



**Raffles University, Neemrana**  
**School of Engineering and Technology**  
**Department of Electronics and Communication Engineering**

**B.Tech. III-VIII Semester (2011-2015)**

**Subject:- Electronic Devices & Circuits**

**L T P**

**Subject Code: - ECE 201**

**3 1 0**

**Diodes and Transistor characteristics:** Current components in a diode, transition and diffusion capacitances. The junction transistor, Transistor current components, The transistor as an Amplifier, Transistor construction, The common base configuration, The common emitter configuration, The CE cutoff Region, The CE Saturation Region, Typical Transistor-Junction Voltage Values, Common-Emitter current gain, The Common-Collector configuration, Analytical Expressions for Transistors Characteristics, Maximum Voltage rating, The phototransistor.

**Transistor Biasing and Thermal Stabilization:** The operating point, Bias stability, Self-Bias, or Emitter Bias, Stabilization against variations in  $I_{CO}$ ,  $V_{BE}$ , and  $\beta$ , Bias compensation, Biasing techniques for Linear Integrated Circuits, Thermistor and Sensor Compensation, Thermal Runaway, Thermal Stability.

**The Transistor at low frequencies:** Graphical Analysis of the CE configuration, Two-Port devices and the hybrid Model, Transistor hybrid model, The h-parameter, Conversion formulas for the parameters of the three transistor Configuration, Analysis of a transistor Amplifier Circuit using h parameters, The Emitter follower, Comparison of transistor amplifier configurations, Linear Analysis of a Transistor Circuit, Cascading Transistor Amplifiers, Simplified Common-Emitter Hybrid Model, Simplified calculations for the Common-Collector Configuration, The Common-Emitter Amplifier with an emitter resistance, High input resistance transistor circuits.

**Field Effect Transistors :** The Junction Field Effect Transistor, The Pinch-off voltage, The JFET Volt-Ampere characteristics, The FET Small-Signal model, The Metal-Oxide-Semiconductor FET (MOSFET), The Low-Frequency Common-Source and Common-Drain Amplifiers, The FET as a Voltage-variable Resistor (VVR).

**High frequency model of BJT:** High frequency hybrid-P model of BJT, Common emitter and common collector configurations.

**References:**

1. Integrated Electronics, Millman Halkias, TMH
2. Microelectronics devices, D. Nagchoudhuri, Pearson education
3. Microelectronic Circuits, Sedra Smith, Oxford press, India.
4. Solid state devices, Ben G. Streetman, PHI/Pearson



**Raffles University, Neemrana**  
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**Department of Electronics and Communication Engineering**

<b>Subject:- Digital Electronics &amp; Switching Circuits</b>	<b>L T P</b>
<b>Subject Code: - ECE 203</b>	<b>3 1 0</b>

- 1. Review of Number Systems & Logic Gates.**
- 2. Non Functional Properties of Logic gates:** Noise Margin, Power dissipation, Gate delay, Open Collector connection, Fan-in, Fan-out, TTL-CMOS-TTL interfacing.
- 3. Minimization Techniques:** Using Boolean identities, Karnaugh Map, Map entered variables, Quine-McCluskey method.
- 4. Combinational Circuits:** Adder, Subtractor, Encoder, Decoder, Tristate, Multiplexer, Demultiplexer, Parity checker & generator.
- 5. (a) Fundamental concepts of sequential logic :** Introduction, Synchronous and Asynchronous operation, Latches, Flip Flops, Timing in Synchronous sequential circuits, State table and state diagram.  
**(b) Synchronous sequential circuits :** Introduction Problem definition of sequential circuits, State reduction, Derivation of design equation
- 6. Counters and Shift Registers:** Ripple, Decade, Up-down counters, Mod-N counter, Serial, Parallel, Serial-parallel registers.
- 7. Asynchronous sequential logic:** Introduction, state reduction, races, cycles & Hazards.

References:

1. Bartee T.C. Digital Electronics, TMH
2. Moris-Mano- Digital Electronics
3. Parag K. Lala, Practical Digital Logic Design and Testing – PHI
4. Sandige – Modern Digital Design – MGH
5. Kohavi, Switching and Automata Theory



**Raffles University, Neemrana**  
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**Subject:- Telecommunication Engg. Fundamentals**

**L T P**

**Subject Code: - ECE 205**

**3 1 0**

**Transmission Lines :** Types of transmission lines, general transmission line equations, line constants, equivalent circuits, infinite line, reflection on a line, SWR of lines with different type of terminations. Distortionless and dissipationless lines. Cable circuits and composite lines. Coaxial cables, Transmission lines at audio and radio frequencies. Losses in transmission line, Transmission equalizers. Characteristics of quarterwave, half wave and other lengths, Smith chart and its application. Transmission line applications, Stub matching. Measurement of parameters of transmission line, measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio.

**Attenuators & Filters :** Different Attenuators, p-section & T-section attenuators, Filters, constant K-section, Ladder type, p-section, Tsection filter, m-derived filter sections, Lattice filter section.

**Basics of Automatic Telephony :** Trunking concepts, Grade of service, Traffic definitions, Introduction to switching networks, Electronic Exchanges, EPABX and SPC Exchanges, Principle of STD, ISD.

**Recent Trends in Telecommunications:** Operation of Mobile phone system, Paging, Internet working concept, Modems, Concept of ISDN.

**References:**

1. John D. Ryder- Networks Lines & Fields , PHI
2. T. Vishwanathan- Telecommunication Switching Systems & Networks, PHI
3. Bellami- Digital Telephony
4. W. Fraser- Telecommunication



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**Subject:- Signals and Systems**  
**Subject Code: - ECE 207**

**L T P**  
**3 1 0**

**INTRODUCTION:** Continuous time and discrete time signals and systems, Properties of systems. Linear time invariant systems- continuous time and discrete time. Properties of LTI systems and their block diagrams. Convolution, Discrete time systems described by difference equations.

**FOURIER SERIES REPRESENTATION OF SIGNALS:** Fourier series representation of continuous periodic signal & its properties. Fourier series representation of Discrete periodic signal & its properties. Continuous time filters & Discrete time filters described by Diff. equation.

**FOURIER TRANSFORM:** The continuous time Fourier transform for periodic and non periodic signals, Properties of CTFT. Discrete time Fourier transform for periodic and non periodic signals Properties of DTFT.

**Z-TRANSFORM & LAPLACE TRANSFORM:** The region of convergence for the Z-transform. The Inverse Z-transform. Two dimensional Z transform. Properties of Z transform. Laplace transform: Properties of Laplace Transform, Application of Laplace transform to system analysis.

**SAMPLING:** Mathematical theory of sampling. Sampling theorem. Ideal & Real sampling. Interpolation technique for the reconstruction of a signal from its samples. Aliasing. Sampling in freq. domain. Sampling of discrete time signals.

**Text books:**

1. Signals And Systems M J Roberts, Mc-Graw Hill.(2004).
2. Signals And Systems, Oppenheim, Willsky, Nawab, PHI.(1992).

**Reference books:**

1. Principles Of Linear Systems And Signals, 2e (Intl. Version), Lathi 2nd, Oxford, 2002
2. Signal & Systems 3e, Chen 3rd, Oxford 2004.
3. Fundamentals Of Signals And Systems, Wiley 2009.
4. Signals And Systems, P Rao, Mc-Graw Hill 2011.
5. Signals And Systems: A Simplified Approach, Ganesh Rao, 4e, Pearson 2012



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**Subject:- Graph Theory**  
**Subject Code: - ECE 209**

<b>L</b>	<b>T</b>	<b>P</b>
<b>2</b>	<b>1</b>	<b>0</b>

**Graph Theory-** basics, Planarization, triangulation, graph algorithms for shortest/longest paths, spanning tree, search etc.

**Optimization problem-** Convex sets and functions. The SIMPLEX algorithm- forms of linear programming problem, geometry of LP, organization of Tableau. Computational considerations for simplex algorithm Duality- dual of LP, dual simplex problem. Primal-dual algorithm.

**Algorithms & complexity-** shortest path, max-flow, Dijkstra's algorithm, min-cost flow, algorithm for graph search and matching; spanning trees and matroids; Integer Linear programming, Greedy algorithm, approximation algorithms; branchand- bound; dynamic programming.

**Reference**

1. Narsingh Deo, Graph theory, Prentice Hall India, 2008.
2. T. H. Cormen, C. E. Leiserson and R. L. Rivest, "Introduction to Algorithms," McGraw-Hill, 2007
3. S. Baase, Computer algorithms, Pearson India 2008.
4. Papadimitriou and Steiglitz, Combinatorial optimization, PH India, 2001.
5. Nemhauser and Wolsey, Integer and Combinatorial optimization, Wiley Inter-science 1999.



**Raffles University, Neemrana**  
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**Subject:- Electronic Measurements & Instrumentation**

**L T P**

**Subject Code: - ECE 211**

**3 1 0**

**Theory Of Errors:** Accuracy & precision, Repeatability, Limits of errors, Systematic & random errors Modeling of errors, Probable error & standard deviation, Gaussian error analysis, Combination of errors.

**Electronic Instruments For Measuring Basic Parameters:** Electronic Voltmeter, Electronic Multimeters, Digital Voltmeter, Component Measuring Instruments, Q meter, Vector Impedance meter, RF Power & Voltage Measurements. Measurement of frequency. Introduction to shielding & grounding.

**Oscilloscopes:** CRT Construction, Basic CRO circuits, CRO Probes, Oscilloscope Techniques of Measurement of frequency, Phase Angle and Time Delay, Multibeam, multi trace, storage & sampling Oscilloscopes. Curve tracers.

**Signal Generation:** Sine wave generators, Frequency synthesized signal generators, Sweep frequency generators. Signal Analysis – Measurement Technique, Wave Analyzers, Frequency - selective wave analyser, Heterodyne wave analyser, Harmonic distortion analyser, Spectrum analyser.

**Transducers:** Classification, Selection Criteria, Characteristics, Construction, Working Principles, Application of following Transducers- RTD, Thermocouples, Thermistors, LVDT, RVDT, Strain Gauges, Bourdon Tubes, Bellows. Diaphragms, Seismic Accelerometers, Tachogenerators, Load Cell, Piezoelectric Transducers, Ultrasonic Flow Meters.

**References:-**

- Electronic Instrumentation, H S Kalsi, TMH
- Electronic Measurements & Instrumentation, Bernard Oliver, TMH
- Instrumentation Measurement & Analysis, B.C.Nakra, K.K. Chaudhry, TMH
- Electronic Measurements & Instrumentation, Bernard Oliver, John Cage, TMH
- Electronic Measurements And Instrumentation, Lal Kishore, Pearson
- Elements Of Electronic Instrumentation And Measurement, Carr, Pearson
- Electronic Instrument And Measurment, Bell, Oxford
- Electronic Instrumentation And Measurements, David A. Bell, PHI
- Introduction To Measurements And Instrumetation, Arun K. Ghosh, PHI
- A Course In Electrical & Electronic Measurement & Instrumentation, A.K.Sawhney



**ECE-P-201 Electronics Devices and Circuit Lab**

**List of Experiments:-**

1. Measurement & study of p-n junction diode I-V and C-V characteristics.
2. Study of half-wave & full-wave rectifier.
3. Study of diode as clipper & clamper.
4. Study of Zener diode as voltage regulator.
5. Measurement & study of input & output characteristics of a BJT.
6. Study of CE amplifier current & power gains and input, output impedances.
7. To study the frequency response of RC coupled amplifier.
8. Measurement and study of output characteristics of JFET.
9. Measurement and study of output characteristics of MOSFET.
10. Study of SCR/Thyristor characteristics.
11. Study of UJT characteristics.
12. Study of Push-Pull amplifier.



**ECE-P-203 Digital Electronics & Switching Circuit Lab**

**List of Experiments:-**

1. Study of primary gates AND, OR, NOT
2. Study of secondary gates NAND, NOR, EX-OR & EX-NOR.
3. Design all gates using NAND gate
4. Converts Binary code to Gray code using Ex-OR gate.
5. Converts Gray code to Binary code using Ex-OR gate.
6. Study of Half Adder and Full Adder.
7. Study of Half Subtractor and Full Subtractor.
8. Study of 4- bit counter circuit.
9. To verify the truth table of S-R, J-K, T, D flip-flops.
10. Design & realize a given function using K-Maps & verify its performance.
11. To verify the operation of Multiplexer & Demultiplexer.
12. To verify the operation of Comparator.
13. Study of TTL logic family characteristics.
14. Study of encoder & decoder.
15. Study of BCD to 7 segment decoder.
16. To verify the operation of Bi- direction shift register.



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**ECE-P-205 Electronic Measurement and Instrumentation Lab**

**List of Experiments:-**

1. To measure the unknown inductance in terms of capacitance and resistance by using Maxwell's Inductance bridge.
2. To measure unknown capacitance of small capacitors by using Wein's bridge.
3. To measure unknown frequency using Wein's frequency bridge.
4. To measure unknown low resistance by Portable Kelvin's Double bridge.
5. To measure self Inductance of a coil using Anderson bridge.
6. Measurement of displacement with the help of LVDT kit.
7. Draw the characteristics of the following temperature, Transducer: RTD (pt-100) Thermistors, Thermocouple kit.
8. To plot the B-H curve of different magnetic materials.
9. To convert the voltmeter into Ammeter using potentiometer.
10. Insulation testing of cables using digital insulation tester.
11. Use of load cell for counting of small objects.
12. Use of load cell for strain gauge transducer.
13. Study of h parameters.



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**Subject : ADVANCED ENGINEERING MATHEMATICS** **L T P**  
**Subject Code: - MA 200** **3 1 0**

**Unit 1**

Introduction: Engineering application of optimization, Statement and classification of optimization problem, single variable and multivariable optimization with and without constraints.

**Unit 2**

Linear Programming: Formulation of Linear Programming problem, Graphical Approach, General Linear Programming problem, Simplex Method. Duality in Linear Programming and Transportation Problems.

**Unit 3**

Elements of Number Theory: Divisibility and Euclid Algorithm, Primes and the Sieve of Eratosthenes, testing for primes, Prime Number Theorem, Euler's, Fermat's Little theorems, Congruences, Computing Inverse in Congruences, Legendre and Jacobi Symbols, Chinese Remainder Theorem,

Algebraic Structures in Computing (Definitions, properties and Elementary Operations Only): Groups, subgroup, order of group, cyclic group, ring, field, division algorithm, polynomial over a field. Galois Field

**Unit 4**

LAPLACE TRANSFORM: Laplace transform with its simple properties. Inverse Laplace transform, convolution theorem (without proof), solution of ordinary differential equation with constant coefficient, solution of partial differential equation having constant coefficient with special reference to diffusion, Heat conduction and wave equation. Boundary value problems

**Unit 5**

NUMERICAL ANALYSIS: Difference operators forward, backward, central, shift and average operators and relation between them. Newton's and Gauss forward and backward interpolation formula for equal interval, Stirling's formula for central difference. Lagrange's Interpolation formula and Inverse Interpolation.

Numerical differentiation by Newton's, Gauss and Sterling's formula. Numerical Integration by Simpson's one third and there eight rule. Numerical Integration of ordinary differential equation of first order by Picard's method, Euler's and modified Euler's method, Milne's method and Runge-Kutta fourth order method. Solution of difference equation.

**Text/References:**

1. Elementary Number Theory with applications: Thomas Koshy, 2nd Ed., Elsevier.
2. Operation Research By Kanti Swaroop, P. K. Gupta & Manmohan, Sultan chand & sons
3. Integral Transform By Dr. R.K. Gupta, A.R. Vashishtha, Krishna Prakashan Mandir Meerut
4. Calculus of Finite Differences & Numerical Analysis By Dr. Gupta & Malik Krishna Prakashan Mandir Meerut



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**Subject:- Analog Electronics**

**L T P**

**Subject Code: - ECE 202**

**3 1 3**

**Unit-I**

**Feedback Amplifiers:** Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers, Analysis of voltage-series, voltage-shunt, current-series and current-shunt feedback amplifier, Stability criterion.

**Unit-II**

**Oscillators:** Classification. Criterion for oscillation, Tuned collector, Hartley, Colpitts, RC Phase shift, Wien bridge and crystal oscillators, Astable, monostable and bistable multivibrators. Schmitt trigger, Blocking oscillators.

**Unit-III**

**HIGH FREQUENCY AMPLIFIERS:** Hybrid Pi model, conductance's and capacitances of hybrid Pi model, high frequency analysis of CE amplifier, gain bandwidth product, Emitter follower at high frequencies.

**Unit-IV**

**Tuned Amplifier:** Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit, Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET, Double Tuned Transformer Coupled Amplifier, Stagger Tuned Amplifier, Pulse Response of such Amplifier, Shunt Peaked Circuits for Increased Bandwidth.

**Unit-V**

**POWER AMPLIFIERS:** Power amplifier circuits, Class A output stage, class B output stage and class AB output stages, class C amplifiers, pushpull amplifiers with and without transformers, Complementary symmetry & quasi complimentary symmetry amplifiers.

**References:-**

- Millman's Integrated Electronics, Millman & Parekh, TMH
- Electronic Devices And Circuits, Salivahanan, TMH
- Millman's Electronic Devices And Circuits (Special Indian Edition), Millman & Halkias, TMH
- Analysis And Design Of An Analog Integrated Ckt, Gray, Wiley
- Electronic Devices And Circuit Theory, Boylested, Pearson
- Electronic Devices, Floyd, Pearson
- Electronic Devices And Integrated Circuits, Singh, Pearson
- Electronic Devices And Circuits, 5e, Bell, Oxford
- Microelectronic Circuits, 5e (Intl. Version), Sedra, Oxford



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**Subject:- Circuit Analysis and Synthesis** **L T P**  
**Subject Code: - ECE 204** **3 1 0**

**Unit-I**

**Network Theorems And Elements:** Thevenin's, Norton's, Reciprocity, Superposition, Compensation, Miller's, Tellegen's and maximum power transfer theorems, Networks with dependent sources, Inductively coupled circuits – mutual inductance, coefficient of coupling and mutual inductance between portions of same circuits and between parallel branches. Transformer equivalent, inductively and conductively coupled circuits.

**Unit-II**

**Transients Analysis:** Impulse, step, ramp and sinusoidal response, Analysis of first order and second order circuits. Time domain & transform domain (frequency, Laplace) analysis, Initial and final value theorems, Complex periodic waves and their analysis by Fourier analysis, Different kind of symmetry, Power in a circuit.

**Unit-III**

**Network Functions:** Terminals and terminal pairs, driving point impedance transfer functions, poles and zeros, Procedure of finding network functions for general two terminal pair networks, Stability & causality, Hurwitz polynomial, positive real function.

**Unit-IV**

**Two Port Networks:** Two port parameters and their interrelations – Z parameters, Y parameters, h-parameters, ABCD parameters, Equivalence of two ports, transformer equivalent, interconnection of two port networks, Image parameters, Attenuation & phase shift in symmetrical T and networks.

**Unit-V**

**Network Synthesis:** RL & RC networks synthesis, Foster First & Second form, Cauer forms.

**References:-**

- Circuits And Networks: Analysis And Synthesis, Sudhakar, TMH
- Network Analysis and Synthesis, Ghosh & Chakrabarti, TMH
- Electrical Networks, Singh, TMH
- Schaum's Outlines Of Electric Circuits (Sie), Nahvi, TMH
- Electronic Circuits: Analysis And Design(Sie), Donald Neamen, TMH
- Electric Circuits & Networks, Suresh Kumar, Pearson
- Electric Circuits, Nilsson, Pearson
- Linear Circuits Analysis, Decarlo, Oxford
- Linear Circuits (Includes Cd), Ramakalyan, Oxford
- Circuits And Network: Analysis, Design, And Synthesis, Sukhija, Oxford
- Basic Engineering Circuit Analysis, Irwin, Wiley
- Network Theory: Analysis And Synthesis, Smarjit Ghosh, PHI



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**Subject:- Data Structures & Algorithms**

**L T P**

**Subject Code: - ECE 206**

**4 0 3**

**Unit-I**

**Performance Measurement:** Space complexity and Time complexity, big oh, omega and theta notations and their significance. Linear Lists - Array and linked representation, Singly & Doubly linked lists, Concept of circular linked lists.

**Unit-II**

**Array & Matrices:-** Row and Column Major mapping & representation, irregular 2D array, Matrix operations, Special matrices: diagonal, tri-diagonal, triangular, symmetric, Sparse matrices representation and its transpose.

**Unit-III**

**Stacks:-** Representation in array & linked lists, basic operation, Applications of stacks in parenthesis matching, towers of Hanoi etc. Queues - Representation in array & linked lists, applications, circular queues.

**Unit-IV**

**Trees:-** Binary Tree, representation in array & linked lists, basic operation on binary trees, binary tree traversal (preorder, post order, in order).  
Search Trees - Binary search tree, indexed-binary search tree, basic operation, AVL tree, B-tree.

**Unit-V**

**Graphs:-** Representation of un weighted graphs, BFS, DFS, Minimum cost spanning trees, Single source shortest path, Sorting - Bubble sort, insertion sort, merge sort, selection sort, quick sort, heap sort.

**References:-**

- Data Structures (Special Indian Edition) (Schaums' Outlines Series), Lipschutz & Pai, TMH
- Data Structures And Algorithms, Pai, TMH
- Data Structure Using C (Sigma Series), Mukherjee, TMH
- Introduction To Data Structures With Applications, Tremblay, TMH
- Data Structure Using C, Krishnamoorthy, TMH
- Data Structures, Keogh, Wiley



**Raffles University, Neemrana**  
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**Subject:- Electromagnetic Field and Theory**

**L T P**

**Subject Code: - ECE 208**

**3 1 0**

**Unit-I**

**Introduction:** Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system, Concept and physical interpretation of gradient, Divergence and curl, Green's & Stoke's theorems.

**Unit-II**

**Electrostatics:** Electric field intensity & flux density. Electric field due to various charge configurations, The potential functions and displacement vector, Gauss's law, Poisson's and Laplace's equation and their solution, Uniqueness theorem, Continuity Equation, Capacitance and electrostatics energy, Field determination by method of images, Boundary conditions, Field mapping and concept of field cells.

**Unit-III**

**Magnetostatics:** Magnetic field intensity, flux density & magnetization, Faraday's Law, Bio-Savart's law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance, Energy stored in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field mapping and concept of field cells.

**Unit-IV**

**Time Varying Fields:** Displacement currents and equation of continuity, Maxwell's equations, Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflection & refraction of Uniform Plane Wave, standing wave ratio, Pointing vector and power considerations.

**Unit-V**

**Radiation, EMI and EMC:** Retarded Potentials and concepts of radiation, Radiation from a small current element, Radiation resistance: Introduction to Electromagnetic Interference and Electromagnetic compatibility, EMI coupling modes, Methods of eliminating interference, shielding, grounding, conducted EMI, EMI testing: emission testing, susceptibility testing.

**References:-**

- Engineering Electromagnetics, (With Cd), Hayt, TMH
- Electromagnetics (Sie) (Schaum's Outlines Series), Edminister, TMH
- Electromagnetics With Applications, Jd Kraus, TMH
- Electromagnetic Field Theory And Transmission Lines, Raju, Pearson
- Field & Wave Electromagnetic, Cheng, Pearson
- Elements Of Engineering Electromagnetics, Rao, Pearson
- Electromagnetic For Engineers, Ulaby, Pearson
- Fundamentals Of Electromagnetics For Engineers, Rao, Pearson



**Raffles University, Neemrana**  
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**Subject:- Electronic Materials & Processes**  
**Subject Code: - ECE 210**

**L T P**  
**3 1 0**

**Unit-I**

**Dielectric Materials:** Polarisation phenomenon, spontaneous polarisation, dielectric constant and loss, piezo and ferro electricity.

**Unit-II**

**Magnetic Materials:** Dia, para, ferro-ferrimagnetism; soft and hard magnetic materials and their applications.

**Unit-III**

**Semi Conductor Materials:** Crystal growth, zone refining, Degenerate and nondegenerate semiconductors, Direct and indirect band gap semiconductors, Electronic properties of silicon, Germanium, Compound Semiconductor, Gallium Arsenide, gallium phosphide & Silicon carbide.

**Unit-IV**

**Conductive & Superconductive Materials:** Electrical properties of conductive and resistive materials, Important characteristics and electronic applications of specific conductor & resistance materials, Superconductor phenomenon, Type I and Type II superconductors and their applications.

**Unit-V**

**Passive Components & PCB Fabrication:** Brief study of fabrication methods of fixed and variable type of resistors; capacitors, Inductors, solenoid and toroid, air core, iron core and Ferro core conductors. Printed Circuit Boards – Types, Manufacturing of copper clad laminates, PCB Manufacturing process, Manufacturing of single and double sided PCBs. Surface mount devices – advantages & limitations.

**References:-**

- Principles Of Electronic Materials And Devices, S O Kasap, TMH
- Electronics Engineering Material And Devices, J Allison, TMH
- Electronics Material And Processes Hand
- BOOK, Charles Harpa, Ronald Sampson, TMH
- Introduction To Materials Science For Engineers, Shackelford, Pearson
- Elements Of Materials Science & Engineering, Van Vlack, Pearson
- Material Science For Electrical And Electronic Engineers, Jones, Oxford
- Introduction To Semiconductor Materials And Devices, Tyagi, Wiley
- Electronic Instrumentation And Measurements, David A. Bell, PHI
- Introduction To Measurements And Instrumentation, Arun K. Ghosh, PHI
- Electronic Components And Processes, Maheshwari, Preeti, New Age
- Rudiments of Materials Science, Pillai, S.O., New Age



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<b>Subject:- Analog Electronics Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Subject Code: - ECE-P-202</b>	<b>0</b>	<b>0</b>	<b>3</b>

**List of Experiments:-**

1. Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.
2. Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor.
3. Plot and study the characteristics of small signal amplifier using FET.
4. Study of push pull amplifier. Measure variation of output power & distortion with load.
5. Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency.
6. Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
7. Study the following oscillators and observe the effect of variation of C on oscillator frequency: (a) Hartley (b) Colpitts.
8. Design Fabrication and Testing of k-derived filters (LP/HP).
9. Study of a Digital Storage CRO and store a transient on it.
10. To plot the characteristics of UJT and UJT as relaxation.
11. To plot the characteristics of MOSFET and CMOS.



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**Subject:- Data Structures & Algorithms Lab**

**L T P**

**Subject Code: - ECE-P-206**

**0 0 3**

**List of Experiments:-**

1. Write a simple C program on a 32 bit compiler to understand the concept of array storage, size of a word. The program shall be written illustrating the concept of row major and column major storage. Find the address of element and verify it with the theoretical value. Program may be written for arrays upto 4-dimensions.
2. Simulate a stack, queue, circular queue and dequeue using a one dimensional array as storage element. The program should implement the basic addition, deletion and traversal operations.
3. Represent a 2-variable polynomial using array. Use this representation to implement addition of polynomials.
4. Represent a sparse matrix using array. Implement addition and transposition operations using the representation.
5. Implement singly, doubly and circularly connected linked lists illustrating operations like addition at different locations, deletion from specified locations and traversal.
6. Repeat exercises 2, 3 & 4 with linked structures.
7. Implementation of binary tree with operations like addition, deletion, traversal.
8. Depth first and breadth first traversal of graphs represented using adjacency matrix and list.
9. Implementation of binary search in arrays and on linked Binary Search Tree.
10. Implementation of insertion, quick, heap, topological and bubble sorting algorithms.



**Raffles University, Neemrana**  
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**Subject:- Advanced Data Structures**  
**Subject Code: - ECE 301**

**L T P**  
**3 1 2**

**Unit I**

**Advanced Trees:** Definitions and operations on weight balanced trees (Huffman trees) , 2-3 trees and Red-Black trees. Augmenting Red-Black trees to dynamic order statistics and interval tree applications. Operations on disjoint sets and its Union-Find problem. Implementing sets, discionerics, priority queues and concatenable queues using 2-3 trees.

**Unit II**

**Mergeable Heaps:** Mergeable Heap operations, binomial trees, implementing binomial heaps and its operations. 2-3-4- trees and 2-3-4 heaps. Structure and potential function of Fibonacci heap. Implementing Fibonacci Heap.

**Unit III**

**Graph Theory Definitions:** Definitions of Isomorphism, Components, Circuits, Fundamental Circuits, Cut-sets, Cut-Vertices, Planer and dual graphs, Spanning trees, Kuratovski's two graphs.

**Unit IV**

**Graph Theoretic Algorithms:** Algorithms for connectedness, finding all spanning trees in a weighted graph and planarity testing. Breadth first and depth first search, topological sort, strongly connected components and, articulation point.

**Unit V**

**Application Of Graphs:** Single source shortest path and all pair shortest path algorithms. Min-Cut Max-Flow theorem of network flows, Ford-Fulkerson Max Flow algorithms.

**BOOKS**

- “ Data Structures using C” by A.M. Tanenbaum.
- “The C Programming Language” by Kerninghan.
- “An introduction to data structures with applications: by Trembly and Sorenson.
- “Fundamentals of Data structures” by Horowitz and Sahani.



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**Subject:- Analog Communication**

**L T P**

**Subject Code: - ECE 303**

**3 1 2**

**Unit-I**

**Noise Effects in Communication Systems:** Resistor noise, Networks with reactive elements, Noise temperature, Noise bandwidth, effective input noise temperature, Noise figure. Noise figure & equivalent noise temperature in cascaded circuits.

**Unit-II**

**Amplitude modulation:** Frequency translation, Recovery of base band signal, Spectrum & power relations in AM systems. Methods of generation & demodulation of AM DSB, AM-DSB/SC and AM-SSB signals. Modulation & detector circuits for AM systems. AM transmitters & receivers.

**Unit-III**

**Frequency modulation:** Phase & freq. modulation & their relationship, Spectrum & band width of a sinusoidally modulated FM signal, phasor diagram, Narrow band & wide band FM. Generation & demodulation of FM signals. FM transmitters & receivers. Comparison of AM, FM & PM. Pre emphasis & deemphasis. Threshold in FM, PLL demodulator.

**Unit -IV**

**Noise in AM and FM:** Calculation of signal-to-noise ratio in SSB-SC, DSBSC, DSB with carrier, Noise calculation of square law demodulator & envelope detector. Calculation of S/N Ratio in FM demodulators, Super heterodyne receivers.

**Unit-V**

**Pulse Analog Modulation:** Practical aspects of sampling: Natural and flat top sampling. PAM, PWM, PPM Modulation and Demodulation methods, PAM-TDM.

**BOOKS**

- Modern Digital & Analog Communication Systems, Lathi, Oxford
- Analog Communication, Chandrasekhar, Oxford
- An Introduction to Analog & Digital Communications-, Haykins, Wiley
- Digital and Analog Communication Systems-, Shanmugam, Wiley
- Communications Systems, 4ed-, Haykins, Wiley
- Principles Of Communication Systems, Herbert Taub, Donald Schilling, Goutam Saha-, TMH
- Communication Systems, R Singh, S. Sapre, TMH



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**Subject:- Antenna & Wave Propagation**

**L T P**

**Subject Code: - ECE 305**

**3 1 0**

**Unit I**

**Antenna Fundamentals:** Antenna parameters, Radiation from a current element in free space. Quarter & half wave antenna. Reciprocity theorem. Resonant and non-resonant antenna. Effective length and aperture, gain, beamwidth, directivity, radiation resistance, efficiency, polarization, impedance and directional characteristics of antenna, antenna temperature.

**Unit II**

**Antenna Arrays:** Two element array, N-element linear arrays, Broadside, End fire, collinear and combination arrays, Multiplication of patterns, Binomial arrays. Effect of ground on antennas, Antenna loading Antenna Measurements - Antenna impedance, radiation pattern, gain, directivity, polarization and phase measurements

**Unit III**

**Antennas:** V and Rhombic antennas, Folded dipole, Yagi-Uda antenna, Frequency independent antennas, Log-periodic antennas, UHF and Microwave antennas- Antenna with parabolic reflectors, Horn and Lens antennas, Helical antennas, Square and Circular loop antennas, Fundamentals of Slot and Microstrip antennas.

**Unit IV**

**Radio Wave Propagation:** Mechanism of radio wave propagation, Reflection, Refraction interference and diffraction of radio waves. Theory of ground wave, space wave and sky wave propagation. Plane earth reflection, Reflection factors for horizontal and vertical polarizations. Duct propagation and tropospheric scattering.

**Unit V**

Various Ionospheric layers. Characteristics of ionosphere and its effects on wave propagation. Critical frequency, Virtual height, skipzone & maximum usable frequency. Multiple hop transmission. Oblique & vertical incidence transmission. Effect of earth's magnetic field, solar activity and meteorological conditions on wave propagation.

**BOOKS**

- Antennas, John Kraus, Ronald Marhefka, TMH
- Electromagnetic Waves And Radiating Systems, E.C. Jordan And K.G. Balmain, PHI
- Antenna Theory: Analysis And Design, Constantine A. Balanis , John Wiley & Sons
- Antenna Theory & Design, Robert S. Elliott, John Wiley & Sons
- Antennas And Wave Propagation, G. S. N. Raju , Pearson



**Raffles University, Neemrana**  
**School of Engineering and Technology**  
**Department of Electronics and Communication Engineering**

**Subject:- Control System**  
**Subject Code: - ECE 307**

**L T P**  
**3 1 0**

**Unit I**

**Control Systems Analysis and Components:** Examples and application of open loop and close loop systems. Brief idea of multivariable control system, Brief idea of Z-transform and digital control systems. Differential equations. Determination of transfer function by block diagram reduction technique & signal flow graph method.

**Unit II**

**Time Response Analysis Of First Order & Second Order Systems:** Transient response analysis. Steady state error & error constants. Dynamic error and dynamic error coefficient, Performance Indices.

**Unit III**

**Frequency Domain Methods:** Bode plot, Design specification in frequency domain and their co-relation with time domain.

**Unit IV**

**Stability Of The System:** Absolute stability and relative stability. Routh's stability criterion, Hurwitz criterion. Root locus method of analysis. Polar plots, Nyquist stability criterion. M and N loci, Nicholas charts.

**Unit V**

**State Variable Analysis:** Concepts of state, state variable and state model. State models for linear continuous time systems. Brief idea of state variable analysis in discrete time domain. Transfer functions, Solution of state equation. Concepts of controllability & observability

**BOOKS**

- Control System Engineering, S Palani, TMH
- Control Systems, Manjita Srivastava, Mahesh Srivastava, Smriti Bhatnagar, TMH
- Control Systems: Principles & Design, M. Gopal, TMH
- Control Systems Engineering, S. K. Bhattacharya, Pearson
- Design Feedback Control System, Stefani, Oxford
- Automatic Control Systems, B. C. Kuo, Wiley
- Control Systems Engg., Norman S. Nise, Wiley
- Control System, N.K.Sinha, New Age
- Control System Engineering, J.Nagrath, New Age



**Raffles University, Neemrana**  
**School of Engineering and Technology**  
**Department of Electronics and Communication Engineering**

<b>Subject:- Linear Integrated Circuits</b>	<b>L T P</b>
<b>Subject Code: - ECE 309</b>	<b>3 1 2</b>

**Unit I**

**Operational Amplifiers:** Basic differential amplifier analysis, Single ended and double ended configurations, Op-amp configurations with feedback, Op-amp parameters, Inverting and Non-Inverting configuration, Comparators, Adder.

**Unit II**

**Operational Amplifier Applications:** Integrator, Differentiator, Voltage to frequency & Frequency to voltage converters. Oscillators: Phase shift, Wien bridge, Quadrature, square wave, triangular wave, sawtooth oscillators. Voltage controlled oscillators.

**Unit III**

**Active Filters:** Low pass, high pass, band pass and band reject filters, All pass filter, Switched capacitor filter, Butterworth filter design, Chebyshev Filter design.

**Unit IV**

**Phase-Locked Loops:** Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM 565 PLL.

**Unit V**

**Linear IC's:** Four quadrant multiplier & its applications, Basic blocks of linear IC voltage regulators, Three terminal voltage regulators, Positive and negative voltage regulators. The 555 timer as astable and monostable multivibrators. Zero crossing detector, Schmitt trigger.

**BOOKS**

- Linear Circuits (Includes Cd), Ramakalyan-, Oxford
- Linear Circuit Analysis, Decarlo, Oxford
- Linear Integrated Circuits, Nair, Wiley
- Analysis And Design Of Analog Integrated Circuits, Gray, 5e, Wiley
- Analog Mos Integrated Circuits For Signal Processing-Gregorian, Gregorian, 1e, Wiley
- Linear Integrated Circuits, S Salivahanan, TMH
- Electronic Circuits: Discrete And Integrated, Donald Schilling, TMH
- Op-Amps And Linear Integrated Circuits, Gayakwad, Ramakant A, PHI



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**Subject:- Microwave Engineering-I**

**L T P**

**Subject Code: - ECE 311**

**3 1 2**

**Unit-I**

**Wave Guides:** Introduction of Microwaves and their applications. Rectangular Waveguides, Solution of Wave equation in TE and TM modes. Power transmission and Power losses. Excitation of modes in Rectangular waveguides, circular waveguides: Basic idea of TE and TM modes, field patterns, TEM mode of propagation.

**Unit-II**

**Waveguide Components:** Scattering matrix representation of networks. Rectangular cavity and circular cavity resonators. Waveguide Tees, Magic Tees. Hybrid rings. Waveguide corners, Bends and twists. Directional couplers, Circulators and isolators.

**Unit-III**

**Klystrons:** Limitation of conventional vacuum tubes, Construction and operation of two cavity & multicavity klystrons, Velocity modulation and electron bunching (analytical treatment), Applegate diagram and applications of two cavity klystrons. Construction, working and operation of Reflex klystron. Applications and practical considerations, Velocity modulation, power output and frequency characteristics of a Reflex klystron, Electron admittance.

**Unit-IV**

**Travelling Wave Tubes (TWT):** Construction, operation and practical consideration of helix type TWT. Introduction to CW power, pulsed dual mode TWT. Coupled cavity TWT. Applications of TWT.

**Unit-V**

**Magnetron:** Types of Magnetron. Construction, operation, analysis and practical consideration of cavity or travelling wave magnetron. Introduction to coaxial, frequency angle and voltage tunable magnetrons. Backward cross field oscillator, Forward wave cross field amplifier.

**BOOKS**

- Foundations For Microwave Engineering – R.E. Collin, R.E. Collin, Wiley
- Microwave Engineering By, Pozar, Wiley
- Microwave Engineering, Annapurna Das, Sisir Das, TMH
- Microwave Devices And Circuits, 3, Samuel Y. Liao, Pearson
- Microwave Devices And Circuit Design, Ganesh Prasad Srivastava, Vijay Laxmi Gupta, PHI
- Microwave Semiconductor Devices, Roy Mitra, PHI



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**Subject:- Computer Programming Lab**

**L T P**

**Subject Code: - ECE-P-301**

**0 0 2**

**List of Experiment**

1. To implement traversal, insertion, deletion in a linear array.
2. To implement Stacks using arrays.
3. To implement Linear and Circular Queue using arrays.
4. To Implement Singly Linked List.
5. To Implement Doubly Linked List.
6. To Implement Circular Linked List.
7. To Implement Stacks using linked list.
8. To Implement Queues using linked list.
9. To implement Sparse Matrix using array.
10. To Implement Circular-Doubly Linked List.
11. To Implement Polynomial Arithmetic using linked list.
12. To evaluate postfix expression using stacks.
13. To Implement Binary Search Tree.
14. To Implement Tree Traversal.
15. To Implement Sequential Search.
16. To Implement Binary Search.
17. To Implement Insertion sort.
18. To Implement Exchange sort aka Bubble Sort.
19. To Implement Selection sort.
20. To Implement Quick sort aka Partition-Exchange Sort.
21. To Implement Shell sort.
22. To Implement Merge sort.
23. To Implement Dijkstra's Algorithm.
24. To Implement Floyd Warshall's Algorithm.
25. To implement Radix sort.
26. To implement Heap sort.
27. WAP to Implement Depth-First-Search in a graph.
28. WAP to Implement Breadth-First-Search in a graph.



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**Subject:- Communication Lab-I**

**L T P**

**Subject Code: - ECE-P-303**

**0 0 2**

**List of Experiment**

1. Harmonic analysis of a square wave of a modulated wave form.
2. Observe the Amplitude modulated wave form & measure modulation index.  
Demodulation of AM signal.
3. Generation & Demodulation of DSB – SC signal.
4. Modulate a sinusoidal signal with high frequency carrier to obtain FM signal.  
Demodulation of the FM signal.
5. To observe the following in a transmission line demonstrator kit :
  - (a) The propagation of pulse in non reflecting transmission line.
  - (b) The effect of losses in transmission line.
  - (c) Transmission with standing waves on a Transmission line.
  - (d) The resonance characteristics of a half-wave length long X-mission line.
6.
  - (a) To observe the operation of sampling and sample & hold circuits.
  - (b) To study the effect of sampling time (sampling pulse width).
  - (c) To study the effects of changing the sampling frequency & observing aliasing phenomena.
7. To study & observe the operation of a super heterodyne receiver.
8. To study & observe the amplitude response of automatic gain controller (AGC ).
- 9, 10. PAM, PWM & PPM: Modulation and demodulation.



**Raffles University, Neemrana**  
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**Department of Electronics and Communication Engineering**

**Subject:- Electronic Engineering Design Lab**  
**Subject Code: - ECE-P-309**

**L T P**  
**0 0 2**

**List of Experiment**

1. Op-Amp characteristics and get data for input bias current, measure the output-offset voltage and reduce it to zero and calculate slew rate.
2. Op-Amp in inverting and non-inverting modes.
3. Op-Amp as scalar, summer and voltage follower.
4. Op-Amp as differentiator and integrator.
5. Design LPF and HPF using Op-Amp 741.
6. Design Band Pass and Band reject Active filters using Op-Amp 741.
7. Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts
8. Design (i) Astable (ii) Monostable multivibrators using IC-555 timer
9. Design Triangular & square wave generator using 555 timer.
10. Design Amplifier (for given gain) using Bipolar Junction Transistor.



**Raffles University, Neemrana**  
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**Department of Electronics and Communication Engineering**

**Subject:- Microwave Engineering Lab**

**L T P**

**Subject Code: - ECE-P-311**

**0 0 2**

**List of Experiment**

1. Study of various microwave components and instruments like frequency meter, attenuator, and detector & VSWR meter.
2. Draw V-I characteristics of microwave source like Gunn diode/ Reflex Klystron.
3. Measurement of frequency and wavelength in a rectangular waveguide.
4. Measurement of VSWR (small as well as large values) & reflection coefficient.
5. Measure unknown impedance with smith chart.
6. Draw the following characteristics of Gunn Diode
  - (i) Output power and frequency as a function of voltage
  - (ii) Square wave modulation by PIN diode.
7. Drawing polar pattern of Horn antenna.
8. To observe the action of directional coupler and its use in separating incident & reflected wave.
9. Study of Magic Tee, Circulator, and isolator
10. Study of spectrum analyzer & its use in observing the response of
  - (i) High frequency amplifier
  - (ii) Low pass, high pass, band pass, band reject filters.



**Raffles University, Neemrana**  
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**Department of Electronics and Communication Engineering**

**ECE 302 - DIGITAL COMMUNICATION**

**UNIT 1: PCM & DELTA MODULATION SYSTEMS:** Uniform and Non-uniform quantization. PCM and delta modulation, Signal to quantization noise ratio in PCM and delta modulation. DPCM, ADM, T1 Carrier System, Matched filter detection. Error probability in PCM system.

**UNIT 2: BASE BAND TRANSMISSION:** Line coding (RZ, NRZ): Polar, Bipolar, Manchester, AMI. Inter symbol interference, Pulse shaping, Nyquist criterion, Raised cosine spectrum.

**UNIT 2: DIGITAL MODULATION TECHNIQUES:** Geometric interpretation of signals, Orthogonalization. ASK, BPSK, BFSK, QPSK, MSK modulation techniques and Coherent detection of these techniques. Calculation of error probabilities.

**UNIT 4: INFORMATION THEORY:** Amount of Information, Average Information, Entropy, Information rate, Increase in Average information per bit by coding, Shannon's Theorem and Shannon's bound, Capacity of a Gaussian Channel, BW-S/N trade off,

**UNIT 5: CODING:** Coding and decoding of Information, Hamming code, Single Parity- Bit Code, Linear Block code, cyclic code & convolutional code.

**Reference books:**

1. Analog And Digital Communication, Hwei Hsu, Debjani Mitra, TMH
2. Digital Communication, Amitabha Bhattacharya, TMH
3. Schaums Outline And Digital Communication, Hwei Hsu, TMH
4. Taub's Principles Of Communication Systems, Taub & Schilling, TMH
5. Electronic Communication Systems, Kennedy, TMH
6. Analog And Digital Communication, Sudakshina Kundu, Pearson

**Text books:**

1. Modern Digital And Analog Communication Systems, Lathi, Oxford
2. Digital Communications, Simon Haykin, Wiley
3. Digital And Analog Communication Systems, K. Sam Shanmugam, Wiley
4. An Introduction To Analog And Digital Communication System, Simon Haykin, Wiley



## **ECE 304 - INDUSTRIAL ELECTRONICS**

**UNIT 1: SEMICONDUCTOR POWER DEVICES** - Basic characteristics & working of Power Diodes, Diac, SCR, Triac, Power Transistor, MOSFETs, IGBT, and GTO.

**UNIT 2: RECTIFIERS & INVERTERS** - Working principles of single and three phase bridge rectifiers, Voltage and current source inverters.

**UNIT 3: POWER SUPPLIES:** Principle of operation of choppers. Step up, Step down and reversible choppers. High frequency electronic ballast, Switch Mode Power Supply: Fly back converter, forward/buck converter, Boost converter and buck-boost converter. Uninterruptible Power Supply.

**UNIT 4: MOTOR CONTROL:** Introduction to speed control of DC motors using phase controlled converters and choppers, Basic idea of speed control of three phase induction motors using voltage and frequency control methods.

**UNIT 5:** Stepper Motors: Variable reluctance, Permanent magnet and hybrid stepper motors. Induction and dielectric heating control.

### **Reference books:**

1. Power Electronics Principles & Applications, Joseph Vithayathil, TMH
2. Power Electronics, Ravish Singh, TMH
3. Industrial Electronics And Control, Titi, TMH
4. Power Electronics: Converters Applications., Mohan, Robbins, Wiley.

### **Text books:**

1. Power Electronics, Moorthi, Oxford
2. Elements Of Power Electronics, Krein, Oxford
3. Power Electronics, R.S.Murthy, Pearson
4. Power Electronics: Circuits, Devices And Applications, Muhammad.H.Rashid, Pearson



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 306- MICRO-ELECTRONICS**

**UNIT 1: Crystal Growth:** MGS, EGS, Czochralski crystal Puller, Silicon shaping, Wafer Preparation. Oxidation: Thermal Oxidation Kinetics, Oxidation Techniques, Oxide Properties, Oxidation induced defects. Thin film deposition techniques: Epitaxy, VDE, CVD, PECVD, MOCVD, PVD, Sputtering, MBE and epitaxial layer evaluations.

**UNIT 2: Lithography:** Photolithography, E-beam lithography, X-ray Lithography, reactive Plasma Etching, Plasma Properties, Feature Size control and anisotropic etching, Plasma etching techniques and equipment.

**UNIT 3: Diffusion:** A Qualitative view of atomic diffusion in Solids, diffusion mechanisms, Fick's one dimensional diffusion equation, constant source and limited source diffusion, Diffusion of Group 3 and 5 impurities in Silicon Impurity Sources, diffusion apparatus, Characterization of diffused layers.

Ion Implantation: Introduction, Range Theory, Implantation Equipment Annealing.

**UNIT 4: Isolation Techniques:** Bipolar IC fabrication Process Sequence, N-MOS IC fabrication Process Sequence. C-MOS IC fabrication Process Sequence.

**UNIT 5: Assembly & Packaging:** Package Types, design considerations, Package fabrication technologies, Future trends reference to MEMS packaging.

**References:**

1. S.M.Sze, VLSI Technology, Mc Graw Hill.
2. S.K.Ghandhi, VLSI Fabrication Principles.



**Raffles University, Neemrana**  
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**Department of Electronics and Communication Engineering**

**ECE 308 - MICROPROCESSOR AND MICROCONTROLLER**

**UNIT 1: INTRODUCTION:** CPU, address bus, data bus and control bus. Input/ Output devices, buffers, encoders, latches and memories.

**UNIT 2: 8085 MICROPROCESSOR ARCHITECTURE:** Internal data operations and registers, pins and signals, peripheral devices and memory organization, interrupts. CISC and RISC architecture overview.

**UNIT 3: 8085 MICROPROCESSOR INSTRUCTIONS:** Classification, format and timing. Instruction set. Programming and debugging, 8 bit and 16 bit instructions.

**UNIT 4: 8085 MICROPROCESSOR INTERFACING:** 8259, 8257, 8255, 8253, 8155 chips and their applications. A/D conversion, memory, keyboard and display interface (8279).

**UNIT 5: INTRODUCTION TO 8051 MICROCONTROLLER:** General features & architecture of 8051. Memory, timers and interrupts. Pin details. Interfacing and applications.

**Reference books:**

1. 8051 Microcontroller: Hardware, Software And Application., V Udayashankara, M Mallikarjunaswamy, TMH
2. Introduction To Microprocessors, Mathur, TMH
3. Modern Microprocessors, Korneev, Wiley
4. The 8085 Microprocessor: Architecture, Programming And Interfacing, K. Udaya Kumar, Pearson

**Text books:**

1. Microprocessor Interfacing And Applications, B.P.Singh, New Age
2. Microprocessor: Architecture, Programming And Application For 8085, Goankar, Penram International
3. Microprocessor: Architecture, Programming And System Featuring In 8085, William A.Routt, Delmur Pub
4. The 8051 Microcontrollers & Embedded Systems, Mazidi, Pearson



**Raffles University, Neemrana**  
**School of Engineering and Technology**  
**Department of Electronics and Communication Engineering**

**ECE 310 - MICROWAVE ENGINEERING-II**

**UNIT 1: MICROWAVE MEASUREMENTS:** Detection of microwaves, Microwave power measurement, Impedance measurement, Measurement of scattering parameters, Frequency measurement, VSWR measurements.

**UNIT 2:** Introduction to microstrip lines, Parallel striplines, Coplanarstriplines, Shielded striplines, Slot lines, Integrated Fin line, Non-radiative guide, Transitions, Bends and Discontinuities.

**UNIT 3: MICROWAVE NETWORK ANALYSIS:** Impedance and Admittance matrices, Scattering matrix, Reciprocal networks and Loss less networks parameters, ABCD Matrix, Equivalent circuits for Two port Network, Conversions between two port network Signal flow graphs, Discontinuities in waveguides and microstrip.

**UNIT 4: MICROWAVE SEMICONDUCTOR DEVICES:** Construction, Operation and Practical applications of PIN diode, varactor and Tunnel diode, Gunn diode, IMPATT, TRAPTT diodes, BJT, JFET, MESFET, CCD, MASER and LASER.

**UNIT 5: MONOLITHIC MICOWAVE INTEGRATED CIRCUITS:** Introduction, Materials, MMIC Growth, MOSFET fabrication, Thin film formation, Hybrid integrated circuit fabrication, Advantages & Difficulties of MICs.

**Reference books:**

1. Microwave Engineering, Annapurna Das, Sisir Das, TMH
2. Foundations For Microwave Engineering, R.E. Collin, Wiley
3. Microwave Devices And Circuits, Samuel Y. Liao, Pearson

**Text books :**

1. Microwave Engineering, Pozar, Wiley
2. Microwave Engineering, M.L. Sisodiya, New Age



**Raffles University, Neemrana**  
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**Department of Electronics and Communication Engineering**

**ECE 312.1 NEURAL NETWORKS**

**UNIT 1: INTRODUCTION:** Introduction to Neural Networks, Biological basis for NN, Human brain, Models of a Neuron, Directed Graphs, Feedback, Network architectures, Knowledge representation, Artificial intelligence & Neural Networks.

**UNIT 2: LEARNING PROCESSES:** Introduction, Error –Correction learning, Memory – based learning, Hebbian learning, Competitive learning, Boltzmann learning, Learning with a Teacher & without a teacher, learning tasks, Memory, Adaptation.

**UNIT 3: SINGLE LAYER PERCEPTRONS:** Introduction, Least-mean-square algorithm, Learning Curves, Learning rate Annealing Techniques, Perceptron, Perceptron Convergence Theorem.

**UNIT 4: MULTI LAYER PERCEPTRONS:** Introduction, Back-Propagation Algorithm, XOR Problem, Output representation and Decision rule, Feature Detection, Back- Propagation and Differentiation, Hessian Matrix, Generalization.

**UNIT 5: RADIAL-BASIS FUNCTION NETWORKS & SELF-ORGANISING MAPS:** Introduction to Radial basis function networks, Cover’s Theorem on the Separability of Patterns, Interpolation Problem, Generalized Radial-Basis function networks, XOR Problem. Self-Organizing map, Summary of SOM Algorithm, Properties of the feature.

**Reference books:**

1. Artificial Neural Networks, Jacek M Zurada, Pws Pub Co
2. Neural Networks: A Classroom Approach, Satish Kumar, TMH
3. Artificial Neural Networks, Christina Ray, TMH
4. Neural Networks For Pattern Reconization, Bishop, Oxford
5. Neural Network In Soft Computing Framework, Swamy, Springer

**Text books:**

1. Fundamentals Of Neural Networks: Architectures, Algorithms And Applications., Fausett, Pearson
2. Learning And Soft Computing: Support Vector Machines, Neural Networks, And Fuzzy Logic Models, Vojislav Kacman, Pearson
3. Fuzzy Logic And Neural Networks:,Chennakesava R, New Age



**Raffles University, Neemrana**  
**School of Engineering and Technology**  
**Department of Electronics and Communication Engineering**

**ECE 312.2 - PARALLEL COMPUTATION & ARCHITECTURE**

**UNIT 1 : INTRODUCTION** - Synchronous and asynchronous paradigms of parallel computing.

**UNIT 2 : HARDWARE TAXONOMY** – Flynn’s classification, Handler’s classification, Software taxonomy, Kung’s taxonomy, SPMD.

**UNIT 3 : ABSTRACT PARALLEL COMPUTATIONAL MODELS** – Combinational circuits, Sorting networks, PRAM models, interconnection RAMs.

**UNIT 4 : PARALLEL PROGRAMMING LANGUAGES: Performances Matrices** – Laws governing performance measurements, metrics-speedup, efficiency utilization, communication, overheads, single/multiple programme performances, benchmarks.

**UNIT 5 : PROCESSOR ARRAYS:**

Basic Algorithms – Fast Fourier Transform, Linear System Solution, Sorting etc.

**Reference books:**

1. Kai Hwang, “Advanced Computer Architecture”, McGraw Hill
2. Hwang and Briggs, “Advanced Computer Architecture”, McGraw Hill.



**Raffles University, Neemrana**  
**School of Engineering and Technology**  
**Department of Electronics and Communication Engineering**

**ECE 312.3 – SENSOR TECHNOLOGY**

**Unit 1: Sensor fundamentals and application consideration:** Basic sensor technology, sensor system, sensor characteristics, system characteristics, instrument selections.

**Unit 2: Sensor signal conditioning:** conditioning bridge circuits, amplifiers for signal conditioning, analog to digital convertor for signal conditioning, signal conditioning high impedance sensors.

**Unit3: capacitive and inductive displacement sensors:** introduction, capacitive sensors, inductive sensors, capacitive and inductive sensor types, comparing capacitive and inductive sensors and applications.

**Unit 4: Bio –Sensor and chemical sensor:** introduction, baroreceptor molecule, transduction mechanism in biosensor and application, chemical sensor fundamentals and applications.

**Unit 5: Wireless sensor networks: Principles and applications:** introduction, wireless sensors node architecture, wireless sensor networks architecture, power consideration in WSNs and Applications.



## **ECE-P-302 - COMMUNICATION LAB-II**

### **LIST OF EXPERIMENT :**

1. (a) To observe sampling of analog signal. Identify & solve the aliasing problem.  
(b) To observe the Transmission of two signals over a single channel using sampling methods.
2. TDM-PAM: Modulation & demodulation.
3. Operation of a PCM encoder & decoder.
- 4 TDM-PCM: Modulation & demodulation.
5. Observe the performance of a Delta modulation system & to derive from it a delta sigma modulation system.
6. To generate and study the various data formatting schemes (Unipolar, Bi-polar, Manchester,AMI etc.).
7. Generate ASK signals, with and without carrier suppression. Demodulation of these two types of modulated signal.
8. Generate the FSK wave forms & demodulate the FSK signals based on the properties of  
(a) Tuned circuits (b) PLL
9. Generate the PSK signals and demodulate it.

### **Simulation using any virtual Instrumentation Software:**

10. To carry out convolution in both continuous time and discrete time systems.
11. Companding and multiplexing of PCM signals.
12. Perform various keying Techniques: PSK, ASK, FSK & MSK.



**ECE-P-304 - INDUSTRIAL ELECTRONICS LAB**

**LIST OF EXPERIMENTS:**

1. Study the characteristics of SCR and observe the terminal configuration, Measure the breakdown voltage, latching and holding current. Plot V-I characteristics.
2. Perform experiment on triggering circuits for SCR. i.e. R-triggering, R-C triggering and UJT triggering circuit.
3. Study and test AC voltage regulators using triac, antiparallel thyristors and triac&diac.
4. Study and obtain the waveforms for single-phase bridge converter.
5. Perform experiment on single phase PWM inverter.
6. Perform experiment on buck, boost and buck-boost regulators.
7. Control speed of a dc motor using a chopper and plot armature voltage versus speed characteristic.
8. Control speed of a single-phase induction motor using single phase AC voltage regulator.
9. i) Study single-phase dual converter.  
ii) Study speed control of dc motor using single-phase dual converter.
10. Study single-phase cycloconverter.
11. Perform experiment on Motor control – open loop & closed loop.
12. Design, observe and perform experiment on various type of pulse generation from DSP/ FPGA Platform. Perform experiment for PWM inverters and choppers.



**ECE-P- 308 - MICROPROCESSOR LAB**

**LIST OF EXPERIMENT :**

**Following exercises are to be done in 8085 assembly language.**

- 1 Arranging a set of data in Ascending order.
- 2 Arranging a set of data in Descending order.
- 3 Finding out number of Positive, Negative and Zeros from a Data Set.
- 4 Searching the Existence of a certain data in a given data.
- 5 BCD to Binary conversion.
- 6 Binary to BCD conversion
- 7 Design a Up/Down Counter
- 8 Multiply Two 8 Bit Numbers using Successive Addition and Shifting method.
- 9 Find Factorial of a number.
- 10 Solve the given Algebraic Equation
- 11 Generate a Software Delay.
- 12 Division of 8 bit Unsigned Numbers.
- 13 A program to display real time clock. Assume a periodic signal is interrupting RST 7.5 signal after every 0.5 seconds,
- 14 Generate a square wave and rectangular wave of given frequency at the Output pin of 8255 chip.



# Raffles University, Neemrana

## School of Engineering and Technology

Department of Electronics and Communication Engineering

### ECE 314 - PERSONALITY DEVELOPMENT & GENERAL APTITUDE

#### UNIT 1. Introduction

- Meaning of Personality
- Determinants of Personality- biological, psychological and socio- cultural factors.
- Misconceptions and clarifications
- Need for personality development

#### UNIT 2. Self-Awareness and Self Motivation

- Self analysis through SWOT and Johari window
- Elements of motivation
- Seven rules of motivation
- Techniques and strategies for self motivation
- Motivation checklist and Goal setting based on principle of SMART
- Self motivation and life
- Importance of self-esteem.

#### UNIT 3. Memory and study skills

- Definition and importance of memory
- Causes of forgetting
- How to forget (thought stopping), how to remember (techniques for improving memory)
- The technique of passing exams-management of examination fear.

#### UNIT 4. Power of positive thinking

- Nurturing creativity, decision-making and problem solving.
- Thinking power- seven steps for dealing with doubt
- Traits of positive thinkers and high achievers

#### UNIT 5. General Knowledge and Current Affairs

- Regional, national and international events
- Geographical, political and historical facts
- Information on sports and other recreational activities
- Basic knowledge with regard to health and health promotion

#### Textbooks:

1. Hurlock, E.B, Personality Development, 28<sup>th</sup> Reprint. New Delhi: Tata McGraw Hill. (2006).
2. Mikew, Martin, schinzinger, Ethics in engineering, TMH. (2010)

#### References books:

- 1 Mile, D.J., Power of positive thinking. Delhi: Rohan Book Company. 2004
  - 2 Pravesh Kumar, All about self- Motivation. New Delhi: Goodwill Publishing House. 2005
  - 3 Dudley, G.A. ,Double your learning power. Delhi: Konark Press. Thomas Publishing Group Ltd. 2004
  - 4 Lorayne, H. ,How to develop a super power memory. Delhi: Konark Press. Thomas Publishing Group Ltd 2004
  - 5 Personal Development for Life and Work, \_Wallace, Cengage Learning 2013
  - 6 Soft Skills for Everyone w/CD, Butterfield, Cengage Learning 2013
- Goals and techniques for positive thinking
  - Enhancement of concentration through positive thinking
  - Practicing a positive life style.



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE-401 RANDOM VARIABLES & STOCHASTIC PROCESSES**

**UNIT 1: UNIT 1: PROBABILITY:** Definitions, sample, space & events, joint & conditional probability, dependent events.

**UNIT 2: RANDOM VARIABLES:** Introduction, distribution & density functions, discrete & continuous random variables, special distributions: binominal, poisson, uniform, exponential, normal, rayleigh.conditional distribution & density functions.

**UNIT 3: MULTIPLE RANDOM VARIABLES** Vector random variable, joint distribution functions, joint probability density function, conditional distribution & density functions. Statistical independence, distribution & density function of sum of random variable, one function of one random variable, one function of two random variable, two function of two random variable.

**UNIT 4: OPERATION ON SINGLE & MULTIPLE RANDOM VARIABLES:** Mean & Variance, moments, chebyshev's inequality, Central limit theorem, characteristic functions & moment generating function, covariance & correlation coefficient of multiple random variable.

**UNIT 5: STOCHASTIC PROCESSES:** Introduction, random process concept, stationary & independence, ergodicity, correlation, functions. Gaussian Random Process, Transmission of Random process through linear systems. Power spectral Density, Cross Spectral density.

**Reference books:**

1. Classical Electrodynamics, Jackson, Wiley
2. Probability, Statistics And Random Processes, Veerarajan,
3. Probability, Random Variables And Stochastic Processes, Papoulis, TMH
4. Probability, Random Variables And Random Signal Principles, Peebles, TMH
5. Probability And Random Processes With Application To Signal Processing, Stark,

**Text books:**

1. Probability And Random Processes For Electrical Engineering, Leongarcia,
2. Probability & Measure, Billingsley, Pearson
3. An Introduction To Probability Theory & Its App., Feller, Wiley
4. Probability & Statistics In Engg., Hines, Wiley



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 403 –DIGITAL SIGNAL PROCESSING**

**UNIT 1: SAMPLING** - Discrete time processing of Continuous-time signals, continuous time processing of discrete-time signals, Changing the sampling rate using discrete-time processing.

**UNIT 2: TRANSFORM ANALYSIS OF LTI SYSTEMS** - Introduction, The frequency response of LTI systems, System functions for systems characterized by LCCD (Linear Constant Coefficient Difference) equations, All-pass system, Minimum-Phase systems, Linear systems with linear phase.

**UNIT 3 : STRUCTURES FOR DISCRETE-TIME SYSTEMS**- Block diagram and signal flow graph representation of LCCD equations, Basic structures for IIR and FIR systems, Transposed forms.

**UNIT 4 : FILTER DESIGN TECHNIQUES** - Introduction, Analog filter Design: Butterworth & Chebyshev, IIR filter design by impulse invariance & Bilinear transformation, Design of FIR filters by Windowing: Rectangular, Hanning, Hamming & Kaiser.

**UNIT 5 DFT, FFT**- The Discrete Fourier transform (DFT), Properties of the DFT, Linear Convolution using DFT, Efficient computation of the DFT: Decimation-in-Time and Decimation in frequency FFT Algorithms.

**Reference books:**

1. Digital Signal Processing: A Modern Introduction, Amardar, cengage learning 2011
2. Introduction to Digital Signal Processing using MATLAB, Schilling 2011
- 3 Sanjit K Mitra, "Digital Signal Processing", 4th ed., TMH 2013
- 4 Tan, Jiang, "Digital Signal Processing: Fundamentals and Applications", 2nd ed., Elsevier 2008
- 5 Ifeachor, Jervis, "Digital Signal Processing", 2nd ed., Pearson Education.

**Text books:**

1. Proakis, Manolakis, "Digital Signal Processing: Principles, Algorithms And Applications", 4th ed., Pearson Education. (2006)
2. Oppenheim, Schaffer, "Discrete Time Signal Processing", 3rd ed. , PHI (2010)



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 405 - IC TECHNOLOGY**

**UNIT 1- INTRODUCTION TO IC TECHNOLOGY-** Semiconductor Substrate- Crystal defects, Electronic Grade Silicon, Czochralski Growth, Float Zone Growth, Characterization & evaluation of Crystals; Wafer Preparation- Silicon Shaping, Etching and Polishing, Chemical cleaning.

**UNIT 2 :DIFFUSION & OXIDATION** - Ficks diffusion Equation in One Dimension, Atomic model, Analytic Solution of Ficks Law, correction to simple theory, Diffusion in SiO<sub>2</sub>. Ion Implantation and Ion Implantation Systems. Oxidation Growth mechanism and Deal-Grove Model of oxidation, Linear and Parabolic Rate co-efficient, Structure of SiO<sub>2</sub>, Oxidation techniques and system, Oxide properties.

**UNIT 3: CHEMICAL VAPOUR DEPOSITION AND EPITAXIAL LAYER GROWTH-** CVD for deposition of dielectric and polysilicon thick Layer – a simple CVD system, Chemical equilibrium and the law of mass action, Introduction to atmospheric CVD of dielectric, low pressure CVD of dielectric and semiconductor. Epitaxy-Vapour Phase Epitaxy, Defects in Epitaxial growth, Metal Organic Chemical Vapor Deposition, Molecular beam epitaxy.

**UNIT 4:PATTERN TRANSFER & ETCHING** - Introduction to photo/optical lithography, Contact/ proximity printers Projection printers, Mask generation, photo resists. Dry & Wet etching, methods for anisotropic etching, Plasma etching, Reaction ion etching (RIE).

**UNIT 5:VLSI PROCESS INTEGRATION-** Junction and Oxide Isolation, LOCOS methods, Trench Isolation, SOI; Metallization, Planarization. Fundamental consideration for IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology. Fault diagnosis and characterization techniques.

**Reference books :**

- 1 S.K. Ghandhi, VLSI Fabrication Principles, John Wiley Inc., New York, 1983
- 2 IC Technology, Gouranga Bose, McGraw Hill 2013
3. C.Y. Chang and S.M.Sze (Ed), ULSI Technology, McGraw Hill Companies Inc.

**Text books:**

1. S.M. Sze (Ed), VLSI Technology, 2nd Edition, McGraw Hill (1988).



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 407 - VLSI DESIGN**

**UNIT 1:INTRODUCTION TO MOSFET:** - Basic MOS transistors, Enhancement Mode transistor action, Depletion Mode transistor action, NMOS and CMOS fabrication. Aspects of threshold voltage, threshold voltage with body effect.  $I_{ds}$  versus  $V_{ds}$  relationship, channel length modulation. Transistor Trans-conductance  $g_m$ . MOS transistor circuit Model, Model parameter (oxide and junction capacitor, channel resistance) variation with scaling and biasing. High order effects (i.e. subthreshold conduction, hot electron effect, narrow channel effect and punch through effect).

**UNIT 2CMOS LOGIC CIRCUITS-** nMOS inverter (resistive and active load), Pull up to Pull-down ratio for a NMOS Inverter and CMOS Inverter ( $B_n/B_p$ ), , determination of inverter parameter ( $V_{IL}$ ,  $V_{IH}$   $V_{OL}$   $V_{OH}$  ) and Noise Margin. **Speed and power dissipation analysis of CMOS inverter.** Combinational Logic, NAND Gate, NOR gate, XOR gate, Compound Gates, 2 input CMOS Multiplexer, Memory latches and registers, Transmission Gate, estimation of Gate delays, Power dissipation and Transistor sizing.

**UNIT 3:** Basic physical design of simple Gates and Layout issues. Layout issues for CMOS inverter, Layout for NAND, NOR and Complex Logic gates, Layout of TG, Layout optimization using Euler path. DRC rules for layout and issues of interconnects, Latch up problem.

**UNIT 4:Dynamic CMOS circuits:** Clocked CMOS (C2MOS) logic, DOMINO logic, NORA logic, NP(ZIPPER) logic, PE(pre-charge and Evaluation) Logic. Basic Memory circuits, SRAM and DRAM.

**UNIT 5Physical Design:** Introduction to ECAD tools for first and back end design of VLSI circuits. Custom /ASIC design, Design using FPGA and VHDL. VHDL Code for simple Logic gates, flip-flops, shift registers.

**Reference books :**

- 1 N.Weste and K. Eshraghian, Principles of CMOS VLSI, 2e, Pearson Education. 2011
- 2 VLSI Design , P PSahu , , McGraw. 2013
- 3 VLSI Design, D.P. Das, Oxford. 2011
- 4 Chip Design for Submicron VLSI: CMOS Layout & Simulation, Uyemura, cengage learning 2009.

**Text books :**

1. **Cmos digital integrated circuits analysis and design.** Sung-mo (steve) ang,yusuf leblebigi, mcgraw hill (2008).



**Raffles University, Neemrana**  
**School of Engineering and Technology**  
**Department of Electronics and Communication Engineering**

**ECE 409 - WIRELESS COMMUNICATION**

**UNIT 1: Spread Spectrum Modulation Techniques** – Concept of spread spectrum, system processing gain, Spread Spectrum signals: Direct-sequence spread spectrum signals, Frequency hopped spread spectrum signals, Code-division multiplexing, Spreading codes

**UNIT 2: Wireless Microwave Communication-** Link Engineering, Frequency planning, Free space loss, Fresnel zone clearance, bending of radio beam, Effective earth radius, Fundamentals of fading, types and effects, Multipath channels; parameters, measurements, Building blocks of Transmitter & Receiver.

**UNIT 3 : Multiple Access Techniques and Networks** - FDMA, TDMA and CDMA with reference to mobile radio and satellite systems. TDMA based networks, OFDM and its characteristics, Packet radio multiple access techniques. CDMA based networks: Architecture, Air interface, Call processing, power control, Rake receiver concept and performance of CDMA system.

**UNIT 4 : Cellular Wireless Networks-**, GSM: Introduction, overview of the GSM systems, GSM codec, channel coding and interleaving, radio link control. Cordless systems and WLL, Mobile IP, Wireless access protocol. Wireless LAN's: Technology, IEEE 802.11 standards, Broadband Wireless 802.16, Blue tooth, Wi-Fi, Wi-Max, Zigbee & RFID technology.

**UNIT 5 Satellite Communication** - Elements of satellite communication: Frequency bands, Transmission and Multiple access. Satellite orbit and description- orbital period and velocity, effects of orbital inclination, Azimuth and elevation, Coverage angle and slant range, Satellite Link: basic link design and analysis, Geostationary orbit, Satellite subsystems. Earth Station antenna, high-power amplifier, low-noise amplifier, up converter, down converter, monitoring and control, reliability.

**Reference books :**

- 1 Gottapu Sasibhushana Rao, Mobile Cellular Communications, Pearson Education 2013
- 2 Singal, T.L, Wireless Communication, Tata McGraw Hill 2011
- 3 Vijay Kr. Garg, Wireless Communications and Networking, Morgan Kaufmann, Elsevier 2013
- 4 Blake, Wireless Communication Technology, Cengage Learning 2013
- 5 W.C.Y. Lee , Mobile Cellular Telecommunications , Tata McGraw Hill 2011
- 6 Wireless Communications and Networking, Price, TMH 2014

**Text books :**

1. William Stallings, Wireless Communication and Networks, Pearson Education (2013)
2. Rappaport, T.S., Wireless Communications, Pearson Education (2013)



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 411.1 – ADVANCED MICROPROCESSOR**

**UNIT 1: The 10086 Microprocessor Family:** 10086 ARCHITECTURE- Hardware specifications, Pins and signals, Internal data operations and Registers, Minimum and maximum mode, System Bus Timing, Linking and execution of Programs.

**UNIT 2: Software & Instruction Set:** Assembly language programming: addressing mode and instructions of 10086, Strings, Procedures and Macros, 10086 interrupts. Assembler Directives and operators.

**UNIT 3 :Analog Interfacing:** A/D and D/A converter interfacing, keyboard and display interfacing, RS 232 & IEEE 488 communication standards. An 10086 based Process Control Systems.

**UNIT 4: Digital Interfacing:** Programmable parallel ports, Interfacing microprocessor to keyboard and alphanumeric displays, Memory interfacing and Decoding , DMA controller.

**UNIT 5 Multiprocessor Configurations:** - Multiuser / Multi tasking operating system concepts, 10086 based Multiprocessor systems. Introduction and basic features of 286, 386, 486 & Pentium processors.

**Reference books :**

- 1 A. Ray & K. Bhurchandi. “Advanced Microprocessors and Peripherals. Tata McGraw Hill, 2012
- 2 A NagoorKani “Microprocessors and Microcontrollers” McGraw Hill Education 2ed. 2012
- 3 Introduction to Microprocessors, A. P. Mathur McGraw Hill 2011
- 4 The Intel Family of Microprocessors: Hardware and Software Principles and Applications, Antonakos, cengage learning 2012
5. The 8086 Microprocessor: Programming & Interfacing the PC, Ayala, cengage learning 2007

**Text books :**

1. A NagoorKani “Microprocessors and Microcontrollers” McGraw Hill Education 2ed. (2012)
2. Douglas V. Hall “Microprocessors and Interfacing Programming and Hardware” Tata McGraw Hill.(2000)



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 411.2 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS**

**UNIT1: Introduction to Artificial Intelligence:** Intelligent Agents, State Space Search, Uninformed Search, Informed Search, TwoPlayers Games, Constraint Satisfaction Problems.

**UNIT2 : Knowledge Representation:** Knowledge Representation And Logic, Interface in Propositional Logic, First OrderLogic, Reasoning Using First Order Logic, Resolution in FOPL.

**UNIT 3 KNOWLEDGE ORGANIZATION:** Rule based System, Semantic Net, Reasoning in Semantic Net Frames, Planning.

**UNIT 4 : KNOWLEDGE SYSTEMS:** Rule Based Expert System, Reasoning with Uncertainty, Fuzzy Reasoning.

**UNIT 5 KNOWLEDGE ACQUISITION:** Introduction to Learning, Rule Induction and Decision Trees, Learning Using neuralNetworks, Probabilistic Learning Natural Language Processing.

**Reference books :**

- 1 James A Anderson, An introduction to Neural Networks. Bradford Books 1995
- 2 Dan. W Patterson, Artificial Intelligence and Expert Systems, PHI 1990
- 3 Kumar Satish, "Neural Networks" Tata McGraw Hill 2004
- 4 S. Rajsekaran& G.A. VijayalakshmiPai, "Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications" Prentice Hall of India. 2006
- 6 SimanHaykin,"Neural Netowrks"Prentice Hall of India 1990.

**Text books :**

1. Elaine Rich and Kevin Knight, Artificial Intelligence 3/e, TMH (1991)
2. PADHY: ARTIFICIAL INTELLIGENCE & INTELLIGENT SYSTEMS, Oxford(2005)



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**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 411.3 – OPERATING SYSTEM**

**UNIT 1:INTRODUCTION**– History, Operating system services, types, responsibilities, generations, LINUX, WINDOWS.

**UNIT 2: PROCESS MANAGEMENT**- Operations on process, Process state, Scheduling, Criteria, scheduling algorithms, Evaluation, Synchronization, Semaphores, Monitors.

**UNIT 3: MEMORY MANAGEMENT**- Swapping, Continuous memory allocation, Paging, Pure paging, Demand paging, Page-replacement algorithms, thrashing, Example-Pentium, Disk Scheduling.

**UNIT 4 :INFORMATION MANAGEMENT**- File and directory concept, Access methods, Protection, Free space management, Efficiency and performance, Access matrix, Capability-based systems, Program threats, User authentication, Firewall.

**UNIT 5: DEAD LOCKS**- System model, Dead lock characterization, Deadlock prevention, Avoidance, Detection, Recovery, Classic problems of synchronization.

**Reference books :**

- 1 Modern Operating Systems, Andrew S Tanenbaum, PHI 2008
- 2 Operating Systems:, Pal Chaudhury, PHI 2009
- 3 Operating System Principles, Peter B. Galvin, Greg Gagne, John Wiley & Sons 2002
- 4 Operating Systems, Gary Nutt, Pearson 2003
- 5 Operating Systems: Internals And Design Principles, William Stallings, Pearson 2012.

**Text books :**

1. Operating Systems, Dhamdhare, TMH, (2006).
2. Operating System:, Crowley, TMH, (1996).



**ECE-P-403 - SIGNAL PROCESSING LAB**

**LIST OF EXPERIMENTS :**

**Modeling and simulation using MATLAB**

1. Realising a given block diagram having multiplier, adder/subtractor and system (Discrete/Continuous) with given Impulse response. Calculating output for given input.
2. To simulate the transmitter and receiver for BPSK
3. To design and simulate FIR digital filter (LP/HP).
4. To design and simulate IIR digital filter (LP/HP).

**DSP Lab using TMS320C6XXX DSP Kits**

5. To study the architecture of TMS320C6XXX DSP kits using Bloom with DSP.
6. To generate wave form (SINE, COSINE, SQUARE & TRIANGULAR).
7. Verification of Sampling Theorem.
8. Verification of linear/circular convolution.
9. To design FIR and FIR digital filter ( LP/HP).



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE-P- 409 - WIRELESS COMMUNICATION LAB**

**LIST OF EXPERIMENTS:**

1. Measurement of antenna characteristics:

Radiation Pattern on polar plots, Beam width and Gain of main lobe for the following types of antennas.

- (a) Half wave and quarter wave dipole
- (b) Folded dipole
- (c) Yagi UDA multiple element folded dipole
- (d) Hertz Antenna
- (e) End fire array and broad side array
- (f) Helix antenna
- (g) Paraboloid reflector antenna
- (h) Loop antenna
- (i) Ground plane antenna
- (j) Log periodic antenna
- (k) Rhombus antenna
- (l) Slot antenna

2. Demonstration of modeling of wire antenna using appropriate design software.

3. Simulation of antenna arrays using appropriate software.

4. Design and testing of microstrip rectangular patch antenna using appropriate software.

5. Investigate the transmission characteristics of the link and measure the gain of the microstrippatch antennas. Draw the antenna radiation diagram.

6. Radar Trainer: Working of Doppler radar, velocity of moving object, time and frequency measurement and other applications.

7. To perform Modulation, Demodulation and BER measurement using CDMA – DSSS Trainer.

8. To establish analog/digital communication link and transmit & receive three signals (audio, video, Vtone) simultaneously using Satellite Communication Trainer.

9. To study GPS Receiver, establishing link between GPS satellite & GPS trainer and measure of latitude & longitude.



**Raffles University, Neemrana**  
**School of Engineering and Technology**  
**Department of Electronics and Communication Engineering**

**ECE 402 - IMAGE PROCESSING AND PATTERN RECOGNITION**

**UNIT 1: INTRODUCTION:** Imaging in ultraviolet and visible band. Fundamental steps in image processing. Components in image processing. Image perception in eye, light and electromagnetic spectrum, Image sensing and acquisition using sensor array.

**UNIT 2: DIGITAL IMAGE FUNDAMENTALS:** Image sampling and quantization, Representing digital images, Spatial and gray-level resolution, Aliasing and Moiré patterns, Zooming and Shrinking digital images.

**UNIT 3: IMAGE RESTORATION:** Image restoration model, Noise Models, Spatial and frequency properties of noise, noise probability density functions, Noise - only spatial filter, Mean filter Statistic filter and adaptive filter, Frequency domain filters - Band reject filter, Band pass filter and Notch filter.

**UNIT 4: IMAGE COMPRESSION:** Compression Fundamentals - Coding Redundancy, Interpixel redundancy, Psycho visual redundancy and Fidelity criteria. Image Compression models, Source encoder and decoder, Channel encoder and decoder, Lossy compression and compression standards. Color space formats, scaling methodologies (like horizontal, vertical up/down scaling). Display format (VGA, NTSC, PAL).

**UNIT 5: EXPERT SYSTEM AND PATTERN RECOGNITION:** Use of computers in problem solving, information representation, searching, theorem proving, and pattern matching with substitution. Methods for knowledge representation, searching, spatial, temporal and common sense reasoning, and logic and probabilistic inferencing. Applications in expert systems and robotics.

**Reference books :**

1. Digital Image Processing Using MATLAB, Gonzalez, Woods and Eddins, Gatesmark Publishing
2. Applications of Pattern Recognition, Fu, K.S., CRC Press
3. Digital Image Restoration, Andrews, H.C. Hunt, B.R., Prentice Hall, Englewood Cliffs.

**Text books :**

1. Digital Image Processing, Gonzalez, R.C. & Wintz, P.A., Reading, Addison-Wesley.
2. Digital Image Processing, Pratt, W.K., New York: Wiley
3. Digital Image Processing of Remotely Sensed Data, Hord, R.M., Academic Press.
4. Pattern Recognition: Human and Mechanical, Watanabe, S., Wiley
5. Fundamentals of Digital Image Processing, Jain, A.K., Prentice Hall.



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 404 - OPTICAL COMMUNICATION**

**UNIT 1: OPTICAL FIBERS** - Basic optical laws and definitions, Principles of light propagation in fibers, Ray theory, Optical fiber modes and configurations, Step index and graded index fibers, Monomode and multimode fibers, Fiber materials, fiber fabrication, Fiber optic cables. Attenuation, signal distortion in optical fibers, Dispersion intra modal & inter modal, Dispersion shifted and flattened fiber.

**UNIT 2: OPTICAL SOURCES** - LED's- Structure, Materials, Characteristics, Modulation, Power & efficiency, Laser Diodes - Basic concept, Hetro Structure, properties and modulation.

**UNIT 3: OPTICAL DETECTORS** - PIN and Avalanche photo diodes, photo detector noise, detector response time, Avalanche multiplication noise. Photo diode materials. Fundamental of Optical Receiver Operation.

**UNIT 4: OPTICAL FIBER COMMUNICATION SYSTEMS**- Source to fiber coupling, fiber to fiber joints, fiber splicing, fiber connectors. Principal components. Link design calculation, Applications, Wavelength division multiplexing.

**UNIT 5: OPTICAL FIBER MEASUREMENTS:** Measurements of Fiber attenuation, Dispersion, refractive index profile, Numerical aperture & diameter.

**Reference books :**

1. Optical Fibre And Laser: Principles And Applications, De, Anuradha, New Age
2. Opto Electronics And Fibre Optics Communication, Sarkar, D.C,
3. Optical Fiber Communications: Principles And Practice, G P Agrawal, Govind P Agrawal, Wiley
4. Optical Fiber Communications: Principles And Practice, John Senior, PHI

**Text books :**

1. Fiber Optics Communications, Joseph C Palais, PHI
2. Fiber- Optic Communications Technology, Lowell L Scheiner, PHI
3. Fiber Optics Communications, Harold Kolimbiris, PHI
4. Understanding Fiber Optics, Jeff Hecht, PHI
5. Optical Communication System, Johan Gowar, PHI
6. Fiber Optics And Optoelectronics, Khare, Oxford



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 406 - RADAR & TV ENGINEERING**

**UNIT 1: RADAR** - Radar Block diagram, frequencies and applications. Radar range equation. Continuous wave (CW) & FM radar; Moving target indicator (MTI): Delay line cancellers, blind velocity Pulse Doppler Radar. Tracking radar sequential lobbing, Conical scan and monopulse radar, Types of display, Radar receivers, Noise figure.

**UNIT 2: NAVIGATIONAL AIDS** - Principle of operation of Radar direction finder & range system. LORAN system, DME, TACAN, Aircraft landing systems.

**UNIT 3: TV ENGINEERING-** Theory of scanning standards, Principles of Monochrome and colour T.V. system (PAL, SECAM, NTSC). Composite video signal analysis. T.V Cameras: Image orthicon, plumbicon, vidicon. CCD camera tubes. Types of Monochrome and colour picture tubes, set-up adjustments. LCD and Plasma displays.

**UNIT 4:** Picture, colour and sound carriers. Vestigial side band transmission. Encoding picture information. Chrominance modulation. Compatibility of colour and monochrome T.V. systems. Block diagram of T.V. transmitters. TV transmission & reception antennas.

**UNIT 5: TV RECEIVER:** Functional block diagram of T.V. receiver, R.F. Tuner, I.F. amplifier, Video detector, video amplifier, AGC, Synch. Separation, Sync. Processing and AFC. Deflection oscillators, vertical & horizontal deflection and sound system circuits. EHT generation. Common faults and their diagnosis. Basic idea of HDTV, DBSTV and 3D-TV.

**Reference books :**

1. Radar Principles, By Peyton Z. Peebles, Oxford
2. Radar Handbook, By Merrill I. Skolnik, Oxford
3. Television Engineering And Video System, By Rg Gupta, TMH
- 4 Television & Video Engineering, By Dhake, TMH.

**Text books :**

1. Modern Television Practice – Principle, R.R. Gulati, New Age
2. Monochrome And Colour Tv, By R.R. Gulati, New Age
3. Components, And Circuits Hand book (Hardcover), By Ferril Losee, New Age



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 408.1 COMPUTER NETWORKS**

**UNIT 1: Queuing Theory-** Pure birth, Pure death & Birth-death processes, 2 Mathematical models for M/M/1, M/M/\_, M/M/m, M/M/1/K and M/M/m/m queues. Little's formula.

**UNIT 2: Physical and Data link layer** – OSI model & TCP/IP reference models, Line coding schemes, Packet & Circuit switching, Virtual circuit network, Framing, Simplex protocol, Simplex stop & wait protocol, Sliding window protocol, Go back N protocol, selective repeat, HDLC, PPP

**UNIT 3: MAC Sublayer-** Static & dynamic channel allocation, Multiple Access Protocols: ALOHA, slotted ALOHA, CSMA, Token Bus, Token Ring, FDDI IEEE standards 1002.3 & 1002.5, Virtual circuit network: frame relay & ATM frame and protocol architecture, Network connection devices: Hubs, Bridges, switches, Routers and Gateways.

**UNIT 4: Network Layer-** IPv4 & IPv6 addressing and datagram, Internetworking, Non-adaptive & Adaptive routing algorithms, Distance vector routing and Link state routing algorithms, OSPF and BGP.

**UNIT 5: Transport and Application Layer-** Client server paradigm, TCP frame format, Data traffic descriptors, QoS, Congestion and its control algorithms, Improving QoS by different queuing schemes, leaky bucket and token bucket implementation, Domain name, DNS in the internet, SMTP, FTP, WWW, HTTP.

**Reference books :**

1. Tanenbaum, "Computer Network", 5th ed., Pearson Education 2012
- 2 Leon Garcia, Widjaja, "Communication Networks", 2nd ed., Mcgraw-Hill 2003
- 3 Stallings, "Data and Computer Communications", 10th ed., Pearson Education 2013
- 4 Bertsekas, Gallager, "Data Networks", 2nd ed., PHI 1992
- 5 Computer Networks, Dave, cengage learning 2003
- 6 Fundamentals of Networking and Data Communications, White, cengage learning 2013.

**Text books :**

1. Forouzan, "Data Communications and Networks", 5th ed., Mcgraw-Hill, (2006).



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 408.2- VHDL**

**UNIT 1: INTRODUCTION:** VHDL/PLD Design Methodology, Advantages, Requirement Analysis and specification, VHDL description, Verification Using simulations, Functional Simulation, Logic Synthesis, Place and route and timing Simulation Fundamental & history of various hardware description language, VHDL for Synthesis V/s Simulation, Design flow of ASICs and standard logic circuits. Implementation Details for SPLDs, CPLDs and FPGAs.

**UNIT 2 :LANGUAGE FUNDAMENTALS:** Entities, Architectures and coding Styles, Signals and Data types, Packages, Dataflow, Structural, Behavioral and RTL Style of Combinational design, Event- Driven Simulation: Simulation Approaches, Elaboration Signal Drivers Simulator Kernel process, Signals verses Variables.

**UNIT 3: COMBINATIONAL and SEQUENTIAL CIRCUITS BUILDING BLOCKS:** Multiplexer, Synthesis using Shannon's expansions, Decoders, encoders, CodeConverters, VHDL Code for Combinational Circuits. VHDL code for Flip-Flops, shift registers, Counters.

**UNIT 4: SYNCHRONOUS/ ASYNCHRONOUS SEQUENTIAL CIRCUITS:** Mealy & Moore type FSMs, VHDL Code for Mealy & Moore Machines, VHDL Codes for Serial Adder, Vending Machine.

**UNIT 5: DIGITAL SYSTEM DESIGN:** Building Block circuits, Memory organization, SRAM, Design examples of divider, Multiplier, Shifting & Sorting Operations, Clock Synchronization, CPU organization and design concepts.

**Reference books :**

- 1 VHDL (Text BOOK Binding), Douglas L. Perry, TMH 2002
- 2 VHDL , A design oriented Approach, S S Limaye, TMH 2008
- 3 VHDL: Programming By Example, Douglas Perry, Oxford 2002
- 4 The Designer's Guide To VHDL, Peter J. Ashenden, Oxford 2010
- 5 Circuit Design With VHDL , By Volnei A Pedroni, PHI 2004
- 6 VHDL Bascis to programming, Gaganpreet Kaur, Pearson 2013
- 7 Digital System Design Using VHDL, cengage learning 2008
- 8 HDL Programming Fundamentals VHDL & VERILOG. Botros. cengage learning 2002.

**Text books :**

1. Digital Logic with VHDL Design, Brown, TMH.(2007)
2. VHDL for Engineers, Short, Pearson. (2011)



**Raffles University, Neemrana**  
**School of Engineering and Technology**

**Department of Electronics and Communication Engineering**

**ECE 408.3 – MICROCONTROLLER AND EMBEDDED SYSTEMS**

**UNIT 1: THE 10051 MICROCONTROLLER:** Introduction, The 8051 microcontroller hardware, I/O pins, Ports, External memory, Counters and Timers, Serial data.

**UNIT 2: 8051 ASSEMBLY LANGUAGE PROGRAMMING:** Addressing modes, External data moves, Stack, Push and Pop opcodes, Logical operations, Byte level and bit level logical operations. Arithmetic operations, Jump and call instructions, Interrupts & returns.

**UNIT 3: REAL TIME CONTROL:** Interrupts, Multiple sources of interrupts, Non maskable sources of interrupts, Interrupt structure in 8051, Timers, Free running counter & Real Time control .

**UNIT 4: SYSTEM DESIGN:** Serial I/O interface, Parallel I/O ports interface, Digital and Analog interfacing methods, LED array, keyboard, Printer, Flash memory interfacing.

**UNIT 5: INTRODUCTION TO EMBEDDED SYSTEM:** Application of Microcontrollers in interfacing, MCU based measuring instruments. Real Time Operating System for System Design, Multitasking System, Task Definition in a Multitasking System, Round Robin Scheduling, Full Preemptive Scheduling, Basic study and Features of Commercial RTOS : WINCE and Embedded Linux.

**Reference books :**

- 1 A Textbook of Microprocessors and Microcontrollers, R. Thegarajan, Scitech Publishers 2002
- 2 The 8051 Microcontroller and Embedded Systems, Using Assembly and C, K Ayala & D. Gadre, Cengage Learning 2004
- 3 The 8051 Microcontrollers & Embedded Systems, Mazidi, PHI 2004
- 4 The 8051 Microcontroller, Ayala, cengage learning 2009
- 5 The 8051 Microcontroller & Embedded Systems using Assembly and C, Ayala /Gadrecengage learning.

**Text books :**

1. Kenneth J. Ayala, "The 8051 Micro controller", Penram Interfacing Publishing, 1996.
2. Rajkamal, "Embedded Systems" TMH.

## **ECE-P-404 - VLSI DESIGN & OPTICAL FIBER LAB**

### **PART-I: Design and simulation of following VLSI circuits using EDA Tools (Software)**

Schematic design and make Device Level Layout of following circuits.

1. Design 2-input NAND, NOR and XOR using CMOS logic. Obtain its static and dynamic analysis for speed and power dissipation.
2. Design 2X1 and 4X1 Multiplexer using Transmission Gate (TG). Obtain its static and dynamic analysis for speed and power dissipation.
3. Design a SR-latch and D-latch using CMOS. Obtain its static and dynamic analysis for speed and power dissipation.
4. Design a SRAM and DRAM Memory Cell. Obtain its static and dynamic analysis for speed and power dissipation.

### **PART-II Design and simulation of following VLSI circuits using VHDL and then burn/implement the circuits on FPGA kit for real input.**

5. Design a 4- bit parallel Adder. Obtain its number of gates, area, and speed and power dissipation.
6. Design a 4- bit Serial in-serial out shift register. Obtain its number of gates, area, and speed and power dissipation.
7. Design a 4 bit binary synchronous counter. Obtain its number of gates, area, and speed and power dissipation.

### **PART-III**

To perform following experiments based on Fiber Optic Trainer.

8. To set up Fiber Optic Analog link.
9. To set up fiber Optic Digital link.
10. Measurement of Propagation loss and numerical aperture.
11. Characterization (VI Characteristics) of laser diode and light emitting diode.



## **ECE-P-410 - RF FABRICATION LAB**

### **LIST OF EXPERIMENTS:**

1. Design and fabricate the following *Planar Transmission Lines*:

- Stripline and microstrip lines
- Parallel coupled striplines and microstrip lines
- Slot lines and Coplanar lines

Measure their S-parameters and Characteristic impedance.

2 Design and Fabricate the following;

- 3-dB branchline coupler,
- backward wave coupler,
- Wilkinson power dividers
- Low pass filters
- band pass filters.

Measure their S-parameters & frequency responses.

3 Design, fabrication, and measurement of RF amplifier using microwave BJT.



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**ECE 412 – INDUSTRIAL ECONOMICS & MANAGEMENT**

**UNIT 1:** Framework of industrial economics – organizational forms and alternative motives of the firm, industrial efficiency, theory of profitability, market structure, principles of costing.

**UNIT 2:** Approaches to industrial location analysis, Productivity analysis, Input-Output analysis, Concentration of economic power. New Industrial Policy – Critical analysis, Role of technology and entrepreneurship in industrial development.

**UNIT 3:** Industrial project appraisal- classification of industries, industrial legislations in India, recent trends in MNCs, LPG, FDI & joint ventures, methods of project evaluation- NPV, CBA, IRR, break-even analysis.

**UNIT 4:** Management–Principles of management, functions of management planning, organizing, staffing, directing, controlling, co-ordinating, decision making.

**UNIT 5:** Emerging issues – Total quality management, JIT , quality circle, KANBAN, benchmarking, six sigma, quality management, ,ISO 9000, ISO 14000 , Customer relationship management(CRM) .

**Text books:**

1. Subburay, Total quality management, TMH. (2011)
2. Barthwal R.R- industrial economics .wiley eastern limited.