revolutions.
CO3: Comprehend the means, ideology and social base used in different social movements.
CO4: Analyse the revolutions and Social movements in the South Asian context.

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MA ECONOMICS(CO and Po complied)

M.A. (Semester-I) Principles of Micro Economics

Unit-I

Nature and scope of Economics and Microeconomics. Positive and normative analysis. Role of assumptions in economic analysis. Circular flow of economic activity. Concepts of: household, firm, factors of production, equilibrium – partial and general, static, comparative static and dynamic analysis, margin and slope.

Elasticity – need and measures – Relationship between revenue and elasticity.

Unit-II

Analysis of consumer behaviour, demand function, law of demand – cardinal, ordinal and revealed preference approaches, income-consumption curve, Engel curve, substitute and complimentary goods.

Market demand curve; consequences of Bandewagon, Snob and Veblen effect. Concept of consumer surplus.

Unit-III

Laws of Production: short run and long run. Internal and External economies and diseconomies. Concept of cost, derivation of short and long run cost curves. Optimum input combination Simple case of a multiproduct firm. Technical progress and production function – Hick's classification. Elasticity of substitution. Properties of Cobb-Douglas and CES production function.

Unit-IV

Pricing process and equilibrium of firm and industry under perfect competition, monopoly (including discriminating and bilateral monopoly), monopolistic competition. Welfare effects of price control, price support and production quota.

Reading List:

- Koutsoyiannes. A. “Modern Microeconomics” (Macmillan)
- Lipsey, R.G. and Chrysal, K. Alec “An Introduction to Positive Economics” (OUP)-

Salvatore, D. “Microeconomics Theory” (Schaum’s Outline series, Tata McCraw Hill)

MA (Economics) Semester- I Principles of Macro Economics-

Course Outcomes:

CO1. Students will be able to explain the concept of opportunity costs, trade – off and benefits of economics.

CO2. Students will learn the concept of fiscal and monetary policies and their effect on economy.

CO3. It will demonstrate knowledge of laws of supply and demand and equilibrium.

CO4. Students will be familiar about a clear picture of circular flow model.

Unit-I

Determination of Output and Employment: Classical Approach – Output and Employment in Classical Theory; The Quantity Theory of Money and the Price Level; Classical Model without saving and investment; Classical Model with saving and investment;

Keynesian Approach _ Two Sector Model, Three Sector Model and Four Sector Model.

Unit-II

Determination of Output and Employment: The Extended Model (Hicks-Henson Synthesis): Fixed Price Level – The goods Market and The Money Market; Equilibrium in Goods Market and Money Market; Changes in Aggregate Demand; Govt. spending, Taxation and Aggregate Demand; The IS-LM Elasticities and Monetary Fiscal Policies.

Unit-III

The Extended Model: Variable Price Level – Deviation of Aggregate Demand Curve and Determinination of equilibrium price and output levels; wage-price flexibility and the Full Employment equilibrium; Monetary – Fiscal policies and the Full-Employment Equilibrium.

Unit-IV

Behavioral Foundation: Theories of consumption – The Absolute Income Hypothesis, The Relative Income Hypothesis; The Permanent Income Theory of Consumption; The Life cycle theory of consumption; Theories of Investment – The Present Value of Criterion for investment; The Marginal Efficiency of Capital and Investment; the accelerator theory; financial Theory of investment.

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Reading List:

- Ackley, G (1978), *Macroeconomics: Theory and Policy*, Macmillan, New York.
- Banson, W.A. (1989), *Macroeconomic Theory and Policy, (3rd Edition),* Harper and Row, New York.
- Dorn Busch, R. and F. Stanley (1997), *Macroeconomics,* McGraw Hill, Inc. New York.
- Heijdra, B.J. and V.P. Fredericck (2001), *Foundation of Modern Macroeconomics*, Oxford University Press, New Delhi.
- Jha, R. (1991), *Contemporary Macroeconomic Theory and Policy*, Wiley Eastern Ltd., New Delhi.
- Shapiro, E. (1996), *Macroeconomic Analysis*, Galgotia Publication, New Delhi.
- Survey, M.J.C. (Ed.) (1976), *Macroeconomic Themes*, Bo and Reed Geoffrey (1994), *International Economics*, Macmillan Press Ltd.
- Peterson, W.C. (1978), Income, Employment and Economic Growth, Norton, New York.
- Sheffrin, Steven M. (1996), Rational Expectations, 2nd edition, Cambridge University Press.

MA (Economics) Semester-I Mathematics for Economists-I

Course Outcomes:

CO1. Students will learn different types of functions and their applications.

CO2 Students will be familiar with the maxima and minima of functions.

CO3 it will impart knowledge about the use of lagrange multiplier methods.

CO4 Students will gain knowledge about the use of net present value and other related concepts.

Unit-I

Basics: real number system, sets and set operations, relations and functions, inverse functions; solution of linear equations in two variables, solution of quadratic equations, logarithms and exponents; exogenous and endogenous variables.

Unit-II

Fundamentals of Matrices; Determinants. Solution of a system of upto 3 equations by matrix inversion and Cramer's rule. Input-Output analysis – Static open model.

Unit-III

Differentiation – idea of limit (but not its evaluation) meaning and economic interpretations of derivative. Rules of differentiation including logarithmic and exponential functions. Unconstrained optimization – single choice variable, global and local.

Unit-IV

Calculus of multivariable functions, higher order derivatives, constrained optimization with upto 2 equality constraints

Reading List:

- Chiang, Alpha C. "Fundamental Methods of Mathematical Economics" (Mc-Graw Hill)
- Dowling, Edward T "Mathematics for Economists" (Schaum's outline Series, Tata Mc-Graw Hill)

M.A. (Semester- I) Economic Development and Policy in India

Course Outcomes

CO1 To have knowledge about the issues in Indian Economy like planning, poverty, unemployment etc.

CO2 To know about relationship between monetary policy, fiscal policy and economic development.

CO3 To know about framework of policy making for the development of Indian economy

CO4 To know about the preparation of budgeting and its utilization for Indian economy.

Unit-I

Features of Indian economy; Nature and Characteristics of Indian economy; Planning; objectives and strategies; failures and achievements of plans.

Basic economic indicators-National income, performance of different sectors. Trends in prices and money supply.

Unit-II

Institutional structure: Land-reforms in India; Agricultural marketing and warehousing; Issues in food security - policies for sustainable agriculture; Agricultural finance policy; Agricultural price policy.

Unit-III

Malthusian theory of population, optimum theory of population, theory of demographic transition, population as 'Limits to Growth' and as 'Ultimate Source'

Concepts of Demography- Vital rates, life tables, composition and uses.

Measurement of fertility - Total fertility rate, gross and net reproduction rate - Age pyramids, population projectionnstable, stationary and quasi-stationary population; Characteristics of Indian population through recent census.

Unit-IV

Financial Sector: Monetary policy of RBI; Money and Capital markets; Growth and problem; Role of commercial banks in India; Banking sector reforms since 1991

Reading List:

- Bardhan. P.K. (9th Edition) (1999), The Political Economy of Development in India,

Oxford University
Press, New Delhi. .
- Brahmadanda, P.R. and V.R. Panchmukhi (Eds.) (2001), Development Experience in the Indian Economy:
Inter-State Perspectives, Bookwell, Delhi.
- Datta, R. and KP.M. Sundhram (2003), Indian Economy. S. Chand & Company Ltd. New Delhi.
- Government of India, Economic Survey, (AnnuaJ), Ministry of Finance, New Delhi.
- Mishra, S.K and V.K Puii Indian Economy- 151 Development Experience, Himalaya Publishing House, Mumbai, Latest Edition.
- Rudra Ashok, Indian Plan Models.
- Todaro, P. Development Planning: Models and Methods.
United Nations, Guidelines for Project Evaluation.

MA (Economics) Semester-II –Open Economy Macro Economics

Course Outcomes:

CO1. It will help the students to apply supply and demand models to analyze responses of market to external events.

CO2 It will help students to describe ISLM model.

CO3 The course will illustrate the role of financial institutions in the economy.

CO4 Students will be able to explain concept of gross domestic product, inflation and unemployment.

Unit-I

The Demand for and supply of money: Classical Approach to Demand for Money – Quantity Theory Approach; ;Fisher's equilibrium; Cambridge Quantity theory; Keynes Liquidity Approach – Transaction; Precautionary and Speculative Demand for Money Aggregate Demand for Money; Friedman, Patinkin Baumol and Tobin.

Determinants of money supply, High-powered money, Money multiplies.

Unit-II

Inflation: Definition of Inflation; Economics effects of Inflation – The effect of Inflation of the distribution of Income and Wealth, The effect of Inflation on output, Employment and the Growth Rate; Demand Side and Supply Side theories of inflation.

Unit-III

Inflation and unemployment: The Phillips Curve, The Inflationary Pressure Curve: Phillips Curve, Inflationary Pressure Curve and the Rate of Inflation. The Phillips Curve; Trade off and Non Trade Off. Adaptive Expectation and Rational Expectation Keynesianism Vs Monetarism.

Unit-IV

Trade Cycles – Models of Samuelson, Hicks and Kaldor, Economic Growth: Harrod- Doman Model; Neo-Classical Model (with money & without money). International Adjustment: The Determination of National Income in Open Economy; The International Transmission of Disturbance: Transmission under Fixed Exchange Rate; Transmission under Floating Exchange Rate (Mudel Fleming Model).

Reading List:

- Ackley, G (1978), *Macroeconomics: Theory and Policy*, Macmillan, New York.
- Banson, W.A. (1989), *Macroeconomic Theory and Policy, (3rd Edition),* Harper and Row, New -York.
- Dorn Busch, R. and F. Stanley (1997), *Macroeconomics,* McGraw Hill, Inc. New York.
- Heijdra, B.J. and V.P. Fredericck (2001), *Foundation of Modern Macroeconomics*, Oxford University Press, New Delhi.
- Jha, R. (1991), *Contemporary Macroeconomic Theory and Policy*, Wiley Eastern Ltd., New Delhi.
- Shapiro, E. (1996), *Macroeconomic Analysis*, Galgotia Publication, New Delhi.
- Survey, M.J.C. (Ed.) (1976), *Macroeconomic Themes*, Bo and Reed Geoffrey (1994), *International Economics*, Macmillan Press Ltd.
- Peterson, W.C. (1978), Income, Employment and Economic Growth, Norton, New York.
- Sheffrin, Steven M. (1996), Rational Expectations, 2nd edition, Cambridge University Press.

MA (Economics) Semester-II

General Equilibrium and Welfare Economics

Course Outcomes:

CO1. It will familiarized the students with different types of equilibrium..

CO2 Students will get to know the different welfare approach.

CO3 Students will get to know about the welfare economics.

Unit-I

Pre-Paretian Welfare Economics: Measurement of Economic Welfare - Definition - Benthamite Approach to Aggregate Welfare - Optimum Resource Allocation and Welfare Maximization - Issue of Interpersonal Comparisons of Utility Principles of Compensating Variation - Hick's Consumer's Surpluses - Concept of Consumer's Surplus - Consumer's Surplus and Tax-Bounty analysis.

Unit-II

Utilitarian Economics. Paretian Welfare Economics: Pareto-Optimality and Market Equilibrium - Arrow's Impossibility Theorem - Externalities and Market Failures - Welfare Economics and Social Choice Theory - Pigouvian Welfare Economics - Second Best Optima - Sen's Contributions to Welfare Economics - Collective Choice and Social Welfare

Unit-III

Compensation Criteria- Contributions of Barone, Kaldor and Hicks; Scitovsky Double Criterion - Bergson's Social Welfare Function -Welfare and General Equilibrium - Pareto-Optimality and Market Equilibrium - Samuelson's Utility Possibility Curve - Value Judgments and Welfare Economics. Choice Theory, Theory of Public Choice and Policy implications of Public Choice Theory

Unit-IV

Divergence between Private and Social Costs - External Economies and Diseconomies Problem of Public Goods; Attempts to Develop Dynamic Welfare Analysis - Collective Choice and Social Welfare - Social Choice and Political Decision Making.

Reading List:

- Koutsoyiannes. A. "Modern Microeconomics" (Macmillan)
- Lipsey, R.G. and Chrysal, K. Alec "An Introduction to Positive Economics: (OUP)
- Salvatore, D. "Microeconomics Theory" (Schaum's Outline series, Tata McCraw Hill)

M.A. (Semester-II) Economics of Growth

Course Outcomes:

CO1 Students would be acquainted with the various perspectives of economic growth and its relevance.

CO2 Students would become familiar with factors affecting economic growth and development.

CO3 Students would understand the conceptual bases of income measurement, physical quality of life index, poverty, inequality and development gap and role of various institutions in economic growth and development.

CO4 Students would have knowledge about the nature and classical theories of development. Students would be able to apply economic theories and concepts to contemporary social issues, as well as formulation and analysis of policy and recognize the role of ethical values in economic decisions.

CO5 Students would learn the key tools to analyse agricultural economies, with an eye towards understanding a wide array of impacts, from agricultural policies to trade and climate change and what the role agriculture and industry have in economic development.

Unit 1

Economic Growth and Development

Factors affecting Economic Growth: capital, labour and technology; Historical Perspective of Economic Growth and its relevance; Structural Diversity and common characteristics of developing nations.

Unit-II

Development and Underdevelopment

Measuring Development: Income Measures, Basic Needs Approach, PQLI and HDI and Capabilities Approach; Poverty, Inequality and Development: Measurement, Impact and Policy options; Development Gap: concepts and measurement. **Unit-III**

Classical Theories of Development

Contributions of Adam Smith, Ricardo, Karl Marx and Schumpeter.

Unit-IV

Growth Models

Harrod and Domar: Instability of equilibrium; Neo Classical Growth Models: Solow and Meade; Growth Models of Joan Robinson and Kaldor. **Basic Reading List**

- Adelman, I. (1961), Theories of Economic Growth and Development, Stanford University Press, Stanford.
- Barro, R. and X. Salai- Martin, Economic Growth, McGraw Hill, New York.
- Behrman, S. and T.N. Srinivasan (1995), Handbook of Development Economics, Vol. 3, Elsevier, Amsterdam.
- Brown, M. (1966), On the Theory and Measurement of Technical Change, Cambridge, University Press, Cambridge, Mass.
- Chakravarti, S. (1982), Alternative Approaches to the Theory of Economic Growth, Oxford University Press, New Delhi.
- Chenery, H. and T.N. Srinivasan (Eds.) (1989), Handbook of Development Economics, Vols. 1 & 2, Elsevier, Amsterdam.
- Ghatak, S. (1986), An Introduction to Development Economics, Allen and Unwin, London.
- Gillis, M., D.H. Perkins, M. Romer and D.R. Snodgrass (1992), Economics of Development, (3rd Edition), W.W. Norton, New York.
- Higgins, B. (1959), Economic Development, W.W. Norton, New York.
- Jones, HG.(1975), An Introduction to Modern Theories of Economic Growth, Nelson, London.
- Kindleberger, C.P. (1977), Economic Development, (3rd Edition), McGraw Hill, New York.

- **Reading List:**

- Meir, G.M. (1995), Leading Issues in Economic Development, Oxford University Press, New Delhi.
- Mishra S.K. and V.K. Puri, Economics of Development and Planning, Himalaya Publishing House, Mumbai.
- Todaro, M.P. Economic Development, Latest Edition, Longman, London.
- Thiwal, A.P. (2003), (6^{th} Edition), Growth and Development, Seventh Edition, Macmillan, New York.
- Hogendorn, J. (1996), Economic Development, Addison, Wesley, New York.

MA (Economics) Semester-II

MONETARY ECONOMICS

Course Objective:

Students after the completion of this course are expected to identify the intensive but diversified role of money and monetary policy in the process of economic transformation and development which is required to uplift the quality of life. They will also be able to take systematic policy decision when it is required.

Unit I:

Basic Concept The function, Advantage and Definition (Theoretical and Empirical) of Money

Unit II:

Development of Monetary Theories a. Classical and Neo-Classical Theories b. Keynesian Monetary Theory c. Patinkin's Theory of Real Balance Effect d. Monetarism e. New Classical School

Unit III:

Supply of and Demand for Money a. Money Supply Analysis: Monetary Base Model of Money Supply Analysis (Money Multiplier), Decomposition of High Power Money. b. Demand for Money: Classical Neo-Classical, Keynes's, Friedman's, Inventory theoretic approach, Portfolio Balance Approach and McKinnon's Approach.

Unit IV:

Theories of Inflation a. Concept and Measurement of Inflation. b. Demand Pull Inflation, Cost Push Inflation. c. Inflation Theories: Classical and Neo-Classical Theories, The Inflationary Gap Model, The Phillips Curve, Lipsey's Version, Samuelson Solow Modification of Phillip Curve.

M.A. (ECONOMICS) SEM.-III

Public Finance

Course Outcomes

CO1 The students would learns of the feature the federal structure and financial relationship among them.

CO2 The course would develop the analytical ability of students to distinguish between beneficial and detrimental effects of a government policy and their effect on macroeconomics framework of an economy.

CO3 It will helps students to critically analyse the fiscal reforms and policy choices of the government in developed and developing countries.

Unit-I

Economic rationale of government, fiscal functions; market failures: imperfections, decreasing costs, externalities and public goods; concepts of private goods, pure public goods, mixed goods and merit goods; theory of public goods; free Rider's problem, the optimal provision of public goods, contributions of Samuelson arid Musgrave. Lindhal equilibrium; public choice and fiscal decision making, voting systems, majority voting.

Unit-II

Budgeting: various concepts, reforms in expenditure budgeting, zero based budgeting and performance budgeting. Budgets of the Union Government in India, budget making process in India; public expenditure in India: trends and issues.

Unit-III

Public Expenditure: structure and growth of public expenditure; Wagner's hypothesis, Peacock-Wiseman hypothesis; economic effects of public expenditure; criteria for public investment, social cost-benefits analysis: valuation of benefits and costs, discount rate.

Unit-IV

Theory of Taxation: Various approaches to taxation, neutrality, equity, ability to pay, benefit principle, revenue maximization, income maximization; analysis of incidence of taxes, elasticity, buoyancy and taxable, capacity, efficient tax design: optional taxation, effects of taxation on work effort, savings, investment and growth; classification of taxes: direct and

indirect taxes, progressive, proportionate and regressive taxes, Advalorem and specific taxes; tax systems in India; structure, composition and various economic issues..

Reading List:

- Musgrave R.A and Musgrave P.B., Public Economics in Theory and Practice, McGraw Hill.
- Stiglitz, J,E., Economics o/Public Sector, J.W. Norton & Company.
- Singh, S.K., Public Finance in Theory and Practice, S. Chand & Co.

Government of India, Ministry of Finance: Economics Survey (of various years).

- Raja J. Challiah, Towards Sustainable Growth, Essays in Fiscal and Financial Sector Reforms in India, o Oxford University

  Press, Delhi, 1996
- Deena Khatkhate (ed.), Money and Finance: Issue, Institutions, Policy, Sameeksha Trust, Orient Longman, 1998.
- Kunal Sen & Rajendra R. Vidya (ed.), Process of Financial Liberalization in India, Oxford

  University o

  Press, 1997.
- Mundel Sudipto (ed.) Public Finance: Policy Issue of India.
- Brown C.V. and Jackson P.M. (1990), Public Sector Economic, Basil Balackwell, Oxford.
- M. Govindia Rao and Tapan Sen (1998), Financial Federalism in India.
- Atkinson A.B. and Stightz, J.E. (1980), Lectures on Public Finance, Tata Mcgraw HilL
- Auerbach, A.J. and M. Feldstern (ed.) (1985), Handbook of Public Economics, Vol-I, North Holland,
  - Amsterdam.
- Raghabendra Jha (1999), Modern Public Economics, Rotledge, London.
- Srivaslava D.K. (ed.) (2000), Fiscal Federalism in India, Har-Anand Publication Ltd., New Delhi.
- Bhargava P.K. (1991), India's Fiscal Critics, Ashish Publishing House, New Delhi.

Govt. of India, Ministry of Finance (1988), Sarkaria Commission Report on Centre-State Finance Relations.

M.A. (Semester-III) Statistical Methods

Course Outcomes:

CO1. Students would learn the common statistical techniques and terminologies used in the course and understand the concept of a frequency distribution for sample data, and able to summarise the distribution by diagrams and statistics.

CO2 Students would be able to apply fundamental concepts and use appropriate software tools for data summary and exploratory data analysis.

CO3 Students would gain knowledge to interpret examples of methods for summarising data sets, including common graphical tools and summary statistics.

CO4 Students would develop an understanding of the basic concepts of probability, random variables, and sampling distribution of a statistic.

CO5 Students would learn the measurement of central tendency, hypothesis testing, analysis of variance and multiple regression and correlation analysis.

CO5 Students would become familiar with the sources of vital statistics data, how to interpret such data and how to perform basic tests to evaluate them which will help students in their doctoral research.

Unit –I

Diagrammatic and graphic representation of statistical data. Measures of central tendency: A.M.,

G. M., H.M., Median, quartiles, deciles, percentiles, mode, relationship between A.M., G.M. and

H. M., Selection of an average, Limitations of Averages.

Unit-II

Measures of dispersion: range, interquartile range, quartile deviation, mean deviation, standard deviation, standard deviation of the combined series, variance, coefficient of variation, relation between various measures of dispersion, Lorenz curve, skew ness and Kurtosis, moments

Unit-III

Index numbers: Problems and methods of construction of various types of indices, Laspeyres,

Pasche's and Fisher's ideal index numbers, Time reversal, factor reversal and circular tests; chain base indices, base shifting splicing and deflating the index nos., costs of living index numbers and consumer price index numbers. Time series: components of time series and their decomposition, Methods of measuring trend, cyclical, seasonal and irregular variation.

Unit-IV

Random experiment, random variable, sample space, events, fundamental principles of counting, classical, relative frequency and axiomatic approaches to probability, basic results on probability, conditional probability, Baye's thereon.

Reading List:

- Gupta S.C. "Fundamentals of Statistics" S. Chand & Sons New Delhi (1993)
- Spiegel, Murry R "Theory and problems of Statistics" (Schaum's outline series, McGraw Hill, 1992)
- Karmal P.H. and Polasek M. "Applied Statistics for Economists (4th edition), Pitman, Australia.

M.A. (Semester- III)
Indian Economy (optional)

Course Outcomes

CO1 To have knowledge about the issues in Indian Economy like planning, poverty, unemployment etc.

CO2 To know about relationship between monetary policy, fiscal policy and economic development.

CO3 To know about framework of policy making for the development of Indian economy

CO4 To know about the preparation of budgeting and its utilization for Indian economy.

Unit-I

Features of Indian economy; Nature and Characteristics of Indian economy; Planning; objectives and strategies; failures and achievements of plans.

Basic economic indicators-National income, performance of different sectors. Trends in prices and money supply.

Unit-II

Institutional structure: Land-reforms in India; Agricultural marketing and warehousing; Issues in food security - policies for sustainable agriculture; Agricultural finance policy; Agricultural price policy.

Unit-III

Malthusian theory of population, optimum theory of population, theory of demographic transition, population as 'Limits to Growth' and as 'Ultimate Source'

Concepts of Demography- Vital rates, life tables, composition and uses.
Measurement of fertility - Total fertility rate, gross and net reproduction rate -
Age pyramids, population projectionnstable, stationary and quasi-stationary population; Characteristics of Indian population through recent census.

Unit-IV

Financial Sector: Monetary policy of RBI; Money and Capital markets; Growth and problem; Role of commercial banks in India; Banking sector reforms since 1991

Reading List:

- Bardhan. P.K. (9th Edition) (1999), The Political Economy of Development in India, Oxford University
  Press, New Delhi. .
- Brahmanada, P.R. and V.R. Panchmukhi (Eds.) (2001), Development Experience in the Indian Economy:
  Inter-State Perspectives, Bookwell, Delhi.
- Datta, R. and KP.M. Sundhram (2003), Indian Economy. S. Chand & Company Ltd. New Delhi.
- Government of India, Economic Survey, (AnnuaJ), Ministry of Finance, New Delhi.
- Mishra, S.K and V.K Puii Indian Economy- 151 Development Experience, Himalaya Publishing House, Mumbai, Latest Edition.
- Rudra Ashok, Indian Plan Models.

- Todaro, P. Development Planning: Models and Methods.
- United Nations, Guidelines for Project Evaluation.

M.A. (Semester-IV)

International Economics

Course Outcomes

CO1 Students would know the country's position regarding international trade, payments and foreign exchange.

CO2 The students would learn the methods regarding improvement in terms of trade, international debt and balance of payments positions.

CO3 Students would know about the policies regarding increase in exports, to deal with international institutions and to maintain relation with other countries.

Since globalization and international relations can increase the rate of growth and solve domestic problems like inflation, unemployment and value of currency etc.

Unit-I

The pure theory of international trade - Theories of absolute advantage, comparative advantage and opportunity costs, modem theory of international trade; Theorem of factor price equalization; Empirical testing of the theory of absolute cost and comparative cost-Heckscher-Ohlin theory of trade. Kravis and Linder theory of trade Role of dynamic factors, i.e. change in tastes, technology and factor endowments in explaining the emergence of trade;

Unit-II

The Rybczynski theorem-concept and policy implications of immiserizing growth; Causes of emergency and measurement of intra-industry trade and its impact on developing economies. Measurement of gains from trade and their distribution; Concepts of terms of trade, their uses and limitations for less developed countries; Trade as an engine of economic growth; Welfare implications - empirical evidence and policy issues;

Unit-III

The Theory of interventions (Tariffs, Quotas and non-tariff barriers); Economic effects of tariffs and quotas on national income, output, employment, terms of trade, income distribution and Balance of payments on trading partners both in particle and general equilibrium analysis. The political economy of non-tariff barriers and their implications; Trade under imperfectly competitive market.

Unit-IV

Meaning and components of balance of payments; Equilibrium and disequilibrium in the balance of payments; The process of adjustment under system of gold standard, fixed exchange rates and flexible exchange rates; Expenditure-reducing and expenditure-switching policies and direct controls for adjustment; Policies for achieving internal and external equilibrium simultaneously under alternative exchange rate regimes; a critical review of the Absorption and monetary approaches to the theory of balance payment adjustment;

Reading List:

- Bhagwani, J. (Ed.) (1981), International Trade, Selected Readings, Cambridge University press, Massachusetts.
- Carbouth, M. (1999), International Economics, International Thompson Publishing, New York.
- Chacholiades, M. (1990), International Trade: Theory and Policy, McGraw Hill, Kogakusha, Japan.
- Dana, M.S. (2000), International Economics: Study Guide and Work Book (5th Edition), Rutledge Publishers, London.
- Dunn, R.M. and J.H. Mutt (2000), International Economics, Rutledge Publishers, London.

- Kenen, P.B. (1994), The international Economy, Cambridge University Press, London.
- Kindleberger, C.P. (1973), International Economics, R.D. Irwin, Homewood.
- King, P.G. (1995), International Economics and International Economic Policy: A Reader, McGraw Hill International, Singapore.
- Krufrnan, P.R. and M. Obstfeld (1994), International Economic: Theory and Policy, Glenview, Foresman.
- Salvatore, D. (1997), International Economics, Prentice Hall, Upper Saddle River, N.J. New York.
- Soderston, BO (1991), International Economics, The Macmillan Press Ltd., London

M.A. (Semester-IV)

Financial Institutions and Markets

Course outcomes

CO1 Students would have knowledge regarding money market, capital market, stock exchange i.e. Indian Financial System which is the backbone of the country.

CO2 To familiar students about the relationship between financial development and economic development.

CO3 To impart knowledge to students about controller of financial system, e.g. RBI, SEBI, IRDA and TERI.

Unit-I

Nature and Role of Financial System and Structure of Interest Rates - Money and finance-Money and near-money-Financial intermediation and financial intermediaries - The structure of the financial development.

Unit-II

Equilibrium in Financial Markets - Financial System and Economic Development Criteria to evaluate assets: Risk and financial assets, types of risk, return on assets, Risk - Return trade off Valuation of securities.

Unit-III

Theories of interest rate determination - Level of interest rates - Long period and Short period rates Term Structure of Interest rates - Theories of interest rates structure - Expectational theory Segmentation theory; Administered interest rates - Appropriate interest rate policy.

Unit-IV

Banks, Monetary Policy and Non-Bank Financial Interest diaries: Functions of Central Bank The aims and objectives of the monetary policy in developed and developing countries.

Reading List:

- Bhole, L.M. (1999), Financial Institutions and Markets, Tata McGraw Hill Company Ltd., New Delhi.
- Bhole, L.M. (2000), Indian Financial System, Chugh Publications, Allahabad.
- Edminster, R.O. (1986), Financial Institutions, Market and Management, McGraw Hill, New York.
- Goldsmith, R.W. (1969), Financial Structure and Development, Yale, London.
- Hanson, J.A. and S. Kathuria (Eds.) (1999), India: A Financial Sector for the Twenty-first Century, Oxford University Press, New Delhi.
- Karker, P.T. and S.A. Zenios (2000) (Ed.), Performance of Financial Institutions, Cambridge University Press, Cambridge.
- Johnson, H.J. (1993), Financial Institutions and Markets, McGraw Hill, New York.
- Khan M. Y. (1996), --Indian Financial Systems, Tata McGraw Hill, New Delhi.
- Machiraju, M.R. (1999), Indian Financial System, Vikash Publishing House, New Delhi.

  Ohlson, J.A. (1987), The Theory of Financial Markets and Institutions, North Holland, Amsterdam.
- Prasad, -K.N. (2001), Development of India's Financial System, Sarup & Sons, New Delhi.
- Robinson, R.I. and D. Wrightman (1981), Financial Markets, McGraw Hill, London.
- Smith, P.F. (1978), Money and Financial Intermediation: The Theory and
- Structure of Financial System, Prentice Hall, Englewood-Cilffs, New Jersey.

M.A. Economics Semester-IV

Agricultural Economics (optional)

Course Outcomes

CO1 Course provides knowledge agricultural background , farm and agro business activities, agri finance and management.

CO2 It introduces learner applied part of economics instead theoretical, which deals with allocation of land under various crops, specialization, diversification and other policy amplifications.

CO3 Course offer relevant production and various techniques to understand agri production, cost benefit analysis and enhance learner to make frontier-production function at least cost.

Unit-I

Land Reforms in India: Agricultural Development and Tenurial conditions: Land Reforms - The

Theoretical Issues (Meaning, Important changes caused by Land Reform and Objectives of Land

Reforms); Land Reforms; Ceiling on Land Holdings; Implementation of Land Reforms in India.

Strategy for Development of Indian Agriculture; The Green Revolution; Factors responsible for Green Revolution; Economics Benefits of Green Revolution; Measures for making Green Revolution all pervasive; Regional disparities created by Green Revolution; Inter-farm disparity in Income; Green Revolution and Employment. Trends in Migration and Labour markets; Minimum Wages Act.

Unit-II

Terms of Trade between Agriculture and Industry: Meaning; Impact of change in terms of trade in favour of and against agriculture; changes in terms of trade between agriculture and industry during the course of economic development; Terms of trade between agriculture and industry in India since Independence; Agricultural Marketing: Need for an efficient system of agricultural marketing; Efficiency of agricultural Marketing system in India; Measures to improve the efficiency of agricultural marketing in India. Cooperative movement in India - organization structure and development of different types of cooperatives in India.

Unit-III

Agricultural Credit: Importance of agricultural credit; Sources (formal and informal), problems and Government policies since Independence. Capital formation in the rural sector - savings, assets and credits. Issues in Agriculture price policy: objectives of Agricultural Price Policy; Main elements of Agricultural Price Policy; Agricultural Price Policy in India: Its evolution; objectives of Price policy in India; Important constitution of Agriculture Price Policy in India; Critical Evaluation of India's Agriculture Price Policy; Need for Revision of Agricultural Price Policy in India.

Unit-IV

The New Economic Policy and Indian Agriculture: Macro Economic Stabilization measures; structural Adjustments in the Agricultural Sector. World Trade Organization and Indian Agriculture; Model of Production Debate: Private V /s Public investment in Agriculture; Trends in public and private investment in Indian Agriculture.

M.A. Economics Semester-IV

International Finance (optional)

Course Outcomes

CO1 Students would know the country's position regarding international trade, payments and foreign exchange.

CO2 The students would learn the methods regarding improvement in terms of trade, international debt and balance of payments positions.

CO3 Students would know about the policies regarding increase in exports, to deal with international institutions and to maintain relation with other countries. Since globalization and international relations can increase the rate of growth and solve domestic problems like inflation, unemployment and value of currency etc.

Unit-I

Foreign trade multiplier with and without foreign repercussions and determination of national income and output; Relative merits and' demerits of fixed and flexible exchange rate in the

context of growth and development in developing countries. Forms of economic cooperation; Static and Dynamic effects of a custom union and free trade areas.

Unit-II

International Monetary System and Trade Policies in India: Multilateralism and WTO; Rise and fall off gold standard and Bretton-Wood system; Need, adequacy and determinants of international reserves; Conditionality clause of IMP; Emerging International Monetary System with special reference to Post Maastrishit developments and developing countries; Reforms of the International Monetary System, Theory of regionalism at global level - collapse of Brettonwood system. Optimum currency Areas - Theory and impact in the developed and developing countries.

Unit-Ill

Indian and developing countries; Functions of GATT/WTO (TRIPS; TRIMS); Recent changes in the direction and composition of trade and their implication; Rationale and impact of trade reforms since 1991 on balance of payments, employment and growth. **Unit-IV**

Problems of India's International debt; Working and regulations of MN9 in India, Instrument of export promotion and recent import and export policies and agenda for future.

Reading List:

- Bhagwani, J. (Ed~) (1981), International Trade, Selected Readings, Cambridge University press, Massachusetts.
- Carbouth, M. (1999), International Economics, International Thompson Publishing, New York.

  Chacholiades, M. (1990), International Trade: Theory and Policy, McGraw Hill, Kogakusha, Japan.
- Dana, M.S. (2000), International Economics: Study Guide and Work Book (5'/1 Edition), Rutledge Publishers, London.'
- Dunn,R.M. and I.H. Mutt (2000), International Economics, Rutledge Publishers, London.
- Kenen, P.B. (1994), The International Economy, Cambridge University Press, London.

SCHOOL OF PHARMACY(SOP)

RAFFELS UNIVERSITY, NEEMRANA

B. PHARMACY (4Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
UNIVERSITY

Vision:

To be an educational Institute of par excellence and produce competent pharmacy professionals to serve the community through research and the ever-increasing needs of Industry.

Mission:

1. Imparting quality education and innovative research for various career opportunities.
2. Creating conducive academic environment to produce competent pharmacy professionals.
3. Indoctrination of students adorned with high human values and make them aware of their responsibility as health care professionals.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 To train graduates of the program with a strong foundation to pursue higher studies and adapt in a globe of constantly developing trends.

PEO 2 To prepare graduates of the program to attain a broad array of professional skills for the successful career in pharmaceutical and healthcare systems.

PEO 3 To produce graduates of the program to exhibit professionalism, ethical attitude, communication skills and teamwork in their profession and adapt to current trends by engaging in lifelong learning.

Program Outcomes

S.No	PO Number	Name of the PO	outcome
1	PO-01	Pharmacy Knowledge	Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.
2	PO-02	Planning Abilities	Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

3	PO-03	Problem analysis	tilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
4	PO-04	Modern tool usage	Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
5	PO-05	Leadership skills:	Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well- being.
6	PO-06	Professional Identity:	Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
7	PO-07	Pharmaceutical Ethics	Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
8	PO-08	Communication:	Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
9	PO-09	The Pharmacist and society:	Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
10	PO-10	Environment and sustainability:	Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

11	PO-11	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self- assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

Program Specific Objectives

PSO1: Work in different divisions of pharmaceutical industry like manufacturing, quality control, quality assurance, sales, marketing and regulatory divisions.

PSO2: Explore opportunities as pharmacists in community and hospital pharmacy settings.

PSO3: Join different government organizations as drug analyst, chemist and drug inspectors for better management and control of pharmaceutical activities.

Course Objective and Course Outcomes

SCHOOL OF PHARMACY

(B. PHARMA w. e. f. 2022-26 onwards)

Sr. No.	sem	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	Con mode+sessional	End Term Exam	Total		
1	I	BP102T	Pharmaceutical Analysis I – Theory	4	-	10+15	75	100	3	4
2		BP108P	Pharmaceutical Analysis I – Practical	-	4	5+10	35	50	3	2
3	II	BP202T	Pharmaceutical Organic Chemistry I – Theory	4	-	10+15	75	100	3	4
4		BP208P	Pharmaceutical Organic Chemistry I–Practical	-	4	5+10	35	50	3	2
5		BP203T	Biochemistry – Theory	4	-	10+15	75	100	3	4
6		BP209P	Biochemistry – Practical	-	4				3	2
7	III	BP301T	Pharmaceutical Organic Chemistry II – Theory	4	-	10+15	75	100	3	4
8		BP305P	Pharmaceutical Organic Chemistry II – Practical	-	4	5+10	35	50	3	2

9	**IV**	BP401T	Pharmaceutical Organic Chemistry III– Theory	4	-	10+15	75	100	3	4
10	**VI**	BP606T	Quality Assurance– Theory	4	-	10+15	75	100	3	4
11	**VII**	BP701T	Instrumental Methods of Analysis – Theory	4	-	10+15	75	100	3	4
12		BP705 P	Instrumental Methods of Analysis – Practical	-	4	5+10	35	50	3	2

SCHOOL OF PHARMACY(SOP)

RAFFELS UNIVERSITY, NEEMRANA

B. PHARMACY (4Years Degree Program)

I-SEMESTER

Name of the course: **Pharmaceutical Analysis I – Theory**

Course code no: **BP102T**

Course Objectives,

1 understand the principles of volumetric and electro chemical analysis
2. carryout various volumetric and electrochemical titrations
3. develop analytical skills,

Course Outcomes:

1. To study fundamentals of pharmaceutical analysis and pharmacopoeia.
2. Understand basic concepts involved in errors and to know the sources of impurities and methods to determine the impurities.
3. Clarify need and basic principles of Acid Base titration, non-aqueous titration
4. Clarify need and basic principles of complexometric titration, precipitation titrations, gravimetric analysis etc

5. Illustrate principle, types of electrodes, instrumentation and applications of Potentiometry, Conductometry and Polarography

Name of the course: **Pharmaceutical Analysis I – practical**

Course code no: **BP108T**

Course Outcomes:

1. To get acquaint to basic knowledge on methods of expressing the concentrations of solutions and errors

2. Understand concept of Acid base and non-aqueous titrations
3. Understand concept of Precipitation and complexometric
4. Understand concept of redox titrations
5. Understand concept of various electrochemical titrations.

II-SEMESTER

Name of the course: Pharmaceutical Organic Chemistry I – Theory

Course code no: BP202T

Course Objectives:

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. identify/confirm the identification of organic compound

Course Outcomes:

1. Knowledge of the classification, nomenclature, structure and the type of isomerism of the organic compound
2. Understanding of important physical properties, reactions (and underlying mechanisms) and methods of preparation of various functional groups
3. Account for reactivity/stability of compounds and intermediates forming in reactions
4. Identify/confirm the identification of organic compound.
5. Explain the structure and uses of various organic compounds

Name of the course: Pharmaceutical Organic Chemistry I– Practical

Course code no: BP208P

Course Outcomes:

1. Knowledge of safety measures in organic chemistry laboratory and various laboratory techniques.
2. Understanding of steps involved in identification of unknown organic compound.
3. Ability to prepare s solid derivatives from organic compounds.
4. Develop skills to prepare stereo models containing various functional groups

Name of the course: BIOCHEMISTRY-Theory

Course code no: BP203 T

Course Objectives:

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Course Outcomes:

1. Learn qualitative analysis test of carbohydrates, amino acids and proteins
2. Understand and prepare the role of buffer solutions
3. Understand qualitative analysis of urine for normal and abnormal constituents.
4. Study principle and procedure for determination of serum total cholesterol, blood sugar and blood creatinine
5. Understand role of salivary amylase

Name of the course: BIOCHEMISTRY-Practical

Course code no: BP2039P

Course Outcomes:

1. Learn qualitative analysis test of carbohydrates, amino acids and proteins
2. Understand and prepare the role of buffer solutions
3. Understand qualitative analysis of urine for normal and abnormal constituents.
4. Study principle and procedure for determination of serum total cholesterol, blood sugar and blood creatinine
5. Understand role of salivary amylase

III-SEMESTER

Name of the course: Pharmaceutical Organic Chemistry II – Theory

Course code no: BP301T

Course Objectives:

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. prepare organic compounds

Course Outcomes:

1. Understand the introduction, orbital picture, resonance, reactions and effects of substituents of benzene.
2. Explain acidity, effect of substituents, reaction and qualitative test of phenols. Also elucidate basicity, effect of substituents, reaction of aromatic amines.
3. Knowledge on the chemistry, reactions and Quality control tests for of fats and oils.
4. Knowledge of synthesis, reactions and structure and medicinal uses of some polynuclear hydrocarbons.
5. Understand the theory of stability and reactions cycloalkanes

Name of the course: Pharmaceutical Organic Chemistry II – practical

Course code no: BP305P

1. Demonstration of recrystallisation and Steam distillation
2. Determine the saponification, acid and iodine value of oil sample.
3. Synthesize the different organic compounds and understand the reaction mechanisms

IV-SEMESTER

Name of the course: Pharmaceutical Organic Chemistry III– Theory

Course code no: BP401T

Course Objectives:

1. understand the methods of preparation and properties of organic compounds

2. explain the stereo chemical aspects of organic compounds and stereo chemical reactions

3. know the medicinal uses and other applications of organic compounds

Course Outcomes:

1. Understand the Stereo-chemical features including optical isomerism and stereo electronic effects.
2. Understand the Geometrical isomers and biphenyl compounds and reactions.
3. To acquire the knowledge and understanding of the basic experimental principles of heterocyclic chemistry.
4. To draw the structures and synthesize simple pharmaceutically active organic compounds having five and six membered heterocyclic compounds.
5. To describe detailed mechanisms for common naming reactions.

VI-SEMESTER

Name of the course: Quality Assurance –Theory

Course code no: BP606 T

Course Objectives:

1. understand the cGMP aspects in a pharmaceutical industry
2. appreciate the importance of documentation
3. Understand the scope of quality certifications applicable to pharmaceuticalindustries
4. understand the responsibilities of QA & QC departments

Course Outcomes:

1. Explain significance Of quality in pharmaceutical manufacturing units
2. Follow cGMP, GLP and GDP while working in pharmaceutical industry
3. Explain the concept of QbD
4. Role of Regulatory Agencies in deciding Quality Standards, significance of validation in quality assurance
5. The various documentation process is highlighted to the student

VII-SEMESTER

Name of the course: Quality Assurance –Theory

Course code no: BP701 T

Course Objectives:

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments

4. Course Outcomes:

1. Understand the interaction of matter with electromagnetic radiations, principle and instrumentation and application of UV Visible spectroscopy and fluorimetry applications in drug analysis.
2. Understand the IR spectroscopy and Flame Photometry principle and instrumentation and application of in drug analysis.
3. Understand the TLC, Adsorption and partition column, Paper, electrophoresis chromatographic principles and instrumentations and application of in drug analysis.
4. Understand Gas chromatography, high performance liquid chromatographic principle and instrumentation and application of in drug analysis.
5. Understand Ion exchange, gel, affinity chromatography , high performance liquid chromatographic principle and instrumentation and application of in drug analysis.

VII-SEMESTER

Name of the course: Quality Assurance –Theory

Course code no: BP705 T

Course Outcomes:

1. Determination of absorption maxima and analysis of drug molecules using the spectrometric methods
2. Estimation of drug molecules using the spectrometric methods
3. Determination of ions in drug molecules using various spectrophotometric techniques
4. Separation of various carbohydrates and plant pigments using chromatographic techniques
5. Demonstration of HPLC and GC chromatographic methods

IMA theory Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	3	1	1	1	2	1	2	3	3	0	2
CO2	3	2	3	1	1	2	2	1	1	2	2	2	0	2
CO3	3	3	3	3	2	1	1	2	1	1	2	3	0	2
CO4	3	1	2	2	2	1	3	2	2	1	3	3	0	2
CO5	3	2	2	1	3	2	3	3	2	1	2	2	0	2
Total	15	11	12	10	09	07	10	10	07	07	12	13	0	10

IMA Practical Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	1	3	0	2	2	1	1	0	3	3	0	2
CO2	3	2	2	2	1	0	2	1	1	0	2	2	0	2
CO3	3	3	3	3	0	1	3	1	1	0	3	3	0	2
CO4	3	2	1	3	1	0	2	0	1	0	3	3	0	2
CO5	3	1	1	2	1	0	1	1	1	0	2	3	0	2
Total	15	11	8	13	3	3	10	4	5	0	13	14	0	10

PA-I theory Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	1	0	2	2	0	2	1	2	3	2	0
CO2	3	3	2	2	0	0	3	1	2	0	2	3	2	0
CO3	3	3	3	1	1	2	3	1	2	1	2	3	2	3
CO4	3	1	2	3	1	2	2	1	2	1	2	2	2	0
CO5	3	2	2	3	1	1	2	1	1	2	1	3	2	0
Total	15	12	11	10	3	7	12	4	9	5	9	14	10	0

PA-I Practical Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	2	0	0	1	1	0	1	1	3	3	0	0
CO2	3	2	2	0	0	2	1	0	2	1	3	3	0	0
CO3	3	1	3	0	0	1	1	0	2	1	3	3	0	0
CO4	3	1	2	0	0	1	2	0	2	1	3	3	0	0
CO5	3	1	1	2	0	1	1	0	2	1	3	3	0	0
Total	15	7	10	2	0	6	6	0	9	5	15	15	0	0

POC-I Theory Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	3	1	1	1	2	1	2	3	2	0	2
CO2	3	2	3	1	1	2	2	1	1	2	2	2	0	2
CO3	3	3	3	3	2	1	1	2	1	1	2	2	0	2
CO4	3	1	2	2	2	1	3	2	2	1	3	2	0	2
CO5	3	2	2	1	1	1	1	1	1	1	1	12	0	2
Total	15	11	12	10	7	6	8	8	6	7	11	20	0	10

POC-I Practical Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	1	3	0	2	2	1	1	0	3	3	0	2
CO2	3	2	2	2	1	0	2	1	1	0	2	2	0	2
CO3	3	3	3	3	0	1	3	1	1	0	3	3	0	2
CO4	3	2	1	3	1	0	2	0	1	0	3	3	0	2
Total	12	10	7	11	2	3	9	3	4	0	11	11	0	8

POC-II Theory Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	2	1	0	2	2	0	2	1	2	3	2	0
CO2	3	3	2	2	0	0	3	1	2	0	2	3	2	0
CO3	3	3	3	1	1	2	3	1	2	1	2	3	2	3
CO4	3	1	2	3	1	2	2	1	2	1	2	2	2	0
CO5	3	2	2	3	1	1	2	1	1	2	1	3	2	0
Total	12	10	9	7	2	6	10	3	8	3	8	11	8	3

POC-II Practical Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	2	0	0	1	1	0	1	1	3	3	0	0
CO2	3	2	2	0	0	2	1	0	2	1	3	3	0	0
CO3	3	1	3	0	0	1	1	0	2	1	3	3	0	0
Total	9	5	7	0	0	4	3	0	5	3	9	9	0	0

POC-III theory Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	2	0	0	1	1	2	1	0	3	0	0	0
CO2	3	2	1	1	0	0	1	2	2	0	2	1	0	0
CO3	3	3	2	2	0	2	2	3	3	3	3	3	0	0
CO4	3	3	3	3	2	3	2	3	3	3	3	3	0	0
	3	2	1	1	0	3	1	2	1	2	2	1	0	0
Total	12	10	8	6	2	6	6	10	9	6	11	7	0	0

Biochemistry theory Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	2	0	0	1	1	2	1	0	3	0	0	0
CO2	3	2	1	1	0	0	1	2	2	0	2	1	0	0
CO3	3	3	2	2	0	2	2	3	3	3	3	3	0	0
CO4	3	3	3	3	2	3	2	3	3	3	3	3	0	0
CO5	3	2	1	1	0	3	1	2	1	2	2	1	0	0
Total	15	12	9	7	2	9	7	12	10	8	13	8	9	7

Biochemistry practical Mapping

Cos	Program Outcomes											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	1	2	2	0	1	2	0	2	1	3	3	0	0
CO2	3	0	2	2	0	2	1	0	2	1	3	3	0	0
CO3	3	1	1	0	0	2	2	0	1	1	3	3	0	0
CO4	3	1	2	2	0	1	1	0	1	1	3	3	0	0
CO5	3	1	1	0	0	1	1	0	2	1	3	3	0	0
Total	15	4	8	6	0	7	7	0	8	5	15	15	0	0

QA theory Mapping

Cos	Program Outcomes											PSO			Total
	1	2	3	4	5	6	7	8	9	10	11	1	2	3	
CO1	3	2	3	1	1	2	2	2	2	3	3	3	0	1	33
CO2	3	1	3	1	1	2	2	1	2	2	2	2	0	1	27
CO3	3	2	2	1	3	3	3	1	3	1	1	3	0	1	31
CO4	3	2	2	2	2	2	1	2	2	2	3	3	0	1	31
CO5	3	3	3	2	3	3	3	3	3	2	2	2	0	1	36
Total	15	10	13	7	10	12	11	9	12	10	11	13	0	5	

SYLLABUS

BP102T. PHARMACEUTICAL ANALYSIS (Theory) 45 Hours

UNIT-I 10 Hours

(a) Pharmaceutical analysis- Definition and scope

i) Different techniques of analysis

ii) Methods of expressing concentration

iii) Primary and secondary standards.

iv) Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate

(b)Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

(c)Pharmacopoeia, Sources of impurities in medicinal agents,limit tests.

UNIT-II 10 Hours Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves Non aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

UNIT-III 10 Hours Precipitation titrations: Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride. Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate. Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate. Basic Principles,methods and application of diazotisation titration.

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UNIT-IV 08 Hours

Redox titrations

(a) Concepts of oxidation and reduction

(b) Types of redox titrations (Principles and applications)

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

UNIT-V 07 Hours Electrochemical methods of analysis Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications. Potentiometry - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications. Polarography - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications

BP108P. PHARMACEUTICAL ANALYSIS (Practical)

4 Hours / Week

I Limit Test of the following

(1) Chloride

(2) Sulphate

(3) Iron
(4) Arsenic
II Preparation and standardization of
(1) Sodium hydroxide
(2) Sulphuric acid
(3) Sodium thiosulfate
(4) Potassium permanganate
(5) Ceric ammonium sulphate
III Assay of the following compounds along with Standardization of Titrant
(1) Ammonium chloride by acid base titration
(2) Ferrous sulphate by Cerimetry
(3) Copper sulphate by Iodometry
(4) Calcium gluconate by complexometry
(5) Hydrogen peroxide by Permanganometry
(6) Sodium benzoate by non-aqueous titration
(7) Sodium Chloride by precipitation titration
IV Determination of Normality by electro-analytical methods
(1) Conductometric titration of strong acid against strong base
(2) Conductometric titration of strong acid and weak acid against strong base
(3) Potentiometric titration of strong acid against strong base

BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY –I (Theory) 45 Hours
UNIT-I 07 Hours Classification, nomenclature and isomerism
Classification of Organic Compounds
Common and IUPAC systems of nomenclature of organic compounds
(up to 10 Carbons open chain and carbocyclic compounds)
Structural isomerisms in organic compounds
UNIT-II10 Hours Alkanes*, Alkenes* and Conjugated dienes*
SP3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins.
Stabilities of alkenes, SP2 hybridization in alkenes
E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E1 verses E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.
Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement
UNIT-III10 Hours
Alkyl halides*
SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.
SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions
Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform. Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol,
chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol
UNIT-IV10 Hours Carbonyl compounds* (Aldehydes and ketones)
Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin

condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.
UNIT-V 08 Hours Carboxylic acids*
Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids ,amide and ester
Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid
 Aliphatic amines* - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY -I (Practical)
I.Systematic qualitative analysis of unknown organic compounds like
1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
3. Solubility test
4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
5. Melting point/Boiling point of organic compounds
6. Identification of the unknown compound from the literature using melting point/ boiling point.
7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
8. Minimum 5 unknown organic compounds to be analysed systematically.
II. Preparation of suitable solid derivatives from organic compounds
III. Construction of molecular models

BP203 T. BIOCHEMISTRY (Theory) 45 Hours
UNIT I 08 Hours Biomolecules
Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins. Bioenergetics
Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.
Energy rich compounds; classification; biological significances of ATP and cyclic AMP
UNIT II 10 Hours Carbohydrate metabolism
Glycolysis – Pathway, energetics and significance
Citric acid cycle- Pathway, energetics and significance
HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency
Glycogen metabolism Pathways and glycogen storage diseases (GSD)
Gluconeogenesis- Pathway and its significance
Hormonal regulation of blood glucose level and Diabetes mellitus Biological oxidation
Electron transport chain (ETC) and its mechanism.

Oxidative phosphorylation & its mechanism and substrate
phosphorylation
Inhibitors ETC and oxidative phosphorylation/Uncouplers
level
UNIT III 10 Hours Lipid metabolism
β-Oxidation of saturated fatty acid (Palmitic acid)
61
Formation and utilization of ketone bodies; ketoacidosis
De novo synthesis of fatty acids (Palmitic acid)
Biological significance of cholesterol and conversion of cholesterol into
bile acids, steroid hormone and vitamin D
Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis,
fatty liver and obesity. Amino acid metabolism
General reactions of amino acid metabolism: Transamination,
deamination & decarboxylation, urea cycle and its disorders
Catabolism of phenylalanine and tyrosine and their metabolic disorders
(Phenyketonuria, Albinism, alkeptonuria, tyrosinemia)
Synthesis and significance of biological substances; 5-HT, melatonin,
dopamine, noradrenaline, adrenaline
Catabolism of heme; hyperbilirubinemia and jaundice
UNIT IV 10 Hours Nucleic acid metabolism and genetic information transfer
Biosynthesis of purine and pyrimidine nucleotides
Catabolism of purine nucleotides and Hyperuricemia and Gout disease
Organization of mammalian genome
Structure of DNA and RNA and their functions
DNA replication (semi conservative model)
Transcription or RNA synthesis
Genetic code, Translation or Protein synthesis and inhibitors
62
UNIT V 07 Hours Enzymes
Introduction, properties, nomenclature and IUB classification of enzymes
Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)
Enzyme inhibitors with examples
Regulation of enzymes: enzyme induction and repression, allosteric
enzymes regulation
Therapeutic and diagnostic applications of enzymes and isoenzymes
Coenzymes –Structure and biochemical functions

BP 209 P. BIOCHEMISTRY (Practical)

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose,
Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins
(Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar

7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity. 12. Study the effect of substrate concentration on salivary amylase activi

BP301T. PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory) 45 Hours
UNIT I 10 Hours Benzene and its derivatives
A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule
B. Reactions of benzene - nitration, sulphonation, halogenationreactivity, Friedelcrafts alkylation- reactivity, limitations,
Friedelcrafts acylation.
C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction
D. Structure and uses of DDT, Saccharin, BHC and Chloramine
UNIT II 10 Hours Phenols* - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols Aromatic Amines* - Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts Aromatic Acids* –Acidity, effect of substituents on acidity and
important reactions of benzoic acid.
UNIT III 10 Hours Fats and Oils
a. Fatty acids – reactions.
73
b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.
c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.
UNIT IV 08 Hours Polynuclear hydrocarbons:
a. Synthesis, reactions
b. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives
UNIT V 07 Hours Cyclo alkanes*
Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

BP305P. PHARMACEUTICAL ORGANIC CHEMISTRY -II (Practical)

I Experiments involving laboratory techniques Recrystallization
 Steam distillation
II Determination of following oil values (including standardization of reagents) Acid value Saponification value Iodine value
III Preparation of compounds Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol

/Aniline by acylation reaction. 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/ Acetanilide by halogenation (Bromination) reaction. 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction. Benzoic acid from Benzyl chloride by oxidation reaction. Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by
hydrolysis reaction. 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling
reactions. Benzil from Benzoin by oxidation reaction. Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction
 Cinnammic acid from Benzaldehyde by Perkin reaction
 P-Iodo benzoic acid from P-amino benzoic acid

BP401T. PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory) 45 Hours
UNIT-I 10 Hours
Stereo isomerism
Optical isomerism – Optical activity, enantiomerism, diastereoisomerism, meso compounds
Elements of symmetry, chiral and achiral molecules
DL system of nomenclature of optical isomers, sequence rules, RS system of
nomenclature of optical isomers
Reactions of chiral molecules
Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute
UNIT-II 10 Hours
Geometrical isomerism
Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems)
Methods of determination of configuration of geometrical isomers.
Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical
activity. Stereospecific and stereoselective reactions
UNIT-III 10 Hours
87
Heterocyclic compounds:
Nomenclature and classification
Synthesis, reactions and medicinal uses of following compounds/derivatives
Pyrrole, Furan, and Thiophene
Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene
UNIT-IV 8 Hours
Synthesis, reactions and medicinal uses of following compounds/derivatives
Pyrazole, Imidazole, Oxazole and Thiazole.
Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine
Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives
UNIT-V 07 Hours
Reactions of synthetic importance
Metal hydride reduction (NaBH4 and LiAlH4), Clemmensen reduction, Birch
reduction, Wolff Kishner reduction.
Oppenauer-oxidation and Dakin reaction.
Beckmanns rearrangement and Schmidt rearrangement.
Claisen-Schmidt condensation

BP606TPHARMACEUTICAL QUALITY ASSURANCE (Theory) 45 Hours

UNIT – I 10 Hours
Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP
Total Quality Management (TQM): Definition, elements, philosophies
ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines
Quality by design (QbD): Definition, overview, elements of QbD program, tools
ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration
NABL accreditation : Principles and procedures
UNIT - II 10 Hours
Organization and personnel: Personnel responsibilities, training, hygiene and personal records.
Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.
Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.
UNIT – III 10 Hours
Quality Control: Quality control test for containers, rubber closures and secondary packing
141
materials.
Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities
UNIT – IV 08 Hours
Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.
Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.
UNIT – V 07 Hours
Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.
Warehousing: Good warehousing practice, materials management

BP701T. INSTRUMENTAL METHODS OF ANALYSIS (Theory) 45 Hours
UNIT –I 10 Hours
UV Visible spectroscopy
Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.
Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode. Applications - Spectrophotometric titrations, Single component and multi component
analysis
Fluorimetry

Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications

UNIT –II 10 Hours

IR spectroscopy

Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations

Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications

Flame Photometry-Principle, interferences, instrumentation and applications

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Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications

Nepheloturbidometry- Principle, instrumentation and applications

UNIT –III 10 Hours

Introduction to chromatography

Adsorption and partition column chromatography-Methodology, advantages, disadvantages and applications.

Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.

Paper chromatography-Introduction, methodology, development techniques, advantages, disadvantages and applications

Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications

UNIT –IV 08 Hours

Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications

High performance liquid chromatography (HPLC)-Introduction, theory, instrumentation, advantages and applications.

UNIT –V 07 Hours

Ion exchange chromatography- Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications

Gel chromatography- Introduction, theory, instrumentation and applications

Affinity chromatography- Introduction, theory, instrumentation and applications

BP705P. INSTRUMENTAL METHODS OF ANALYSIS (Practical)

1 Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds

2 Estimation of dextrose by colorimetry

3 Estimation of sulfanilamide by colorimetry

4 Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy

5 Assay of paracetamol by UV- Spectrophotometry

6 Estimation of quinine sulfate by fluorimetry

7 Study of quenching of fluorescence

8 Determination of sodium by flame photometry

9 Determination of potassium by flame photometry

10 Determination of chlorides and sulphates by nephelo turbidometry

11 Separation of amino acids by paper chromatography
12 Separation of sugars by thin layer chromatography
13 Separation of plant pigments by column chromatography
14 Demonstration experiment on HPLC
15 Demonstration experiment on Gas Chromatography

B.Pharm Pharmaceutics

Syllabus

(2022-2026)

RAFFLES UNIVERSITY

Department of Pharmaceutics

School of Pharmacy

RAFFLES UNIVERSITY

Japanese Zone, National Highway-48, Neemrana-301705,

District: Alwar, RAJASTHAN, INDIA

www.rafflesuniversity.edu.in

SCHOOL OF PHARMACY (SOP)

RAFFLES UNIVERSITY, NEEMRANA

B.Pharm (Department of Pharmaceutics)

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Provide students with fundamental knowledge and ability to expertise in Pharmaceutics.
PO 2	Apply knowledge of excipients, dosage forms, production, quality, safety and production management to optimize pharmaceutical products and drug delivery systems.
PO 3	Use modern tools, software and equipment to analyze and solve problems.
PO 4	Prepare students to be aware of excellence, leadership, written ethical codes and guidelines and lifelong learning needed for successful professional career by providing them with an excellent academic environment.
PO 5	Demonstrate ability to design formulation and drug delivery systems process as per specifications in Pharmaceutical Industries and Marketing.
PO 6	Develop to analysis, visualize and work on multidisciplinary tasks in the Pharma Industry and in research.
PO 7	Formulate solutions and identify risks and Analyze problems with current drug therapy, in order to deliver the best pharmaceutical care to the patient.
PO 8	Assume roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well- being.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Department of Pharmaceutics, offers Four Year (comprising 8 semesters) Graduate Program in Pharmaceutics with objective of empowering students to acquire all-inclusive understanding of Pharmaceutical both theoretical and practical as an academic discipline. Upon completion of B.Pharm Pharmaceutics Degree Program successfully, the students shall acquire the following skills and competencies.

PSO 1	Apply the principles of drug delivery system in the development of eco-friendly, Efficacious dosage forms.
PSO 2	Develop an ability to undertake multidisciplinary tasks in the pharmaceutical quality system.
PSO 3	Analyze, criticize, organize, improvise and manage documents, data and information related to pharmaceutical production process.
PSO 4	Execute team based research to implement innovative solutions in the area of formulation, quality assurance and technology transfer.
PSO 5	Apply problem-based learning approach and analytical thinking in academic and professional life.
PSO 6	Validate the knowledge and skills gained through education to gain recognition in Pharmaceutical society and related field.
PSO 7	Set-up pharmaceutical production unit to design and formulate pharmaceutical dosage forms..

PSO-PO Mapping

	PO							
PSO		**1**	**2**	**3**	**4**	**5**	6	**7**
	1	√	√	√				
	2	√	√		√	√		
	3	√	√	√	√	√		
	4	√	√	√	√	√		√
	5			√	√	√	√	√
	6						√	√
	7			√	√		√	√
	8	√		√	√	√		

Course Objective and Course Outcomes

SCHOOL OF PHARMACY

Department of Pharmaceutics

(B.Pharm w. e. f. 2022-26 onwards)

Sr. No.	Semester	Course Code No.	Name of Course	Continuous Mode	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
					L	P	IA	End Term Exam	Total		
1	I	BP103T	Pharmaceutics I – Theory	10	4	-	15	75	100	3	4
		BP109P	Pharmaceutics I – Practical	5	-	4	10	35	50	3	2
2.	III	BP302T	Physical Pharmaceutics I – Theory	10	4	-	15	75	100	3	4
		BP306P	Physical Pharmaceutics I Practical	5	-	4	10	35	50	3	2
3		BP304T	Pharmaceutical Engineering	10	4	-	15	75	100	3	4
		BP308P	Pharmaceutical Engineering	5	-	4	10	35	50	3	2
4	IV	BP403T	Physical Pharmaceutics II – Theory	10	4	-	15	75	100	3	4
		BP407P	Physical Pharmaceutics II – Practical	5	-	4	10	35	50	3	2
5	V	BP502T	Industrial Pharmacy I Theory	10	4	-	15	75	100	3	4
		BP506P	Industrial Pharmacy I Practical	5	-	4	10	35	50	3	2
6	VI	BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	4	-	15	75	100	3	4
7		BP605T	Pharmaceutical Biotechnology – Theory	10	4	-	15	75	100	3	4

8	**VII**	**BP702T**	**Industrial Pharmacy II Theory**	**10**	**4**	-	15	75	100	3	4
9		**BP704T**	**Novel Drug Delivery Systems Theory**	**10**	**4**	-	15	75	100	3	4
10	**VIII**	**BP809ET**	**Cosmetic Science**	**10**	**4**	-	15	75	100	3	4
	TOTAL			**125**	**40**	**20**			**1250**	45	**50**

SCHOOL OF PHARMACY

(Syllabus & Scheme of Studies w.e.f. 2021-22)

Department of Pharmaceutics

1. Pharmaceutics I

Sub code: (BP103T)

Course Outcomes:

1. Student will be able to know about the history and scope in pharmacy profession.
2. Student will be able to understand different components of prescription and how to handle the patients.
3. Student will know how to calculate dose through using pharmaceutical calculation.
4. Students will come to know different dosage form, additive, method of preparation and Quality control parameter.
5. Students will come to know about Pharmaceutical incompatibility and how to overcome these.

2. Physical Pharmaceutics I

Sub code: (BP302T)

Course Outcomes:

1. Student will be able to know about the solubility expression and mechanism and parameters which affect the solubility.
2. Student will be able to know about different type of system.

3. Student will understand concept of surface tesnion and interfacial tension and its significance.
4. Students will come to know about complexation and protein binding and its method of analysis.
5. Students will come to know about isotonic solution, buffer and its significance in pharmacy.

3. Pharmaceutical Engineering

Sub Code: (BP304T)

Course Outcomes:

1. To understand Beronulli Theorem and mechanism of size reduction and size separation.
2. To learn about Role of heat transfer through conduction, convection and radiation and describe the Concept of Evaporation and Distillation.
3. To study the objective, application, equipments and mechanism of drying and mixing process.
4. To understand objectives, theories, application and equipment used in Filtration and Centrifugation.
5. To learn cause of corrosion, theories, factor influencing and prevention of corrosion.

4. Physical Pharmaceutics II

Sub Code: (BP403T)

Course Outcomes:

1. To understand Colloidal Dispersion and its properties and pharmaceutical importance.
2. To know about Rheology and flow properties of different dosage form.
3. To know basic principles involved in formation of Suspensions and emulsion.
4. To evaluate parameters affect Flow properties of powder
5. To understand about drug stability and its importance in preparation of any formulation.

5. Industrial Pharmacy I

Sub Code: (BP502T)

Course Outcomes:

1. To understand Preformulation studies, physicochemical properties and BCS classification of drugs.
2. To know about different method of preparation of tablet and liquid orals and its significance.
3. To know formulation, method of preparation and quality control of capsule and pelletization process.
4. To evaluate and preparation of Parental product and ophthalmic preparation.
5. To understand different formulation and preparation of cosmetics and pharmaceutical aerosols.

6. Biopharmaceutics and Pharmacokinetics

Sub Code: (BP604T)

Course Outcomes:

1. To know the basic concepts in biopharmaceutics and pharmacokinetics and it's significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. Understand various pharmacokinetic parameters, their significance & applications.

7. Pharmaceutical Biotechnology

Sub Code: (BP605T)

Course Outcomes:

1. To learn and understand about scope of Pharmaceutical Biotechnology, benefit of Enzyme Biotechnology and basic principles of Biosensor and Protein engineering.

2. To analyse, understand and integrate about cloning vectors, restrictions endonucleases, PCR and rDNA technology.
3. To determine and compare immunity and recent advancement to improve immunity as well as understand basic concepts of hybridoma technology.
4. To compare different immunoblotting techniques and understand basic concepts of microbial genetics.
5. To understand about different method of fermentation and production of different preparation.

8. Industrial Pharmacy II

Sub Code: (BP702T)

Course Outcomes:

1. To understand the Pilot plant scale up for solids, liquid orals, semisolids preparation.
2. Have knowledge regarding WHO Guideline of Technology Transfer and Agency related to TT in India
3. To understand about the historical background of Regulatory affair, it's role and responsibilities and brief knowledge of IND, NDA and BE studies.
4. Have knowledge regarding the Quality Management system, ISO 9000 Series and Six Sigma Concept significance.
5. To know about Central Drug Standard Control Organization and certificate issuing authority in state to efficient running of premises

9. Novel Drug Delivery System

Sub Code: (BP704T)

Course Outcomes:

1. To understand benefit of controlled release system and different polymer used under it.
2. To understand different method of preparation penetration enhancers, transmucosal permeability and osmotic pumps.
3. To analyse different drug delivery systems and it's application.
4. To learn in detail about different formulation of targeted drug delivery systems.

5. To know about benefit and polymer used in ODDS and IDDS.

10. Cosmetics Science

Sub Code: (BP809ET)

Course Outcomes:

1. To know about the role of pharmaceutics in formulation of cosmetic
2. To understand principles and building block of skin care and hair care products.
3. To understand about SPF and analytical cosmetics
4. To know different principles of cosmetics evaluation.
5. To know about different Cosmetic problems associated with skin.

CO-PO MAPPING

BP103T	**PO**							
CO	1	2	3	4	5	6	7	8
1	3	2	1	3	2	2	1	1
2	2	2	3	2	2	2	3	2
3	2	1	2	1	1	1	2	3
4	3	2	1	2	2	2	1	2
5	3	1	2	1	1	2	1	2

BP302T	**PO**							
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	3	2	1	3	2	2	1	1
2	1	2	2	2	2	1	1	2
3	2	2	1	1	2	2	2	2
4	3	2	2	3	2	2	3	2
5	2	2	1	2	2	3	2	1

BP304T	**PO**							
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	3	2	2	2	2	3	1	1
2	2	2	3	2	3	2	2	2
3	3	2	2	2	1	1	2	2
4	2	2	1	2	1	2	1	2
5	3	3	2	3	3	2	3	2

BP403T	**PO**							
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	3	2	2	2	2	3	2	3
2	2	2	2	3	2	2	3	2
3	2	1	2	1	3	3	2	2
4	3	2	2	3	2	2	2	3
5	3	2	2	2	3	2	3	2

BP502T	**PO**							
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	3	2	3	2	2	2	1	1
2	2	2	3	2	2	2	3	2
3	2	1	2	1	3	2	2	2
4	3	2	1	2	2	2	1	2
5	3	1	2	2	1	2	1	2

BP604T	**PO**							
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	3	2	1	2	2	2	3	1
2	2	2	3	2	1	2	3	2
3	2	1	2	1	2	1	2	3
4	3	2	1	2	2	2	1	2
5	3	1	2	1	1	2	1	2

BP605T	**PO**							
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	3	2	1	3	2	2	1	1
2	2	2	3	2	2	2	3	2
3	2	1	2	3	1	2	2	3
4	3	2	1	2	2	2	1	2
5	3	1	2	1	1	2	1	2

BP702T	**PO**							
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	3	2	1	3	2	3	2	2
2	2	3	2	2	3	2	2	2
3	2	1	2	3	2	2	2	3
4	2	2	3	2	3	2	3	2
5	2	2	3	1	2	2	2	2

BP704T	**PO**							
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	3	2	1	2	2	2	1	2
2	2	2	1	2	1	2	2	3
3	2	3	2	1	3	2	2	1
4	3	2	2	3	2	3	2	2
5	3	2	2	1	2	2	1	2

BP809ET	**PO**							
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	2	2	3	2	2	2	3	1
2	3	2	1	2	3	2	1	2
3	2	2	2	1	2	1	2	2
4	2	2	1	2	1	2	1	2
5	3	2	2	1	3	2	1	2

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. I Year (I Semester) **Examination Time: 4 Hrs**

Maximum Marks: 100 (25+75)

Paper Title: Pharmaceutics I

Paper Code: BP103T **Schedule per week Lectures: 3**

Note: Examiner will set 3 section and the students will be required to attempt all sections, Section I is compulsory containing 5/10 short answer types' questions covering the entire syllabus and will be of 1/2 mark. Further examiner will be set two section from each unit and the students will be required to attempt two question from each unit which will be of 10 marks each. Section III comprise of 9 question each of 5 marks and it is compulsory to attempt 5 questions out of 9.

UNIT I

- Historical background and development of profession of pharmacy: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.
- Dosage forms: Introduction to dosage forms, classification and definitions
- Prescription: Definition, Parts of prescription, handling of Prescription and Errors in prescription.
- Posology: Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

UNIT II

- Pharmaceutical calculations: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.
- Powders: Definition, classification, advantages and disadvantages,Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.
- Liquid dosage forms: Advantages and disadvantages of liquid dosage forms.Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques.

UNIT III

- Monophasic liquids: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.
- Biphasic liquids: Suspensions: Definition, advantages and disadvantages, classifications,Preparation of suspensions; Flocculated and Deflocculated suspension & stability Problems and methods to overcome. Emulsions: Definition, classification, emulsifying agent, test for the identification of type ofEmulsion, Methods of preparation & stability problems and methods to overcome.

UNIT IV

- Suppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.
- Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

UNIT – V

- Semisolid dosage forms: Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms.

Recommended Books: (Latest Editions)

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.

2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.

3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.

4. Indian pharmacopoeia.

5. British pharmacopoeia.

6. Lachmann. Theory and Practice of Industrial Pharmacy,Lea& Febiger Publisher, The University of Michigan.

7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.

8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.

9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.

10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.

11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.

12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. I Year (I Semester) **Examination Time: 3 Hrs**

Maximum Marks: 50 (15+35)

Paper Title: Pharmaceutics I

Paper Code: BP109P **Schedule per week Lectures: 3**

List of Practical

1 . Syrups

a) Syrup IP'66

b) Compound syrup of Ferrous Phosphate BPC'68

2. Elixirs

a) Piperazine citrate elixir

b) Paracetamol pediatric elixir

3.Linctus

a) Terpin Hydrate Linctus IP'66

b) Iodine Throat Paint (Mandles Paint)

4. Solutions

a) Strong solution of ammonium acetate

b) Cresol with soap solution

c) Lugol's solution

5. Suspensions

a) Calamine lotion

b) Magnesium Hydroxide mixture

c) Aluminimum Hydroxide gel

6. Emulsions

a) Turpentine Liniment

b) Liquid paraffin emulsion

7. Powders and Granules

a) ORS powder (WHO)

b) Effervescent granules

c)Dusting powder

d)Divided powders

8. Suppositories

a) Glycero gelatin suppository

b) Coca butter suppository

c) Zinc Oxide suppository

8. Semisolids

a) Sulphur ointment

b) Non staining-iodine ointment with methyl salicylate

c) Carbopal gel

9. Gargles and Mouthwashes

a) Iodine gargle

b) Chlorhexidine mouthwash

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. II Year (III Semester) **Examination Time: 4 Hrs**

Maximum Marks: 100 (25+75)

Paper Title: Physical Pharmaceutics I

Paper Code: BP302T **Schedule per week Lectures: 3**

Note: Examiner will set 3 section and the students will be required to attempt all sections, Section I is compulsory containing 5/10 short answer types' questions covering the entire syllabus and will be of 1/2 mark. Further examiner will be set two section from each unit and the students will be required to attempt two question from each unit which will be of 10 marks each. Section III comprise of 9 question each of 5 marks and it is compulsory to attempt 5 questions out of 9.

UNIT I

- Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications

UNIT II

- States of Matter and properties of matter:State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid- crystalline, amorphous & polymorphism.
- Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

UNIT III

- Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient,adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

UNIT IV

- Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants

UNIT V

- pH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin
2. Experimental Pharmaceutics by Eugene, Parott.
3. Tutorial Pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia. 5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to
3, MarcelDekkar Inc. 6. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse
systems, volume 1, 2, 3. Marcel Dekkar Inc. 7. Physical Pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
9. Physical Pharmaceutics by C.V.S. Subramanyam
10. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar.

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. II Year (III Semester) **Examination Time: 3 Hrs**

Maximum Marks: 50 (15+35)

Paper Title: Physical Pharmaceutics I

Paper Code: BP307P **Schedule per week Lectures: 3**

List of Practical

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch Equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl4 and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight Method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine Complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine

Complex by pH titration method.

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. II Year (III Semester) **Examination Time: 4 Hrs**

Maximum Marks: 100 (25+75)

Paper Title: Pharmaceutical Engineering

Paper Code: BP304T **Schedule per week Lectures: 3**

Note: Examiner will set 3 section and the students will be required to attempt all sections, Section I is compulsory containing 5/10 short answer types' questions covering the entire syllabus and will be of 1/2 mark. Further examiner will be set two section from each unit and the students will be required to attempt two question from each unit which will be of 10 marks each. Section III comprise of 9 question each of 5 marks and it is compulsory to attempt 5 questions out of 9.

UNIT I

- Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.
- Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.
- Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

UNIT II

- Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.
- Evaporation: Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.
- Distillation: Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

UNIT III

- Drying: Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.
- Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

UNIT IV

- Filtration: Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.
- Centrifugation: Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & supercentrifuge.

UNIT V

- Materials of pharmaceutical plant construction, Corrosion and its prevention: Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

Recommended Books: (Latest Editions)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. II Year (III Semester) **Examination Time: 3 Hrs**

Maximum Marks: 50 (15+35)

Paper Title: Pharmaceutical Engineering

Paper Code: BP308P **Schedule per week Lectures: 3**

List of Practical

1.Determination of radiation constant of brass, iron, unpainted and painted glass.

2. Steam distillation – To calculate the efficiency of steam distillation.

3. To determine the overall heat transfer coefficient by heat exchanger.

4. Construction of drying curves (for calcium carbonate and starch).

5. Determination of moisture content and loss on drying.

6. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.

7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.

8. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.

9. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.

10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.

11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity

12. To study the effect of time on the Rate of Crystallization.

13. To calculate the uniformity Index for given sample by using Double Cone Blender.

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. II Year (IV Semester) **Examination Time: 4 Hrs**

Maximum Marks: 100 (25+75)

Paper Title: Physical Pharmaceutics II

Paper Code: BP403T **Schedule per week Lectures: 3**

Note: Examiner will set 3 section and the students will be required to attempt all sections, Section I is compulsory containing 5/10 short answer types' questions covering the entire syllabus and will be of 1/2 mark. Further examiner will be set two section from each unit and the students will be required to attempt two question from each unit which will be of 10 marks each. Section III comprise of 9 question each of 5 marks and it is compulsory to attempt 5 questions out of 9.

UNIT I

- Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & Electric properties.

UNIT II

- Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers
- Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

UNIT III

- Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

UNIT IV

- Micromeretics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation

method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

UNIT V

- Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention.

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. II Year (IV Semester) **Examination Time: 3 Hrs**

Maximum Marks: 50 (15+35)

Paper Title: Physical Pharmaceutics II

Paper Code: BP407P **Schedule per week Lectures: 3**

List of Practical

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. III Year (V Semester) **Examination Time: 4 Hrs**

Maximum Marks: 100 (25+75)

Paper Title: Industrial Pharmacy I

Paper Code: BP502T **Schedule per week Lectures: 3**

Note: Examiner will set 3 section and the students will be required to attempt all sections, Section I is compulsory containing 5/10 short answer types' questions covering the entire syllabus and will be of 1/2 mark. Further examiner will be set two section from each unit and the students will be required to attempt two question from each unit which will be of 10 marks each. Section III comprise of 9 question each of 5 marks and it is compulsory to attempt 5 questions out of 9.

UNIT I

- Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism

b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization

- BCS classification of drugs & its significant
- Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

UNIT II

- Tablets:

a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.

b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. c. Quality control tests: In process and finished product tests

- Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

UNIT III

- Capsules:

a. Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.

b. Soft gelatin capsules: Nature of shell and capsule content, size of capsules,importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

- Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

UNIT IV

- Parenteral Products:

a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity.

b. Production procedure, production facilities and controls, aseptic processing.

c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.

d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

- Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers;evaluation of ophthalmic preparations

UNIT V

- Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.
- Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.
- Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers stability aspects of packaging materials, quality control tests.

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz

2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. III Year (V Semester) **Examination Time: 3 Hrs**

Maximum Marks: 50 (15+35)

Paper Title: Industrial Pharmacy I

Paper Code: BP506P **Schedule per week Lectures: 3**

List of Practical

1. Preformulation studies on paracetamol/asparin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Qulaity control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. III Year (VI Semester) **Examination Time: 4 Hrs**

Maximum Marks: 100 (25+75)

Paper Title: Biopharmaceutics and Pharmacokinetics

Paper Code: BP604T **Schedule per week Lectures: 3**

Note: Examiner will set 3 section and the students will be required to attempt all sections, Section I is compulsory containing 5/10 short answer types' questions covering the entire syllabus and will be of 1/2 mark. Further examiner will be set two section from each unit and the students will be required to attempt two question from each unit which will be of 10 marks each. Section III comprise of 9 question each of 5 marks and it is compulsory to attempt 5 questions out of 9.

UNIT I

- Introduction to Biopharmaceutics
- Absorption; Mechanisms of drug absorption through GIT, factors influencing drug Absorption though GIT, absorption of drug from Non per oral extra-vascular Routes.
- Distribution Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting
- Protein-drug binding. Kinetics of protein binding, Clinical significance of protein Binding of drugs

UNIT II

- Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs
- Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, in-vitro drug dissolution models, in-vitro-in-vivo correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

UNIT III

- Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model.

(a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extravascular administrations. Pharmacokinetics parameters - KE ,t1/2,Vd,AUC,Ka, Clt andCLR- definitions methods of eliminations, understanding of their significance and application

UNIT IV

- Multicompartment models: Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and Mainetnance doses and their significance in clinical settins

UNIT V

- Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

Recommended Books: (Latest Editions)

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.

2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari

3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall Inernational edition.USA

4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and
Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi

5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.

6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.

7. Biopharmaceutics; By Swarbrick

8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and

9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.

10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company,Pennsylvania 1989.

11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.

12. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. III Year (VI Semester) **Examination Time: 4 Hrs**

Maximum Marks: 100 (25+75)

Paper Title: Pharmaceutical Biotechnology

Paper Code: BP605T **Schedule per week Lectures: 3**

Note: Examiner will set 3 section and the students will be required to attempt all sections, Section I is compulsory containing 5/10 short answer types' questions covering the entire syllabus and will be of 1/2 mark. Further examiner will be set two section from each unit and the students will be required to attempt two question from each unit which will be of 10 marks each. Section III comprise of 9 question each of 5 marks and it is compulsory to attempt 5 questions out of 9.

UNIT I

A) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.

B) Enzyme Biotechnology- Methods of enzyme immobilization and applications.

C) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.

D) Brief introduction to Protein Engineering.

E) Use of microbes in industry. Production of Enzymes- General consideration – Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.

F) Basic principles of genetic engineering.

UNIT II

a) Study of cloning vectors, restriction endonucleases and DNA ligase.

b) Recombinant DNA technology. Application of genetic engineering in medicine.

c) Application of r DNA technology and genetic engineering in the production of:

i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.

d) Brief introduction to PCR

UNIT III

- Types of immunity- humoral immunity, cellular immunity

  a) Structure of Immunoglobulins

  b) Structure and Function of MHC

c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.

d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.

e) Storage conditions and stability of official vaccines

f) Hybridoma technology- Production, Purification and Applications

g) Blood products and Plasma Substituties.

UNIT IV

a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.

b) Genetic organization of Eukaryotes and Prokaryotes

c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.

d) Introduction to Microbial biotransformation and applications.

e) Mutation: Types of mutation/mutants.

UNIT V

a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.

b) Large scale production fermenter design and its various controls.

c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,

d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substituties.

Recommended Books: (Latest Editions)

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.

2. RA Goldshy et. al., : Kuby Immunology.

3. J.W. Goding: Monoclonal Antibodies.

4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.

5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.

6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.

7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. IV Year (VII Semester) **Examination Time: 4 Hrs**

Maximum Marks: 100 (25+75)

Paper Title: Industrial Pharmacy II

Paper Code: BP702T **Schedule per week Lectures: 3**

Note: Examiner will set 3 section and the students will be required to attempt all sections, Section I is compulsory containing 5/10 short answer types' questions covering the entire syllabus and will be of 1/2 mark. Further examiner will be set two section from each unit and the students will be required to attempt two question from each unit which will be of 10 marks each. Section III comprise of 9 question each of 5 marks and it is compulsory to attempt 5 questions out of 9.

UNIT I

- Pilot plant scale up techniques: General considerations – including significance of Personnel requirements, space requirements, raw materials, Pilot plant scale up Considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC Guidelines, Introduction to platform technology

UNIT II

- Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

UNIT III

- Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals
- Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of

Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

UNIT IV

- Quality management systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

UNIT V

- Indian Regulatory Requirements: Central Drug Standard Control Organization(CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Recommended Books: (Latest Editions)

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory_ Affairs.

2. International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php

3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.

4. Regulatory Affairs brought by learning plus, inc. available at http.//www.cgmp.com/ra.htm.

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. IV Year (VII Semester) **Examination Time: 4 Hrs**

Maximum Marks: 100 (25+75)

Paper Title: Novel Drug Delivery Systems

Paper Code: BP704T **Schedule per week Lectures: 3**

Note: Examiner will set 3 section and the students will be required to attempt all sections, Section I is compulsory containing 5/10 short answer types' questions covering the entire syllabus and will be of 1/2 mark. Further examiner will be set two section from each unit and the students will be required to attempt two question from each unit which will be of 10 marks each. Section III comprise of 9 question each of 5 marks and it is compulsory to attempt 5 questions out of 9.

UNIT I

- Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled Release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations
- Polymers: Introduction, classification, properties, advantages and application of Polymers in formulation of controlled release drug delivery systems.

UNIT II

- Microencapsulation: Definition, advantages and disadvantages, microspheres/microcapsules, microparticles, methods of microencapsulation, applications
- Mucosal Drug Delivery system: Introduction, Principles of bioadhesion /mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems
- Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implantsand osmotic pump

UNIT III

- Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

- Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications
- Nasopulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

UNIT IV

- Targeted drug Delivery: Concepts and approaches advantages and disadvantages, Introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their Applications

UNIT V

- Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome – Preliminary study, ocular formulations and ocuserts
- Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

Recommended Books: (Latest Editions)

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.

2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.

3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim

4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).

5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

SCHOOL OF PHARMACY

Department of Pharmaceutics

(Syllabus and Scheme of Studies w. e. f. 2022-23)

B. Pharm. IV Year (VIII Semester) **Examination Time: 4 Hrs**

Maximum Marks: 100 (25+75)

Paper Title: Cosmetics Science

Paper Code: BP809ET **Schedule per week Lectures: 3**

Note: Examiner will set 3 section and the students will be required to attempt all sections, Section I is compulsory containing 5/10 short answer types' questions covering the entire syllabus and will be of 1/2 mark. Further examiner will be set two section from each unit and the students will be required to attempt two question from each unit which will be of 10 marks each. Section III comprise of 9 question each of 5 marks and it is compulsory to attempt 5 questions out of 9.

UNIT I

- Classification of cosmetic and cosmeceutical products: Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs
- Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application
- Skin: Basic structure and function of skin.
- Hair: Basic structure of hair. Hair growth cycle.
- Oral Cavity: Common problem associated with teeth and gums.

UNIT II

- Principles of formulation and building blocks of skin care products: Face wash, Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmecuticals.
- Antiperspants & deodorants- Actives & mechanism of action.
- Principles of formulation and building blocks of Hair care products: Conditioning shampoo, Hair conditioner, anti-dandruff shampoo. Hair oils.
- Chemistry and formulation of Para-phylene diamine based hair dye. Principles of formulation and building blocks of oral care products:
- Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

UNIT III

- Sun protection, Classification of Sunscreens and SPF.
- Role of herbs in cosmetics:

Skin Care: Aloe and turmeric

Hair care: Henna and amla.

Oral care: Neem and clove

- Analytical cosmetics: BIS specification and analytical methods for shampoo, skin- cream and toothpaste.

UNIT IV

- Principles of Cosmetic Evaluation: Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps,and syndet bars. Evolution and skin benfits.

UNIT V

- Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis.
- Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes
- Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor.
- Antiperspirants and Deodorants- Actives and mechanism of action

Recommended Books: (Latest Editions)

1. Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4Th Edition, Vandana Publications Pvt. Ltd., Delhi.
3. Text book of cosmelicology by Sanju Nanda & Roop K. Khar, Tata Publishers.

School of Pharmacy

RAFFLES UNIVERSITY, Neemrana, India.

Program: B. Pharmacy (Four Years Degree Course)

Programme Educational Objective (PEO)Programme Outcomes (POs) Programme Specific Outcomes (PSOs) Course Outcomes (COs)

RAFFLES UNIVERSITY

Japanese Zone, NH-48, Neemrana, District Alwar, Rajasthan, INDIA. PIN: 301705

BACHELOR IN PHARMACY

Vision:

To evolve as an Institution of Excellence, where scholars develop informed and inquiring minds and broaden the frontiers of pure and applied knowledge.

Mission:

In graining the capacity to us usher in change by discovering nurturing and expanding individual skills talents and interests while standing forth as leader and path breaker in their future carrier.

Program Educational Objectives

PEO 1: To train graduates of the program with a strong foundation to pursue higher studies and adapt in a globe of constantly developing trends.

PEO 2: To prepare graduates of the program to attain a broad array of professional skills for the successful career in pharmaceutical and healthcare systems.

PEO 3: To produce graduates of the program to exhibit professionalism, ethical attitude, communication skills and teamwork in their profession and adapt to current trends by engaging in lifelong learning

.

Programme Outcomes (POs)

After completing the program students will be able to:

S. No	PO Number	Name of the PO	Outcome
1	PO-01	Pharmacy Knowledge	Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.
2	PO-02	Planning Abilities	Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
3	PO-03	**Problem analysis**	tilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
4	PO-04	**Modern tool usage**	Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
5	PO-05	**Leadership skills:**	Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well- being.
6	PO-06	**Professional Identity:**	Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

7	PO-07	**Pharmaceutical Ethics**	Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
8	PO-08	**Communication:**	Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
9	PO-09	**The Pharmacist and society:**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
10	PO-10	**Environment and sustainability:**	Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
11	PO-11	**Life-long learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

(PSOs):

After completing the program students will be able to:

PSO1: Work in different divisions of pharmaceutical industry like manufacturing, quality control, quality assurance, sales, marketing and regulatory divisions.
PSO2: Explore opportunities as pharmacists in community and hospital pharmacy settings.
PSO3: Join different government organizations as drug analyst, chemist and drug inspectors for better management and control of pharmaceutical activities.

Table-I: Course of study for semester I

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP101T	Human Anatomy and Physiology I– Theory	3	1	4
BP102T	Pharmaceutical Analysis I – Theory	3	1	4
BP103T	Pharmaceutics I – Theory	3	1	4

BP104T	Pharmaceutical Inorganic Chemistry – Theory	3	1	4
BP105T	Communication skills – Theory *	2	-	2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics – Theory*	2	-	2
BP107P	Human Anatomy and Physiology – Practical	4	-	2
BP108P	Pharmaceutical Analysis I – Practical	4	-	2
BP109P	Pharmaceutics I – Practical	4	-	2
BP110P	Pharmaceutical Inorganic Chemistry – Practical	4	-	2
BP111P	Communication skills – Practical*	2	-	1
BP112RBP	Remedial Biology – Practical*	2	-	1
Total		32/34[$]/36[#]	4	27/29[$]/30[#]

[#]Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC andappearing for Remedial Biology (RB)course.

[$]Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC andappearing for Remedial Mathematics (RM)course.

* Non University Examination (NUE)

Table-II: Course of study for semester II

Course Code	Name of the course	No. of hours	Tutorial	Credit points
BP201T	Human Anatomy and Physiology II – Theory	3	1	4
BP202T	Pharmaceutical Organic Chemistry I – Theory	3	1	4
BP203T	Biochemistry – Theory	3	1	4
BP204T	Pathophysiology – Theory	3	1	4
BP205T	Computer Applications in Pharmacy – Theory *	3	-	3
BP206T	Environmental sciences – Theory *	3	-	3
BP207P	Human Anatomy and Physiology II –Practical	4	-	2
BP208P	Pharmaceutical Organic Chemistry I– Practical	4	-	2
BP209P	Biochemistry – Practical	4	-	2
BP210P	Computer Applications in Pharmacy – Practical*	2	-	1
Total		32	4	29

*Non University Examination (NUE)

Table-III: Course of study for semester III

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP301T	Pharmaceutical Organic Chemistry II – Theory	3	1	4
BP302T	Physical Pharmaceutics I – Theory	3	1	4
BP303T	Pharmaceutical Microbiology – Theory	3	1	4
BP304T	Pharmaceutical Engineering – Theory	3	1	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4	-	2
BP306P	Physical Pharmaceutics I – Practical	4	-	2
BP307P	Pharmaceutical Microbiology – Practical	4	-	2
BP 308P	Pharmaceutical Engineering –Practical	4	-	2
Total		28	4	24

Table-IV: Course of study for semester IV

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP401T	Pharmaceutical Organic Chemistry III– Theory	3	1	4
BP402T	Medicinal Chemistry I – Theory	3	1	4
BP403T	Physical Pharmaceutics II – Theory	3	1	4
BP404T	Pharmacology I – Theory	3	1	4
BP405T	Pharmacognosy and Phytochemistry I– Theory	3	1	4
BP406P	Medicinal Chemistry I – Practical	4	-	2
BP407P	Physical Pharmaceutics II – Practical	4		2
BP408P	Pharmacology I – Practical	4	-	2
BP409P	Pharmacognosy and Phytochemistry I – Practical	4	-	2
Total		31	5	28

Table-V: Course of study for semester V

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP501T	Medicinal Chemistry II – Theory	3	1	4
BP502T	Industrial PharmacyI– Theory	3	1	4
BP503T	Pharmacology II – Theory	3	1	4
BP504T	Pharmacognosy and Phytochemistry II– Theory	3	1	4
BP505T	Pharmaceutical Jurisprudence – Theory	3	1	4
BP506P	Industrial PharmacyI – Practical	4	-	2
BP507P	Pharmacology II – Practical	4	-	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4	-	2
Total		27	5	26

Table-VI: Course of study for semester VI

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP601T	Medicinal Chemistry III – Theory	3	1	4
BP602T	Pharmacology III – Theory	3	1	4
BP603T	Herbal Drug Technology – Theory	3	1	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3	1	4
BP605T	Pharmaceutical Biotechnology – Theory	3	1	4
BP606T	Quality Assurance –Theory	3	1	4
BP607P	Medicinal chemistry III – Practical	4	-	2
BP608P	Pharmacology III – Practical	4	-	2
BP609P	Herbal Drug Technology – Practical	4	-	2
Total		30	6	30

Table-VII: Course of study for semester VII

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP701T	Instrumental Methods of Analysis – Theory	3	1	4
BP702T	Industrial PharmacyII – Theory	3	1	4
BP703T	Pharmacy Practice – Theory	3	1	4
BP704T	Novel Drug Delivery System – Theory	3	1	4
BP705P	Instrumental Methods of Analysis – Practical	4	-	2
BP706PS	Practice School*	12	-	6
Total		28	5	24

Table-VIII: Course of study for semester VIII

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP801T	Biostatistics and Research Methodology	3	1	4
BP802T	Social and Preventive Pharmacy	3	1	4
BP803ET	Pharma Marketing Management	3 + 3 = 6	1 + 1 = 2	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science			
BP805ET	Pharmacovigilance			
BP806ET	Quality Control and Standardization of Herbals			
BP807ET	Computer Aided Drug Design			
BP808ET	Cell and Molecular Biology			
BP809ET	Cosmetic Science			
BP810ET	Experimental Pharmacology			
BP811ET	Advanced Instrumentation Techniques			
BP812ET	Dietary Supplements and Nutraceuticals			
BP813PW	Project Work	12	-	6
Total		24	4	22

COURSE OUTCOMES (COs):

Course	Course outcomes: - After completion of these courses' students should be able to
5.1 Semester - I	
BP101T	CO-01 Study about the anatomy and physiology of body system CO-02 Understand and remembering the physiology of muscle contraction, neuromuscular junction, structure and function of joints CO-03 Understand the composition of blood and circulation and function of lymphatic system CO-04 Understand the peripheral nervous system and special senses CO-05 Understand the anatomy of heart and its working
BP106RBT	CO-01 Know about the living organism and flowers plants CO-02 Understand the general introduction blood or fluid circulation, respiration, digestion and absorption CO-03 Understand the various type of system and neuron function C0-04 Know about the nutrients and photosynthesis process. CO-05 Understand about the plant growth, development and respiration.
BP201T	CO-01 Study about the anatomy of various organ system i. e brain, digestive system, respiratory system endocrine system a and reproductive system CO-02 Understand and remembering the anatomy and function of various system CO-03 Understand the mechanism of action of various system CO-04 Understand the classification and mechanism of action of hormone. CO-05 Understand the disorders of various system .
BP204T	CO-01:Understand the cell injury, mechanism of cell injury CO-02: Understand the cardiovascular diseases and its disorders. CO-03: Understand about the various diseases and its disorders CO-04: Name the sign and symptoms of diseases. CO-05: Understand the complication of diseases.

BP303T	CO-01: Identify the microorganisms of relevance to healthcare and the pharmaceutical industry. CO-02 Discuss microbial spoilage and antimicrobial preservation of pharmaceutical formulation CO-03 Evaluate microbial content testing and sterility testing CO-04 Demonstrate theory and practical skill in microscopy and their handling technique and staining procedure CO-05 Understand the basic morphology and structure of bacteria and learn the staining
BP404T	CO1. Students would have understood the pharmacological actions of different categories of drugs CO2. They would have studied in detailed about mechanism of drug action at organ system/sub cellular/ macromolecular levels. CO3. They would have understood the application of basic pharmacological knowledge in the prevention and Treatment of various diseases. CO4. They would have observed the effect of drugs on animals by simulated experiments CO5. They would get an idea about correlation of pharmacology with other bio medical sciences. CO6. They would have understood the signal transduction mechanism of various receptors
BP503T	CO-01 Understand the mechanism of drug action and its relevance in the treatment of different diseases C0-02 Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments CO-03 Demonstrate the various receptor actions using isolated tissue preparation CO-04 Appreciate correlation of pharmacology with related medical sciences
BP602T	CO-01 Know about the living organism and flowers plants CO-02 Understand the general introduction blood or fluid circulation, respiration, digestion and absorption CO-03 Understand the various type of system and neuron function C0-04 Know about the nutrients and photosynthesis process. CO-05 Understand about the plant growth, development and respiration.

BP703T	CO-01 Know about the drug distribution method, therapeutic committee patient counseling. CO-02 Know about the pharmaceutical care service, ADR and community pharmacy ,hospital formulary, medication adherence and TDM CO-03 Understand the organization and function of hospital C0-04 Understand the OTC sale and clinical pharmacy CO-05 Know about the training program, inventory control and drug store management.
BP802T	CO-01 Know about the health and diseases CO-02 Understand the general principles of prevention and control of diseases. C0-03 Know about the national health program CO-04 Understand the various program run in India CO-05 Understand the community service in urban and rural
BP810ET	CO-01 Know about the various laboratory experimental animals CO-02 Understand the screening method for preclinical research. C0-03 Know about the preclinical screening method for drugs CO-04 Understand the importance of biostatistics' and research methodology CO-05 Understand the research hypothesis.

Mapping: Semester – I to VIII
DEPARTMENT OF PHARMACOLOGY

BP101T

COs	Program Outcomes											Total
	1	2	3	4	5	6	7	8	9	10	11	
CO1	3	0	0	1	0	1	1	1	0	0	2	9
CO2	3	0	0	0	0	1	1	1	0	0	2	8
CO3	3	0	0	0	0	1	1	1	0	0	2	8
CO4	3	0	0	0	0	1	0	1	0	0	2	7
CO5	3	0	0	0	0	1	1	1	0	0	2	8

BP106RBT

COs	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
CO1	3	0	0	0	0	0	0	0	1	0	1
CO2	3	0	1	0	1	0	0	0	0	0	1
CO3	3	1	1	0	0	0	0	1	1	0	2
CO4	3	1	0	0	1	0	0	1	1	0	2
CO5	3	1	1	0	0	0	0	1	1	0	1

BP201T

COs	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
CO1	3	0	0	1	0	1	2	0	0	0	2
CO2	3	0	0	0	0	1	2	0	0	0	2
CO3	3	0	0	0	0	1	2	0	1	0	2
CO4	3	0	0	0	0	1	0	0	1	0	2
CO5	3	0	0	0	0	1	2	0	1	0	2

BP204T

Cos	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
CO1	3	0	0	0	0	1	1	0	0	1	1
CO2	3	0	1	0	0	0	1	0	0	0	1
CO3	3	1	1	0	0	1	1	0	0	0	2
CO4	3	1	0	0	0	0	0	1	0	1	2
CO5	3	1	1	0	0	0	0	1	0	0	1

BP303T

Cos	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
CO1	3	0	0	0	0	1	1	0	1	1	1
CO2	3	0	1	0	0	0	1	0	1	1	1
CO3	3	1	1	0	0	1	1	0	1	1	2
CO4	3	1	0	0	0	0	0	0	1	1	2
CO5	3	1	1	0	0	0	0	0	1	0	1

BP404T

Cos	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
CO1	3	0	0	1	1	0	1	0	1	2	0
CO2	3	0	0	2	0	0	2	0	0	0	0
CO3	3	0	0	2	2	0	1	1	0	0	0
CO4	3	0	0	2	0	0	0	1	0	0	2
CO5	3	0	0	1	2	0	2	0	1	0	0
CO6	3	0	0	2	1	0	0	1	0	1	0

BP503T

Cos	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
CO1	3	2	0	0	2	0	0	0	3	0	2
CO2	2	2	1	3	0	2	0	0	2	2	2
CO3	2	2	1	3	0	2	0	0	2	2	3
CO4	3	0	0	0	2	0	0	0	3	0	2
CO5	0	0	0	0	0	0	0	0	0	0	0

BP602T

COs	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
CO1	3	1	1	2	1	2	1	1	2	1	1
CO2	3	1	1	1	1	1	1	2	2	1	1
CO3	3	1	1	1	2	2	1	2	2	2	2
CO4	3	1	1	1	2	2	1	2	1	1	2
CO5	3	1	1	1	2	2	2	2	1	1	1
CO6	3	0	1	1	0	1	1	0	1	0	1

BP703T

COs	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
CO1	3	1	2	2	1	2	2	2	2	2	1
CO2	3	1	2	1	1	2	2	2	2	2	1
CO3	3	1	2	1	1	2	2	2	2	2	2
CO4	3	1	2	1	2	2	2	2	1	2	2
CO5	3	1	2	1	2	2	1	2	1	2	1

BP802T

COs	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
CO1	3	0	1	0	1	1	1	1	2	1	1
CO2	3	1	0	1	1	2	1	1	2	1	1
CO3	3	1	0	1	1	2	1	1	2	1	1
CO4	3	1	1	1	1	2	1	1	1	1	1
CO5	3	1	1	1	1	2	1	1	1	1	1

BP810ET

COs	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
CO1	3	0	1	2	0	1	2	0	0	0	1
CO2	3	0	2	2	0	1	2	0	0	1	1
CO3	3	0	1	2	0	1	2	0	0	1	1
CO4	3	0	1	2	0	2	1	0	1	1	1
CO5	3	1	1	2	1	1	1	1	1	1	1

CO, PO AND PSO COURSE ATTAINMENT VALUES- (2022-23)

PROGRAM- B. PHARM, SEM. -I

COURSE NAME AND CODE: HAP-I THEORY/ BP101T

ATTAINMENT VALUE-1.9

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment Level*	1.9	1.4	1.1	0.6	1.1	0.3	1.3	0.9	0.8	0.8	1.7	1.9	1.6	0.9

PROGRAM- B. PHARM, SEM. -I

COURSE NAME AND CODE: HAP-I PRACTICAL / BP107P

ATTAINMENT VALUE-2.2

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	0
PO / PSO Attainment Level*	2.2	1.5	1.5	0.7	1.5	0.7	1.5	1.5	0.7	0.7	2.2	2.2	2.2	0.0

PROGRAM- B. PHARM, SEM. -I

COURSE NAME AND CODE: REM BIO THEORY / BP106RBT

ATTAINMENT VALUE-1.9

REM BIO THEORY

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	0
PO / PSO Attainment Level*	1.9	1.4	1.1	0.6	1.1	0.3	1.3	0.9	0.8	0.8	1.7	1.9	1.6	0.0

PROGRAM- B.PHARM, SEM. -I

COURSE NAME AND CODE: REM BIO PRACTICAL /BP 112RBP

ATTAINMENT VALUE- 2.7

REM BIO PRACTICAL

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03

Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment Level*	2.7	1.9	1.6	0.9	1.6	0.4	1.8	1.3	1.2	1.2	2.4	2.7	2.2	1.3

PROGRAM- B.PHARM, SEM. -V

COURSE NAME AND CODE: PHARMACOLOGY-II THEORY /BP503T

ATTAINMENT VALUE-1.9

PHARMACOLOGY-II THEORY

	PO-01	**PO-02**	**PO-03**	**PO-04**	**PO-05**	**PO-06**	**PO-07**	**PO-08**	**PO-09**	**PO-10**	**PO-11**	**PSO-01**	**PSO-02**	**PSO-03**
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	0
PO / PSO Attainment Level*	1.9	1.4	1.1	0.6	1.1	0.3	1.3	0.9	0.8	0.8	1.7	1.9	1.6	0.0

PROGRAM- B.PHARM, SEM. -V

COURSE NAME AND CODE: PHARMACOLOGY-II PRACTICAL/ BP507P

ATTAINMENT VALUE-1.9

PHARMACOLOGY-II PRACTICAL

CO, PO AND PSO COURSE ATTAINMENT VALUES- (2022-23)

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	0
PO / PSO Attainment Level*	1.9	1.4	1.1	0.6	1.1	0.3	1.3	0.9	0.8	0.8	1.7	1.9	1.6	0.0

PROGRAM- B.PHARM, SEM. -VI

COURSE NAME AND CODE: PHARMACOLOGY-III THEORY / BP602T

ATTAINMENT VALUE-2.4

PHARMACOLOGY-III THEORY

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	2	1
PO / PSO Attainment Level*	2.4	1.7	1.4	0.8	1.4	0.4	1.6	1.2	1.0	1.0	2.1	2.4	1.6	0.8

PROGRAM-B.PHARM, SEM. -VI

COURSE NAME AND CODE: PHARMACOLOGY-III PRACTICAL BP608P

ATTAINMENT VALUE-2.58

CO, PO AND PSO COURSE ATTAINMENT VALUES- (2022-23)

PHARMACOLOGY-III PRACTICAL

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment Level*	2.58	1.86	1.58	0.86	1.58	0.43	1.72	1.29	1.15	1.15	2.29	2.58	2.15	1.29

PROGRAM-B.PHARM, SEM. -VIII

COURSE NAME AND CODE: SOCIAL & PREVENTIVE PHARMACY-THEORY BP802T

ATTAINMENT VALUE-2.10

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	0	2	2	1	1	2	3	2	0
PO / PSO Attainment Level*	2.10	1.52	1.28	0.70	1.28	0.00	1.40	1.05	0.93	0.93	1.40	2.10	1.40	0.00

PROGRAM-B.PHARM, SEM. -VIII

CO, PO AND PSO COURSE ATTAINMENT VALUES- (2022-23)

COURSE NAME AND CODE: EXPERIMENTAL PHARMACOLOGY /BP810ET

ATTAINMENT VALUE-2.48

EXPERIMENTAL PHARMACOLOGY

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	0	2	2	1	1	3	3	2	0
PO / PSO Attainment Level*	2.48	1.79	1.52	0.83	1.52	0.00	1.65	1.24	1.10	1.10	2.20	2.48	1.65	0.00