GOA UNIVERSITY

SECOND YEAR OF BACHELOR'S DEGREE COURSE IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING (REVISED COURSE-2007) SCHEME OF INSTRUCTION AND EXAMINATION

SEMESTER III,

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur (Hrs)	Marks				
		L	T	P		Th.	S	P	O	Total
3.1	Applied Mathematics-III	4	0	-	3	100	25	-	-	125
3.2	Digital System Design	4	0	2	3	100	25	50	-	175
3.3	Network Analysis and Synthesis	3	1	2	3	100	25	-		125
3.4	Electronic Devices and Circuits	3	1	2	3	100	25	50		175
3.5	Managerial Economics	4	0	-	3	100	25	-	-	125
3.6	Computer Oriented Numerical Techniques	4	0	2	3	100	25	-	-	125
	Total	**22**	**2**	**8**		**600**	**150**	**100**		**850**

L – Lectures, T-Tutorials, P-Practicals.
Th. Dur. – Duration of Theory Paper
Th – Theory, S – Sessional, P– Practical, O – Oral.

SEMESTER IV,

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur (Hrs)	Marks				
		L	T	P		Th.	S	P	O	Total
4.1	Applied Mathematics-IV	4	0	-	3	100	25	-	-	125
4.2	Signals and Systems	3	1	2	3	100	25	-	50	175
4.3	Electrical Technology	4	0	2	3	100	25	-		125
4.4	Electro magnetic Fields and Waves	3	1	-	3	100	25	-	-	125
4.5	Linear Integrated circuits	4	0	2	3	100	25	50	-	175
4.6	Data structures using C^{++}	4	0	2	3	100	25	-	-	125
	Total	**22**	**2**	**8**		**600**	**150**	**50**	**50**	**850**

L – Lectures, T-Tutorials, P-Practicals.
Th. Dur. – Duration of Theory Paper
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3.1 APPLIED MATHEMATICS III

MODULE I

Matrices: Types of matrices, Determinant, adjoint, inverse of matrix, elementary transformation, (2Hrs)
Elementary matrices, Rank of matrix, Reduction to normal form, canonical form. (3Hrs)
Rank using elementary transformation, Linear independence end dependence. (2Hrs)
System of the form AX=0 and AX=B, their solutions. (3Hrs)

MODULE II

Eigen values, Eigen vectors with properties. (2Hrs)
Cayley Hamilton theorem with Applications. Minimal polynomial, Diagonalisation. (3Hrs)
Fourier Series: Fourier Series, Fourier series of Periodic functions, Trigonometric Series, Euler's formulas, Dirichlets condition, Even and Odd functions, Half range series, Parseval's Identity. (5Hrs)

MODULE III

Laplace Transforms: Definition, Existence condition, Properties, (3Hrs)
Inverse Laplace Transform. Laplace Transform of periodic functions, Convolution theorem, Laplace Transform of Dirac-Delta function. (5Hrs)
Applications of Laplace Transform in solving linear differential equations with initial conditions and system of linear simultaneous differential equations. (2Hrs)

MODULE IV

Fourier Transforms: Properties, Inverse Fourier Transform, convolution, Applications. (5Hrs)
Z- Transforms: Properties, inverse, convolution and applications to deference equations. Wave equation-derivation and solution using separation of variable method. (5Hrs)

TEXT BOOKS:

1. Higher Engineering Mathematics by B.S.Grewal, Khanna Publications
2. Advanced Engineering Mathematics: Erusing Kreyszig, New International Ltd

REFERENCE BOOKS:

1. Theory and Problems of Matrices: Fraank Ayres, Schaum Outline Series
2. Signals and DSP: Xavier, S. Chand Publication
3. Matrix and Linear Algebra: Datta K.B., PHI
4. Engineering Mathematics Vol III: Kandasamy P, S. Chand & Co.
5. Advanced Engineering Mathematics: H. K. Dass, S. Chand

3.2 DIGITAL SYSTEM DESIGN

MODULE I

Number Systems & Codes:
Decimal, Binary, Hexadecimal, Octal systems; Interconversions, Signed & Unsigned Binary numbers, Complements, Binary Arithmetic: Addition & Subtraction using 1's & 2's complements; 2 hours

Binary Codes-Decimal codes (BCD, Excess-3, 8421, 2421), Error Detection codes (Parity generation & Detection), Reflected code, Alphanumeric codes (EBCDIC, ASCII), Study of Binary logic with logic gates. 2 hours

Boolean Algebra:
Postulates & Theorems, Boolean functions and their Algebraic manipulation, Canonical & Standard forms, Minterms & Maxterms, 3 hours
Simplification of Boolean functions: K-maps, POS & SOP simplification and their interconversions, NAND & NOR implementation, Plotting & Reading of K-map using VEM. 3 hours

MODULE II

Combinational Logic:
Design Procedure for Combinational logic circuits, Design & Analysis of Adder, Subtractor, Code Conversion, 2 hours
binary Parallel Adder, Look-ahead Carry generator, Decimal Adder (BCD Adder), Magnitude Comparator, Decoders, 2 hours
Combinational logic implementation, Demultiplexers, Encoders, Multiplexers, Boolean function implementation with multiplexers. 2 hours

Flip-flops: Basic flip-flop circuit, Clocked RS flip-flop, D flip-flop, JK flip-flop, T flip-flop, Triggering of flip-flops, Master Slave flip-flop, Edge triggered flip-flops: their schematic symbols, truth table & Excitation table. 4 hours

MODULE III

Sequential Circuits: Design procedure for sequential circuits using state diagrams, 1 hour
state table, state equations, state reduction and assignment, Circuit implementation, 2 hours
Moore & Mealy Machine. 1 hour
Design and analysis of counters, Modulo Counters, Synchronous, Ripple and ring counters (Switch tail, Johnson), Application of counters, Timing Sequences, Word time generation, timing signals. 3 hours
Registers: SISO, SIPO, PISO, PIPO, Register with parallel load, Shift registers, Bidirectional shift register with parallel load. 3 hours

MODULE IV

Digital Logic families:
Characteristics of Digital ICs, RTL, DTL, 2 hours
TTL-Operation of TTL NAND gate, Active pull-up, Open Collector output, Wired AND, three state (or tri-state) output, Schottky TTL,
ECL, I^2L. 4 hours
Characteristics of MOSFET's, CMOS Inverter, NAND and NOR, CMOS to TTL and TTL to CMOS interfacing. 1 hours
Noise Considerations: Types of Noise and Control methods, Shielding, Grounding and Decoupling, Crosstalk. (Refer Reference book:5) 1 hour

Memories:-Memory organization and operation: Write operation, read operation. Expanding memory size: Expanding Word size, Expanding Word Capacity, Basic concepts of RAM, ROM. 2 hours

TEXT BOOKS:

1. M. Morris Mano, Digital Logic and Computer Design.-PHI
2. Tocci, Digital Systems-Principles & Applications-PHI

REFERENCE BOOKS:

1. William Fletcher, An Engineering Approach to Digital Design-PHI
2. M. Morris Mano, Digital Design-PHI
3. Malvino & Leach, Digital Principles & Applications-Tata McGraw-Hill
4. Thomas Floyd, Digital Fundamentals-UBS Publishers & Distributors
5. Designing with TTL integrated circuits by Robert Morris & John Miller

3.3 NETWORK ANALYSIS AND SYNTHESIS

MODULE I

Network classification: Distributed and lumped, passive and active, time variable and time invariant, symmetrical and asymmetrical networks. Network analysis: Mesh and nodal analysis; super-node and super-mesh analysis 3Hrs

T-Pi and Pi-T, conversions, Network theorems: Review of Thevenin's, Norton's, Superposition, Millman's Theorem 4Hrs

Compensation,Reciprocity Tellgen's, Substitution, Superposition and Maximum power transfer Theorems. 3 Hrs

MODULE II

Graph theory: Basic definitions, matrices associated with networks graphs: Incidence, Cutset, Tieset Matrices and Duality. Applications to Mesh & Nodal Analysis**.** 4Hrs

Time-Domain Analysis: Network equations in time-domain, first and second-order circuits, initial conditions, analysis of transient and steady state response to step, ramp, impulse and sinusoidal inputs. 3Hrs

Application of Laplace Transform to analysis of networks for different inputs (impulse, step, ramp and sinusoidal) 3Hrs

MODULE III

Resonance: Series resonance- Band Width, selectivity and Q-factor of resonance circuits. 3Hrs

parallel resonance- Band Width, selectivity and Q-factor of resonance circuits**.** 3Hrs

Two port networks: Characterisation in terms of Z, Y, H and ABCD parameters, Equivalent circuits, inter-relationship between the two port parameters; Input, output, characteristic impedance and image impedances of two ports**.** 4Hrs

MODULE IV

Attenuators and filters: Symmetrical and unsymmetrical, balanced and unbalanced attenuators; analysis and design of T, Pi, Lattice and Bridged-T attenuator. Types of filters-Low pass, high pass, band pass and band elimination filter. 4Hrs

Basics of Butterworth, Chebyshev, Inverse Chebyshev and Elleptic approximations. 3Hrs

Elements of network synthesis: Positive-real functions, Reactance functions, RL and RC functions (Foster method and Caver Method**)** 3Hrs

TEXT BOOKS:

1. Franklin F. Chuo, Network Analysis And Synthesis, Wiley Eastern
2. Circuits and networks – Sudhakar & Shyamohan
3. Networks & Systems – Roy Choudhary

REFERENCE BOOKS:

1. N. Balabanian, T.A. Bichkart and Sundaran Seshu- Electric Network Theory, Wiley &sons
2. L. O. Chau, C.A. Desoer and E.S. Kuyh, Linear and Non-linear Circuits, McGraw Hill International,1987
3. M.E. Vanvalkenbarg, Network Analysis, Prentice (I) Ltd.
4. L.O Chau, C.A. Desoer, E.S Kuh, Linear and Nonlinear Circuits, McGraw Hill International edition,.1987

3.4 ELECTRONIC DEVICES & CIRCUITS

MODULE I

Filters: Design of C, L and LC types. Zener Voltage Regulators: 2 hrs
Modeling of BJT: h-parameter and re model for all biasing circuits, Miller's theorem. 3 hrs
Multistage amplifiers-direct, RC-coupled and transformer coupled, Darlington pair, Cascade, Cascode. 3hrs
Large signal amplifiers: Class A,B,C,D (derivation for efficiency), complementary symmetry and push-pull amplifiers. 2 hrs

MODULE II

Steady state response of RC differentiator & integrating circuits to square wave, BJT as a switch, Junction & Diffusion Capacitance of a BJT , Improving switching times, 3hrs
Analysis & Design of Basic BJT Monostable Multivibrator, 2hrs
BJT Bistable Multivibrator, 1hrs
BJT Astable Multivibrator, 1hrs
and BJT Schmitt trigger. 1hrs
Sampling gates: UJT, JFET and MOSFET Sampling gate, Sample & Hold circuits. Transistor bootstrap ramp generator. 2hrs

MODULE III

Principle of negative feedback in electronic circuits, Voltage series, Voltage shunt, current series, current shunt types of negative feedback, 2hrs
Typical transistor circuits effects of negative feedback on input & output impedance, voltage & current gains, Bandwidth, Noise & Distortion. 3hrs
Principle of positive feedback, concept of stability in electronic circuits, Barkhausen criteria for oscillations, 1hr
various types of oscillators-RC, Clapps, Wein Bridge, Colpitt, Hartley, Tuned LC, 3 hrs
UJT Relaxation oscillator, Crystal Oscillators (Working and Derivation of frequency of oscillation) 1hr

MODULE IV

Intrinsic & Extrinsic Semiconductors, types of doping & its effect on properties of Semiconductors, Diffusion, Mass-action law, Graded Semiconductors. 2hrs
Conduction mechanism in Semiconductors, Carrier density and conductivity of intrinsic Semiconductors, Drift & Diffusion currents, hall effect, Continuity equation, Qualitative treatment of pn junction diode. 3 hrs
Superconductivity: Meissner effect, Single particle tunneling, Josephson Superconductor. 2 hrs
Introduction to MEMS: Materials, Application ; Introduction to Nanotechnology: Materials, Application. 3hrs

TEXT BOOKS :

1. Electronic Devices and circuits – Millman and Halkias – McGraw Hill Publications
2. Solid State Electronic Devices – B.G. Streetman - PHI

REFERENCE BOOKS:

1. Physics of Semiconductor Devices by S.M.Sze - Wiley Publication
2. Electronic Devices & Linear circuits by Garud & Jain. (Tata McGraw Hill)
3. Electronic Devices and Circuit Theory – Robert Boylestead and Louis Nashelsky – PHI Publications
4. Solid State Pulse Circuits by David Bell.
5. Electronic Devices and Circuits – Allen Mottershed – PHI Publications

6. Electrical Engineering materials – A.J. Dekkar – PHI
7. Introduction to Solid State physics by Charles Kittel.- Wiley Publication
8. Nanoelectronics & Nanosystems by Glosekotter-Denstube
9. Tai-Ran Hsu, MEMS & Microsystems: Design and Manufacture. McGraw Hill, New York, 2002.
10. Nadim Maluf, An Introduction to Microelectromechanical Systems Engineering, Artech House, 2000.

3.5 Managerial Economics

MODULE I

Introduction and general concepts :Demand and supply – Demand curve, Equilibrium, Aggregate Supply and Demand. 2 hrs

National Income terms-GDP, Real v/s Nominal GDP, Net Domestic Product, GNP, National Income, Per capita income, Disposable Income,Price Index, 2 hrs

Inflation 1 hrs

Exchange Rates – Pure, flexible, Terminology for Exchange rate changes, Forex market, Exchange rate systems. 2 hrs

Individual, firm and Market Demand and Supply, Price, Income and Cross Elasticity Applications of Elasticity, Estimation/forecasting of Demand. 2 hrs

Pricing of multiple Products, Price Discrimination, Cost plus pricing, Market driven pricing decisions 1 hr

MODULE II

Costing And Financial Analysis: Break even Analysis, Basic Concepts-Contribution Cost, Break-even Volume, break-even revenue. 2 hrs

Preparation of Income statement, Balance sheet, fund Flow statement, 2 hrs

Understanding and analyzing them using financial ratios. Ratio Analysis Liquidity, Leverage and Profitability ratios 2 hrs

Working Capital Management-Determinants of working capital, Financing of working Capital, Dangers of Excessive and shortage of working Capital. 1 hr

Inviting investment proposals, Selection of project proposals. Capital Rationing, different Methods of Evaluation of Project-Payback Period Accounting rate of return. Discounted cash Flow Methods – Net Present Value, Internal Rate of return, Profitability Index, 2 hrs

Sources of funds for Business-Share capital, Debentures, Loans 1 hr

MODULE III

General Principles Of Management: Different schools of Management, effectiveness, efficiency, Productivity, functions of Managers, 2 hr

Planning, Types of plans.Nature of Objectives, MBO, Merits and Demerits of MBO.Organisation, Purpose, Span of management, 2 hrs

Departmentation, Structure of Organisation, O. D. Process, Organisational culture, values. Matrix Organisation, Unity of command, SBU, line and staff function, 3 hrs

Decentralization, Advantages, Limitations, Marketing Mix, Advertisement, Sale Promotion, Sales Management and Training, Market Research –Tools, Methods, Analysis 3 hrs

MODULE IV

Managing People: Motivation, Theories of Motivation, Maslow's Theory of Needs, Herzberg's Theory, Vroom's expectancy theory, Managing Creative Staff. 2 hrs

Leadership, leadership styles and behaviors. Human Resource Management, Staffing, Skills needed by Mangers, Recruitment and Selection, Appraisal Methods, 4 hrs

Nature of Communication, Basic communication Process, Barriers in Communication, Guidelines for improved communication, Informal and formal communication, Principles of Effective communication 2 hrs

Controlling, steps in Basic control process, Importance of Standards. 2 hr

TEXT BOOKS :

1. Varshney &Maheswari, Managerial Economics
2. Koontz, Harold and Weihrich Heinz, Essentials of Management, Tata McGraw Hill, New Delhi, 1998
3. Peterson, Lewis, Managerial Economics, Prentice-Hall

REFERENCE BOOKS:

1. Samuelson P.A., Economics, McGraw – Hill, 1998
2. Stoner, James, Freeman, Edward R. and Gilbert, Daniel R., Management, Prentice Hall, New Delhi, 1999
3. Hicks, Phillip E., Industrial Engineering and Management, McGraw Hill, New York,2994
4. Riggs, Bedworth, Randhawa, engineering Economics, Tata McGraw Hill.
5. Sepulveda, Schaum's Outlines.
6. Homgren, Datar, foster, Cost Accounting, Prentice – Hall.
7. Nellis, Parker, Essence of Business Economics

3.6 COMPUTER ORIENTED NUMERICAL TECHNIQUES

MODULE I

Errors and Approximations: introduction, sources of errors, problems in computations, safeguards against errors,floating point arithmetic, absolute error, relative error, percentage error- calculations. 3 hrs
Forward and backward differences, Newton's interpolation formula (Forward and backward) 3 hrs
Lagrange's Interpolation, Newton's Dividend difference interpolation formula. Cubic spline interpolation and C programmes for all above methods. 4 hrs

MODULE II

Solution of transcendental and polynomial equations in one variable by using Newton Raphson method, Regula Falsi method 3 hrs
Bisection method and Secant method 3 hrs
C programmes for all above methods. 4 hrs

MODULE III

Solution of linear equations: Gauss's Elimination, pivoting, computation of matrix inverse using Gauss Elimination, Gauss Jordan methods. 3 hrs
Iterative Algorithms – Jacobi and Gauss Seidal methods, Eigen values and Eigen vectors by using power method 3 hrs
C programmes for all above methods. 4 hrs

MODULE IV

Numerical Integration: Trapezoidal rule & Simpson's rule (one third and three eights), Romberg's formula. 3 hrs
Numerical Differentiation: Newton's forward and backward difference formulae. Solutions of ordinary differential equation, Euler's methods, Runge Kutta methods, Predictor Corrector method (Euler's, Milne and Adams Methods) 4 hrs
C programmes for all above methods. 3 hrs

TEXTBOOKS:

1. Numerical Methods – E. Balaguruswamy, TMH.
2. Numerical methods in Engineering & Science Dr. B. S. Grewal - Khanna Publication

REFERENCE BOOKS:

1. Computer Oriented Numerical methods – Rajaraman – PHI
2. Introduction methods of numerical analysis – S. S. Sastry – PHI

4.1 APPLIED MATHEMATICS IV

MODULE I

Bessel's and Legendre's equations and their solutions, (3Hrs)
Bessel's functions of first kind and second kind. Recurrence relations for Bessel's functions of first kind and applications. (2Hrs)
Orthogonality for Bessel's functions and Bessel's Fourier series. (2Hrs)
Generating functions for Bessel's functions. Relation between Laplace equation and Bessel's equation. (3Hrs)

MODULE II

Series solution for Legendre's equation and Legendre's polynomials, (3Hrs)
Recurrence relations for Legendre's polynomials and Orthogonality for Legendre's polynomials. (3Hrs)
Legendre Fourier Series expansion. Relation between Laplace equation and Legendre equation. (4Hrs)

MODULE III

Complex Integration, Cauchy's Integral theorem and its application. (4Hrs)
Integral formula for simply and multiply connected domains and its applications. (2Hrs)
Taylors and Laurents Series and their application. Singular points. (4hrs)

MODULE IV

Liouvilles theorem with applications.Residue theorem and applications. (4 Hrs)
Contour Integration. Boundary value problems. (4Hrs)
Derivation and solution of one dimensional heat equation using separation of variable method. (2hrs)

TEXT BOOKS:

1. Engineering Mathematics by B.S.Grewal
2. Complex Variables and Its applications by Churchill and Brown

REFERENCE BOOKS:

1. Complex Analysis by Schaum Series
2. Special Functions by K.P.Gupta
3. Complex Variables (Theory and Applications): H.S.Kasana, PHI

4.2 SIGNALS AND SYSTEMS

MODULE I

Introduction:
Definitions and concept of different types of signals; continuous time and discrete time signals; transformation of independent variable; exponent ional and sinusoidal signal; unit impulse and unit step functions. 5 hrs
Systems: continuous time and discrete time system and basic system properties. MATLAB programs. Linear time invariant (LTI) systems: Introduction: Discrete time LTI system; the convolution sum; continuous time LTI systems; the convolution integral; properties of LTI systems. MATLAB programs.
5 hrs

MODULE II

Fourier series: introduction; response of LTI system to complex exponential; Fourier series representation of continuous-time periodic signals; convergence of the Fourier series; properties. 5 hours
Fourier series representation of discrete time periodic signals; properties of discrete- time Fourier series MATLAB programs. 5 hrs

MODULE III

Continuous-time Fourier transform: Representation of periodic signals: Fourier transform of periodic signals and their properties; convolution property; multiplication property. MATLAB programs. 3 hrs
Discrete- time Fourier transform: Representation of a periodic signals; Fourier transform for periodic signals; properties; convolution property; multiplication property. 4 hrs

Sampling:
Introduction; representation of continuous time signals by its samples; sampling theorem; reconstruction of a signal from its samples using interpolation; the effects of under sampling; aliasing; Discrete-time processing of continuous-time signals; sampling of discrete- time signals; Mat lab exercises. 3 hrs

MODULE IV

The Laplace transform: introduction; laplace transforms; the region of convergence; inverse lap lace transform; Analysis and characterization of LTI system using the laplace transform. Unilateral laplace transforms. MATLAB programs. 5 hrs

The Z-transform: introduction; Z-transform; the region of convergence; the inverse Z-transform; properties of Z-transform; analysis and characterization of LTI system using Z-transforms. 5 hrs

TEXT BOOKS:

1. Alan V Oppenheim,A.S.Willsky,Signals and systems,PHI

REFERENCE BOOKS:

1. Simon Haykins , Signals and Systems
2. Salivahanan s, Vallavaraj. A.and Gnanapriya c,Digital signal processing,Tata McGraw Hill
3. Nagrath, I.J.sharan,Rajan R.And Kumar,S, Signal and systems,Tata McGraw Hill
4. Ziemer,R.E.Trantor,W.H.and Fannin, D.R.Signal and Systems,Pearson education, Asia.

4.3 ELECTRICAL TECHNOLOGY

MODULE I

DC generator: - Principle, types of generators and EMF equation. 2Hrs

DC motor:- Principle, voltage equation- illustrative examples, torque equation- illustrative examples, motor characteristics, speed control- illustrative examples, losses- illustrative examples, starters- three point starter. 4 Hrs

Three phase induction motors:- Principle, construction, slip- illustrative examples, starting torque- illustrative examples, torque under running condition- illustrative examples, torque slip characteristics, starting- illustrative examples and speed control. 4 Hrs

MODULE II

Single phase induction motors: - working of resistance start, capacitor start, capacitor start capacitor run, permanent capacitor single phase induction motors. 3Hrs

Stepper motors: - operation of permanent magnet stepper motor, variable reluctance stepper motor, hybrid stepper motor. 2Hrs

Synchros: - construction, principle of operation. 2Hrs

Servomotor: - DC servomotor, Two phase AC servomotor. 1Hrs

Drives: - concept of an electric drives, four quadrant diagram of speed torque characteristics, classification and application of drives, braking of DC motors. 2 Hrs

MODULE III

DC potentiometers: - Slide wire potentiometer- illustrative examples, Crompton's potentiometer, applications. 3Hrs

AC potentiometer: - Drysdale's polar potentiometer. 2Hrs

Electrodynamometer type wattmeter: - construction, operation, torque equation. 2Hrs

Energy meter: - construction, working, torque equation- illustrative examples. 2Hrs

Current transformer: - use of CT for current measurement, relationships in a CT- illustrative examples, errors. 1Hrs

MODULE IV

AC bridges: - Maxwell's inductance bridge, Maxwell's inductance capacitance bridge, Hay's bridge, Owen's bridge, Schering's bridge, Wein's bridge-illustrative examples on all above mentioned bridges and Wagner's earthing device. 5Hrs

Illumination: - Definitions, Law of Inverse squares, Lambert's cosine law- illustrative examples. 2Hrs

Electric heating: - principle of resistance heating, high frequency eddy current heating, dielectric heating. 1Hrs

Introduction to power systems: - introduction to generation of electrical energy, hydal power plant, thermal power plant, nuclear power plant.

Typical AC electrical power system. 2 Hrs

TEXT BOOKS:

1. A textbook of electrical technology—B.L. Theraja (Vol II)
2. A Course in electrical and electronics measurements and instruments: - A.K.Sawhney.

REFERENCE BOOKS:

1. Electrical Power: - J.B.Gupta
2. A first course in Electrical Drives: - S.K. Pillai
3. A textbook of electrical technology:-B.L. Theraja (Vol I)

4.4 ELECTROMAGNETIC FIELDS AND WAVES

MODULE I

System of coordinates : 3 Hrs

Cartesian, cylindrical and spherical coordinate system, transformation from cartesian to cylindrical and spherical coordinate system, transformation from cylindrical to spherical coordinates.

Integration of scalar and vector functions : 2 Hrs

Line integrals, surface integral, volume integral.

Differentiation of scalar and vector functions : 4 Hrs

Gradient of a scalar function, gradient in Cartesian, cylindrical and spherical coordinates.

Divergence of a vector field, divergence in Cartesian, cylindrical and spherical coordinates, Divergence theorem

Circulation of a vector field, Curl of a vector in Cartesian,cylindrical and spherical coordinates, Stoke's theorem.

Conservative and non-conservative fields, Helmholtz's theorem

Electrostatics : 1 Hrs

Coulomb's Law, Electric Field Intensity due to point charges and distributed charges.

MODULE II

Electrostatics : 2 Hrs

Electric Flux density, Electric flux, Postulates of the electrostatic field, Gauss's law and its applications, Electric potential: Electrical potential due to point charges and distributed charges.

Energy in electrostatic field : 1 Hrs

Energy due to point and distributed charges.

Boundary value problems : 3 Hrs

Poisson's equations for the electrostatic field, Laplace's equation for the electrostatic field, Solution methods, Uniqueness theorem, Solution by direct integration, Solution by the method of Images.

Interface Conditions : 1 Hrs

Interface conditions between two dielectrics, Interface conditions between dielectrics and conductors.

Capacitance : 1 Hrs

Parallel plate capacitor, Capacitance of infinite structures.

Conduction and Convection current density : 2 Hrs

Convection current and convection current density, Conduction current and Conduction current density, Power dissipation and Joule's law, The continuity equation.

MODULE III

The Static Magnetic Field : 3 Hrs

Magnetic Field, Magnetic Field Intensity, Magnetic Flux Density and Magnetic Flux, Postulates of static Magnetic field, Magnetic Vector potential, Magnetic Scalar potential, Magnetic Dipole

Biot Savart Law, Ampere's circuital Law.

Behaviour of Magnetic Materials, Diamagnetic and Ferromagnetic materials.

Magnetic circuits : 1 Hrs

Magnetomotive force, Magnetic reluctance, Forces in the magnetic field.

Energy stored in the magnetic field: 1Hrs

Magnetostatic energy in terms of fields.

Time varying Electric and Magnetic fields : 2 Hrs

Faraday's Law, Lenz's Law, Electromotive force, Eddy currents.

Maxwell's Equations : 2 Hrs

Continuity equation for time varying fields, Displacement current density, Generalized Ampere's Law, Maxwell's equations in differential, integral and time harmonic representation.

Interface conditions for Electromagnetic Field : 1 Hrs

Interface condition for the electric field, interface condition for the magnetic field.

MODULE IV

Electromagnetic wave equation and its solution: 2 Hrs

Electromagnetic waves, Time dependent wave equation, Time Harmonic Wave Equation, Solution of the wave equation for uniform plane waves in free space , perfect dielectrics.

Poynting's Theorem: 2 Hrs

Poynting vector, Complex Poynting vector, Electromagnetic power density.

Propagation of Plane waves in Materials : 1 Hrs

Propagation of plane waves in lossy dielectrics, low loss dielectrics and conductors, Concept of Phase and Group velocity.

Polarization of Plane Waves : 2 Hrs

Concept of Polarization, Linear, Elliptical and Circular Polarization

Reflection and Transmission of Plane Waves : 3 Hrs

Reflection and Transmission at a General Dielectric Interface with Normal Incidence, Standing Waves, Oblique incidence on a conducting surface with perpendicular polarization and parallel polarization, Brewster's Angle, Total Internal Reflection.

Text books :

1. Engineering Electromagnetics by Nathan Ida, 2nd Edition, Springer International Edition.
2. Elements of Electromagnetics by Mathew Sadiku, 4th edition, Oxford University Press.

Reference Books :

1. Electromagnetics by John D. Kraus,5th Edition, Mcgraw Hill.
2. Theory and Problems in Electromagnetcs by Joseph Edminister, Schaum Series, McGraw Hill
3. Field and Wave Electromagnetics by David K. Cheng, Second Edition, Pearson Education
4. Engineering Electromagnetics by William H. Hayt and John A. Buck, Seventh Edition, Tata McGraw Hill Edition.

4.5 LINEAR INTEGRATED CIRCUITS

MODULE I

Differential Amplifiers (4 types), Derivations, FET diff. amp, constant current bias, current mirror 2Hrs
Op- amps parameters, definitions, Measurements, offset compensation, Functional block diagrams and working specification of IC741, equivalent circuit of Op-amp and transfer curve 2Hrs
Feedback in op-Amp, Frequency response and methods of frequency compensation 1Hrs
Applications of Operational amplifiers (linear amplifiers and filters , Inverting and non inverting amplifiers, Ac & DC Differentiator, Integrator, summing & difference amplifier. 2Hrs
Instrumentation amplifier, voltage follower, V-I & I-V converter,Precision rectifier, Log and antilog amplifier 2Hrs
Design of Active filters such as Butterworth low pass, high pass, band pass, notch filters 1Hrs

MODULE-II

Op-Amps as Comparators, zero crossing detectors, Schmitt trigger, ramp generators, Triangular wave generator. 2Hrs
Analysis of the waveform with SPICE 1Hrs
Oscillators : wein bridge oscillator, phase shift oscillators , design & problems 2Hrs
Voltage regulators.Specifications, functional block diagrams of IC 723, Design of IC 723 as high & low voltage regulators 2Hrs
Specifications, functional block diagrams of IC LH 105 1Hrs
Three terminal regulator IC78XX, 79XX, LM309, LM317, voltage regulator and tracking regulator. 1Hrs
Principles and working of switching mode regulators, applications of switching regulator IC 78540, Universal Switching regulator 1Hrs

MODULE III

Introduction to resolution & accuracy in convertors, quantization error, sample & hold circuit 1Hrs
ADC and DAC: A/D and D/A conversion principles, principle of successive approximation, successive approximation ADC, binary weighted resistors & R-2R resistor ladder (Design & problems) 3 Hrs
Specifications, functional block diagrams, applications of 0809 & 0808 1 Hrs
Phase- Locked loop(PLL)
Basic principles of phase-locked loop and block diagram 1 Hrs
Transfer characteristics of PLL, Lock Range, and Capture range. 1 Hrs
Applications of PLL as frequency multiplier, AM Demodulation, FM demodulation, 2 Hrs
Study of PLL IC 565 and its applications design 1 Hrs

MODULE IV

Op-Amps as bistable, monostable and astable multivibrator 2 Hrs
IC 555: Functional block diagram and specification, Modes of IC555 1Hrs
Applications of IC555 as monostable & astable multivibrator (design) 2Hrs
IC 555: Application as VCO, missing pulse detector, frequency divider, ramp generator, PWM 2 Hrs
Waveforms generating ICs:
Study of IC566, IC 8038 and IC XR2206 and their applications in waveforms generations 3 Hrs

Text Books :

1. Ramakant Gayakwad, Op-Amps and linear integrated circuits, Prentice Hall of India Pvt. Ltd.
2. Botkar, K.R. Integrated Circuits, Khanna Pub.
3. SPICE by Gorden W. Roberts & Adel Sedra, Oxford

Reference Books:

1. Millman And Halkias, integrated electronics: Analog and digital circuits system McGraw Hill Pub.
2. Sergio Franco, Design with operational amplifiers and analog integrated circuits, McGraw Hill.
3. Modern Digital Electronics by R. P. Jain, TMH
4. SPICE by Circuits & Electronics using Pspice by Muhamad H. Rassid, PHI

4.6 DATA STRUCTURES USING C++

MODULE I

Object Oriented Programming: Basic concepts and benefits of OOP, Basic, User defined and derived data types. 2hrs

Reference variables, Arithmetic and logical operators, scope resolution and memory management operators. Expressions and control structures. 4hrs

Functions in C++, Classes & Objects, Constructors & Destructors. 4hrs

MODULE II

Operator Overloading: Definition, Overloading unary and binary operators, manipulation of strings. 4hrs

Inheritance: derived classes, Types of inheritance, constructors in derived classes, nesting of classes. 3hrs

Pointers: pointers to objects, this pointer, pointers to derived classes. Virtual functions, Templates: Class templates & Function templates. 3hrs

MODULE III

Linked list: Single, Doubly, Circular linked lists. Stacks: as an array and linked list, applications of stacks. 4hrs

Queues: as an array and linked list, Circular, deque. 4hrs

Trees: Traversal of binary tree, BST, operations on BST, Reconstruction of Binary tree.
Heap. 3hrs

MODULE IV

Graphs: Definitions and Terminology, DFS & BFS, Spanning Tree. 4hrs

Searching: Linear search, Binary search. 2hrs

Sorting: Bubble sort, selection sort, Quick sort, Insertion sort, Merge sort, Heap sort, Binary Tree sort. 4hrs

Text Books:

1. Object Oriented Programming with C++ by E. Balagurusamy.
2. Data Structures through C++ by Yeshwant Kanetkar
3. Let Us C++ by Yeshwant Kanetkar

Reference Books:

1. Object Oriented Programming in Turbo C++ by Robert Lafore
2. Schaum Series Programming with C++ by John Hubbard
3. Programming with C++ by Ravichandran
4. C++ Primer by Lippman and Lajoie.
5. Mastering C++ by Venugopal, Rajkumar, Ravishankar
6. Data Structures using C++ by Tenenbaum.