RAJASTHAN TECHNICAL UNIVERSITY

Teaching and Examination Scheme for B.Tech. (4 Year Course)
In
Electronics & Communication Engg.

Year : II **Semester : III**
(Revised)

Code	Subject	Hrs./week			Exam Hrs.	Maximum Marks		
		L	T	P		*I.A.	Exam	Total
A. Theory Papers								
3EC1	Mathematics-III	3	1	-	3	20	80	100
3EC2	Electronic Devices & Circuits	3	1	-	3	20	80	100
3EC3	Circuit Analysis & Synthesis	3	1	-	3	20	80	100
3EC4	Electronic Measurements & Instrumentation	3	0	-	3	20	80	100
3EC5	Electronic Materials and processes	3	0	-	3	20	80	100
3EC6	Data Structures & Algorithms	3	0	-	3	20	80	100
B. Practical & Sessional :								
3EC7	Electronics Workshop	-	-	2	-	45	30	75
3EC8	Computer Programming Lab-I	-	-	3	-	60	40	100
3EC9	Electronics Lab-I	-	-	3	-	60	40	100
3EC10	Electronic Measurement & Instrumentation Lab	-	-	3	-	45	30	75
3ECDC	**Discipline & Extra Curricular activities :**					-	-	50
	GRAND TOTAL	18	3	11	-	-	-	1000

* I.A. – Internal Assessment

RAJASTHAN TECHNICAL UNIVERSITY

Teaching and Examination Scheme for B.Tech. (4 Year Course)
In
Electronics & Communication Engg.

Year : II **Semester : IV**
(Revised)

Code	Subject	Hrs./week			Exam Hrs.	Maximum Marks		
		L	T	P		*I.A.	Exam	Total
A. Theory Papers								
4EC1	Mathematics-IV	3	1	-	3	20	80	100
4EC2	Analog Electronics	3	1	-	3	20	80	100
4EC3	Digital Electronics	3	0	-	3	20	80	100
4EC4	Electromagnetic Field Theory	3	1	-	3	20	80	100
4EC5	Random Variables & Stochastic Processes	3	1	-	3	20	80	100
4EC6 4EC6.1 4EC6.2 4EC6.3	Elective (any one of the following) Object Oriented Programming Data Base Management System Computer Graphics	3	0	-	3	20	80	100
B. Practical & Sessional :								
4EC7	Computer Programming Lab-II	-	-	3	-	60	40	100
4EC8	Electronics Lab-II	-	-	3	-	60	40	100
4EC9	Digital Electronics Lab	-	-	2	-	60	40	100
4EC10	Humanities	-	-	2	-	30	20	50
4ECDC	**Discipline & Extra Curricular activities :**					-	-	50
	GRAND TOTAL	18	4	10	-	-	-	1000

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RAJASTHAN TECHNICAL UNIVERSITY

Teaching and Examination Scheme for B.Tech. (4 Year Course)
In
Electronics & Communication Engg.

Year : III **Semester : V**

Code	Subject	Hrs./week			Exam Hrs.	Maximum Marks		
		L	T	P		*I.A.	Exam	Total
A. Theory Papers								
5EC1	Signals & Systems	3	1	-	3	20	80	100
5EC2	Linear Integrated Circuits	3	1	-	3	20	80	100
5EC3	Telecommunication Engg.	3	0	-	3	20	80	100
5EC4	Analog Communication	3	1	-	3	20	80	100
5EC5	Microwave Engg. -I	3	0	-	3	20	80	100
5EC6 5EC6.1 5EC6.2 5EC6.3	Elective (any one of the following) Biomedical Instrumentation Advanced Data Structures Computer Oriented Numerical & Statistical Methods	3	0	-	3	20	80	100
B. Practical & Sessional :								
5EC7	Electronic Engineering Design Lab	-	-	3	-	60	40	100
5EC8	Microwave Engg. Lab	-	-	3	-	45	30	75
5EC9	Communication Lab-I	-	-	3	-	60	40	100
5EC10	Signal Processing Lab-I	-	-	2	-	45	30	75
5ECDC	**Discipline & Extra Curricular activities :**					-	-	50
	GRAND TOTAL	18	3	11	-	-	-	1000

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RAJASTHAN TECHNICAL UNIVERSITY

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Electronics & Communication Engg.

Year : III **Semester : VI**

Code	Subject	Hrs./week			Exam Hrs.	Maximum Marks		
		L	T	P		*I.A.	Exam	Total
A. Theory Papers								
6EC1	Microwave Engg.-II	3	1	-	3	20	80	100
6EC2	Microprocessor and Microcontroller	3	0	-	3	20	80	100
6EC3	Industrial Electronics	3	0	-	3	20	80	100
6EC4	Digital Communication	3	1	-	3	20	80	100
6EC5	Control Systems	3	1	-	3	20	80	100
6EC6 6EC6.1 6EC6.2 6EC6.3	Elective (any one of the following) Neural Networks Parallel Computation & Architecture Optimization Techniques	3	0	-	3	20	80	100
B. Practical & Sessional :								
6EC7	Communication Lab-II	-	-	3	-	60	40	100
6EC8	Microprocessor Lab	-	-	3	-	60	40	100
6EC9	Unix Shell Programming Lab	-	-	3	-	45	30	75
6EC10	Industrial Electronics Lab	-	-	2	-	45	30	75
6ECDC	**Discipline & Extra Curricular activities :**					-	-	50
	GRAND TOTAL	18	3	11	-	-	-	1000

* I.A. – Internal Assessment

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Teaching and Examination Scheme for B.Tech. (4 Year Course)
In
Electronics & Communication Engg.

Year : IV **Semester : VII**

Code	Subject	Hrs./week			Exam Hrs.	Maximum Marks		
		L	T	P		*I.A.	Exam	Total
A. Theory Papers								
7EC1	Antenna & Wave Propagation	3	1	-	3	20	80	100
7EC2	Digital Signal Processing	3	1	-	3	20	80	100
7EC3	Wireless Communication	3	1	-	3	20	80	100
7EC4	IC Technology	3	0	-	3	20	80	100
7EC5	VLSI Design	3	1	-	3	20	80	100
7EC6 7EC6.1 7EC6.2 7EC6.3	Elective (any one of the following) Advanced Microprocessors Artificial Intelligence and Expert Systems Operating System	3	0	-	3	20	80	100
B. Practical & Sessional :								
7EC7	Signal Processing Lab-II	-	-	3	-	60	40	100
7EC8	Wireless Communication Lab	-	-	3	-	60	40	100
7EC9	Practical Training Seminar & Industrial Visit	-	-	2	-	60	40	100
7EC10	Project (Stage I)	-	-	2	-	50	-	50
7ECDC	**Discipline & Extra Curricular activities:**					-	-	50
	GRAND TOTAL	18	4	10	-	-	-	1000

* I.A. – Internal Assessment

RAJASTHAN TECHNICAL UNIVERSITY

Teaching and Examination Scheme for B.Tech. (4 Year Course)
In
Electronics & Communication Engg.

Year : IV **Semester : VIII**

Code	Subject	Hrs./week			Exam Hrs.	Maximum Marks		
		L	T	P		*I.A.	Exam	Total
A. Theory Papers								
8EC1	Computer Networks	3	1	-	3	20	80	100
8EC2	Radar & TV Engineering	3	1	-	3	20	80	100
8EC3	Optical Communication	3	1	-	3	20	80	100
8EC4 8EC4.1 8EC4.2 8EC4.3	Elective (any one of the following) Image Processing and Pattern Recognition VHDL Microcontroller and Embedded Systems	3	0	-	3	20	80	100
B. Practical & Sessional :								
8EC5	Computer Network Programming Lab	-	-	3	-	45	30	75
8EC6	Industrial Economics & Management.	-	-	2	-	45	30	75
8EC7	VLSI & Optical Fiber Lab	-	-	3	-	60	40	100
8EC8	Project(Stage-II)	-	-	4	-	120	80	200
8EC9	Seminar	-	-	2	-	60	40	100
8ECDC	**Discipline & Extra Curricular activities :**					-	-	50
	GRAND TOTAL	12	3	14	-	-	-	1000

* I.A. – Internal Assessment

3EC1 MATHEMATICS-III

UNIT 1 : LAPLACE TRANSFORM - Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant co-efficients with special reference to the wave and diffusion equations.
UNIT 2 : FOURIER SERIES & Z TRANSFORM – Expansion of simple functions in fourier series. Half range series, Change of intervals, Harmonic analysis. **Z TRANSFORM -** Introduction, Properties, Inverse Z Transform .
UNIT3 : FOURIER TRANSFORM - Complex form of Fourier Transform and its inverse, Fourier sine and cosine transform and their inversion. Applications of Fourier Transform to solution of partial differential equations having constant co-efficient with special reference to heat equation and wave equation.
UNIT 4 : COMPLEX VARIABLES - Analytic functions, Cauchy-Riemann equations, Elementary conformal mapping with simple applications, Line integral in complex domain, Cauchy;s theorem. Cauchy's integral formula.
UNIT 5 : COMPLEX VARIABLES -Taylor's series Laurent's series poles, Residues, Evaluation of simple definite real integrals using the theorem of residues. Simple contour integration.

3EC2 - ELECTRONIC DEVICES & CIRCUITS

UNIT 1 : SEMICONDUCTOR PHYSICS : Mobility and conductivity, charge densities in a semiconductor, Fermi Dirac distribution, carrier concentrations and fermi levels in semiconductor, Generation and recombination of charges, diffusion and continuity equation, Mass action Law, Hall effect.
UNIT 2 : Junction diodes, Diode as a ckt. element, load line concept, clipping and clamping circuits, Voltage multipliers. Construction, characteristics and working principles of UJT
UNIT 3 : Transistor characteristics, Current components, Current gains: alpha and beta. Operating point. Hybrid model, h-parameter equivalent circuits. CE, CB and CC configuration. DC and AC analysis of CE,CC and CB amplifiers. Ebers-Moll model. Biasing & stabilization techniques. Thermal runaway, Thermal stability.
UNIT 4 : JFET, MOSFET, Equivalent circuits and biasing of JFET's & MOSFET's. Low frequency CS and CD JFET amplifiers. FET as a voltage variable resistor.
UNIT 5 : SMALL SIGNAL AMPLIFIERS AT LOW FREQUENCY : Analysis of BJT and FET, DC and RC coupled amplifiers. Frequency response, midband gain, gains at low and high frequency. Analysis of DC and differential amplifiers, Miller's Theorem. Cascading Transistor amplifiers, Darlington pair. Emitter follower, source follower.

3EC3- CIRCUIT ANALYSIS & SYNTHESIS

UNIT 1 : 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 2 :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 3 : 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 4 : 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 π networks.

UNIT 5 : NETWORK SYNTHESIS : RL & RC networks synthesis, Foster First & Second form, Cauer forms.

3EC4- ELECTRONIC MEASUREMENTS & INSTRUMENTATION

UNIT 1 : 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.

UNIT 2 : 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.

UNIT 3 : 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.

UNIT 4 : 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.

UNIT 5 : 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.

3EC5 ELECTRONIC MATERIALS & PROCESSES

UNIT 1 : DIELECTRIC MATERIALS : Polarisation phenomenon, spontaneous polarisation, dielectric constant and loss, piezo and ferro electricity.
UNIT 2 : MAGNETIC MATERIALS: Dia, para, ferro-ferrimagnetism; soft and hard magnetic materials and their applications.
UNIT 3 : SEMI CONDUCTOR MATERIALS : Crystal growth, zone refining, Degenerate and non-degenerate semiconductors, Direct and indirect band gap semiconductors. Electronic properties of silicon, Germanium, Compound Semiconductor, Gallium Arsenide, gallium phosphide & Silicon carbide.
UNIT 4: 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 5: PASSIVE COMPONENETS & 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.

3EC6 DATA STRUCTURES & ALGORITHMS

UNIT 1 : 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 2 : 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 3 : 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 4 : 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 5 : 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.

3EC7 ELECTRONICS WORKSHOP

1. Identification, Study & Testing of various electronic components :
   (a) Resistances-Various types, Colour coding (b) Capacitors-Various types, Coding, (c) Inductors
   (d) Diodes (e) Transistors (f) SCRs (g) ICs (h) Photo diode (i) Photo transistor (j) LED (k) LDR
   (l) Potentiometers
2. Study of symbols for various Electrical & Electronic Components, Devices, Circuit functions etc.
3. To study and perform experiment on CRO demonstration kit.
4. Soldering & desoldering practice.
5. (a) To Design & fabricate a PCB for a Regulated power supply.
   (b) Assemble the Regulated power supply using PCB and test it.
6. To study and plot the characteristics of following Opto-Electronic devices –
   (a) LED (b) LDR (C) Photovoltatic cell (d) Opto-coupler
   (e) Photo diode (f) Photo transistor (g) Solar cell
7. To study the specifications and working of a Transistor radio kit and perform measurements on it.
8. To study the specifications and working of a Tape Recorder kit.
9. To prepare design layout of PCBs using software tools.
10. To fabricate PCB and testing of electronics circuit on PCB.
11. To design and test regulated power supply using ICs
12. To study the specifications and working of a VCD Player.
13. To study the specifications and working of color TV.

3EC8 COMPUTER PROGRAMMING LAB-I

Program in C

1. Simple array and sorting algorithm implementations.
2. Addition, multiplication and transpose of sparse matrices represented in array form.
3. Polynomial addition, multiplication (8^{th} degree polynomials), using array & linked lists.
4. Implementation of stack and queue using array & linked lists.
5. Implementation of circular queue using array.
6. Infix to postfix/prefix conversion.
7. Binary search tree creation and traversing.
8. Generation of spanning trees for a given graph using BFS & DFS algorithms.
9. AVL tree implementation (creation, insertion, deletion).
10. Symbol table organization (Hash Table).

3EC9 ELECTRONICS LAB I

1. Study the following devices:
   (a) Analog & digital multimeters
   (b) Function/ Signal generators
   (c) Regulated d. c. power supplies (constant voltage and constant current operations)
   (d) Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.
2. Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse Saturation current and static & dynamic resistances.
3. Plot V-I characteristic of zener diode and study of zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
4. Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.
5. Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of I_{dss} & V_p
6. Application of Diode as clipper & clamper
7. Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.
8. Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.
9. Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters.
10. Study half wave rectifier and effect of filters on wave. Also calculate theoretical & practical ripple factor.
11. Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor.

3EC10 ELECTRONIC MEASUREMENT & INSTRUMENTATION LAB

1. Measure earth resistance using fall of potential method.
2. Plot V-I characteristics & measure open circuit voltage & short circuit current of a solar panel.
3. Measure unknown inductance capacitance resistance using following bridges
   (a) Anderson Bridge (b) Maxwell Bridge
4. To measure unknown frequency & capacitance using Wein's bridge.
5. Measurement of the distance with the help of ultrasonic transmitter & receiver.
6. Measurement of displacement with the help of LVDT.
7. Draw the characteristics of the following temperature transducers:
   (a) RTD (Pt-100) (b) Thermistors (c) Thermocouple
8. Draw the characteristics between temperature & voltage of a K type thermocouple.
9. Measure the speed of a Table Fan using stroboscope.
10. Measurement of strain/ force with the help of strain gauge load cell.
11. Study the working of Q-meter and measure Q of coils.
12. To study the working of Spectrum analyzer and determine the bandwidth of different signals.

4EC1 MATHEMATICS-IV

UNIT 1 : N**UMERICAL ANALYSIS -** Finite differences – Forward, Backward and Central differences. Newton's forward and backward differences, interpolation formulae. Stirling's formula, Lagrange's interpolation formula.
UNIT 2 : NUMERICAL ANALYSIS- Integration-Trapezoidal rule, Simpson's one third and three-eighth rules. Numerical solution of ordinary differential equations of first order - Picard's mathod, Euler's and modified Euler's methods, Miline's method and Runga-Kutta fourth order method.,Differentiation
UNIT 3 : SPECIAL FUNCTIONS – Bessel's functions of first and second kind, simple recurrence relations, orthogonal property of Bessel's , Transformation, Generating functions, Legendre's function of first kind. Simple recurrence relations, Orthogonal property, Generating function.
UNIT 4 : STATISTICS AND PROBABILITY - Elementary theory of probability, Baye's theorem with simple applications, Expected value, theoretical probability distributions-Binomial, Poisson and Normal distributions. Lines of regression, co-relation and rank correlation.
UNIT 5 : CALCULUS OF VARIATIONS - Functional, strong and weak variations simple variation problems, the Euler's equation.

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4EC2 – ANALOG ELECTRONICS

UNIT 1 : 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 2 : 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 3 : HIGH FREQUENCY AMPLIFIERS : Hybrid Pi model, conductances and capacitances of hybrid Pi model, high frequency analysis of CE amplifier, gain-bandwidth product. Emitter follower at high frequencies.
UNIT 4 : **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 5 : 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
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4EC3-DIGITAL ELECTRONICS

UNIT 1 : NUMBER SYSTEMS, BASIC LOGIC GATES & BOOLEAN ALGEBRA: Binary Arithmetic & Radix representation of different numbers. Sign & magnitude representation, Fixed point representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function. Derived logic gates: Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and vica-versa. Converting logic diagrams to universal logic. Positive, negative and mixed logic. Logic gate conversion.
UNIT 2 : DIGITAL LOGIC GATE CHARACTERISTICS: TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET. Interfacing logic families to one another.
UNIT 3 : **MINIMIZATION TECHNIQUES:** Minterm, Maxterm, Karnaugh Map, K map upto 4 variables. Simplification of logic functions with K-map, conversion of truth tables in POS and SOP form. Incomplete specified functions. Variable mapping. Quinn-Mc Klusky minimization techniques.
UNIT 4 : **COMBINATIONAL SYSTEMS:** Combinational logic circuit design, half and full adder, subtractor. Binary serial and parallel adders. BCD adder. Binary multiplier. Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder. Multiplexer, demultiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode switching matrix. Design of logic circuits by multiplexers, encoders, decoders and demultiplexers.
UNIT 5 : **SEQUENTIAL SYSTEMS:** Latches, flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops. Counters : Asynchronous (ripple), synchronous and synchronous decade counter, Modulus counter, skipping state counter, counter design. Ring counter. Counter applications. Registers: buffer register, shift register.

4EC4 ELECTROMAGNETIC FIELD THEORY

UNIT 1 : 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 2 : 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 3 : 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 maping and concept of field cells.
UNIT 4 : 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 5: 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.

4EC5 RANDOM VARIABLES & STOCHASTIC PROCESSES

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. Gaussion Random Process, Transmission of Random process through linear systems. Power spectral Density, Cross Spectral density,

4EC6.1 OBJECT ORIENTED PROGRAMMING

UNIT 1 : OOP FUNDAMENTALS: Concept of class and object, attributes, public, private and protected members, derived classes, single & multiple inheritance,

UNIT 2 : PROGRAMMING IN C++: Enhancements in C++ over C, Data types, operators and functions. Inline functions, constructors and destructors. Friend function, function and operator overloading. Working with class and derived classes. Single, multiple and multilevel inheritances and their combinations, virtual functions, pointers to objects. Input output flags and formatting operations. Working with text files.

UNIT 3 : JAVA: Variation from C++ to JAVA. Introduction to Java byte code, virtual machine, application & applets of Java, integer, floating point, characters, Boolean, literals, and array declarations.

UNIT 4 : OPERATORS AND CONTROL STATEMENTS: Arithmetic operators, bit wise operators, relational operators, Boolean logic operators, the assignment operators, ?: operators, operator precedence. Switch and loop statements.

UNIT 5: PACKAGE AND INTERFACES: Packages, access protection, importing & defining packages. Defining and implementing interfaces.

4EC6.2 - DATA BASE MANAGEMENT SYSTEM

UNIT 1 :Introduction Need, purpose and goals of DBMS. DBMS Architecture, Concept of keys, Generalisation and specialization, Introduction to Relational data model, ER Modeling, Relational algebra.
UNIT 2: DATABASE DESIGN : Conceptual Data Base design. Theory of normalization, Primitive and composite data types, concept of physical and logical databases, data abstraction and data independence,. Relational calculus.
UNIT 3 : SQL : DDL and DML. Constraints assertions, views, data base security. Application Development using SQL : Host language interface, embedded SQL programming. GL's, Forms management and report writers. Stored procedures and triggers.
UNIT 4 INTERNAL OF RDBMS - Physical data organization in sequential, indexed, random and hashed files. Inverted and multilist structures.
UNIT 5 : Transaction processing, concurrency control, Transaction model properties and state serialisability. Lock base protocols, two phase locking, Log based recovery Management.

4EC6.3 COMPUTER GRAPHICS

UNIT 1 : Introduction to interactive computer graphics, picture analysis, overview of programmer's model of interactive graphics. Fundamental problems in geometry, Hardware for Computer Graphics.
UNIT 2 : BASIC RASTER GRAPHICS - Scan conversion algorithms for line, Circle, Ellipse, Filling algorithms, Line Clipping and Polygon clipping.
UNIT 3 : GEOMETRIC MANIPULATION : 2 D and 3 D Transformation, Composite Transformations, Concept of Homogenous Coordinates Viewpoints.
UNIT 4 : **ELEMENTRY 3 D GRAPHICS** – Types of Projections, Vanishing Points, specification of 3 D View, Matrices for Parallel and Perspective Projections.
Visibility ; Image and object precision, z-buffer algorithms, area based algorithms, floating horizon.
UNIT 5: RENDERING - Ray tracing, antialiasing, Gourard and Phong Shading.
Curves and Surfaces : Parametric Representation, Bezier and B-Spline curves.

4EC7 COMPUTER PROGRAMMING LAB-II

Programs in C++

1. Write a program to perform the complex arithmetic.
2. Write a program to perform the rational number arithmetic.
3. Write a program to perform the matrix operations. (Transpose, addition, subtraction, multiplication, test if a matrix is symmetric/ lower triangular/ upper triangular)
4. Implement Morse code to text conversion and vice-versa.
5. To calculate Greatest Common Divisor of given numbers.
6. To implement tower of Hanoi problem.

Program in Java

7. To implement spell checker using dictionary.
8. To implement a color selector from a given set of colors.
9. To implement a shape selector from a given set of shapes.
10. By mapping keys to pens of different colors, implement turtle graphics.
11. To implement a calculator with its functionality.
12. To implement a graph and display BFS/DFS order of nodes.

4EC8 ELECTRONICS LAB II

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.

4EC9 DIGITAL ELECTORNICS LAB

1. To study and perform the following experiments.
   (a) Operation of digital multiplexer and demultiplexer.
   (b) Binary to decimal encoder.
   (c) Characteristics of CMOS integrated circuits.
2. To study and perform experiment- Compound logic functions and various combinational circuits based on AND/NAND and OR/NOR Logic blocks.
3. To study and perform experiment -Digital to analog and analog to digital converters.
4. To study and perform experiment- Various types of counters and shift registers.
5. To study and perform experiment - Interfacing of CMOS to TTL and TTL to CMOS ICs.
6. To study and perform experiment- BCD to binary conversion on digital IC trainer.
7. To study and perform experiment -
   (a) Astable (b) Monostable (c) Bistable Multivibrators and the frequency variation with different parameters, observe voltage waveforms at different points of transistor.
8. To study and perform experiment -Voltage comparator circuit using IC-710.
9. To study and perform experiment- Schmitt transistor binary circuit.
10. Design 2 bit binary up/down binary counter on bread board.

4EC10 HUMANITIES

UNIT 1 : INDIA- Brief History of Indian Constitution- framing, features, fundamental rights, duties, directive principles of state. History of Indian national movement, Socio economic growth after independence.

UNIT 2 : SOCIETY – Social Groups- Concepts and types, socialization- concept and theory, social control; concept, social problem in contemporary India, status and role.

UNIT 3 : THE FUNDAMENTALS OF ECONOMICS – Meaning, definition and importance of economics, Logic of choice, Central Economic Problems, Positive and Normative approaches, economic systems-socialism and capitalism.

UNIT 4 : MICROECONOMICS –Law of demand and supply, Utility approach, Indifference curves, Elasticity of demand & supply and applications, Consumer surplus, Law of returns to factors and returns to scale.

UNIT 5: MACRO ECONOMICS –Concept relating to national product-National income and its measurement, Simple Keynesian theory, Simple multiplier, Money and banking,- Meaning, Concept of international trade, Determination of exchange rate, Balance of payments. Characteristics of Indian Economy.

5EC1 SIGNALS AND SYSTEMS

UNIT 1: **INTRODUCTION :** Continuous time and discrete time 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.
UNIT 2 : 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.
UNIT 3 : **FOURIER TRANSFORM:** The continuous time Fourier transform for periodic and aperiodic signals, Properties of CTFT. Discrete time Fourier transform for periodic and aperiodic signals. Properties of DTFT. The convolution and modulation property.
UNIT 4 : **Z-TRANSFORM & LAPLACE TRANSFORM** : Introduction. 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.
UNIT 5 : **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.

5EC2 LINEAR INTEGRATED CIRCUITS

UNIT 1 : 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 2 : 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 3 : 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 4 : 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 5 : 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.

5EC3 TELECOMMUNICATION ENGINEERING

UNIT 1 : TRANSMISSION LINE: Types of transmission lines, general transmission line equation, line constant, equivalent circuits, infinite line, and reflection on a line, SWR of line with different type of terminations. Distortion less and dissipation less lines, Coaxial cables, Transmission lines at audio and radio frequencies, Losses in transmission line,. Characteristics of quarter wave, half wave and lines of other lengths,

UNIT 2 :TRANSMISSION LINE APPLICATIONS: Smith chart and its application. Transmission line applications, Impedance matching Network. Single & double Stub matching. Measurement of parameters of transmission line, measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio.

UNIT 3 : ATTENUATORS & FILTERS: Elements of telephone transmission networks, symmetrical and Asymmetrical two port networks. Different Attenuators, π-section & T-section attenuators, stub matching, Transmission equalizers Filters, constant K-section, Ladder type, π-section, T-section filter, m-derived filter sections, Lattics filter section.

UNIT 4 : TELEPHONE TRANSMISSION: Telephone set, Touch tone dial types, two wire/ four wire transmission, Echo suppressors & cancellors, cross talk. Multi-channel systems: Frequency division & time division multiplexing.

UNIT 5: AUTOMATIC TELEPHONY & TELEGRAPHY: Trunking concepts, Grade of service, Traffic definitions, Introduction to switching networks, classification of switching systems. Principle of Electronic Exchange, EPABX and SPC Digital telephone Exchange,Numberig Plan, Fascimile services.

5EC4 ANALOG COMMUNICATION

UNIT 1: **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 2 : **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 3: **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 4: NOISE IN AM AND FM: Calculation of signal-to-noise ratio in SSB-SC, DSB-SC, DSB with carrier, Noise calculation of square law demodulator & envelope detector. Calculation of S/N ratio in FM demodulators, Super heterodyne receivers.

UNIT 5: **PULSE ANALOG MODULATION :** Practical aspects of sampling: Natural and flat top sampling. PAM, PWM, PPM modulation and demodulation methods, PAM-TDM.

5EC5 MICROWAVE ENGINEERING-I

UNIT 1 : 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 2 : **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 3 : **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 4 : 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 5 : 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.

5EC6.1 BIOMEDICAL INSTRUMENTATION

UNIT 1 : HUMAN BODY SUBSYSTEMS: Brief description of neural, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities.
TRANSDUCERS AND ELECTRODES: Principles and classification of transducers for Bio-medical applications, Electrode theory, different types of electrodes, Selection criteria for transducers and electrodes.
UNIT 2: BIOPOTENTIALS: Electrical activity of excitable cells, ENG, EMG, ECG, ERG, EEG. Neuron potential.
CARDIOVASCULAR SYSTEM MEASUREMENTS: Measurement of blood pressure, blood flow, cardiac output, cardiac rate, heart sounds, Electrocardiograph, phonocardiograph, Plethysmograph, Echocardiograph.
UNIT 3 : INSTRUMENTATION FOR CLINICAL LABORATORY: Measurement of pH valve of blood, ESR measurement, hemoglobin measurement, O_2 and CO_2 concentration in blood, GSR measurement.
Instrumentation for clinical laboratory: Spectrophotometry, chromatography, Hematology, Measurement of pH value, concentration in blood.
MEDICAL IMAGING: Diagnostic X-rays, CAT, MRI, thermography, Ultrasonography, medical use of isotopes, endoscopy.
UNIT 4: PATIENT CARE, MONITORING AND SAFETY MEASURES: Elements of Intensive care monitoring basic hospital systems and components, physiological effect of electric current shock hazards from electrical equipment, safety measures, Standards & practices.
COMPUTER APPLICATIONS AND BIOTELEMETRY: Real time computer applications, data acquisition and processing, remote data recording and management.
UNIT 5: THERAPEUTIC AND PROSTHETIC DEVICES: Introduction to cardiac pacemakers, defibrillators, ventilators, muscle stimulators, diathermy, heart lung machine, Hemodialysis, Applications of Laser.

5EC6.2 ADVANCED DATA STRUCTURES

UNIT 1 : 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, discitionerics, priority queues and concatenable queues using 2-3 trees.
UNIT 2 : 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 3 : 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 4 : GRAPH THEORETIC ALGORETHMS - 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 5 : 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.

5EC6.3 COMPUTER ORIENTED NUMERICAL & STATISTICAL METHODS

UNIT 1 : MATRIX COMPUTATION: Algebra of matrix, Inverse of a matrix, Rank of a matrix, Matrix inversion by Gauss elimination, Computer programs for matrix inversion.
UNIT 2 : SOLUTION OF LINEAR EQUATIONS: Cramer's rule, Gauss elimination, Gauss Jordan elimination and Gauss Seidal iterative method and their implementation in C.
UNIT 3 : SOLUTION OF NON-LINEAR EQUATIONS: Interval bisection method, Secant method, Regula-Falsi method, Curve fitting, Method of least squares and their implementation in C.
UNIT 4 : SOLUTION OF DIFFERENTIAL EQUATIONS: Euler's method, Modified Euler's method, Runge Kutta method of fourth order, Solution of partial differential equation with special reference to heat equation, Laplace equation and wave equation Milne's and their implementation in C.
UNIT 5 : STATISTICAL METHODS: Curve fitting methods – method of least squares, fitting a straight line, parabola. Correlation and Linear regression.

5EC7 ELECTRONIC ENGINEERING DESIGN LAB

To design the following circuits, assemble these on bread board and test them.
Simulation of these circuits with the help of appropriate software.

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.

5EC8 MICROWAVE ENGINEERING LAB

1. Study of various microwave components and instruments like frequency meter, attenuator, 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 an 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, 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.

5EC9 COMMUNICATION LAB-I

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.

5EC10 – SIGNAL PROCESSING LAB-I

Simulation in MATLAB Environment:

1. Generation of continuous and discrete elementary signals (periodic and non-periodic) using mathematical expression.
2. Generation of Continuous and Discrete Unit Step Signal.
3. Generation of Exponential and Ramp signals in Continuous & Discrete domain.
4. Continuous and discrete time Convolution (using basic definition).
5. Adding and subtracting two given signals. (Continuous as well as Discrete signals)
6. To generate uniform random numbers between (0, 1).
7. To generate a random binary wave.
8. To generate random sequences with arbitrary distributions, means and variances for following :
   (a) Rayleigh distribution
   (b) Normal distributions: N(0,1).
   (c) Gaussion distributions: N (m_x, σx^2)
9. To plot the probability density functions. Find mean and variance for the above distributions

6EC1-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, Coplanar striplines, 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.

6EC2 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.

6EC3 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.

6EC4 DIGITAL COMMUNICATION

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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.

6EC5 CONTROL SYSTEMS

UNIT 1 : 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 2 : 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 3 : FREQUENCY DOMAIN METHODS: Bode plot, Design specification in frequency domain and their co-relation with time domain.
UNIT 4: 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 5 : 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.

6EC6.1 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 map.

6EC6.2 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-speed up, efficiency utilization, communication, overheads, single/multiple programme performances, benchmarks.
UNIT 5 : **PROCESSOR ARRAYS:**
Basic Algorithms – Fast Fourier Transform, Linear System Solution, Sorting etc.

6EC6.3 OPTIMIZATION TECHNIQUES

UNIT 1: INTRODUCTION -Historical development, engineering application of optimization, Formulation of design problems as a mathematical programming problem, Classification of optimization problems.
UNIT 2: LINEAR PROGRAMMING - Simplex methods, Revised simplex method, Duality in linear programming, post optimality analysis.
UNIT 3: Applications of Linear programming, Transportation and assignment problems.
UNIT 4: NON-LINEAR PROGRAMMING - Unconstrained optimization techniques, Direct search methods, Descent methods, Constrained optimization, Direct and Indirect methods.
UNIT 5: Dynamic Programming: Introduction, multi-decision processes, computational procedure

6EC7 COMMUNICATION LAB-II

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.

6EC8 MICROPROCESOR LAB

1. Study the hardware, functions, memory structure and operation of 8085 microprocessor kit.
2. Program to perform integer division: (i) 8-bit by 8-bit (ii) 16-bit by 8-bit.
3. Transfer of a block of data in memory to another place in memory in the direct and reverse order.
4. Searching a number in an array and finding its parity.
5. Sorting of array in: (i) Ascending (ii) Descending order
6. Programme to perform following conversion: (i) BCD to ASCII (ii) BCD to Hexadecimal
7. Programme to multiply two 8-bit numbers.
8. Programme to generate and sum 15 fibanocci numbers.
9. Programme for rolling display of message “INDIAN”.
10. To insert a number at correct place in a sorted array.
11. Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light, and sequential lights on off by above hardware.
12. Generation of different waveform on 8253/ 8254 programmable timer.

6EC9 UNIX SHELL PROGRAMMING LAB

1. Use of Basic Unix Shell Commands: ls,mkdir,rmdir,cd,cat,banner,touch,file,wc,sort,cut,grep, dd,dfspace,du,ulimit.
2. Commands related to Inode,I/O redirection and piping, process control commands, mails.
3. Shell Programming: Shell script exercises based on following
   (i) Interactive shell scripts
   (ii) Positional parameters
   (iii) Arithmetic
   (iv) if-then-fi, if-then-else-fi, nested if-else
   (v) Logical operators
   (vi) else + if equals elif, case structure
   (vii) while, until, for loops, use of break
   (viii) Metacharacters
   (ix) System administration: disk management and daily administration
4. Write a shell script to create a file in $USER /class/batch directory. Follow the instructions
   (i) Input a page profile to yourself, copy it into other existing file;
   (ii) Start printing file at certain line
   (iii) Print all the difference between two file, copy the two files at $USER/CSC/2007 directory.
   (iv) Print lines matching certain word pattern.
5. Write shell script for-
   (i) Showing the count of users logged in,
   (ii) Printing Column list of files in your home directory
   (iii) Listing your job with below normal priority
   (iv) Continue running your job after logging out.

6. Write a shell script to change data format .Show the time taken in execution of this script.
7. Write a shell script to print files names in a directory showing date of creation & serial number of the file.
8. Write a shell script to count lines, words and characters in its input(do not use wc).
9. Write a shell script to print end of a Glossary file in reverse order using Array. (Use awk tail)
10. Write a shell script to check whether Ram logged in, Continue checking further after every 30 seconds till success.

6EC10 INDUSTRIAL ELECTRONICS LAB

1. Study the characteristics of SCR.
   1.1 Observe the terminal configuration.
   1.2 Measure the breakdown voltage.
   1.3 Measure latching and holding current.
   1.4 V-I characteristics.
2. Perform experiment on triggering circuits for SCR.
   2.1 R-triggering circuit.
   2.2 R-C triggering circuit.
   2.3 UJT triggering circuit.
3. Study and obtain the characteristics of Diac.
4. Study and obtain the waveforms for single-phase half-wave controlled converter.
5. Study and obtain the waveforms for single-phase half controlled symmetrical and asymmetrical bridge converters.
6. Study and obtain the waveforms for single-phase fully controlled bridge converter.
7. Study and obtain the waveforms for voltage-commutated chopper.
8. Study and obtain the waveforms for current-commutated chopper.
9. Perform experiment on single phase PWM inverter.
10. Perform experiment on buck, boost and buck-boost regulators.
11. Perform experiment on Motor control – open loop & closed loop.

7EC1- ANTENNA & WAVE PROPAGATION

UNIT 1 : 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 aperature, gain, beamwidth, directivity, radiation resistance, efficiency, polarization, impedance and directional characteristics of antenna, antenna temperature.

.**UNIT 3 : 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 2 : 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 4 : 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 5 : 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.

7EC2 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 (LCCD – Linear Constant Coefficient Difference) 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 : 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. Processing of speech signals: Vocoders, linear predictive coders.

7EC3 WIRELESS COMMUNICATION

UNIT 1 : PROPAGATION PHENOMENA - Fundamentals of fading, Multipath channels, Spread Spectrum signals: Direct-sequence spread spectrum signals, p-n sequences, Frequency-hopped spread spectrum signals, Code-division multiplexing.

UNIT 2 : LINE OF SIGHT MICOWAVE COMMUNICATION- Link Engineering, Frequency planning, Free space loss, Fresnel zone clearance bending of radio beam, Effective earth radius, Building blocks of Transmitter & Receiver.

UNIT 3 : MULTIPLE ACCESS TECHNIQUES - FDMA, TDMA and CDMA with reference to mobile radio and satellite systems. TDMA based networks. CDMA based networks,

UNIT 4 : CELLULAR WIRELESS NETWORKS-, GSM: Introduction, overview of the GSM systems, GSM codec, channel coding and interleaving, radio like control. Cordless systems and WLL, Mobile IP, Wireless access protocol. Wireless LAN's: Technology, IEEE 802.11 standards and Blue tooth. Broadband Wireless 802.16

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

7EC4 IC TECHNOLOGY

UNIT 1 : INTRODUCTION TO TECHNOLOGIES- 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 & ION IMPLANTATION- Ficks diffusion Equation in One Dimension, Atomic model, Analytic Solution of Ficks Law, correction to simple theory , Diffusion in SiO_2. Ion Implantation and Ion Implantation Systems Oxidation. Growth mechanism and Deal-Grove Model of oxidation, Linear and Parabolic Rate co-efficient, Structure of SiO_2, Oxidation techniques and system, Oxide properties.

UNIT 3 : CHEMICAL VAPOUR DEPOSITION AND LAYER GROWTH- CVD for deposition of dielectric and polysilicon – 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 Expitaxy, Defects in Epitaxial growth, Metal Organic Chemical Vapor Deposition, Molecular beam epitaxy.

UNIT 4 : PATTERN TRANSFER- Introduction to photo/optical lithography, Contact/ proximity printers, Projection printers, Mask generation, photoresists. Wet etching, Plasma etching, Reaction ion etching.

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.

7EC5 VLSI DESIGN

UNIT 1 : INTRODUCTION TO MOS TECHNOLOGY- Basic MOS transistors, Enhancement Mode transistor action, Depletion Mode transistor action, NMOS and CMOS fabrication.
UNIT 2 : BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS- I_{ds} versus V_{ds} relationship, Aspects of threshold voltage, Transistor Transconductance g_m. The nMOS inverter, Pull up to Pull-down ratio for a NMOS Inverter and CMOS Inverter (B_n/B_p), MOS transistor circuit Model, Noise Margin.
UNIT 3 : CMOS LOGIC CIRCUITS- The inverter, Combinational Logic, NAND Gate NOR gate, Compound Gates, 2 input CMOS Multiplexer, Memory latches and registers, Transmission Gate, Gate delays, CMOS-Gate Transistor sizing, Power dissipation.
UNIT 4 : Basic physical design of simple Gates and Layout issues. Layout issues for inverter, Layout for NAND and NOR Gates, Complex Logic gates Layout, Layout optimization for performance.
UNIT 5 : Introduction to VHDL, Prolog & other design tools. VHDL Code for simple Logic gates, flip-flops, shift registers.

7EC6.1 ADVANCED MICROPROCESSORS

UNIT 1 : 8086 ARCHITECTURE- Hardware specifications, Pins and signals, Internal data operations and Registers, Minimum and maximum mode, System Bus Timing, Linking and execution of Programs, Assembler Directives and operators.
UNIT 2: SOFTWARE & INSTRUCTION SET- Assembly language programming: addressing mode and instructions of 8086, MACRO programming, 8086 interrupts.
UNIT 3: ANALOG INTERFACING: A/D and D/A converter interfacing, keyboard and display interfacing, RS 232 & IEEE 488 communication standards**.**
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 / Multitasking operating system concepts, 8086 based Multiprocessor systems. Introduction and basic features of 286, 386, 486 & Pentium processors.

7EC6.2 ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

UNIT 1 : INTRODUCTION TO AI KNOWLEDGE- Importance of AI, Knowledge Base System Knowledge organization & manipulation, Conceptual Introduction to LISP and other AI programming Languages.
UNIT 2 : KNOWLEDGE REPRESENTATION- Syntax Semantics, Inference Rules, Non-deductive Inference methods, and representations using rules, forward chaining and backward chaining. Fuzzy Logic & Natural languages computations. Probabilistic Reasoning. Object Oriented Representations.
UNIT 3 : KNOWLEDGE ORGANIZATION & MANIPULATION- Search & control strategies, matching techniques, knowledge organization & management, Genetic Algorithms based search techniques.
UNIT 4 : KNOWLEDGE SYSTEMS ARCHITECTURE- Rule based, non-production, uncertainty knowledge system building tools.
UNIT 5 : KNOWLEDGE ACQUISITION- General concepts, learning by induction.

7EC6.3 OPERATING SYSTEMS

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.

7EC8 SIGNAL PROCESSING LAB-II

Modeling and simulation using MAT LAB

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).

7 EC9 WIRELESS COMMUNICATION LAB

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 microstrip patch 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, tone) simultaneously using Satellite Communication Trainer.
9. To study GPS Receiver, establishing link between GPS satellite & GPS trainer and measure of latitude & longitude

8EC1 COMPUTER NETWORKS

UNIT 1: QUEUING THEORY- Pure birth, Pure death & Birth-death processes, Mathematical models for M/M/1, M/M/∞, M/M/m, M/M/1/K and M/M/m/m queues. Little's formula. M/G/1 Queuing model basics.
UNIT 2: DATA LINK LAYER - Packet & Circuit switching, OSI & TCP/IP Reference Models, Framing, Simplex protocol, Simplex stop & wait protocol, Sliding window protocol, Go back N protocol, selective repeat, HDLC, Data link layer in internet.
UNIT 3: MEDIUM LAYER- Static & dynamic channel allocation, Multiple Access Protocols: ALOHA, slotted ALOHA, CSMA, Token Bus, Token Ring, FDDI, IEEE standards 802.2, 802.3 Hubs, Bridges, Routers & Gateways.
UNIT 4: NETWORK LAYER- Network layer Design issues.
Adaptive & Non-adaptive routing algorithms, Congestion control algorithms for TCP/IP networks, Internetworking, Network layer in the Internet: IPv4 & IPv6 Protocols, OSPF and BGP.
TCP Protocol architecture.
UNIT 5: ATM NETWORKS- Connection Oriented Networks: X.25, Frame Relay & ATM. ISDN system architecture. Broadband ISDN. ATM Protocol architecture, Recognition Algorithm in ATM Networks, Congestion control Algorithms.

8EC2-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, DBS-TV and 3D-TV.

8EC3-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.

8EC4. 1 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

8EC4.2 VHDL

UNIT 1 : INTRODUCTION – Fundamental & history of various hardware description language, Design flow of ASICs and and standard logic circuits using software.
UNIT 2 : COMBINATIONAL CIRCUIT BUILDING BLOCKS- Multiplexer, Decoders, encoders, Code Converters, VHDL Code for Combinational Circuits.
UNIT 3 : SEQUENCIAL CIRCUITS: VHDL code for Flip-Flops, shift registers, Counters.
UNIT 4 : SYNCHRONOUS/ ASYNCHRONOUS SEQUENCIAL 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.

8EC4.3 MICROCONTROLLER AND EMBEDED SYSTEMS

UNIT 1 : THE 8051 MICROCONTROLLER: Introduction, The 8051 microcontroller hardware, I/O pins, Port, External memory, Counters and Timers, Serial data. Interrupts.
UNIT 2 : 8051 ASSEMBLY LANGUAGE PROGRAMMING: Addressing modes, External data moves, 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 EMBEDED SYSTEM: Application of Microcontrollers in interfacing, Robotics, MCU based measuring instruments. Real Time Operating System for System Design, Multitasking System, Task Definition in a Multitasking System, Round Robin Scheduling, Full Pre-emptive Scheduling, Basic study and Features of Commercial RTOS : WINCE and Embedded Linux.

8EC5 COMPUTER NETWORK PROGRAMMING LAB

1. **PRELIMINARIES:** Study and use of common TCP/IP protocols and term viz. telnet rlogin ftp, ping, finger, Socket, Port etc.
2. **DATA STRUCTURES USED IN NETWORK PROGRAMMING:** Representation of unidirectional, , Directional weighted and unweighted graphs.
3. **ALGORITHMS IN NETWORKS:** computation of shortest path for one source-one destination and one source –all destination.
4. **SIMULATION OF NETWORK PROTOCOLS:**
   (i) Simulation of M/M/1 and M/M/1/N queues.
   (ii) Simulation of pure and slotted ALOHA.
   (iii) Simulation of link state routing algorithm.
5. **Case study : on LAN Training kit**
   (i) Observe the behavior & measure the throughput of reliable data transfer protocols under various Bit error rates for following DLL layer protocols-
      a. Stop & Wait
      b. Sliding Window : Go-Back-N and Selective Repeat
   (ii) Observe the behavior & measure the throughput under various network load conditions for following MAC layer Protocols
      a. Aloha
      b. CSMA, CSMA/CD & CSMA/CA
      c. Token Bus & Token Ring
6. **DEVELOPMENT OF CLIENT SERVER APPLICATION:**
   (i) Develop ‘telnet’ client and server which uses port other than 23.
   (ii) Write a finger application which prints all available information for five users currently logged on and are using the network for longest duration. Print the information in ascending order of time.

8EC6 INDUSTRIAL ECONOMICS & MANAGEMENT

UNIT 1 : Organizational forms, Profit maximization and other objectives of industrial firms, Theory of profitability, Economies of scale.
Financing of Industries- Need and sources of finance, Role of special financial institutions, Investment criteria-NPV, IRR.
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: Management – Principles of management, functions-planning, Organization staffing, Directing, Controlling, Coordination, Decision making.
UNIT 4 : Production Management – Total quality management, JIT, Quality circle, Quality-ISO9000, ISO14000, KANBAN, Bench marking, Effective communication.
UNIT 5: Labour Legislations.

8EC7 VLSI & Optical fiber LAB

PART-I

Schematic design and make Device Level Layout of following circuits.

1. BJT/FET Amplifier in various configuration..
2. Counters, Shift Registers & Sequence Decoders.
3. Various circuits with Op-Amp.

PART-II

Design of following ckt using appropriate software like VHDL/ FPGA.

4. 3-input NAND gate.
5. Half adder.
6. D-Latch.
7. Serial in-serial out shift register.

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 of laser diode and light emitting diode.

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