ANNEXURE I

GOA UNIVERSITY

FIRST YEAR OF BACHELOR'S DEGREE COURSE IN ENGINEERING
(Revised in 2007-08)

SCHEME OF INSTRUCTION AND EXAMINATION

SEMESTER I (Common for all branches of Engineering)

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur (Hrs)	Marks				
		L	T	P		Th.	S	P	O	Total
1.1	Applied Mathematics I	4	-	-	3	100	25	-	-	125
1.2	Applied Sciences I (Physics & Chemistry)	4	-	2	3	100	50	-	-	150
1.3	Basic Civil Engineering and Engineering Mechanics.	4	-	2	3	100	25	-	-	125
1.4	Basic Electrical Engineering	3	-	2	3	100	25	-	-	125
1.5	Engineering Graphics	2	-	4	4	100	50	-	-	150
1.6	Communication Skills	3	-	-	3	100	25	-	-	125
1.7	Workshop Practice - I	-	-	4	-	-	50	-	-	50
	TOTAL	**20**		**14**	**-**	**600**	**250**	**-**	**-**	**850**

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

FIRST YEAR OF BACHELOR'S DEGREE COURSE IN ENGINEERING
(Revised in 2007-08)

SCHEME OF INSTRUCTION AND EXAMINATION

SEMESTER II: (Common for all branches of Engineering)

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur (Hrs)	Marks				
		L	T	P		Th.	S	P	O	Total
2.1	Applied Mathematics II	4	-	-	3	100	25	-	-	125
2.2	Applied Sciences II (Physics & Chemistry)	4	-	2	3	100	50	-	-	150
2.3	Information Technology	4	-	2	3	100	25	-	-	125
2.4	Basic Mechanical Engineering	3	-	2	3	100	25	-	-	125
2.5	Basic Electronic Engineering	3	-	2	3	100	25	-	-	125
2.6	Environmental and Social Sciences	4	-	-	3	100	50	-	-	150
2.7	Workshop Practice II Modern	-	-	4	-	-	50	-	-	50
	TOTAL	**22**	**-**	**12**	**-**	**600**	**250**	**-**	**-**	**850**

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

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.

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

SEMESTER IV

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur	Marks				
		L	T	P	(Hrs)	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**	**100**	**50**	**850**

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

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

SEMESTER V

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur (Hrs)	Marks				
		L	T	P		Th.	S	P	O	Total
5.1	Probability Theory and Random Processes	4	0	-	3	100	25	-	-	125
5.2	Control System Engineering	4	0	2	3	100	25	-	-	125
5.3	Communication Engineering - I	4	0	2	3	100	25	-	50	175
5.4	Microprocessors	4	0	2	3	100	25	-	50	175
5.5	Digital Signal Processing	4	0	2	3	100	25	-	-	125
5.6	Transmission Lines and Waveguides	4	0	-	3	100	25	-	-	125
	TOTAL	**24**	**0**	**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.

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

SEMESTER VI

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur (Hrs)	Marks				
		L	T	P		Th.	S	P	O	Total
6.1	Communication Engineering -II	4	0	0	3	100	25	-	50	175
6.2	Peripheral Devices and Interfacing	4	0	2	3	100	25	-	-	125
6.3	Power Electronics	4	0	2	3	100	25	-	-	125
6.4	Antenna and Wave Propagation	4	0	0	3	100	25	-	-	125
6.5	Electronic Instrumentation	4	0	2	3	100	25	-	-	125
6.6	VLSI Technology and Design	4	0	2	3	100	25	-	50	175
	TOTAL	**24**	**0**	**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.

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

SEMESTER VII

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur (Hrs)	Marks				
		L	T	P		Th.	S	P	O	Total
7.1	Data Communication	4	0	2	3	100	25	-	50	175
7.2	Microwave and Radar Engineering	4	0	2	3	100	25	-	50	175
7.3	Optical Fiber Communication	4	0	2	3	100	25	-	-	125
7.4	Elective - I	4	0	2	3	100	25	-	50	175
7.5	Elective-II	4	0	0	3	100	25	-	-	125
7.6	Project Seminar	0	0	4	-	-	25	-	50*	75
	TOTAL	**20**	**0**	**12**	**-**	**500**	**150**	**-**	**200**	**850**

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

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

SEMESTER VIII

Sub code	Subjects	Scheme Of Instruction Hrs/Week			Scheme Of Examination					
					Th. Dur (Hrs)	Marks				
		L	T	P		Th.	S	P	O	Total
8.1	Satellite & Television Engineering	4	0	2	3	100	25	-	50	175
8.2	Elective - III	4	0	2	3	100	25	-	50	175
8.3	Elective - IV	4	0	2	3	100	25	-	50	175
8.4	Wireless Communications	4	0	0	3	100	25	-	50	175
8.5	Project	0	0	10	-	-	50	-	100**	150
	TOTAL	**16**	**0**	**16**	**-**	**400**	**150**	**-**	**300**	**850**

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

Elective	**Subject Code**	**Subject Name**
I	7.4.1	Embedded Systems
	7.4.2	Operating Systems
	7.4.3	Hardware Description Language
	7.4.4	Virtual Instrumentation
	7.4.5	Wavelets and Multirate Digital Signal Processing
	7.4.6	Electronic Circuits: Design, Simulation and Testing
	7.4.7	Introduction to Java and J2EE
	7.4.8	Optical Computing
	7.4.9	Process Control Instrumentation
II	7.5.1	Mobile Communication Systems
	7.5.2	Artificial Neural Network
	7.5.3	Secure Communications
	7.5.4	Nanoelectronics
	7.5.5	Optical Networking
	7.5.6	Adaptive Signal Processing
III	8.2.1	Consumer Electronics
	8.2.2	Speech Signal Processing
	8.2.3	Mobile Computing
	8.2.4	Introduction to Robotics
	8.2.5	ASIC Design and FPGA
	8.2.6	Microwave Networks and Applications
	8.2.7	Error Control Coding
IV	8.3.1	E-Commerce
	8.3.2	Bio-medical Electronics and Instrumentation
	8.3.3	Digital Image Processing
	8.3.4	Electromagnetic Interference/Electromagnetic Compatibility
	8.3.5	Ad-hoc Wireless Networks
	8.3.6	Global System for Mobile Communication
	8.3.7	Mobile Phone Programming

ANNEXURE II

1.1 APPLIED MATHEMATICS-I

1. Total no. of lectures per week	: 04 hours
2. Duration of the semester end examination	: 03 hours
3. Maximum marks for semester end examination	: 100
4. Maximum marks for internal assessment	: 25
5. Total marks	: 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of these 8 questions, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

1. **Beta and Gamma functions:** Various forms and properties, relation between Beta and Gamma functions, Legendre's duplication formula, Error function.

2. **Infinite sequence and Infinite series**: Convergence and Divergence of sequences and series, tests for Convergence and Divergence of infinite series such as Integral test, Comparison test, D' Alemberts ratio test, Cauchy's root test and Leibnitz test for Alternating series, Power series and Radius of Convergence.

MODULE II

Complex variables: Complex numbers and their properties, Modulus and Argument of Complex number, Polar and Exponential form of Complex number, Geometric interpretation of Complex numbers, De Moivre's theorem and its applications, Exponential, Trigonometric, Hyperbolic and Logarithmic functions, Inverse Trigonometric and Hyperbolic functions, Continuity, Differentiability and Analytic functions. Cauchy-Reiman equations, Harmonic functions.

MODULE III

Differential Calculus: Leibnitz theorem, Taylor's theorem (without proof), Taylor's and Maclaurin's series expansion, Indeterminate forms, Partial Differentiation, Total Differentiation.

MODULE IV

Partial differential Equations and Extreme Values of Functions : Formation of first order Partial Differential Equations, Methods to solve first order Partial Differential Equations, Euler's theorem on Homogenous functions, Extreme values of functions of two and three variables, Langrange's method of Undetermined Multipliers.

Textbooks:

1. Applied mathematics-P.N.Wartikar and J.N.Wartikar Vol- I and Vol II

References:

1. Advanced Engineering Mathematics-Erwin Kreysig.
2. Applied Mathematics: Ch. V. Ramana Murthy and N. C. Srinivas
3. Higher Engineering Mathematics: Dr. B. S. Grewal

1.2 APPLIED SCIENCES-I

1. Total no of Lectures per Week : 04 hours
2. Practicals per week : 02 hours
3. Duration of semester end examination : 03 hours
4. Max. marks for Semester end Examination : 100
5. Max marks for internal assessment : 50
6. Total Marks : 150
7. No. of Sections : 02

The question paper will consist of 8 questions divided into two sections, Total of 4 questions are to be attempted, answering 1 question from each module, each question will carry 25 marks. There shall be 2 questions from each module.

SECTION – I (APPLIED PHYSICS)

MODULE – I

INTERFERENCE OF LIGHT:
Interference based on division of amplitude, phase change at reflection, geometric and optical path, Interference due to reflected and transmitted light in thin parallel films, Interference in wedge shaped film, Newton's rings for reflected and transmitted light. Determination of radius of curvature of plano-convex lens, wavelength of light used and refractive index of liquid. Applications of interference, optical flatness, Antireflection films–amplitude and phase conditions, Derivation of formula $\mu_f = \sqrt{\mu_g}$, $\mu_f t = \lambda/4$ (10hrs)

SEMICONDUCTORS:
Mobility, drift velocity, conductivity of charge carriers, generation and recombination of charges, Diffusion, Continuity equation, Hall effect
(5hrs)

MODULE – II

ULTRASONICS:
Production of ultrasonic waves, magnetostriction, Piezo-electric oscillator, detection of ultrasonic waves, properties, cavitation, Applications of ultrasonics in various fields. Measurement of wavelength, velocity by means of acoustic diffraction grating. (7hrs)

ELECTRON BALLISTICS: Electrostatic and Magnetic focusing, CRO and applications. (6hrs)

PARTICLE DETECTORS: Ionisation chamber and GM counter (2 hrs)

SECTION – II (APPLIED CHEMISTRY)

MODULE – III

1. **ELECTROCHEMICAL ENERGY SYSTEMS**

Single electrode potential, Definition, Sign conventions. Derivation of Nernst equation. Standard electrode potential, Definition, Construction of Galvanic Cell – classification, representation, emf of an electrochemical cell. Concentration cells. Reference electrodes, Calomel electrode, Ag/AgCl electrode. Numerical problems on electrode potential and emf. Ion-selective electrode, glass electrode, determination of pH using glass electrode.

(8 Hrs)

2. **CONVERSION AND STORAGE OF ELECTROCHEMICAL ENERGY**

Battery Technology – Batteries – Basic Concepts, battery characteristics, classification of batteries. Construction working and applications of Zn – air, Nickel – Metal hydride and Lithium – MnO_2 batteries.

Fuel cells: Introduction, types of fuel cells – Alkaline, phosphoric acid and Molten Carbonate fuel cells. Solid polymer electrolyte and solid oxide fuel cells, construction and working of $H_2 – O_2$ and Methanol – Oxygen fuel cell. (7 Hrs)

MODULE IV

1. **CORROSION SCIENCE**

Corrosion: - Definition, chemical corrosion and Electrochemical theory of corrosion.

Types of corrosion, Differential metal corrosion, Differential aeration corrosion (pitting and waterline corrosion), Stress corrosion. Factors affecting the rate of corrosion.

Corrosion control: - Inorganic coatings – Anodizing and phosphating, metal coatings – Galvanization and Tinning, corrosion inhibitors, cathodic and anodic protection.

(8 Hrs)

2. **METAL FINISHING**

Technological importance of metal finishing. Significance of polarization, decomposition potential and overvoltage in electroplating processes, effect of plating variables on the nature of electrodeposit, surface preparation and electroplating of Cr and Au.

Electroless plating:-

Distinction between electroplating and electroless plating, advantages of electroless plating. Electroless plating of Copper on PCB and Nickel.

(7 Hrs)

EXPERIMENTS IN APPLIED PHYSICS

1. Newton's Rings
2. Air-Wedge
3. Zener diode characteristics
4. Voltage regulator
5. Rectifiers
6. Use of CRO

NOTE: Minimum of 4 experiments have to be completed per semester.

EXPERIMENTS IN APPLIED CHEMISTRY

1. Conductometric estimation of an acid using standard NaOH solution.
2. Determination of pKa of a weak acid using pH meter.
3. Determination of viscosity of oil using Redwood viscometer.
4. Determination of viscosity coefficient of a given liquid using Ostwald's viscometer.
5. Colorimetric determination of copper.
6. Flame photometric estimation of sodium in the given water sample.

Reference

1. Vogels text book of quantitative inorganic analysis, revised by J. Bassett, R. C. Denny, G.H. Jeffary, 4th Ed.
2. Practical Engineering Chemistry by Sunita & Ratan.

APPLIED PHYSICS

Text books

1. Applied Physics – V R Doiphode
2. Engineering Physics – Uma Mukherji
3. Applied Physics – Patgaonkar

Reference books

1. Engineering Physics – Gaur And Gupta
2. Engineering Physics – M.N. Avadhanulu P.G. Kshirsagar
3. Engineering Physics – A.S.Vasudev

APPLIED CHEMISTRY

Text Books

1. A text book of Engineering chemistry by Jain and Jain Dhanapatrai Publications, New Delhi.
2. Engineering chemistry by M. M. Uppal, Khanna Publishers, Sixth Edition, 2001.

Reference books

1. Principles of Physical chemistry B. R. Puri, L. R. Sharma & M. S. Pathama, S. Nagin Chand & Co.
2. Text book of polymer Science by F. W. Billmeyer, John Wiley & sons, 1994
3. Liquid crystals and plastic crystals, Vol –I, edited by G. W. Gray and P. A. Winsor, Ellis Horwood series in Physical chemistry, New York.
4. Corrosion Engineering – by M. G. Fontana, Mc Graw Hill Publications.
5. A text book of Engineering chemistry by S. S. Dara, S. Chand Publications, New edition.

1.3 BASIC CIVIL ENGINEERING & ENGINEERING MECHANICS

1. Total no. of lectures per week	: 04 hours
2. Practicals per week	: 02 hours
3. Duration of the semester end examination	: 03 hours
4. Maximum marks for semester end examination	: 100
5. Maximum marks for internal assessment	: 25
6. Total marks	: 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of these 8 questions, 5 questions are to be attempted, choosing at least one from each module**.**

CIVIL ENGINEERING

MODULE-I

1.3.1 Introduction to Civil Engineering: Scope of different fields of Civil Engineering Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering.

1.3.1.1 MATERIALS
Concrete: Ingredients, mixing, transporting, placing, curing. Grade of concrete, properties of hardened concrete.
Structural Steel: Structural forms of steel,
Advanced materials: FRP, Aluminum, RMC and SCC

1.3.1.2 BUILDING COMPONENTS
Framed and load bearing structures, Components of a building (Sub and Superstructure)

1.3.1.3 ROADS: Type of roads, Components and their functions.

1.3.1.4 BRIDGES: Types of bridges, typical sketches of RCC and Steel bridges.

ENGINEERING MECHANICS

MODULE-II

1.3.2 Introduction to Engineering mechanics: Basic idealizations - Particle, Continuum, Rigid body and Point force; Newton's laws of motion, Definition of force, Introduction to SI units, Elements of a force, Classification of force and force systems; Principle of transmissibility of forces; Moment of a force, couple, moment of a couple, characteristics of couple, Equivalent force - couple system; Resolution of forces, composition of forces; Numerical problems on moment of forces and couples, on equivalent force - couple system.

1.3.2.1 Composition of forces: Definition of Resultant; Composition of coplanar - concurrent force system, Principle of resolved parts; Numerical problems on composition of coplanar concurrent force systems.

Composition of coplanar - non-concurrent force system, Varignon's principle of moments; Numerical problems on composition of coplanar non-concurrent force systems.
Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent force system. Types of supports, statically determinate beams, Numerical problems on equilibrium of coplanar – non – concurrent force system and support reactions for statically determinate beams.

MODULE – III

1.3.2.2 Centroid of plane figures: Locating the centroid of triangle, semicircle, quadrant of a circle using method of integration, centroid of simple built up sections; Numerical problems. Moment of inertia of an area, polar moment of inertia, Radius of gyration, Perpendicular axis theorem and Parallel axis theorem; Moment of Inertia of rectangular, circular and triangular areas from method of integration; Moment of inertia of composite areas; Numerical problems

1.3.2.3 Friction: Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Wedge friction; Ladder friction; Numerical problems.

MODULE – IV

1.3.2.4 D'Alemberts principle, Work energy, Impulse momentum

1.3.2.5 Simple Lifting Machines – Mechanical advantage, velocity ratio and efficiency of machines, law of machines, conditions for machine efficiency, self-locking, study of the following machines- Single-purchase crab, Double-purchase crab, Differential wheel and axle, Differential pulley block, worm and worm wheel, Simple screw jack; Coils and Springs

TEXT BOOKS

1. S.S. Bhavikatti, K. G. Rajashekarappa " Engineering Mechanics", New Age, International (P) Limited
2. T. R. Jagadeesh, M. A. Jayaram, "Elements of Civil Engineering & EngineeringMechanics", Sapna Book House

REFERENCES

1. R. S. Khurmi "A Text Book of Engineering Mechanics", S. Chand &Co.Publishers
2. A.K. Tayal " Engineering Mechanics", Umesh Publications
3. SCHAUM's Outline Series " Engineering Mechanics", McGraw Hill Publishers, New Delhi
4. G. Shanmugham, M. S. Palanchamy, "Basic Civil and Mechanical Engineering", Tata McGRaw Hill Limited
5. Singer, F. L., Engineering Mechanics
6. Timoshenko and Young, Engineering Mechanics
7. Beer and Johnston, Engineering Mechanics, McGraw Hill
8. Shames, I. H., Engineering Mechanics, Prentice Hall Haung, I C., Engineering Mechanics

1.4 BASIC ELECTRICAL ENGINEERING

1. Total no. of lectures per week : 03 Hours
2. Practicals per week : 02 Hours
3. Duration of semester end examination : 03 Hours
4. Maximum marks for semester end examination : 100
5. Maximum marks for internal assessment : 25
6. Total marks : 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of this, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

DC CIRCUITS: Circuit parameters (R, L, and C) definition from circuital, geometrical and energy viewpoint, Ohm's law, Kirchoff's current and voltage law. Series and parallel connection of circuit parameters. Star and delta transformation. Analysis of simple circuits excited by independent voltage sources for power energy, current and voltage. Thevenin's, Norton's and Maximum power transfer theorem. Illustrative examples.

MODULE II

ELECTROMAGNETISM: Concept of magnetic flux and magnetic field. Definition of terms related to magnetic field, flux density, permeability. Amperes law, Faraday's law, Lenz's law their significance and application. Fleming's rules. Electromagnetic induction, statically and dynamically induced emf, self and mutual inductance. Magnetic circuit concept and its analogue with electric circuit. Comparison between electric and magnetic circuits. Coupled circuits, coefficient of coupling. Energy stored in magnetic field. Illustraitve examples covering above topic.

MODULE III

AC CIRCUITS: Generation of sinusoidal AC voltage. Definition of various terms related to AC wave, average value, RMS value, form factor, peak factor. Concept of phasor and representation of AC quantity by phasor. Concept of leading and lagging phase angle. Addition and subtraction of sinusoidal alternating quantity. Definition of real, reactive, apparent power, power factor. Analysis with phasor diagram of circuits with R –L, R-C, R-L-C elements. Illustrative examples.
Three-phase circuits. Representation of three-phase system. Concept of phase sequence, balanced and unbalanced system. Relation between line and phase quantities for star and delta connections. Real reactive and apparent power in three-phase system.

MODULE IV

Principle of operation and construction of a single phase transformer (core and shell type). EMF equation, losses in transformer, efficiency and voltage regulation. Rating of transformer. Illustrative examples on EMF equation, efficiency, regulation current, voltage, turns ratio of transformer. Brief description of open and short circuit test on single-phase transformer.
Measurments: Construction, principle of operation of PMMC and moving iron and dynamometer type of instruments. Methods of measurement of power in three phase circuits, balanced and unbalanced load (no derivation and phasor diagram). Illustrative examples.

TEXT BOOKS

1) Principles of Electrical Engineering By V Del Toro. PHI Publication
2) Electrical and Electronics Technology By Edward Hughes Eighth edition, Pearson Education
3) Fundamentals of Electrical Engineering By Rajendra Prasad PHI Publication.

1.5 ENGINEERING GRAPHICS

1. Total no. of lectures per week	: 02 Hours
2. Practicals per week	: 04 Hours
3. Duration of semester end examination	: 04 hours
4. Maximum marks for semester end examination	: 100
5. Maximum marks for internal assessment	: 50
6. Total marks	: 150

The question paper will consist of 8 questions. There shall be 2 questions from each module. Total of 5 questions are to be attempted, answering 1 question from each module, each question will carry 20 marks**.**

MODULE I

1. Introduction to engineering graphics, different types of lines used in engineering graphics, curves involving conic sections, cycloid and in volute curves.
2. Projections of points, straight lines- when line is parallel to both the planes, parallel to one and perpendicular to other, line inclined to both the principle planes.

MODULE II

1. Projections of planes: circle, square, triangle, rectangle, pentagon, hexagon and combination of these.
2. Projections of solids: cube, tetrahedron, cylinder, cone, pyramid, prism.

MODULE III

1. Sections of solids.
2. Developments of lateral surfaces of the objects like cube, tetrahedron, cylinder, cone, pyramid, prism.

MODULE IV

1. Orthographic projection (using 1^{st} angle projection only) of machine parts and castings etc.
2. Isometric projection.

PRACTICE (Excluded from theory examination):

Introduction to at least one CAD software application limited to orthographic projection and isometric projection (Minimum 04 Hrs exposure).

TEXT BOOKS:

1. Engineering Drawing- N.D.Bhat – Charotar Publishing company.
2. Engineering Drawing- K.R.Gopalkrishna-- Subash Publications.
3. Engineering Drawing - K.R. Mohan – Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Engineering Drawing- P.J.Shah – Vol. 1 & 2 – Praveen Shah Publishers.
2. Engineering Drawing- Luzadeer & Duff - PHI.
3. Engineering Drawing- P.S.Gill – S.K.Kataria & Sons.

1.6 COMMUNICATION SKILLS

1. Total no. of lectures per week : 03 hours
2. Duration of semester end examination : 03 hours
3. Maximum marks for semester end examination : 100
4. Maximum marks for internal assessment : 25
5. Total marks : 125

Internal assessment will include internal tests (written) based on Modules 1 to 3 and an assignment (seminar/presentation) based on the oral component Module 4.
Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of this, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

Language construction

- Grammatical concepts like tenses, active and passive voice, direct and indirect speech, conjunctions, prepositions and prepositional phrases, prefixes and suffixes, degrees of comparison and idioms.
- Transformation of sentences (Affirmative, Negative, Interrogative and Exclamatory), use of 'too', 'no sooner…than', 'not only… but also', 'unless', 'so…that'.
- Correct usage of language and common errors.

Comprehension and vocabulary

- Ability to understand and interpret ideas, vocabulary building, vocabulary expansion, synonyms and antonyms, one-word substitution.
- Technical, scientific and general text with Multiple Choice questions to test analytical skills, comprehension, expression, vocabulary and grammar.

MODULE II

Summarization and Interpretation

- Techniques to summarize a given passage to test comprehension ability to present written matter in a brief and concise manner
- Precis writing.
- Note taking and Note making

Technical communication

- Report writing and Project proposal (in a letter format)
- Technical writing - framing definitions, classification, technical description of objects and process, writing instructions. (topics relevant to the first year engineering syllabus)

MODULE III

- Basic official correspondence (Notices, Minutes of the meeting, Agenda, Invitations, Memos)
- Principles of correspondence, language and style in official letters, formats of letters, claims and adjustments, methods of adjustment.
- Application letter with Curriculum Vitae/ Resume; letters of order, claims and adjustment; letters of enquiry and replies; letters requesting for duplicate marksheets, provisional marksheets, bonafide certificate, change in name etc.

MODULE IV

Oral Expression

- Principles of Effective Communication and Barriers to communication
- Types of Non Verbal Communication
- Good public speaking
- Debates, Elocution,
- Seminars, Presentation skills
- Effective Listening
- Attitudes in Team speaking and Do's and don'ts of Group discussion
- Job Interview – interview techniques, preparing for an interview and conducting an interview.

Text books:

1. Business Correspondence and Report Writing, R. C. Sharma, & Krishna Mohan, Tata McGraw Hill
2. Basic Communication Skills for Technology, Andrea J. Rutherford, Pearson Education Pte. Ltd.

References:

1. Objective English, Edgar and Showick Thorpe, Pearson Education
2. Professional Communications Skills, Pravin S. R. Bhatia & A. M. Sheikh, S. Chand & Company Ltd.
3. Principles and Practice of Business Communication, Rhoda A.Doctor and Aspi H. Doctor, Sheth Publications.

1.7 WORKSHOP PRACTICE – I

1. Practicals per week : 04 Hours
2. Maximum marks for internal assessment : 50

i) **FITTING: -** Demonstration of various tools and equipments used in fitting shop.
Practical: At least one job covering simple fitting practice.

ii) **PLUMBING: -** Demonstration of various tools and equipments used by plumber. Demonstration of various plumbing fittings.
Practical: At least two jobs as follows
1) G. I. Pipe fitting by threading. -------- One Job
2) P.V.C. Pipe fitting. ---------- One Job

iii) **CARPENTRY: -** Demonstration of wood cutting machines, tools and equipments.
Practical: At least two jobs as follows
1) Wooden joint. ---------- One Job
2) Wood turning. ---------- One Job

iv) **FORGING:-** Demonstration of various tools and equipments used in forging shop.
Practical: At least two different jobs covering forging practice.

2.1 APPLIED MATHEMATICS – II

1. Total no. of lectures per week	: 04 hours
2. Duration of the semester end examination	: 03 hours
3. Maximum marks for semester end examination	: 100
4. Maximum marks for internal assessment	: 25
5. Total marks	: 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of these 8 questions, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

1. Differentiation under the Integral sign: Integral with its limit as constant and as a function of the parameter.
2. Curve tracing and Rectification of Plane Curves: Tracing of Plane Curves in two dimensions, Polar and Parametric forms of Plane Curves such as Cardiod, Asteroid, Cycloid, Leminiscate etc., Rectification of Plane Curves in Polar, Cartesian and Parametric form, Vector Differentiation, Curves in space, Tangent, Normal and Binormal vectors, Torsion and Curvature, Serret- Frenet formulas.

MODULE II

Multiple Integrals: Double Integration in Polar and Cartesian co-ordinates, change of order in Double Integration, application of Double Integration to computation of Centre of Gravity; Triple Integration in Cartesian , Spherical and Cylindrical co-ordinate systems, Geometrical interpretation of Triple Integration and applications to surface area and volume.

MODULE III

Vector calculus: Scalar and Vector fields, Directional Derivatives, Divergence and Curl of Vector fields, Gradient of a Scalar field, Line Integrals and their applications, Greens theorem in a Plane, Surface and Volume Integrals, Divergence theorem and Stroke's theorem(both without proof) and their applications.

MODULE IV

Ordinary Differential Equations: First order and first degree Ordinary Differential Equations, Method of separation of variables, Homogeneous and Non- Homogeneous Equations reducible to Homogeneous form, Linear Differential Equations, Bernoulli's Differential Equation, Exact and Non- Exact Differential Equations; higher order Differential Equation with constant coefficients and with right hand side of the form $e^{ax,}$ Sin ax, Cos ax, e^{ax} f(x), x^n f(x) etc., Linear equations with variable coefficients such as Cauchy Equation and Lagrange's Equation, D- operators and Inverse D- operators, method of Variation of Parameters.

Text Books:
1. Applied Mathematics - P.N.Wartikar and J.N.Wartikar Vol- I and Vol-II

References:

1. Vector Calculus: Shanti Narayan
2. Higher Engineering Mathematics: Dr. B. S. Grewal
3. Applied Mathematics: Ch. V. Ramana Murthy and N.C. Srinivas
4. Advanced Engineering Mathematics: Erwin Kreysig

2.2 APPLIED SCIENCES-I

1. Total no of Lectures per Week : 04 hours
2. Practicals per week : 02 hours
3. Durations of Semester end examination : 03 hours
4. Max. marks for Semester end Examination : 100
5. Max marks for internal assessment : 50
6. Total Marks : 150
7. No. of Sections : 2

The question paper will consist of 8 questions divided into two sections, Total of 4 questions are to be attempted, answering 1 question from each module, each question will carry 25 marks. There shall be 2 questions from each module.

SECTION – I (APPLIED PHYSICS)

MODULE – I

LASERS:
Interaction of radiation with matter from quantum mechanical view, Absorption, Spontaneous and stimulated emission of radiation, Active medium, metastable state, population inversion, non–equilibrium state, pumping, Conditions for light amplification, Einstein's theory of stimulated emission, Operating principle of a laser, pumping–schemes, Optical resonator, Properties of laser, He–Ne laser, Ruby Laser, Applications

(9hrs)

FIBRE OPTICS:
Total internal reflection, propagation of light in optical fibre, structure of an optical fibre and fibre cable, acceptance angle and cone, Numerical aperture of an optical fibre, Types of optical fibres, Modes of propagation, single and multimode fibres, frequency or V-number of fibre ,Applications- Fibre optic communication and
Fibrescope (6hrs)

MODULE – II

MODERN PHYSICS:
Compton Effect, wave nature of particle, de Broglie hypothesis, Davison Germer experiment (5 hrs)
X-rays- Continuous and characteristic x-ray spectra , Moseley's law, X-Ray diffraction-Bragg's spectrometer. (5 hrs)
Super conductors-Meissner effect, type-I and II, high Tc superconductors, BCS theory (qualitative analysis only) properties and applications.

SECTION – II (APPLIED CHEMISTRY)

MODULE – III

1. **HIGH POLYMERS**

Definition, classification – Natural and synthetic with examples. Polymerization – definition, types of polymerization – free radical mechanism (ethylene as an example), Methods of polymerization – bulk solution, suspension and emulsion polymerization. Glass transition temperature, structure and property relationship. Compounding of resins, synthesis properties and applications of Teflon, PMMA, polymethane and phenol – formaldehyde resin. Elastomers – Deficiencies of natural rubber and advantages of synthetic rubber. Synthesis and application of Neoprene, Butyl rubber. Adhesives – Manufacture and application of Epoxy resins. Conducting polymers – definition, mechanism of conduction in polyacetylene, structure and applications of conducting polyaniline. (8 Hrs)

2. CHEMICAL ENERGY SOURCES

Introduction to energy: Fuels – definition, classification, importance of hydrocarbon as fuels, calorific value definition, Gross and net calorific values. Determination of calorific value of solid/liquid fuel using bomb calorimeter. Petroleum cracking - fluidized catalytic cracking, Reformation of petrol. Knocking - mechanism octane number, cetane number, prevention of knocking, antiknocking agents, unleaded petrol, synthetic petrol – Berguis process and Fischer Tropsch process, power alcohol.

Solar Energy

Photovoltaic cells – Introduction, definition, importance, working of a PV cell, solar grade silicon, physical and chemical properties of silicon relevant to photovoltaics, production of solar grade (crystalline) silicon and doping of silicon.

(7 Hrs)

MODULE IV

1. WATER TECHNOLOGY

Impurities in water, water analysis – Determination of different constituents in water. Hardness, Alkalinity, chloride, Flouride, Nitrate, Sulphate and dissolved oxygen. Numerical problems on hardness and alkalinity. Biochemical oxygen demand and chemical oxygen demand, Numerical problems on BOD and COD. Sewage treatment. Potable water, purification of water – Flash evaporation, Electro dialysis and Reverse osmosis. Hazardous chemicals with ill effects. (8 Hrs)

2. LIQUID CRYSTALS AND THEIR APPLICATIONS

Introduction, classification. Thermotropic and lyotropic with examples. Types of mesophases, nematic, chiral nematic (cholestric), smectic and columnar. Homologues series (PAA and MBBA), Applications of liquid crystals in display systems.

Instrumental methods of analysis

Theory, Instrumentation and Applications of colorimetry, potentiometry, conductometry. (7 Hrs)

EXPERIMENTS IN APPLIED PHYSICS

1. Thermistor characteristics

2. Hall effect
3. e/m by Thomson method
4. Velocity of Ultrasonic wave
5. Energy gap of a semiconductor
6. Planck's constant by photocell
7. He-Ne Laser/Diode Laser

NOTE: Minimum of 4 experiments have to be completed per semester.

EXPERIMENTS IN APPLIED CHEMISTRY

1. Determination of total hardness of a sample of water using disodium salt of EDTA.
2. Determination of Calcium oxide (CaO) in the given sample of cement by Rapid EDTA method.
3. Determination of percentage of copper in brass using standard sodium thiosulphate solution.
4. Determination of Iron in the given sample of Haematite ore solution using potassium dichromate crystals by external indication method
5. Determination of chemical oxygen demand (COD) of the given industrial waste water sample.
6. Determination of dissolved oxygen in the given sample by winkler method.

Reference

1. Vogels text book of quantitative inorganic analysis, revised by J. Bassett, R. C. Denny, G.H. Jeffary, 4^{th} Ed.
2. Practical Engineering Chemistry by Sunita & Ratan.

APPLIED PHYSICS

Text books

1. Applied Physics – V R Doiphode
2. Engineering Physics – Uma Mukherji
3. Applied Physics – Patgaonkar

Reference books

1. Engineering Physics – Gaur And Gupta
2. Engineering Physics – M.N. Avadhanulu P.G. Kshirsagar
3. Engineering Physics – A.S.Vasudev

APPLIED CHEMISTRY

Text Books

1. A text book of Engineering chemistry by Jain and Jain, Dhanapatrai Publications, New Delhi.
2. Engineering chemistry by M. M. Uppal Khanna Publishers, Sixth Edition, 2001.

Reference books

1. Principles of Physical chemistry B. R. Puri, L. R. Sharma & M. S. Pathama, S. Nagin Chand & Co.
2. Text book of polymer Science by F. W. Billmeyer, John Wiley & sons, 1994
3. Liquid crystals and plastic crystals, Vol –I, edited by G. W. Gray and P. A. Winsor, Ellis Horwood series in Physical chemistry, New York.
4. Corrosion Engineering – by M. G. Fontana, Mc Graw Hill Publications.
5. A text book of Engineering chemistry by S. S. Dara, S. Chand Publications, New edition.

2.3 INFORMATION TECHNOLOGY

1.	Lectures per week	: 4 hours
2.	Practical per week	: 2 hours
3.	Max. Marks for the paper	: 100
4.	Max. Marks for Sessional	: 3 hours
5.	Total no. of modules	: 4
6.	Questions to be drawn from each module	: 2
7.	Min. No. of questions to be answered from each module	: 1
8.	Total no of questions to be answered in the paper	: 5

MODULE I

Introduction to Computer: Specifications of Personal Computer (Pentium Based Computer), Anatomy of digital computer, Memory Units, Auxiliary storage units.
Input devices: Keyboard, mouse
Output Devices: Monitor: characteristics of monitor, Printers: Dot matrix, Inkjet printers

Operating Systems: Functions of an operating system, salient features and elementary operations with DOS, Windows and Linux.

Networks of computers:
Topologies
Network Architecture: Peer to peer, Client-Server architecture
Internet and World Wide Web: Domain Name, IP Address, URL, WWW, Web Browsers.

Email: How Email works, Email names and addresses, Spamming

MODULE II

Database Management System:
Introduction to Database Management System: What is database, Characteristic of data in database, Types of database management systems.

Introduction to Programming languages: Introduction, Machine languages, Assembly languages, High level languages, types of high level languages. Functions of an assembler, interpreter and compilers, Compilation process.

Fundamental algorithms along with their Flow charts:
- Exchange of values of two variables
- Summation of set of numbers
- Factorial Computation
- Fibonacci Series
- Reversing the digits of an Integer

MODULE III

Fundamentals of Programming using C Language:

Overview of C, Constants variables and data types, operators and expressions, data input output, Decision making and looping: If, If-else, while, do-while, for, switch.

MODULE IV

Functions: Function declarations and prototypes, Call by value, Call by reference.

Arrays: Introduction, One dimension array, two dimension array, array initialization, Passing array to a function.

File Input Output Operations: File management in C, Defining opening and closing of files.

Textbooks:

1. Fundamentals of Information technology by Alexis Leon (Module I and II)
2. How to solve it by computers by R.G Dromey(Module II)
3. Programming in ANSI C by Balagurusamy (Module III and IV)
4. Let Us C by Yeshwant Kanetkar (Module IV)

Experiments:

1) Components of PC and Network Components
2) Commands of DOS and Linux
3) Study of MS Word and Powerpoint
4) Study of MS Access and MS Excel
5) C program on Decision control structure
6) C program on Loop control structure
7) C program on Case control structure
8) C program on Functions
9) C program on Arrays
10) C program on Files

2.4 BASIC MECHANICAL ENGINEERING

1. Total no. of lectures per week	: 03 Hours
2. Practicals per week	: 02 Hours
3. Duration of semester end examination	: 03 hours
4. Maximum marks for semester end examination	: 100
5. Maximum marks for internal assessment	: 25
6. Total marks	: 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of this, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

BASICS OF THERMODYNAMICS

Basic concepts of thermodynamics – system, surroundings, property, process, heat and work (concepts only); First law-Non-Flow Energy equation (no proof) with the concept of internal energy and enthalpy; Reversible process - constant volume, constant pressure, isothermal and adiabatic only (restricted to basic calculations of heat and work transfer); First law applied to boiler, turbine, condenser and pump; Second law and degradation of energy, absolute temperature scale (concepts only); Air standard cycle (representation on P-V plane only)- Otto and Diesel cycle only (no derivation)- efficiency –definition, basic calculation

MODULE II

BASICS OF HEAT ENGINES AND REFRIGERATION

Internal Combustion (I.C) Engines: Basics- definition, taxonomy – Spark Ignition & Compression Ignition with two-stroke and four stroke - operating principles with basic parts, Systems - fuel, ignition, lubrication and cooling (elementary description with schematic sketches only)- basic calculations of brake power and specific fuel consumption, introduction to Multi-Point Fuel Injection (MPFI)

Thermal power plant – Working principle using schematic diagram; Steam Engineering – latent heat, dryness fraction (no steam table and Mollier diagram); Vapour power cycle - basic Rankine cycle only (preliminary treatment without numericals)

Refrigeration- Basics, refrigerants, working principle using schematic diagram, domestic refrigerator - tonne of refrigeration (preliminary treatment without numericals)

MODULE III

BASICS OF AUTOMOBILE ENGINEERING

Preamble, Components - basic structure, transmission-working principle of single plate clutch, gear box-construction and working principle of constant mesh gear box, universal joint, propeller shaft, differential - construction and working principle; brake system – lay out for air and power brake systems with working principles; Steering system - lay out for manual and hydraulic steering systems with working principles; Classification of automobiles; Automotive emissions and control – basic concepts only

MODULE IV

INTRODUCTION TO MANUFACTURING ENGINEERING- (BRIEF TREATMENT)

Casting – sand, die, centrifugal; Rolling – flat, shape; Forging-open die, closed die; Extrusion and drawing-hot, cold, impact, hydrostatic; Sheet metal forming processes - bending, tube bending, stretch forming, spinning; Machining processes to produce various shapes-turning, drilling, milling, tapping, grinding, relative motion between work piece and tool for each process; Joining processes-arc welding, laser-beam welding, brazing, soldering, adhesive bonding, mechanical fastening.

Text Books

1. Rathakrishnan E. (2003), Fundamental of Engineering Thermodynamics, Prentice Hall of India Pub., New Delhi.
2. Singh K. (1994), Automobile Engineering, Standard Publishers, New Delhi.
3. Campbell J. S. (1985) Principles of manufacturing materials and processes, Tata McGraw Hill Pub., New Delhi.
4. Palanichamy M.S. (1991), "Basic Civil & Mechanical Engineering", Tata McGraw Hill Pub., New Delhi.

Reference Books

1. Venugopal K. (1997), Basic Mechanical Engineering, Anuradha Publishers, Chennai
2. Crouse. (2004), Automotive mechanics, Tata McGraw Hill Pub., New Delhi.
3. Cengel Y. A., Boles M. A. (2002), Thermodynamics - an Engineering approach, Tata McGraw Hill Pub., New Delhi.
4. Rao P. N. (2001), Manufacturing Technology, Tata McGraw Hill Pub., New Delhi.
5. Kalpakjian S. and Schmid S. R. (2000), Manufacturing Engineering and Technology, Addison Wesley Longman Pub., Singapore

2.5 BASIC ELECTRONIC ENGINEERING

1. Total no. of lectures per week : 03 Hours
2. Practicals per week : 02 Hours
3. Duration of semester end examination : 03 Hours
4. Maximum marks for semester end examination : 100
5. Maximum marks for internal assessment : 25
6. Total marks : 125

Semester end examination is of 100 marks and the question paper consists of 4 modules and 8 questions. Each module carries 2 questions of 20 marks each. Out of this, 5 questions are to be attempted, choosing at least one from each module.

MODULE I

SEMICONDUCTOR DIODES: Ideal Diode; Semiconductor Diode; Resistance Levels; Diode Equivalent Circuits; Transition and Diffusion Capacitance; Effect of temperature; Avalanche Breakdown. DIODE APPLICATIONS: Load Line Analysis; Diode Approximations; Series, Parallel and Series-Parallel Diode Configurations; Half-wave, Full-wave and Bridge Rectifiers; PIV; DC and r.m.s. voltages, Derivation of Ripple Factor, Transformer Utilization Factor; Basic Concept of a Capacitor-filter; Voltage Regulation; Zener diodes ; Clippers; Clampers; Voltage Multiplier Circuits.

MODULE II

BIPOLAR JUNCTION TRANSISTOR(BJT): Transistor Construction; Transistor Operation; Common-Base Configuration; Transistor Amplifying Action; Common-Emitter Configuration; Common-Collector Configuration; Limits of Operation.

DC BIASING: Operating Point; Fixed-Bias Circuit; Emitter-Stabilized Bias Circuit; Voltage-Divider Bias; Transistor Switching Networks; Bias Stabilization (Fixed Bias, Emitter-Bias and Voltage-Divider Bias).

MODULE III

FIELD-EFFECT TRANSISTORS: Construction and Characteristics of JFETs; Transfer Characteristics; Depletion-Type MOSFET; Enhancement-Type MOSFET; CMOS. FET BIASING: (JFETs and Depletion –type FET) -Fixed-Bias, Self-Bias and Voltage-Divider Bias Configurations(both n- and p-channel); Enhancement-Type MOSFETs-Feedback Biasing Arrangement, Voltage –Divider Biasing Arrangement.

MODULE IV

DISCRETE AND IC MANUFACTURING TECHNIQUES: Discrete Diodes; Transistor Fabrication; Integrated Circuits; Monolithic Integrated Circuit.

OPERATIONAL AMPLIFIERS: Introduction.

FEEDBACK AND OSCILLATOR CIRCUITS:Feedback Concepts; Feedback Amplifier-Phase and Frequency Considerations; Oscillator
Operation.

OTHER TWO-TERMINAL DEVICES:Photodiodes; Photoconductive Cells; IR Emitters; Liquid-Crystal Displays; Solar Cells;
Thermistors.

pnpn AND OTHER DEVICES. Silicon- Controlled Rectifier(SCR); Basic SCR Operation; SCR Characteristics and Ratings.

OSCILLOSCOPE (CRO):Cathode Ray Tube- Theory and Construction; CRO-Operation; Voltage Sweep Operation; Synchronization and Triggering.

SESSIONALS:

1. Eight Assigments to cover the syllabus.
2. A minimum of six experiments based on the syllabus.

TEXT BOOKS:

1. R. Boylestad and L. Nashelsky, Electronic Devices and Circuits, 6th Edn. PHI.
2. A. Mottershead, Electronic Devices and Circuits PHI.

REFERENCES:

1. N.N.Bhargava., Basic Electronics and Linear Circuits, Tata McGraw-Hill.

2.6 ENVIRONMENTAL AND SOCIAL SCIENCES

1. Total no. of lectures per week	: 04 Hours (2+2)
2. Duration of semester end examination	:03 hours
3. Maximum marks for semester end examination	: 100
4. Maximum marks for internal assessment	: 50 (25+25)
5. Total marks	: 150
6. No. of sections	: 02

The question paper will consist of 8 questions divided into two sections, Total of 4 questions are to be attempted, answering 1 question from each module, each question will carry 25 marks. There shall be 2 questions from each module.

SECTION – I

ENVIRONMENTAL SCIENCES

MODULE-I

The Environment: Definition, scope, nature and its importance. Need for public awareness.

Natural Resources and Associated Problems

- **a) Forest resources:** Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests.
- **b) Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- **c) Mineral resources:** Usage and exploitation, environmental effects of extracting and using mineral resources.
- **d) Food resources:** World food problem, changes caused by agriculture effects of modern agriculture, fertilizer-pesticide problems.
- **e) Energy resources:** Growing energy needs, renewable and non renewable energy sources, need for conservation of energy, use of alternate energy sources.
- **f) Land resources:** Land as a resource, its degradation, man induced land-slides, soil erosion and desertification.
- **g) Role of an individual in conservation of natural resources**
- **h) Equitable use of resources for sustainable lifestyle.**

Ecosystems: Concept, structure and function of an ecosystem, producers, consumers and decomposers. Food chains, food webs and ecological pyramids.
Introduction, types, characteristics features, structure and function of the following ecosystems
A) Grassland ecosystem,
B) Pond ecosystem

MODULE-II

Environmental Pollution: Definition, causes, effects and control measures of:
a) Air pollution b) Water pollution d) Marine pollution e) Noise pollution.
Solid waste management: Causes, effects and control measures of urban and industrial wastes.
Global Issues: Acid rain, Ozone layer depletion and Global warming.

Social Issues and the Environment

From unsustainable to sustainable development, urban problems related to pollution, water conservation, rain water harvesting
Functions of CPCB and SPCB

SECTION – II

SOCIAL SCIENCES

MODULE- III

Personality: Types (Heredity + Environment Tolerance)

1. Personality and Motivation
2. Coping with Stress- Repetitive Prayer, Meditation, yoga
3. Adjustment
4. Positive thinking and Positive Living: balanced diet, proper habits and healthy living
5. Personal Grooming

Inter-Group Relations

1. Inter-Personal Relations and Inter- Group relations (working as a team, cooperation and competition)
2. Empowerment of Women
3. Responsibility: Personal, Moral and Social
4. Business Manners- Etiquettes and Social behavior

MODULE- IV

Society and Culture

1. Education- Nature and Significance, Limitations and Evaluation, different kinds of education systems
2. Ethics: Moral foundations of social order
Professional ethics
3. Our Culture: different aspects
4. Culture and Identity
5. Changes in culture: Cross cultural interactions, Acculturation, enculturation, cultural diffusion etc.
6. Globalisation
7. Religious Tolerance

TEXT BOOKS:

Environmental Studies

1. A Basic Course in Environmental Studies by S. Deswal
Publisher: Dhanpat Rai and Co. Pvt. Ltd.
2. Principles of Environmental Science and Engineering by R. Pannirselvam SPGS Publisher, Chennai.

Social Sciences

1. Psychology, Robert A. Baron, Pearson Education Pte. Ltd.
2. Sociology (Principles of Sociology with an Introduction to social thought), C. N. Shankar Rao, S. Chand Publications.

References: Environmental Studies

1. De A. K., Environmental Chemistry, Wiley Eastern Ltd.
2. Desh Ka Paryavaran - Anupam Misra, Ganolai santi Pratisthan. New Delhi.
3. Down to Earth, Centre for Science and Environment
4. Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p

5. Mckinney, M. L. & Schocl. R. M. 1996, Environmental Science Systems
6. Odum, E. P. 1971, Fundamentals of Ecology, W. B. Saunders Co. USA,
7. Rao M. N. & Datta, A. K. 1987, Waste Water Treatment, Oxford & IBH Publ.Co.
8. Sharma B. K., 2001, Environmental Chemistry, Goel Publ. House, Meerut Society, Bombay (R)
9. Trivedi R. K. and P. K. Goel, Introduction to air pollution, Techno-Science
10. Trivedi R. K., Handbook of Environmental Laws, Rules, Guidelines, Compliances

References: Social Sciences

1. Sociology, Richard T. Schaefer and Robert P. Lamm, Tata Mcgraw Hill publications
2. Articles in relevant Journals/Publications
3. The New Encyclopedia Britannica, Macropedia.

2.7 WORKSHOP PRACTICE – II

1. Practicals per week : 04 Hours
2. Maximum marks for internal assessment : 50

i) **WELDING:-**Demonstration of various welding machines and equipments.
Practical: At least one job on Electric Arc welding.

ii) **TURNING: -** Demonstration of lathes, tools and equipments. Demonstration of drilling machines, grinding machines, shapers, and milling machines.
Practical: At least one job on lathe covering simple lathe operations.

iii) **PATTERN MAKING: -** Timber classification, seasoning defects in Timber, Knowledge of plywood, hardwood, adhesive glues, paints, varnish, and polish.
Practical: At least one simple pattern of wood.

iv) **FOUNDRY: -** Demonstration of hand tools, equipments, and furnaces used in foundry shop.
Practical: At least four various types of sand moulds.

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.

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 hours
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. 3 Hrs

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

MODULE III

Resonance: Series resonance- Bandwidth, selectivity and Q-factor of resonance circuits 3 Hrs

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 Publication
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, ArtechHouse, 2000.

3.5 MANAGERIAL ECONOMICS

MODULE I

Introduction and general concepts :Demand and supply – Demand curve, Equilibrium, Aggregate Supply and Demand. (2Hrs)

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

Inflation (1 Hr)

Exchange Rates – Pure, flexible, Terminology for Exchange rate changes, Forex market, Exchange rate systems. (2Hrs)

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

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. (2Hrs)

Preparation of Income statement, Balance sheet, fund Flow statement, (2Hrs)

Understanding and analyzing them using financial ratios. Ratio Analysis Liquidity, Leverage and Profitability ratios (2Hrs)

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 (2Hrs)

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, (2Hrs)

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

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

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

MODULE IV

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

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

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

Controlling, steps in Basic control process, Importance of Standards. (2Hrs)

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. (4Hrs)

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. (5Hrs)

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. (5Hrs)

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 (5Hrs)

Fourier series representation of discrete time periodic signals; properties of discrete- time Fourier series MATLAB programs. (5Hrs)

MODULE III

Continuous-time Fourier transform: Representation of periodic signals: Fourier transform of periodic signals and their properties; convolution property; multiplication property. MATLAB programs. (3Hrs)

Discrete- time Fourier transform: Representation of a periodic signals; Fourier transform for periodic signals; properties; convolution property; multiplication property. (4Hrs)

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. (3Hrs)

MODULE IV

The Laplace transform: introduction; laplace transforms; the region of convergence; inverse laplace transform; Analysis and characterization of LTI system using the laplace transform. Unilateral laplacetransforms. MATLAB programs. (5Hrs)

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. (5Hrs)

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.
5.
6.

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. (4Hrs)

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. (4Hrs)

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. (1Hr)

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

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. (1Hr)

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. (1Hr)

Introduction to power systems: - introduction to generation of electrical energy, hydal power

plant, thermal power plant, nuclear power plant. Typical AC electrical power system. (2Hrs)

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 :
Cartesian, cylindrical and spherical coordinate system, transformation from cartesian to cylindrical and spherical coordinate system, transformation from cylindrical to spherical coordinates. (3Hrs)

Integration of scalar and vector functions :
Line integrals, surface integral, volume integral. (2Hrs)

Differentiation of scalar and vector functions :
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 (4Hrs)

Electrostatics :
Coulomb's Law, Electric Field Intensity due to point charges and distributed charges. (1Hr)

MODULE II

Electrostatics :
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. (2Hrs)

Energy in electrostatic field :
Energy due to point and distributed charges. (1Hr)

Boundary value problems :
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. (3Hrs)

Interface Conditions :
Interface conditions between two dielectrics, Interface conditions between dielectrics and conductors. (1Hr)

Capacitance :
Parallel plate capacitor, Capacitance of infinite structures (1Hr)

Conduction and Convection current density :
Convection current and convection current density, Conduction current and Conduction current density, Power dissipation and Joule's law, The continuity equation. (2Hrs)

MODULE III

The Static Magnetic Field :
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. (3Hrs)
Behaviour of Magnetic Materials, Diamagnetic and Ferromagnetic materials.

Magnetic circuits :
Magnetomotive force, Magnetic reluctance, Forces in the magnetic field. (1Hr)

Energy stored in the magnetic field:
Magnetostatic energy in terms of fields. (1Hr)

Time varying Electric and Magnetic fields :
Faraday's Law, Lenz's Law, Electromotive force, Eddy currents. (2Hrs)

Maxwell's Equations :
Continuity equation for time varying fields, Displacement current density, Generalized Ampere's Law, Maxwell's equations in differential, integral and time harmonic representation. (2Hrs)

Interface conditions for Electromagnetic Field :
Interface condition for the electric field, interface condition for the magnetic field. (1Hr)

MODULE IV

Electromagnetic wave equation and its solution:
Electromagnetic waves, Time dependent wave equation, Time Harmonic Wave Equation, Solution of the wave equation for uniform plane waves in free space , perfect dielectrics. (2Hrs)

Poynting's Theorem:
Poynting vector, Complex Poynting vector, Electromagnetic power density. (2Hrs)

Propagation of Plane waves in Materials :
Propagation of plane waves in lossy dielectrics, low loss dielectrics and conductors, Concept of Phase and Group velocity. (1Hr)

Polarization of Plane Waves :
Concept of Polarization, Linear, Elliptical and Circular Polarization (2Hrs)

Reflection and Transmission of Plane Waves :
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. (3Hrs)

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 (1Hr)

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 (1Hr)

MODULE-II

Op-Amps as Comparators, zero crossing detectors, Schmitt trigger, ramp generators, Triangular wave generator. (2Hrs)

Analysis of the waveform with SPICE (1Hr)

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 (1Hr)

Three terminal regulator IC78XX, 79XX, LM309, LM317, voltage regulator and tracking regulator. (1Hr)

Principles and working of switching mode regulators, applications of switching regulator IC 78540, Universal Switching regulator (1Hr)

MODULE III

Introduction to resolution & accuracy in convertors, quantization error, sample & hold circuit (1Hr)

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) (3Hrs)

Specifications, functional block diagrams, applications of 0809 & 0808 (1Hr)

Phase- Locked loop(PLL)
Basic principles of phase-locked loop and block diagram (1Hr)

Transfer characteristics of PLL, Lock Range, and Capture range. (1Hr)

Applications of PLL as frequency multiplier, AM Demodulation, FM demodulation, (2Hrs)

Study of PLL IC 565 and its applications design (1Hr)

MODULE IV

Op-Amps as bistable, monostable and astable multivibrator (2Hrs)

IC 555: Functional block diagram and specification, Modes of IC555 (1Hr)

Applications of IC555 as monostable & astable multivibrator (design) (2Hrs)

IC 555: Application as VCO, missing pulse detector, frequency divider, ramp generator, PWM (2Hrs)

Waveforms generating ICs:
Study of IC566, IC 8038 and IC XR2206 and their applications in waveforms generations (3Hrs)

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. 3hrs

Heap.

MODULE IV 4hrs

Graphs: Definitions and Terminology, DFS & BFS, Spanning Tree. 2hrs

Searching: Linear search, Binary search.

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.

5.1: PROBABILITY THEORY AND RANDOM PROCESSES

MODULE I

Introduction to Probability Theory and Random Variables

Introduction - Sample Space and Events, Probabilities defined on Events, Conditional Probabilities, Independent Events, Total Probability Theorem, Bayes' Theorem and its Applications. (2 Hrs)

Random Variables, Discrete and Continuous Random Variables, Probability Distribution, Expectation, Variance, Cumulative Distribution Function, Moment Generating Function, Functions of a Random Rariable and their Distribution, Expectation and Variance of functions of a random variable. (4 Hrs)

Some Important Probability Distributions and their Mean, Variance and Moments –Bernoulli Distribution, Binomial Distribution, Geometric Distribution Poisson Distribution, Uniform Distribution, Exponential Distribution, Gamma Distribution and Normal Distribution. (4 Hrs)

MODULE II

Higher Dimensional Random Variables

Introduction, Discrete and Continuous Two Dimensional Random Variables- Joint Probability Distribution, Marginal Distributions, Independence of Random Variables, Covariance and Correlation, Uncorrelated Random Variables. (5 Hrs)

Real Valued Functions of Two Dimensional Random Variables and their Probability Distributions, Conditional Probability Distribution and Conditional Expectation, Computing Probabilities and Expectations by Conditioning, Moment Generating Function of Sums of Independent Random Variables. (5 Hrs)

MODULE III

Tests of Hypotheses and Analysis of Variance (ANOVA)

Sampling Theory, Random Samples, Sampling Distributions, Statistical Decisions and Statistical Hypotheses, Tests of Hypothesis and Significance, Level of Significance, One-Sided and Two-sided Hypotheses, Two-Tailed and One-Tailed Tests. (1 Hr)

Tests of Hypothesis for Large samples – Tests of hypotheses on the Mean, Tests of Hypothesis on the equality of Two Means, Tests of Hypothesis on a Proportion, Tests of Hypothesis on the Equality of Two Proportions, Tests of Hypothesis on a Standard Deviation, Tests of Hypothesis on the Equality of Two Standard Deviations. (2 Hrs)

Tests of Hypotheses for Small Samples – Test of Hypothesis on the Mean for a Normally Distributed Population, Tests of Hypothesis on the equality of Two Means for Normally Distributed Populations, Tests of Hypothesis on the Variance of a Normally Distributed Population, Tests of Hypothesis on Equality of Variances of two Normally Distributed Populations, Testing for Goodness of Fit, Tests for Independence of Attributes. (6 Hrs)

Analysis of Variance (ANOVA) – One-Way and Two- Way Classification Analysis of Variance. (1 Hr)

MODULE IV

Stochastic Processes

Introduction, State Space, Higher Order Joint Distributions of a Stochastic Process, Independence of a Stochastic Process, Auto – Correlation Function, Auto – Covariance, Correlation Coefficient, Cross –Correlation Function, Cross-Covariance, Cross- Correlation Coefficient, Strict Sense Stationary Process, Wide Sense Stationary Process, Jointly Wide Sense Stationary Process, Evolutionary Process, Ergodicity in Mean and Auto - Correlation Function. (3 Hrs)

Markov Chains – Introduction, Transition Probabilities, Homogeneous Markov Chains, One-Step and n-Step Transition Probability Matrix , Initial Distribution, Probability Mass Function of the Random Variables of a Markov Chain, Joint Distribution of a Markov Chain, Chapman-Kolmogorov Equations, Absorbing States, Communication between States, Irreducible Markov Chains, Steady State Vector. (5 Hrs)

Poisson Processes – Introduction, Counting processes, Definition of Poisson Process, Sum of Two Independent Poisson Processes, Inter-Arrival and Waiting Time Distributions for a Poisson Process, Applications of Poisson Processes. (2 Hrs)

TEXT BOOKS

1. A first Course in Probability, Sixth Edition, Pearson Education, by Sheldon Ross.
2. Probability and Statistics in Engineering by William W. Hines, Douglas C. Montgomery, David M. Goldsman, and Connie M. Borror .
3. Probability, Statistics and Random Processes, Second Edition, Tata McGraw-Hill, by T. Veerajan

REFERENCE BOOKS

1. Probability and Statistics with Reliability, Queuing and Computer Science Applications, Prentice Hall, by Kishor S. Trivedi.
2. Statistics, Third Edition, Schaum's Outlines, by Murray R. Spiegel and Harry J. Stephens.
3. Introduction to Probability Models, Seventh Edition, Academic Press, by Sheldon Ross

5.2 CONTROL SYSTEM ENGINEERING

MODULE I

Introduction to control systems; types of control systems, basic concept of open-loop and closed-loop control systems; (1 Hr)

Mathematical modeling and representation of mechanical (translational & rotational) and electrical systems; (3 Hrs)

Conversion of mechanical to analogous electrical systems (force-voltage and force-current analogy); (1 Hr)

Block diagrams, (3 Hrs)

Signal flow graphs and transfer functions. (2 Hrs)

MODULE II

Transient response of first and second order systems; (3 Hrs)

Type -0, -1 and –2. control systems; Steady state error and error co-efficient; (3 Hrs)

Stability concept, Routh-Hurwitz criteria; (2 Hrs)

Stability under parameter uncertainty: robust control; (2 Hrs)

Root-locus techniques. (3 Hrs)

MODULE III

Frequency-domain analysis, polar-plots, (2 Hrs)

Bode-plots, (4 Hrs)

Nyquist-plots; Relative stability using Nyquist-plot. (4 Hrs)

MODULE IV

Concept of compensators; types of compensators; (1 Hr)

Design of Cascade compensator in time domain- Lead, Lag and Lead-Lag compensation (3 Hrs)

Design of Cascade compensator in frequency domain -Lead, Lag and Lead-Lag compensation (4 Hrs)

Introduction to digital control system, discrete time system, sampled data and digital control system-digital Vs analog controller, sampling process. (2 Hrs)

TEXT BOOKS:

1. Control Systems-Principles and Design - M. Gopal, Tata Mc Graw Hill
2. Control Systems Engineering,– I.J. Nagrath and M. Gopal, The New Age International (P) Ltd., New Delhi
3. Modern Control Engineering—D. Roy Choudhry

REFERENCE BOOKS:

1. Modern Control Engineering, -K.Ogala, PHI
2. Control Systems, -A.Nagoor Kani, RBA Publications, Chennai
3. Automatic Control Systems, - B.C.Kuo ,PHI

5.3 COMMUNICATION ENGINEERING - I

MODULE I

Need for modulation. Principles of AM, Frequency spectrum of AM wave, AM power and current relationship, modulation by multiple sine waves.
Generation of AM: Modulated transistor amplifier. AM Detection – Diode Detector (3 Hrs)

DSB-SC Techniques, Suppression of carrier, Effect of non-linear resistance on added signals (Square law modulator), Balance modulator

Methods of generation of SSB -Filter systems, phase shift method & third method. Comparison of various methods. (3 Hrs)

Principles of FM and PM, Mathematical representation, Spectrum, Narrowband and wideband FM, power contents of carrier and sideband. Effects of noise in FM. (2 Hrs)

FM generation methods: Direct method, Armstrong method, Slope Detector, Foster-Seelay discriminator, Ratio detector. (2 Hrs)

MODULE II

AM and FM transmitter, TRF receivers, super heterodyne receivers, solidstate circuits for RF-amplifiers, Mixer, IF amplifier, AGC, AFC, Amplitude limiter, Pre-emphasis, De-emphasis, Audio muting. (4 Hrs)

Noise- various noise sources, Noise calculations for – single noise sources, multiple noise sources, cascade amplifiers. Noise figure , Noise temperature, Equivalent input noise resistance. (4 Hrs)

Pulse Modulation: Introduction, PAM, PWM, PPM. Generation and detection. (2 Hrs)

MODULE III

Correlation: Correlation between waveforms, Cross-correlation, Autocorrelation, Autocorrelation of a periodic waveform, autocorrelation of a non-periodic waveform of finite energy, autocorrelation of other waveforms (2 Hrs)

Sampling: Sampling theorem, Natural Sampling, Flat top sampling, recovery through holding. (2 Hrs)

Quantization: Quantization of signals, Midrise and Midtread Quantizers, Quantization

error. (1 Hr)

Pulse Code Modulation: Pulse Code Modulation, Electrical representation of binary digits, PCM system, Companding, μ Law and A Law Companders, Differential Pulse Code Modulation (DPCM), Delta Modulation (DM), Adaptive Delta Modulation (ADM) (5 Hrs)

MODULE IV

Multiplexing: Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM) (1 Hr)

Digital Modulation Techniques: Binary Phase Shift Keying (BPSK), Differential Phase Shift Keying (DPSK), Differentially Encoded PSK(DEPSK), (4 Hrs)

Quadrature Phase Shift Keying (QPSK), M-ary PSK, Minimum Shift Keying (MSK), Gaussian MSK, Quadrature Amplitude Shift Keying(QASK), Binary Frequency Shift Keying(BFSK), Comparison of digital modulation techniques. (5 Hrs)

TEXT BOOK

1. Electronic Communication System – George Kennedy- Tata McGraw Hill
2. Principles of Communication Systems by Taub, Schilling, Saha, Third Edition, Tata McGraw Hill Publishing Company.

REFERENCE BOOKS

1. Modern Digital and Analog Communication Systems - B.P. Lathi 3rd edition - OXFORD University Press
2. Electronic Communication System – Dennis Roddy and John Coolen- PHI
3. Electronic communications Systems-Wayne Tomasi, Pearson Education, 3rd edition
4. Digital Communications by John Proakis, 4th Edition, McGraw Hill International
5. Communication Systems : Analog & Digital by Singh & Sapre, Tata McGraw Hill Publishing Company
6. Digital Communications : Fundamental & Applications by Bernard Sklar, Second Edition, Pearson Education

5.4 MICROPROCESSORS

MODULE I

Introduction to microprocessors, block diagram of microprocessor, difference between microprocessor & microcontroller, CISC & RISC processors, different ways of programming: machine, assembly & high level language, (2 Hrs)

8085 Microprocessor: pin out and signal description, (1 Hr)

Architecture, demultiplexing Address/Data bus, Generating Control Signals (2 Hrs)

Addressing modes, (1 Hr)

Timing diagrams for Opcode Fetch, memory read and write signals , (1 Hr)

Stack organization (stack ,push & pop instructions with example) (1 Hr)

Interrupts (types, priorities), (1 Hr)

Overview of instruction set (classification of instruction set),

Limitations of 8085,introduction to 8086, comparision between 8085 & 8086 . (1 Hr)

MODULE II

8086 Microprocessor: Register organization, pipelining, (1 Hr)

Architecture, (1 Hr)

Physical memory organization, (1 Hr)

Pin out & signal description, (1 Hr)

Operating modes of 8086 and timings, (1 Hr)

Addressing modes of 8086, (1 Hr)

Calculation of physical address, constructing machine codes

for instructions (2 Hrs)

data transfer , arithmetic instructions & related programming (2 Hrs)

MODULE III

8086 Microprocessor:Logical, string control instructions & related programming, (2 Hrs)

Machine control, conditional, unconditional, flag manipulation instructions & related programming (2 Hrs)

Assembler directives, (1 Hr)

Writing programs using assembler (1 Hr)

Stack, macros & related programming, (2 Hrs)

Procedures. (2 Hrs)

MODULE IV

8086 Interrupts, related programming, (2 Hrs)

Multiprocessing systems: Software aspects of multiprocessor systems, (1 Hr)

Numeric processor 8087: architecture, signal description, register set, exception, handling, interconnection of 8087 with CPU ,communication with CPU , (3 Hrs)

I/O processors 8089: Architecture, communication with CPU, bus arbitration and Control, arbitration schemes, (3 Hrs)

Comparison of features of Intel Processors: from 80186 to Pentium . (1 Hr)

TEXTBOOKS:

1. Microprocessor Architecture, Programming and Applications with 8085, Ramesh S. Gaonkar, Penram International Publishing (India).
2. Microprocessors and Interfacing programming and Hardware-Douglas V. Hall

REFERENCE BOOKS:

1. Advanced Microprocessors and Peripherals –A .K. Ray and K. M. Bhurchandi
2. Introduction to microprocessor, Aditya Mathur, Tata McGraw hill.
3. Microprocessor and Microcomputer based System Design, Rafiquzzaman, USB, New Delhi.
4. Microprocessors and Microcomputers, B. Ram, Tata McGraw Hill.
5. Microcomputer Systems The 8086 /8088 family Architecture, Programming and Design-Yu-Cheng Liu and Glenn A. Gibbon
6. Advanced Microprocessors and Interfacing –Badri Ram

5.5 DIGITAL SIGNAL PROCESSING

MODULE I

Discrete Time signal and its application to LTI system, Discrete Time Fourier transform (DTFT), Discrete Fourier Transform (DFT), Relationship between the DTFT and DFT and their inverses (2Hrs)

DFT properties, Linear and circular convolution, Linear filtering methods based on DFT (2Hrs)

Efficient computation of DFT: Fast Fourier Transform [F.F.T], Direct computation of DFT, Divide and conquer approach of DFT (2Hrs)

Radix-2 FFT algorithm: Decimation in Time [D.I.T] and Decimation in frequency [D.I.F], Shuffling of the data and bit reversal (4Hrs)

MODULE II

Realisation of Discrete Time System -introduction, Basic Realisation block diagram and the signal flow graph, Basic structures of IIR filter: Direct, canonical, cascade and parallel realizations. (2Hrs)

Design of Digital Filters: General considerations: causality and its implications, characteristics of practical frequency selective filters. (2Hrs)

Design of IIR filter: IIR filter design by impulse invariance, bilinear transformation, Butter worth filter, Chebyshev filters (6Hrs)

MODULE III

Design of FIR filters: Linear phase FIR systems. Symmetric FIR Filters, design of linear phase-FIR filters using windows (Rectangular, Hann, Hamming, Kaiser), frequency sampling method. (4Hrs)

Multirate Digital Signal Processing : Introduction, Decimation by factor D, Interpolation by factor I, sampling, sampling rate conversion by rational factor I/D (4Hrs)

Application of Multirate signal processing, Design of Phase shifters, interfacing of

digital systems with different sampling rates, Subband coding of speech signals. (2Hrs)

MODULE IV

Introduction to programmable Digital signal processors: Multiplier and Multiplier Accumulator (MAC), modified bus structure and memory access schemes, pipelining, special addressing modes, on–chip peripherals. (5Hrs)

Architecture of TMS320C5X-Introduction, bus structure, central arithmetic logic unit(CALU), registers, flags, on-chip memory, on-chip peripherals (5Hrs)

TEXT BOOKS:

1. Digital Signal Processing, Algorithm and Applications: John C. Proakis & Dimitries G. Manolakis, PHI
2. Digital signal processors architecture, programming and applications: B Venkataramani, M Bhaskar, Tata McGraw Hill

REFERENCE BOOKS

1. Digital Signal Processing: Salivahanan
2. Signal Processing & Linear systems: B.P.Lathi, Oxford
3. Understanding Digital Signal Processing: Lyons, Addison Wesseley
4. Theory and Application of Digital Signal Processing: Rabiner and Gold, PHI
5. Introduction to Digital Signal Processing: Johny R. Johnson,PHI
6. Discrete Signal Processing: Oppenheim & Schaffer, PHI

5.6 TRANSMISSION LINES AND WAVEGUIDES

MODULE I

Transmission-Line Theory: A line of cascaded T-sections (line constants: Z, Y, characteristic impedance Zo, propagation constant γ); The transmission line-general solution; Physical significance of the equations; the infinite line. (3Hrs)

Wavelength; velocity of propagation; Waveform Distortion; The distortionless line. (2Hrs)

Reflection on a line not terminated in Zo (Voltage and current-phasors, Energy view point of Reflection); Reflection coefficient. (3Hrs)

Input and transfer impedance; Open- and short-circuited lines. (2Hrs)

MODULE II

The Line At Radio Frequencies : Introduction; Constants for the line of zero dissipation (Lossless Lines); Voltages and currents on the dissipationless line (Voltage and Current phasors on the line for various terminations); Standing waves; nodes; standing wave ratio (SWR);Directional Coupler. (3Hrs)

Input-impedance of the dissipationless line; Input impedance of open- and short-circuited lines. (3Hrs)

Power and Impedance measurement on lines; Reflection losses on the unmatched line. (2Hrs)

The eighth- wave line; The quarter-wave line; impedance matching; The half-wave line. (2Hrs)

MODULE III

Single-stub impedance matching on a line; The Smith circle diagram. (3Hrs)

Applications of the Smith chart; Single-stub matching with the Smith chart; Double-stub impedance matching on a line. (4Hrs)

Lines of small Dissipation: Constants for the line of "small" dissipation; Voltages and currents on the line of small dissipation; Open- and short-circuit impedances when considering dissipation; Quarter and half wave lines of small dissipation. (3Hrs)

MODULE IV

Guided waves: Waves between parallel planes; Transverse Electric (TE) waves; Transverse magnetic (TM) waves; Characteristics of TE and TM waves; Transverse electromagnetic (TEM) waves; Velocities of propagation. (3Hrs)

Wave Guides: Rectangular guides; Transverse magnetic waves in rectangular guides; Transverse electric waves in rectangular guides (field configurations of TE and TM waves in rectangular guides); Excitation methods for various modes; Impossibility of TEM wave in waveguides. (4Hrs)

Wave impedances (for rectangular guides); Transmission line analogy for wave guides; Wave guide discontinuities. (3Hrs)

TEXT BOOKS:

1. Networks, Lines and Fields by J.D. Ryder, PHI.
2. Electromagnetic Waves & Radiating Systems by E.C. Jordan and K. G. Balmain, PHI.

REFERENCE BOOKS:

1. Electronic Communication Systems,3rd Edition, Tata McGraw Hill by George Kennedy.
2. Fields and Waves in Communication Circuits, Ramo & Whinnery, John , Wiley & Sons.

6.1 COMMUNICATION ENGINEERING - II

MODULE I

Optimal Reception of Digital Signal :

A Baseband Signal Receiver: Peak Signal to RMS Noise Output Voltage Ratio,Probability of Error, Optimum Threshold : Maximum Likelihood Detector and Bayes Receiver. (1Hr)

Optimum Receiver for both Baseband and Passband : Calculation of Optimum Filter transfer Function, Optimum Filter Realization using Matched Filter, Probability of Error of the Matched Filter,Optimum Filter realization using Correlator (2Hrs)

Information Theory:

Discrete messages and information content :The Concept of amount of Information, Average Information, Entropy, Information rate. (1Hr)

Source Coding to increase average information per bit : Shannon Fano Coding, Huffman Coding, Lempel Ziv Coding. (2Hrs)

Shannon's Theorem and Channel capacity: Capacity of a Gaussian Channel, Bandwidth S/N tradeoff. (1Hr)

Use of orthogonal signals to attain Shannon's limit : Orthogonal Signals, Matched Filter reception,Calculation of Error Probability, Efficiency of Orthogonal transmission, Shannon Limit. (2Hrs)

Mutual Information and Channel Capacity, Rate Distortion Theory and Lossy Source Coding. (1Hr)

MODULE II

Coding :

Coding : Introduction, Error Probability with Repetition in the Binary Symmetric Channel, Parity Check bit for error detection, Coding for Error detection and correction, Block Codes, Hamming distance. (2Hrs)

Upper Bound of the Probability of error with Coding, Hard Decision Coding. Block Codes : Coding and Decoding, Decoding the received Code Word. (1Hr)

Hadamard , Hamming, Cyclic, BCH and other Algebraic Codes: Single Parity Check Bit Code, Repeated Codes, Hadamard Code, Hamming Code, Cyclic Codes, Golay Code, BCH Codes. (1Hr)

Burst Error Correction : Block interleaving, Convolutional Interleaving, Reed Solomon Code, Concatenated Codes. (1Hr)

Convolutional Coding : Code Generation, Decoding Convolutional Code : The Code Tree, decoding in the presence of Noise, Sequential Decoding, State and Trellis Diagrams, The Viterbi Algorithm. (2Hrs)

Comparison of Error rates in Coded and Uncoded Transmission, Turbo Codes, Automatic Repeat Request, Performance of ARQ Systems. (1Hr)

An Application of Information Theory : An Optimum Modulation System, Comparison of Amplitude Modulation System with Optimum System, A Comparison of FM Systems, Comparison of PCM and FM Communication Systems. (1Hr)

Feedback Communication : System description, Calculation of Average Transmitted Signal Energy per bit, Comparison of Information Rate with Channel capacity. Trellis Decoded Modulation (1Hr)

MODULE III

Spread Spectrum Modulation :
Use of Spread Spectrum
Direct Sequence (DS) Spread Spectrum: Effect of Thermal Noise, Single Tone interference and Jamming. (2Hrs)

Spread Spectrum and Code Division Multiple Access, Multipath Fading and its avoidance.Ranging using DS Spread Spectrum (2Hrs)

Frequency Hopping (FH) Spread Spectrum : The Need for Coding, The Near Far Problem, Spectrumof FH Spread Spectrum, Detection of FH/BFSK Signal. (1Hr)

Pseudo random Sequences : Generation and characteristics, Sequence Length, Independence of Sequences, Number of ones and zeros in a maximal sequence, Clustering in a PN Sequence, Properties of Shifted Sequences, Autocorrelation of a PN Sequence, Power Spectral Density. (2Hrs)

Synchronization in Spread Spectrum Systems: Acquisition of an FH Signal, Tracking of an FH Signal, Acquisition of a DS Signal, Tracking of a DS Signal (1Hr)

Mobile Telephone Communication :
The Cellular Concept, Call Setup in Mobile Communication, Mobile to Mobile Communication, Mobile to Mobile Calls, Mobile to Fixed Subscriber Calls, Digital Cellular PhoneSystems : TDMA/GSM, CDMA/CDMAONE, Global Positioning System. (1Hr)

Application of Phase Locked Loops :
Carrier Recovery, Clock Recovery, Frequency Synthesis, Phase and Frequency Modulation (1Hr)

MODULE IV

Switching Systems :
Classification of switching systems, simple telephone communication, Basics of a switching system, Signaling tones, Principle of common control, touch tone dial telephone, Centralized SPC and Distributed SPC. (4Hrs)

Time Division Switching :
Basic Time Division Space Switching, Basic Time division time switching, Time multiplexed Space Switching, Time multiplexed time switching. (3Hrs)

Traffic Engineering :
Network Traffic Load & Parameters, Grade of Service & Blocking Probability, Incoming traffic & Service time characterization. (2Hrs)

Numbering Plan, Common Channel Signaling (1Hr)

TEXT BOOKS :

1. Principles of Communication Systems by Taub, Schilling, Saha, Third Edition, Tata McGraw Hill Publishing Company.,
2. Telecommunication Switching Systems & Networks by K Vishwanathan, Prentice Hall of India.

REFERENCE BOOKS :

1. Digital Communications by John Proakis, 4th Edition, McGraw Hill International
2. Communication Systems : Analog & Digital by Singh & Sapre, Tata McGraw Hill Publishing Company
3. Digital Communications : Fundamental & Applications by Bernard Sklar, Second Edition, Pearson Education
4. Digital Modulation & Coding by Stephen Wilson, Pearson Education
5. Communication Systems by Simon Haykins, 3rd edition, John Wiley & Sons.
6. Information Theory, Coding & Cryptography by Ranjan Bose, 2nd edition, Tata McGraw Hill Publishing Company Limited.
7. Digital Communications by Sanjay Sharma, S.K.Kataria & Sons.
8. Digital and Analog Communication Systems by K. Sam Shanmughan, John Wiley & Sons Pvt. Ltd.

6.2 PERIPHERAL DEVICES & INTERFACING

MODULE I

1. Input Output Organization

Peripheral devices, Input output interface: I/O bus and interface Modules, I/O bus versus Memory Bus, Isolated V/s Memory mapped I/O, Example of I/O interface synchronous data transfer: strobe control, hand shaking Asynchronous Serial transfer, Asynchronous Communication Interface, FIFO buffer.
Modes of transfer: Programmed I/O, Interrupt initiated I/O
Priority interrupt: Daisy chaining priority, Parallel Priority Interrupt, Priority Encoder, Interrupt Cycle, Software routines, Initial And final Operations
Direct Memory Access(DMA): IDMA controller, DMA transfer

Input output processor(IOP): CPU – IOP Communication, IBM 370 I/O Channel, Intel 8089 IOP
Serial Communication: Character Oriented Protocol, Data Transparency, Bit oriented Protocol (6)

2. Interfacing I/O devices

Peripheral I/O Instructions and Execution, Device selection and data transfer, Input interfacing, Interfacing I/Os using Decoders, Interfacing Output Displays, Interfacing Input devices, Memory Mapped I/O (2)

3. 8155 - Multipurpose Programmable Device

Pin Configuration and Block diagram, Programmable I/O ports and Timer, Interfacing 8155 I/O ports, 8155 timer, 8155 ports in handshake mode. (2)

MODULE II

1. 8255 - Programmable I/O Device / Programmable Parallel Port

Internal Block diagram, Operational modes and Initialization, Control words, Interfacing 8255. (3)

2. **8259 - Programmable Interrupt Controlle**r

Block diagram, Pin diagram, Architecture and signal descriptions, Command words, modes of operation, Interfacing and programming of 8259 (3)

3. 8251 - Programmable Communication Interface - USART

Block diagram, Pin diagram, Architecture and signal descriptions, operating modes, command instruction format, interfacing & programming 8251 with 8086. (4)

MODULE III

1. **8279 - Keyboard/Display Controller**
   Internal Architecture, Pin configuration, Signal descriptions, Modes of operation, Command words, Key code and Status Data Formats, Interfacing & programming 8279 with 8086. (3)

2. **8253 - Programmable Interval Timer**
   Architecture & signal description, Operating modes of 8253, Control word, programming & interfacing 8253. (3)

3. **8237 - Programmable DMA interface**
   Internal Architecture, Register Organization, Signal descriptions, Register Organization, DMA operations with 8237, Transfer modes, 8237 Commands and Programming. Interfacing 8237 with 8086. (4)

MODULE IV

1. **8272 - Floppy Disk Controller**
   Internal Architecture, Signal description, Functional details (2)

2. **8275 - CRT Controller**
   Internal Architecture, Signal description, System Operation, Display formats & operational features. (2)

3. **Analog to Digital Converters and interfacing**:
   ADC 0808/0809, Interfacing 0808 with 8086 through 8255. (2)

4. **Interfacing Digital to Analog Converters :**
   DAC 0800, interfacing DAC 0800 with 8086 (2)

5. **Interfacing buses**
   IEEE 488 (GPIB) & RS - 232C (2)

Textbooks:

1. Advanced Microprocessors & Peripherals by A.K.Ray & K.M.Bhurchandi
2. Computer System Architecture by Morris Mano
3. Microprocessors & interfacing by D.V.Hall
4. Microprocessors - Architecture, Programming & Applications by Ramesh Gaonkar

Reference books:

1. Introduction to Microprocessors by A.P. Mathur
2. Microprocessors - Principle & Applications by Ajit Pal.

6.3 POWER ELECTRONICS

MODULE I

Introduction to Thyristor family :
Structure, Symbol, V.I. Characteristics of SCR (2Hrs)

Transistor analogy
Thyristor Turn-on methods,
Switching characteristics of Thysistors during Turn On & Turn OFF
Thyristors commutations (4Hrs)

Thyristor protection : over voltage protection, suppression of over voltages, over current protection, di/dt protection, dv/dt protection, snubber circuits. (4Hrs)

MODULE II

Mounting of thyristors, series and parallel operation of thyristors,
Thyristor trigger circuits:- RC firing circuits (half wave & Full wave) Ramp triggering, (4Hrs)
Ramp and pedestal trigging.

Triac
Gate turn off Thyristors its structure, characteristics, applications (1Hr)

PUT
Insulated gate bipolar transistor (1Hr)

AC to DC converters :- Principle of phase control, single phone half-wave thysistor rectifier with RL load and RLE load. Single phase mid-point thysistor converter. (4Hrs)

MODULE III

DC to DC converters (choppers) :– principle of operation, (2Hrs)
Control Schemes :– Constant frequency scheme, variable frequency scheme, step up choppers. (6Hrs)
Choppers classification:- Class A,B,C, D,& E (Numericals) (2Hrs)

MODULE IV

Inverters : parallel inverter :- Basic Parallel inverter, modified parallel inverter. (2Hrs)

Series inverter :- Basic series inverter, modified series inverter, (2Hrs)

Single phase half bridge inverter (mathematical analysis)
Single phase full bridge inverter (mathematical analysis)
MC murray –bedford half bridge inverter.

(3Hrs)

Three phase inverter for 1800 and 1200 mode operations
DC motor speed control: – principle of speed control, phase controlled converters. (2Hrs)

AC Drives: - Speed control by static voltage control, variable voltage variable frequency control (1Hr)

TEXT BOOKS:

1. Introduction to Power Electronics By V. Jagannathan (prentice –Hall of India Pvt. Ltd.
2. Power Electronics circuits, Devices & applications By mohammed H Rashi (Prentice–Hall of India Pvt. Ltd., New Delhi)

REFERENCE BOOKS:

1. Thysistor Engineering by Berde
2. Power Electronics by P.C. Sen

6.4: ANTENNA AND WAVE PROPAGATION

MODULE I

Basic Antenna Concepts and Antenna Parameters, Antenna Aperture and Aperture Efficiency. (3Hrs)

Maximum Effective Aperture of a Short Dipole and a Linear Half-Wave Antenna Friss transmission formula. (2Hrs)

Point Sources, Power patterns, power theorem, radiation intensity, different power patterns (hemispherical, unidirectional and bi-directional cosine, sine, sine-squared cosine squared and (cosine). (4Hrs)

Field and phase patterns, effect of earth field patterns. (1Hrs)

MODULE II

The short electric dipole: Retarded vector potential, fields and radiation resistance, Radiation resistance of a half wave dipole and half wave antennas with a uniform traveling wave. (3Hrs)

Various forms of Antenna arrays; Arrays of point sources: Isotropic point sources of : (i) same amplitude and phase (ii) same amplitude but opposite phase (iii) same amplitude and in phase quadrature (iv) equal amplitude and any phase (v) unequal amplitude and any phase. (3Hrs)

Patterns multiplication: Radiation pattern of four and eight isotropic elements fed in phase, linear array with n isotropic point sources with equal amplitude and spacing; broadside case; End-fire case. (2Hrs)

End-fire array with increased directivity, phased array and scanning arrays. (2Hrs)

MODULE III

Loop antenna: field of a small loop, field pattern of circular and square loop, ferrite-rod antenna; Helical Antenna: Geometry, transmission and radiation modes, design of monofilar axial mode type, Wide-band characteristics, tapered monofilar axial mode type. (2Hrs)

Construction, characteristics of : Slot antennas, slotted cylindrical antennas, Aperture antenna, Horn antennas (rectangular and circular), Reflector antennas: Corner, paraboloidal, cylindrical parabolic, Cassegrain feed, Lens antennas, dielectric rod antennas. (3Hrs)

Yagi-Uda array, V- and Rhombic-antenna;, Turnstile antennas; Baluns and traps. (1Hrs)

Antenna Measurements: Directivity, gain, phase, terminal impedance, current istribution, (2Hrs)

polarization; system temperature and signal-to-noise ratio.

Broad-band and frequency-independent antennas: Planar spiral, conical-spiral, Log-periodic antenna and array.

(2Hrs)

MODULE IV

Ground-wave propagation, Plane-earth reflection, space wave, elevated dipoles above plane earth, line of sight propagation, wave tilt of the surface wave, spherical earth propagation. (2Hrs)

Tropospheric propagation: waves, abnormal refraction and reflection, Duet propagation, Tropospheric scattering, Fading and Diversity reception. (3Hrs)

Ionospheric Propagation: Layers, permittivity and conductivity, collision and plasma frequency. (1Hrs)

Reflection and refraction, refractive index, electron density, determination of critical frequency and virtual height. (1Hrs)

Maximum usable frequency, skip distance, optimum frequency, regular and irregular variations. (1Hrs)

Sky-wave transmission, effect of Earth's magnetic field, Whistlers; Incoherent scatter, VLF propagation. (2Hrs)

TEXT BOOKS

1. Antenna & Wave Propagation by K. D. Prasad.
2. Electromagnetic Fields and Waves by Jordan & Balmain.

REFERENCE BOOKS

1. Antennas by J.D. Kraus

6.5 ELECTRONIC INSTRUMENTATION

MODULE I

Frequency & Time Measurements: Time definition & standards, Standard Frequency & Time Signal Broadcasts, Time and Frequency Standards (2Hrs)

Signal generators: Frequency synthesized signal generators, sweep frequency signal generators (1Hrs)

Electronic Voltmeters (Analog): Chopper stabilized DC(Low frequency) voltmeter, different methods of chopping, true RMS responding voltmeters. (1Hrs)

Electronic Voltmeter(digital):
Non-integrating type: Ramp type, Staircase Ramp, Continuous balance, Successive Approximation (2Hrs)

Integrating type: Voltage to frequency, Potentiometer Integrating, Dual Slope integrating Voltmeter (2Hrs)

Digital Multimeter: Block Diagram, General specification of a DVM, Sensitivity & Resolution of a DVM (1Hrs)

Electronic Voltmeter (High Frequency measurement): Sampling Voltmeter (1Hrs)

MODULE II

Oscilloscope: Block diagram, Classification of CRO's, CRT control circuits, Electrostatic focusing, Delay lines, single trace, multiple trace CRO's, Time base circuits, Synchronizing circuits, Z-modulation. (4Hrs)

CRO probes: Active & Passive probes, Compensation for probes. Screen for CRTs Graticule (1Hrs)

Types of Oscilloscops :Digital storage oscilloscope, sampling oscilloscope (1Hrs)

Applications of CRO's: Phase & frequency measurements using triggered sweep method and by using Lissajous patterns (1Hrs)

Spectrum Analyzer: General Block Diagram, Swept Super heterodyne Spectrum Analyzer, FFT based Spectrum Analyzers, frequency Resolution & Bandwidth, Sweep Desensitization, (3Hrs)

sensitivity of spectrum Analyzer, Application of spectrum Analyzers

MODULE III

Displacement Transducer: Basic displacement measurement scheme, different types of displacement transducers: strain gauge, linear variable differential transformer, Capacitive, Inductive, Piezoelectric, Potentiometer. (2Hrs)

Velocity Transducers: Basic principle of measuring velocity, Tachogenerator, Stroboscopic method of measuring rpm (revolutions/minute) (1Hrs)

Pressure Transducers: Inductive, resistive and capacitive transducers for measuring pressure. (1Hrs)

Temperature Measurement Transducers: Resistance Temperature Detectors, Thermistors, Thermocouples. (2Hrs)

Flow measurement transducers: Turbomagnetic Flowmeter, Electromagnetic Flowmeter, and Ultrasound Flowmeter. (2Hrs)

Data Acquisition Systems (DAS): Basic block diagram of Data Acquisition System, Objective of DAS, Signal Conditioning of the inputs, Instrumentation Amplifier, Isolation Amplifier. (2Hrs)

MODULE IV

Programmable Logic Controllers (PLC): PLC Advantages & Disadvantages, Overall PLC System, CPU & Programmable Monitors, PLC input & Output Modules(Interfaces). (1Hrs)

General PLC Programming Procedure : Proper Construction of PLC Ladder diagrams, Process Scanning considerations. (1Hrs)

Devices to which PLC input & output are connected: Input ON/OFF switching devices, Input analog devices, ON/OFF devices, Output analog devices. (1Hrs)

Basic PLC Programming :

(i) Programming ON-OFF inputs to produce ON-OFF outputs: PLC input instructions, Outputs Coils, Indicators, Operational Procedures, Constant Coil input & output programming examples, Fail Safe circuits, Industrial Process Example.

(ii) Relation of digital gate Logic to Contact /Coil Logic: Digital logic gates & PLC equivalents, Boolean Algebra PLC programming, Conversion Examples.

(iii) Creating Ladder Diagrams from Process Control Descriptions: Ladder diagrams & Sequence listing, Large Process Ladder diagram construction.

(iv) PLC Timer Functions: PLC timer functions, Examples of timer and their industrial applications, Industrial process timing applications.

(v) PLC Counter functions : PLC Counters, Examples of Counter Functions, Industrial applications.

(vi) Selecting a PLC: PLC versus Personal Computer, Factors to consider while selecting a PLC

(7Hrs)

TEXT BOOKS

1. Modern Electronic instrumentation & Measurement by Helfrick & Cooper, Prentice Hall of India
2. Electronic Measurements & Instrumentation by Oliver, Cage, Tata McGraw Hill Publishing Company Limited
3. Principles of Industrial Instrumentation by D.Patranabis, Tata McGraw Hill Publishing Company Limited
4. Programmable Logic Controllers: Principles & Applications, 5th Edition, John Webb, Ronal Weiss, Prentice Hall of India.

REFERENCE BOOKS

1. Electronic Instrumentation by Kalsi, Tata McGraw Hill. Introduction to Programmable Logic Controllers by Gary Dunning, 3rd Edition, Thomson/Delmar Learning.
2. Principle of Measurement and Instrumentation by Alan S. Morris, Prentice Hall of India, 2nd Edition.
3. A First Course in Electronics & Electrical Measurement and Instrumentation by J.B.Gupta, S.K.Kataria & Sons.
4.Principles of Electronic Instrumentation by D.Patranabis, Prentice Hall of India

6.6 VLSI TECHNOLOGY AND DESIGN

MODULE I

MOS transistor switches : CMOS logic- Inverter, NOR, NAND and combinational logic compound gates , Multiplexers ,Transmission gates, latches and Registers. (2Hrs)

MOS Transistor : Structures, MOS system under external bias, operation of MOS transistor (MOSFET), threshold voltage, MOSFET I-V characteristics , (3Hrs)

Channel Length Modulation, substrate bias effect, measurements of parameters – K_N, V_{TP} & γ, MOSFET capacitances. (2Hrs)

MOS Inverters : Static load MOS Inverters , CMOS Inverter Design: Operation DC Characteristics, Noise margins , Power and Area considerations. (3Hrs)

MODULE II

Modeling of MOS transistor circuits using **SPICE** (level1 model equations) (3Hrs)

Switching Circuit Characteristics : Rise , fall and delay time , Gate delays , Transistor sizing , static and dynamic power dissipations. (3Hrs)

CMOS logic gate design : Fan –in and fan out , NOR , NAND and Complex logic gates and their layouts (Euler paths). CMOS logic- Inverter, NOR, NAND and combinational logic , compound gates , Multiplexers ,Transmission gates, latches and Registers (4Hrs)

MODULE III

Silicon semiconductor Technology: Wafer processing, Oxidation, Epitaxy, Deposition, Ion-implantation and Diffusion silicon gate process. (4Hrs)

Basic CMOS technology: n-well and p-well CMOS process. Silicon on insulator. (2Hrs)

MOSIS layout design rules (full-custom mask layout designs), stick diagrams, layout editors (Magic/Micro Wind) and circuit extraction. (3Hrs)

FPGA and CPLD: features , differences and working (1Hrs)

MODULE IV

VLSI design methodologies: VLSI design flow, design analysis, simulations: circuit, timing, switch-level, gate-level (or logic). Using HDLs : **VHDL** (5Hrs)

Design verification: Electrical, timing, functional . **Design synthesis:** Circuit and logic Synthesis. (1Hrs)

Testing : Test procedure, Design for Testability (DFT) Scan – Based Test, Boundary- Scan Design, Built in self test (BIST). (2Hrs)

Automatic Test-Pattern generation (ATPG). Fault models and its simulation. (2Hrs)

TEXT BOOKS

1. CMOS Digital Integrated Circuits (Analysis and Design) by Yusuf and Kong.
2. Principles of CMOS VLSI Design by Neil H.E. Weste, Kamran Eshranghian.
3. Digital Integrated Circuits – (Design perspective) by Jan M. Rabaey.
4. Fundamentals of Digital logic with VLSI design by Stephen Brown, Zvonco Vranesic

REFERENCE BOOKS

1. Basic VLSI Design by Douglas Pucknell, Kamran Eshraghian, PHI.
2. Modern VLSI design (Systems on Silicon) by Wayne Wolf.
3. Introduction to VLSI design by Eugene D. Gabricius.
4. VHDL by Douglas Perry.
5. VHDL Primer by J. Bhaskar.

7.1 DATA COMMUNICATION

MODULE I

OSI Model: Layered architecture of OSI model, other layered architecture (TCP/IP) (1hr)
Data communication concepts: parallel and serial transmission, asynchronous and synchronous transmission, line coding-NRZ, RZ, AMI, HDB3, B8ZS, Block Codes
Characteristics of transmission lines in time domain, crosstalk (3hrs)
Modems: types of modems, scrambler and descrambler, block schematic of modem (1hr)

Network architecture
LAN systems: architecture: bus, ring, tree, star, wireless Ethernet, fast Ethernet, Token ring, FDDI, Bluetooth, wireless LAN
IEEE protocols: 802.2, 802.3, 803.4, 802.5, 802.6, 802.11(only frame format and description for these protocols)
IEEE 802.3 Ethernet:Contention access, CSMA, CSMA/CD (3hrs)
Physical Layer: Interface-RS232, DTE-DCE interface, specifications, Null Modems (2hrs)

MODULE II

Data Link Layer: Frame design consideration, flow control, error control (stop and wait mechanism, sliding window), sequence numbering of frames, piggybacking acknowledgement, applications of data link protocols (3hrs)
Data link protocols: BISYNC, transmission frames, protocol operation, HDLC, Flow and error control in HDLC, framing in HDLC, transparency in HDLC, HDLC protocol operations, comparison of BISYNC and HDLC (3hrs)
Switching**:** switching networks, circuits switching, space division switching, time division switching, packet switching (datagram and virtual circuit [SVC, PVC]), message switching (2hrs)
X.25 protocol**:** X.25 layers, characteristics of X.25 packet format, X.25 operation (2hrs)

MODULE III

Network Layer**:** Services, virtual circuits and datagram subnet, routing algorithms (shortest path, flooding, flow based, distance vector, link state), congestion control, choke packets, load shedding, jitter control, flow specifications, traffic shaping(leaky bucket and token bucket algorithm) (4hrs)
Internet protocols: IP protocols, addresses, internet control protocols, OSPF, BGP, mobile IP, IPV6 (2hrs)
Transport protocols: services, address, establishment of connection, releasing a connection, multiplexing, flow control and recovery, crash recovery, internet transport protocols(TCP and UOP),TCP protocol, TCP header, connection management, TCP congestion control, TCP

transmission policy, timer management, UDP, wireless TCP and UDP (4hrs)

MODULE IV

Networking Devices: repeaters, bridges, routers, firewall (1hr)

ATM**:** ATM architecture- virtual connection, identifiers, cells, connection establishment and release (2hrs)

ISDN**:** IDN,ISDN,ISDN channels(B,D,H), ISDN interfaces, functional groupings, ISDN protocols architecture-physical layer, data link layer, network layer, ISDN addressing, broadband ISDN (3hrs)

Application Layer: DNS, DHCP, TFTP, Telnet, FTP, electronic mail, HTTP (4hrs)

TEXT BOOKS:

1. Data Communication and computer networks-Prakash C. Gupta, PHI)
2. Computer Networks-Andrew S Tanenbaum, PHI

REFERENCE BOOKS:

1. Data Communication & Networking- Behrouz A. Forouzan, Tata Mc-Graw Hill (2nd edition)
2. Data & Computer Communications by William Stalling, PHI [5th edition].
3. Data Communication and Networks by Achyut S Godbole, Tata McGraw

7.2 MICROWAVE & RADAR ENGINEERING

MODULE I

Fundamentals of microwave amplifiers and oscillators:
Beam coupling & Beam coupling coefficient. (1 Hr.)
Power transfer from alternating gap field to density modulated beam. (1 Hr.)
Beam loading, Equivalent circuit of Microwave Amplifier and Oscillator. (1 Hr.)
Noise, Microwave oscillators, analysis of two terminal oscillators circuits. (1 Hr.)
Build-up and limitation of amplitude of oscillation. (1 Hr.)
Klystron: Bunching by velocity modulation, Two – cavity Klystrons, velocity diagram small signal theory of bunching in two Cavity klystrons. (2 Hrs.)
Reflex Klystron: Structure, velocity diagram, Mathematical theory of bunching in Reflex Klystron, Power delivered to the resonator, effect of the repeller voltage upon power delivered to the resonator . (3 Hrs.)

MODULE II

Traveling wave magnetron**:** Structure, Traveling wave Magnetron Resonator, modes of oscillation, mode separation by means of Straps. (3 Hrs.)
Traveling wave tube: Construction and Description, slow wave circuits, Backward - wave Traveling wave tube. (2 Hrs.)

Measurements:
Calorimeter Wattmeter, Bolometer, bolometer mounts and bridges. (1 Hr)
Thermocouples and crystals, Measurement of standing waves, Impedance measurement. (1 Hr.)
Measurement of frequency and wavelength. Microwave bridges, Measurement of Q(by transmission, VSWR measurement.) (1 Hr.)
Microwave semiconductor devices**:** Microwave JFETs, (Physical Structure, Principles of Operation) Gunn - diode (Gunn Effect) (1 Hr.)

Avalanche Transit Time devices**:** IMPATT Diodes (Physical Structures, Negative Resistance),TRAPATT Diodes. (Physical Structure, Principles of Operation) (1 Hr.)

MODULE III

Radar: Principle of operation of radar, maximum unambiguous range, radar range equation, Radar block diagram, radar frequencies, applications of radar. Receiver noise, signal to noise ratio, Probability of Detection & False Alarm, Integration of Radar Pulses. (2 Hrs)
Radar Cross Section: Radar Cross Section of Targets, Radar Cross section fluctuations. Transmitter power, pulse repetition frequency, system losses. (2 Hrs)
Doppler frequency shift, Continuous wave Radar, FM-CW Radar. Clutter: Sea clutter, Weather clutter, other sources of atmospheric echoes. (1 Hr)

MTI Radar: Principle of operation, block diagram, single & double delay line cancellers, clutter attenuation, blind speeds, staggered PRF's, limitations to MTI performance, non-coherent MTI, MTI from a moving platform. (3 Hrs)

Radar displays: A- Scope , B-Scope, C-Scope, E- Scope, Plan Position Indicator (PPI), RHI Display. (1 Hr)

Antenna for radars: Electronically Steered Phase Array Antenna, advantages of Phased Array Antenna, limitations. (1 Hr)

MODULE IV

Tracking Radar: Different methods of tracking, Sequential lobing, Conical Scanning, amplitude & phase comparison Monopulse Radar, limitations to tracking accuracy, low angle tracking, frequency agility. (2 Hrs)

Tracking in Range: Split Gate Tracker, Precision on-axis tracking, track while scan, automatic tracking with surveillance radar. Pulse compression, FM pulse compression radar, Chirp, phase coding. (2 Hrs)

Radomes: Rigid radomes, air supported radomes, weather effects on radomes, radome wall construction, metallic radomes, rotodomes. (1 Hr)

Secondary Surveillance Radar (SSR): Principle of operation, problems with SSR. (2 Hrs)

Principle of operation of the following radar :Over the horizon radar, surface wave radar, Sky wave radar, Synthetic Aperture Radar (SAR), ground probing radar, carrier free radar, battlefield radar, concept of bistatic & multistatic radar. (3 Hrs)

TEXT BOOKS:

1. Microwave Principles by H.J.Reich, J.G.Skolnik, P.F.Ordung, H.L.Krauss - Affiliated East West Press Ltd.
2. Introduction to Radar Systems (3rd Edition) by Merill Skolnik – Tata McGraw Hill
3. Understanding Radar Systems by Simon Kingsley & Shaun Queegan – Standard Publisher Distributors, New Delhi

REFERENCE BOOKS:

1. Microwave Devices and Circuits by Samuel Y. Liao
2. Radar Handbook by Merill Skolnik – Tata McGraw Hill

7.3 OPTICAL FIBER COMMUNICATION

MODULE I

Overview Of Optical Fiber Communication: Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, cylindrical fiber (no derivations in article 2.4.4). (3 Hrs)

single mode fiber, cutoff wave length, mode filed diameter, graded index fiber structure, (4 Hrs)

Optical Fibers: fiber materials. and fiber fabrication (3 Hrs)

MODULE II

Transmission Characteristics Of Optical Fibers**:** Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra model dispersion, Inter model dispersion (3 Hrs)

Optical Sources and Detectors- diode, structure, quantum efficiency, modulation of LED's and LASER. (4 Hrs)

Photo detectors, Photo detector noise, Response time, Photo diodes, comparison of photo detectors. (3 Hrs)

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MODULE III

Fiber Couplers and Connectors: Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers. (2 Hrs)

Optical Receiver Operation: Fundamental Receiver operation, Digital receiver performance calculation, Preamplifier types. (3 Hrs)

coherent detection, burst mode receiver, Analog receivers. (3 Hrs)

WDM Concepts**:** WDM concepts, overview of WDM operation principles. (2 Hrs)

MODULE IV

Optical Amplifiers and Networks – optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA. (4 Hrs)

Optical Networks- SONET/SDH rings, SONET/SDH networks . (2 Hrs)

Broadcast and select WDM networks. Wavelength routed networks. (4 Hrs)

TEXT BOOKS:

1. Optical Fiber Communication, Gerd Keiser, 4th Ed., MGH, 2008.
2. Optical Fiber Communications, John M. Senior, Pearson Education. 3rd Impression, 2007.

REFERNECE BOOKS:

1. Optical fiber communication by Oselt, McGraw Hill, 1980.
2. Fiber optics by P.K. Cheo
3. Optical fibers by Okashi
4. An Introduction to optical fibers by H.A. Cherin, Mc Graw Hill, Book Co. 1983
5. Optical communication system by J. Gowar Fiber Optic Communication - Joseph C Palais: 4th Edition, Pearson Education

7.4.1 EMBEDDED SYSTEMS

MODULE I

Different types of microcontrollers. Processor Architecture: Harvard and Princeton, CISC and RISC. The 8051 microcontroller architecture: Hardware, input/output pins, ports and circuits, external memory, counters and timers, serial data input and output, interrupts. (5 hours)

The 8051 instruction set: Data movement instruction: External Data move, Code memory Read-Only-Data moves, Push and Pop opcodes, Data exchanges. Logic operation: Bit and Byte level, Rotate and Swap. The 8051 instruction set: Arithmetic operations: Flags, incrementing, decrementing, addition, subtraction, multiplication and division, decimal arithmetic. Jump instruction: call, subroutine Interrupts and Return. (5 hours)

MODULE II

An 8051 Microcontroller design: A microcontroller design, testing the design, timing subroutines, lookup tables for the 8051, serial data transmission (4 hours)

An 8051 microcontroller Applications: Interfacing of keyboard to 8051 based microcontroller system – Human factors, key switch factors, key configurations, programs for keyboards, a scanning program for small keyboards, interrupt-driven programs for small keyboards, program for a large matrix key. Interfacing LED and LCD – Seven-segment numeric display, intelligent LCD display. Measurement of pulse width and frequency – Measuring frequency, pulse width measurement. Interfacing A/D and D/A Converter – D/A Conversions, A/D Conversions. (6 hours)

MODULE III

Introduction to PIC microcontrollers. CPU architecture and instruction set: Register file structure and addressing modes, CPU registers, instruction set, simple operations. (5 hours)

Features of PIC microcontroller: Interrupt logic, IntService interrupt Service routine, loop time subroutine, RBO/INT external interrupt input, PORTB-Change Interrupts (Pins RB7:RB4), Timer 0,Timer 1, Timer 2, Pulse-Width-Modulated Outputs. I^2C Bus for serial EEPROM, SPI protocol. (5 hours)

MODULE IV

ARM processor: ARM Processor basics, Interrupt scheme, .AMBA: A typical AMBA system, AHB features, components, interconnection. Basic AHB transfers. Burst operation (5 hours)

Introduction to Real Time (RT) Systems : Definitions and Classifications, Programming Structures, Response Latency, Relative speeds, Types of RT systems : Hard, Soft , Firm Real Time Operating Systems (RTOS) : Characteristics of Real-time operating system (RTOS), Kernel Pre-emptibility, Timing, Tasks, Handling Interrupts, Scheduler. (5 hours)

TEXT BOOKS:

1. The 8051 Microcontroller, Architecture, Programming & applications-second edition – Kenneth J. Ayala, Penram International.
2. Design with PIC Microcontrollers – John B. Peatman.
3. Real-time systems development By Rob Williams,
4. ARM System-on-Chip Architecture Steve Furber

REFERENCE BOOKS:

1. Programming and customizing the 8051 microcontroller – Myke Predko.
2. Programming and customizing PIC microcontrollers –Michael predko, Myke Predko
3. PIC-micro microcontroller pocket reference.
4. Embedded systems design By Steve Heath.

7.4.2 OPERATING SYSTEMS

MODULE I

Introduction to Operating System: Definition, Basic diagram, Basic elements, Processor registers, instruction execution, interrupts, memory hierarchy, cache memory, I/O communication techniques, OS objectives and functions. (3 hrs)
Multiprocessor system, Multiprogramming System, time sharing system (1 hr)
Process description & control: Process, process states, creation & termination of processes, two & five model process model, processor modes, suspended process, process description, OS control structures, process control structures, process location, process attributes, process control (3 hrs)
Threads Overview, Multithreading modules (1 hr)
Symmetric MultiProcessing (1 hr)
Microkernels architecture and benefits (1 hr)

MODULE II

Concurrency Control: Principles of concurrency, operating system concerns, process interaction, competition amongst processes for resources, cooperation amongst processes by sharing & communication (2 hrs)
Mutual exclusion: Requirements of mutual exclusion, development of Dekker's Algorithm, Peterson's algorithm, interrupt disabling, machine instruction approach (2 hrs)
Semaphores: Mutual exclusion, producer/consumer problem, implementation of semaphores, message passing, readers/writers problem (3 hrs)
Deadlocks: System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock. (3 hrs)

MODULE III

Memory management: Contiguous Memory allocation, paging, segmentation, segmentation with paging (3 hrs)
Virtual Memory: locality and virtual memory. (1 hr)
Numericals on fetch policy, placement policy, replacement policy, optimal, least recently used, first-in-first-out, clock algorithm for replacement (3 hrs)
File Management: Files, File Management systems, file organization and access, file directories, file sharing, record blocking (3hrs)

MODULE IV

Scheduling: types of scheduling, scheduling algorithms & numerical on: FIFO, Round Robin, Shortest Process Next, Shortest Remaining Time, Highest Response Ratio Next, Feedback. Comparison amongst all the scheduling algorithms. (3 hrs)
Principles of I/O software: Goals of I/O software (1 hr)
Disk Scheduling & Management: Disk scheduling policies-FCFS, SSTF, SCAN, C-SCAN, LOOK , selection of a disk scheduling algorithm, Disk management, disk formatting, bad blocks. (3 hrs)
Security: The Security environment, Basics of Cryptography, user authentication, attacks from inside the system, attacks from outside the system. (3 hrs)

TEXT BOOKS:

1. Operating Systems: Internal & design principles by William Stallings, Sixth Edition, PHI.
2. Operating systems Concepts by A. Silberschatz, P. Galvin, G. Gagne, Sixth Edition, John Wiley & Sons Pte. Ltd.
3. Modern Operating Systems by Andrew S. Tanenbaum, Second Edition, Pearson education, Prentice Hall

REFERENCE BOOKS:

1. Operating Systems: A concept based approach, by D.M. Dhamdhere, TataMc Graw Hill
2. Operating Systems: Concepts and design by Milan Milenkovic, TataMc Graw Hill
3. Operating Systems: A design oriented approach by Charles Crowley, TataMc Graw Hill

7.4.3 HARDWARE DESCRIPTION LANGUAGES

MODULE I

Basic concepts of hardware description languages. 2 hr.
Basic Language elements in VHDL:-Data Objects, Data Types, Operators, Entities and Architecture Declaration 4 hr
Behavioral style of VHDL modeling. :-Process Statement, IF, Case, Loop, Null, Exit, Wait Assert and Report statements. 4 hrs

MODULE II

Dataflow Modeling in VHDL:-Concurrent Signal Assignment and Sequential signal Assignment ,Conditional and Selected Signal Assignment, Delta Delay 4 hrs.
Structural Modeling in VHDL:-Component Instantiation 2hrs
Generics and Configurations, Attributes, Modeling Delays and Packages
Use of Procedures and functions in VHDL, 2 hrs
Examples of design using VHDL. 2hrs

MODULE III

Syntax and Semantics of Verilog hardware description language. Variable types, arrays and tables in Verilog. 2hrs
Operators, expressions and signal assignments in verilog. 2 hrs
Modules, nets and registers in verilog, 2hrs
Concurrent and sequential constructs of Verilog. 2hrs
Tasks and functions in Verilog, 2hrs

MODULE IV

Examples of design using Verilog HDL. 2hrs
System C Design Methodology. Syntax and semantics of System C. DataTypes in SystemC 4hrs
Examples of Design in System C 2hrs.
Synthesis of logic from hardware description. Design using Xilinx family FPGA 2hr

TEXTBOOKS:

1. Douglas Perry, "VHDL", McGraw Hill International (NY), 1993, The Institute of Electrical and Electronics Engineers.
2. S. Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Prentice Hall (NJ, USA), 1996.
3. J. Bhasker, "Verilog HDL Synthesis - A Practical Primer", Star Galaxy Publishing, Allentown, PA) 1998.
4. J.Bhasker :VHDL Primer" PHI.

REFERENCE BOOKS:

1. Stefan Sjoholm & Lennart Lindth,"VHDL for Designers", Prentice Hall.
2. Peter J Ashenden, "The Designer's Guide to VHDL ", Morgan Kaufmann Publishers.
3. "IEEE std 1364-95, Verilog Language Reference Manual", IEEE Press (NY, USA), 1995.
4. Navabi," VHDL Analysis & Modeling of digital systems",1998, McGraw Hill .

7.4.4 VIRTUAL INSTRUMENTATION

7.4.5

MODULE I

Virtual Instrumentation: Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow (3 hours)
Comparison with conventional programming. Development of Virtual Instrument using GUI. (3 hours)
Real-time systems, Embedded Controller, OPC, HMI/SCADA software, Active X programming. (4 hours)

MODULE II

VI programming techniques: VIS and sub-VIS, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes. (2 hours)
Local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in web. (3 hours)
Programming examples (5 hours)

MODULE III

Data acquisition basics: Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements. (5 hours)

VI Chassis requirements. Common Instrument Interfaces: current loop, RS232C/RS485, GPIB, Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office and Industrial applications, VISA and IVI. (5 hours)

MODULE IV

VI toolsets, Distributed I/O modules. Application of Virtual Instrumentation: Instrument Control, Development of process database management system. (3 hours)
Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control. (7 hours)

TEXTBOOKS

1. Gary Johnson, LabVIEW Graphical Programming, Second edition, McGraw Hill, Newyork, 1997.
2. Lisa k. Wells & Jeffrey Travis, LabVIEW for everyone, Prentice Hall, New Jersy, 1997

REFERENCE BOOKS

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newnes, 2000

7.4.5 WAVELET TRANSFORMS AND MULTIRATE DIGITAL SIGNAL PROCESSING

MODULE I

Fundamentals of multi-rate systems**:** Basic multi rate operations, interconnection of building blocks, poly phase representation, multi stage implementation, applications of multi rate systems, special filters and filter banks. (3 Hrs)

Multirate Filter Banks:
Maximally decimated filt er banks:Errors creatd in the QMF bank alias free QMF system, power symmetric QMF banks,M channel filter banks, poly phase representation, perfect reconstruction systems, alias free filter banks,tree structured filter banks,trans multiplexers. (4 Hrs)

Continuous Wavelet Transform:
Introduction, C-T wavelets, Definition of CWT, The CWT as a correlation. Constant Q-Factor Filtering Interpolation and time frequency resolution, the CWT as an operator, inverse CWT. (3 Hrs)

MODULE II

Introduction To Discrete Wavelet Transform And Orthogonal Wavelet Decomposition**:** Introduction. Approximation of vectors in nested linear vector spaces, (i) example of approximating vectors in nested subspaces of a finite dimensional liner vector space, (ii) Example of approximating vectors in nested subspaces of an infinite dimensional linear vector space. Example MRA. (i) Bases for the approximations subspaces and Harr
scaling function, (ii) Bases for detail subspaces and Haar wavelet.
(5 Hrs)

MRA, Ortho Normal Wavelets And Their Relationship To Filter Banks**:** Introduction, Formal definition of an MRA. Construction of a general orthonormal MRA, (i) scaling function and subspaces, (ii) Implication of dilation equation and orthogonality, a wavelet basis for MRA. (i) Two scale relations for (t), (ii) Basis for the detail subspace (iii) Direct sum decomposition, Digital filtering interpolation (i) Decomposition filters, (ii) reconstruction, the signal. (5 Hrs)

MODULE III

Alternative Wavelet Representations**:** Introduction, Bi-orthogonal wavelet bases, Filtering relationship for bi-orthogonal filters, Examples of bi-orthogonal scaling functions and wavelets.
2-D wavelets. (4 Hrs)

Non - separable multidimensional wavelets, wavelet packets. (1 Hr)
Wavelets Transform and Data Compression: Introduction, transform coding, DTWT for image compression (2 Hrs)

(i) Image compression using DTWT and run-length encoding. (3 Hrs)

MODULE IV

(i) Embedded tree image coding (ii) compression with JPEG audio compression (iii) Audio masking, (iv) Wavelet based audio coding. (3 Hrs)

Construction Of Simple Wavelets**:** Construction of simple wavelets like Harr and DB1. (3 Hrs)

Other Applications of Wavelet Transforms: Introduction, wavelet de-noising, speckle removal, edge detection and object isolation, Image fusions, Object detection by wavelet transforms of projections. (4 Hrs)

TEXT BOOKS:

1. Wavelet transforms- Introduction to theory and applications, Raghuveer M.Rao and Ajit S. Bapardikar, Person Education, 2000.
2. P.P.Vaidyana han,"Multirate Systems and Filter Banks,"Pearson Education (Asia)Pte.Ltd,2004.

REFERENCE BOOKS:

1. Wavelet transforms, Prasad and Iyengar, Wiley estern, 2001.
2. Wave-let and filter banks, Gilbert Strang and Nguyen Wellesley Cambridge press, 1996
3. Insight into WAVELETS from theory to practice**,** K.P. Soman and K.L. Ramchandran, Eastern Economy Edition, 2008

7.4.6 ELECTRONIC CIRCUITS: DESIGN, SIMULATION AND TESTING

MODULE I

Concept of Electronics Circuit Design: Functional Sections, Components and Devices, Ratings, Specifications,Design equations and selection criterion. (4 hrs)

Approaches to analysis; Introduction to modeling of devices, components and circuits. (3 hrs)

Computation of characteristics of simple devices (p-n junction, MOS capacitor, MOSFET, etc.) (3 hrs)

MODULE II

Simulation of Electronic Circuits: Role of simulation, various circuit elements and their representation (4 hrs)

Introduction to circuit simulator: SPICE, Simulation exercises; design of circuits and performance evaluation using simulation packages. (4 hrs)

Introduction to schematic, Layout and Routing (OrCad). Noise in electronic systems: design of low noise circuits. (2 hrs)

MODULE III

Design considerations and guidelines for automatic insertion of components. (2 hrs)

Electronic Product design: launch process, design management and design process. (3 hrs)

Design guidelines for dual in line package components. (3 hrs)

Surface mounting technology of electronic components. (2 hrs)

MODULE IV

Introduction to industrial design, product design methodology (4 hrs)

product planning and development data collection (4 hrs)

Marketing and management theory. (2 hrs)

ELECTRONIC CIRCUITS : DESIGN LABORATORY

Mini circuit design project based upon following guidelines:

The project should be strictly hardware based. The project can be carried out individually or in a group. The project work involves fabrication, testing and calibration (if required) work of some electronic circuit. The project should be defended by adequate documentation & presentation. A teacher can assign fabrication of trainer kits to the students.

TEXT BOOKS:

1. Electronic Circuit Design: From Concept To Implementation By Nihal Kularatna; Crc Press (Jun 2008)
2. Printed Circuit Boards: Design and Technology, By W.C. Bosshart, Tata McGraw Hill, 1983.
3. Electronic product design for automated manufacturing by Richard Stillwell, Marcel Dekker Inc.
4. Industrial Organization and Engineering Economics, T.R. Banga, S.C. Sharma, Khanna Publishers
5. Noise Reduction Techniques in Electronic Systems, By H.W.Ott. Wiley 1989

REFERENCE BOOKS:

1. Industrial Design and Engg. Design council By Flurschiem CH (springer verlag)
2. Printed Circuit Design. By G.L. Ginsberg. McGraw Hill, 1991
3. Computer aided analysis and electronic circuits, By L.O.Chua and P.M.Lin. Prentice Hall. 1975
4. Analysis and Simulation of Semiconductor Devices, By S. Selberherr, Springer-Verlag 1984
5. Introduction to Electronic Circuit Design By Richard Spencer and Mohammed Ghausi; Prentice Hal

7.4.7 INTRODUCTION TO JAVA AND J2EE

MODULE I

Introduction to JAVA**:**

Java and Java applications; Java Development Kit (JDK)

Byte Code, JVM; Object-oriented programming; Simple Java programs. 2 Hours

Data types and other tokens:

Boolean variables, int, long, char, operators, arrays, white spaces, literals, assigning values; Creating and destroying objects; Access specifiers.

Operators and Expressions: Arithmetic Operators, Bitwise operators, Relational operators, The Assignment Operator, The? Operator; Operator Precedence; Logical expression; Type casting; Strings 2 Hours

Control Statements: Selection statements, iteration statements, Jump Statements.

1 Hour

Classes, Inheritance, Exceptions, Applets:

Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes.

Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading.

Exception handling**:** Exception handling in Java. 2 Hours

The Applet Class: Two types of Applets; Applet basics; Applet Architecture; An Applet skeleton; Simple Applet display methods; Requesting repainting; Using the Status Window; The HTML APPLET tag; Passing parameters to Applets; getDocumentbase() and getCodebase(); ApletContext and showDocument();

The AudioClip Interface; The AppletStub Interface; Output to the Console. 3 Hours

MODULE II

Multi Threaded Programming, Event Handling:

Multi Threaded Programming: What are threads? How to make the classes threadable; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, read-write problem, producer-consumer problems. 3 Hours

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes**.** 3 Hours

Swings:

Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList; JComboBox; JTable. 4 Hours

MODULE III

JAVA 2 Enterprise Edition Overview, Database Access:

Overview of J2EE and J2SE. The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions. 4 Hours

Servlets:

Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking**.** 6 Hours

MODULE IV

JSP, RMI:

Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects.

Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side. 5 Hours

Enterprise Java Beans:

Enterprise java Beans; Deployment Descriptors; Session Java Bean, Entity Java Bean; Message-Driven Bean; The JAR File. 5 Hours

TEXT BOOKS:

1. Java - The Complete Reference – Herbert Schildt, 7th Edition, Tata McGraw Hill, 2007.
2. J2EE - The Complete Reference – Jim Keogh, Tata McGraw Hill, 2007.

REFERENCE BOOKS

1. Introduction to JAVA Programming – Y. Daniel Liang, 6th Edition, Pearson Education, 2007.
2. The J2EE Tutorial – Stephanie Bodoff et al, 2nd Edition, Pearson Education, 2004

7.4.8 OPTICAL COMPUTING

MODULE I

Mathematical and digital image fundamentals:
Introduction, Fourier Transform, discrete Fourier transform, basic diffraction theory. (2 hours)
Fourier transform property of lens , sampling and quantization, image enhancement, image restoration. (3 hours)

Linear Optical Processing:
Introduction,Photographic film, Spatial filtering using binary filters (2 hours)
Holography, Inverse filtering, Deblurring. (3 hours)

MODULE II

Analog optical arithmetic:
Introduction, Halftone processing, Nonlinear Optical Processing, Arithmetic operations. (3 hours)
Recognition using analog optical systems:
Introduction, Matched filter, Joint transform correlation (2 hours)
Phase-only filter, Amplitude Modulated Recognition Filters (2 hours)
Generalized correlation filter, Mellin transform based correlation. (3 hours)

MODULE III

Digital optical computing devices:
Introduction, Nonlinear devices, Integrated optics, Threshold devices (2 hours)
Spatial high modulators, Theta modulation devices. (2 hours)

Shadow-casting and symbolic substitution:
Introduction, Shadow casting system and Design algorithm, POSC logic operations, POSC multiprocessor, Parallel ALU using POSC, Sequential ALU using POSC (3 hours)

POSC image processing, Symbolic substitutions, Optical implementation of symbolic substitution, Limitations and challenges. (3 hours)

MODULE IV

Optical matrix processing:
Introduction, Multiplication, Multiplication using convolution, Matrix operation (3 hours)
Cellular logic architecture, Programmable logic array. (2 hours)

Artificial intelligent computations:
Introduction, Neural networks, Associative memory (2 hours)
Optical implementations, Interconnections, Artificial Intelligence. (3 hours)

TEXT BOOK:

1. "Optical Computing: An Introduction", Mohammed A. Karim, John Wiley & Sons.

REFERENCE BOOKS:

1. Optical Signal Processing by Vanderlugnt John Wiley & Sons
2. Signal Processing in Optics - Bradly G Boore, Oxford University Press

7.4.9 PROCESS CONTROL INSTRUMENTATION

MODULE I

Introduction to Process Control:
Introduction; control systems; process control block diagram; servomechanisms; control system evaluation; on off control; analog and digital control; process characteristics. (5 hrs)

Sensors: Sensor time response;
Overview of Thermal sensors-RTD, thermistors, thermocouples;
Overview of Mechanical sensors: strain, motion, pressure, and flow;
Optical sensors: photodectectors, pyrometers, applications: design consideration of all sensors. (5 hrs)

MODULE II

Analog and digital signal conditioning;
Analog signal conditioning: Linearization, Conversion, SCR and TRIAC. (2 hrs)
Final Control:Introduction; final control operation; Signal conversion; (1 hr)
Actuators: electrical, pneumatic, and hydraulic; Control elements: mechanical; electrical; Fluid valves; Control valve type; Control valve sizing; Process instrumentation; (4 hrs)
Discrete state process control:Introduction; defination; characteristics of the system; relay controllers. (3 hrs)

MODULE III

Controller Principles:

Introduction; overview of control system parameters; continous controller modes: proportional, integral, derivative control modes; composite control modes: PI, PD, PID; (4 hrs)

Telemetry: neumatic telemetering system; electronic telemetry system; electrical electronic telemetering system. (2 hrs)
Analog /digital controllers:
Introduction; electronic, pneumatic, digital controller; design considerations. (4 hrs)

MODULE IV

Computer in process control: Data logging; supervisory control; computer-based controller; digital controller for a turbine and generator. Introduction to process loops; simple control schemes for level, flow, temperature as applied to reactor, heat exchanger. (4 hrs)

Overview of signal recorders: chart recorder, fiber optic recorder, magnetic recorder, UV recorder, Printing processes: Risograph, laser printers; Process control networks: Modbus communication RS485/RS422. (3 hrs)

Applications of PLC to process control: Traffic generation, water-bottle plant; Microprocessor application in process instrumentation: microprocessor control of a petrol engine, microprocessor based data logger; process loop tuning. (3 hrs)

TEXT BOOKS:

1. Process Control Instrumentation Technology-Curtis D. Johnson, Pearson Education, 7th edition.
2. Principles of Measurement and Instrumentation-Alan S.Morris, EEE, 2nd Edition.
3. Instrumentation Devices and Systems-Rangan, Sarma, Mani, TMH, New Delhi.
4. Industrial Instrumentation and control-SK Singh, TMH, New Delhi.

REFERENCE BOOKS:

1. Automatic process control –Donald P.Eckman
2. Digital control systems-KU

7.5.1 MOBILE COMMUNICATION SYSTEMS

MODULE I

The Cellular Concept: System Design Fundamentals :
Introduction, frequencies used, Concept of Frequency Reuse, Hexagonal shaped cells, Block diagram of Cellular System, Advantages over Conventional Mobile Communication Systems. (2hrs)
Handoff Strategies: Handoffs, Types of handoff, handoff initiation, delaying handoff, forced handoff, Queuing of Handoffs, Power Difference Handoffs, Mobile assisted Handoff (MAHO) and Soft Handoff, Cellsite Handoff, Intersystem handoff (2hrs)

Co-channel Interference reduction factor, Desired C/I for a normal case in a Omnidirectional Antenna System , Reduction of Co-Channel interference by means of a notch in then tilted antenna pattern (2hrs)
Mobile Radio Propagation : Large Scale Path Loss : Introduction to Radio Wave Propagation, Free Space Propagation Model, The Three Basic Propagation Mechanisms, Ground Reflection (Two Ray) Model, Diffraction, Scattering (2hrs)
Obtain path loss from a point to point prediction model-A general Approach, A point to point Model, Mobile to Mobile propagation (2hrs)

MODULE II

Mobile Radio Propagation : Small Scale Fading and Multipath :
Small Scale Multipath Propagation, Impulse Response of a Multipath Channel (1hr)

Parameters of Mobile Multipath Channels , Types of Small Scale Fading, Rayleigh and Rician Distribution. (2hrs)

Modulation Techniques for Mobile Radio :
Factors that influence the choice of Digital Modulation, Gaussian Pulse Shaping Filter, Gaussian Minimum Shift Keying (GMSK). (1hr)

Equalization, Diversity:
Introduction, Fundamentals of Equalization, Equalizers in a Communication Receiver

(1hr)

Diversity Techniques ,Rake Receiver (2hrs)

Multiple Access Techniques for Wireless Communications :
Introduction, TDMA, Fixed TDM, Classical Aloha, Slotted ALOHA, CSMA, DAMA, PRMA, Reservation TDMA, MACA, Polling, Space Division Multiple Access (3hrs)

MODULE III

GSM and CDMA:

Global System for Mobile Communication (GSM) **:** GSM Services and Features, GSM System Architecture, GSM Radio Subsystem, GSM Channel Types, Example of a GSM Cell, Frame Structure for GSM. (4hrs)

CDMA Digital Cellular Standard (IS-95) **:** Frequency and Channel Specifications, Forward CDMA Channel, Reverse CDMA Channel. (3hrs)

Capacity of Cellular Systems : Capacity of Cellular CDMA, Capacity of CDMA with Multiple Cells, Capacity of Space Division Multiple Access. (3hrs)

MODULE IV

MIMO Systems:

Multiple Input Multiple Output Antenna Systems (1 hours)
Space Time Codes for MIMO Wireless Communications (2 hours)
Space Division Multiple Access and Smart Antennas (2 hours)
BLAST Architectures (2 hours)
Global Positioning Satellite System (GPSS) (1hr)
Wideband Code Division Multiple Access (W-CDMA), WI-FI (2 hours)

TEXTBOOKS:

1. Wireless Communication : Principles and Practice by Theodore Rappaport , 3rd Edition,Prentice Hall of India
2. Modern Wireless Communications by Simon Haykin, Micheal Moher, Pearson Education

REFERENCE BOOKS :

1. Fundamentals of Wireless Communications by David Tse and Pramod Vishwanathan,Cambridge University Press
2. Mobile Cellular Telecommunications by William Lee, Tata McGraw Hill,2nd edition
3. Mobile Communications by Jochen Schiller, 2nd Edition, Addison Wesley
4. Introduction to Wireless and Mobile Systems by Dharma Prakash Agrawal, Qin Anzen Thomson Asia Pvt. Ltd.
5. Space Time Codes and MIMO Systems by Mohinder Janakiraman, Artech House

7.5.2 ARTIFICIAL NEURAL NETWORK

MODULE I

Introduction: Introduction to neural networks, structure of biological neuron, Mc-Culloch Pitts neuron model. 1 hour
logic network realization by using Mc-Culloch Pitts neuron model, Neuron modeling for artificial neuron systems, Neural learning. 1 hour
Single layer network: Concept of linear seperability and non-linear separability, training algorithms- 1 hour
Hebbian learning rule, perceptron learning rule, Delta learning rule, Widrow-Hoff learning rule, co-relation learning rules, winner take all and outstar learning rules, and related problems.. 4 hour
Discriminant functions, Minimum distance classification, Single layer Discrete Perceptron, Single layer Continuous Perceptron, ADALINE. 2 hour
Multicatagory single layer perceptron. 1 hour

MODULE II

Multilayer network I: Error back propagation algorithm or generalized delta rule. 1 hour

Setting of parameter values and design considerations (Initialization of weights, Frequency of weight updates, Choice of learning rate, Momentum, Generalizability, Network size, Sample size, Non-numeric inputs). 2 hours
Pocket algorithm, quick prop algorithm, performance evaluation. 2 hours

Multilayer network II: Adaptive multilayer network, network pruning algorithm.
Marchands algorithm, neural tree, tiling algorithm & problems related to adaptive multiplayer network. 3 hours
Prediction network, radial basis function and its applications, polynomial network. 2 hours

MODULE III

Winner-Take-All network, Hamming Distance classifier, MAXNET 2 hour
Clustering, simple competitive learning algorithm, LQV algorithm. 2 hour
Adaptive resonance theory. 1 hour
Topologically organized network – SOM, SOFM, Kohonen's algorithms, Distance based learning, K-means clustering algorithms, Principal Component Analysis Networks and problems. 5 hours

MODULE IV

Hopefield network: Non-iterative procedures for association, Matrix Association memories, Least square procedures, Optimal linear association memory. 2 hours

Discrete Hopefield networks, Continuous Hopefield networks, Energy functions, Energy minimization, Storage capacity of Hopfield networks. 3 hours
Brain-state-in-a-box network, Bi-directional associative memory and problems. 2 hours
Applications of neural network. 3 hours

TEXTBOOKS:

1. Elements of artificial neural network by Malhotra, Mohan, Ranka, Penram Publications.
2. Introduction to Artificial neural network by Zurada, Jaico Publications.

REFERENCE BOOKS:

1. Introduction to Artificial neural network by Patterson

7.5.3 SECURE COMMUNICATIONS

MODULE I

Introduction of Secure Network: Key points(service, mechanisms and attacks),OSI security architecture, Security attacks, security services, security mechanisms, a model for network . (2 hrs)

Classical encryption techniques: Symmetric cipher model substitution techniques, Transposition techniques, rotor machines,steganography and numerical on different ciphers. (4 hrs)

Block Ciphers and DES(Data Encryption Standards):Block cipher principles, Data encryption standards, strength of DES, Block cipher design principles, Block cipher modes of operation, problems on DES. (4 hrs)

MODULE II

Public-Key Cryptography and RSA:Principles of public-key cryptosystems, RSA algorithm and numerical on RSA. (3hrs)
Key Management; Other Public Key Crypto Systems: Key management, Diffie-Hellman key exchange, ECC Diffie-Hellman key exchange algorithm, numericals.
(3hrs)

Message Authentication and Hash Functions: Authentication requirements, Authentication functions. (2 hrs)
Message authentication codes, Requirements of Hash functions, Security of hash functions & MAC's (2 hrs)

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MODULE III

Digital Signature and Authentication Protocol: Digital signature, Authentication protocols, Digital signature standard. (3 hrs)

Authentication Applications:
Kerberos: Kerberos Version 4, Kerberos Version 5. (2 hrs)
X.509 authentication service**:-**Certificates, Authentication Procedures,X.509 Version 3 (3 hrs)
Firewalls: Firewall Design Principles (2 hrs)

MODULE IV

Electronic Mail Security: Pretty good privacy, S/MIME (4 hrs)
IP Security: Overview, IP security architecture, Authentication header, ESP (encapsulating security pay load), Key management. (6 hrs)

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security, 4th edition, Prentice Hall of India, 2008.

REFERENCE BOOKS:

1. C. Kaufman, R. Perlman, and M. Speciner, Network Security: Private Communication in a Public World, 2nd edition, Pearson Education (Asia) Pvt. Ltd., 2002

7.5.4 NANOELECTRONICS

MODULE I

The region of Nanostructures; The Complexity problem, The challenge initiated by Nanoelectronics: Technological processes for microminiaturization; Methods and limits of microminiaturization in silicon; Microelectronics and Mechanical Systems (MEMS): Integrated Optoelectronics. 4 Hours

Basics of Nanoelectronics, quantization of Action, Charge and Flux; Schrodinger Equation, Electrons in Potential Wells, Photons interacting with electrons in solids. Diffusion Processes. 3 Hours

Basics of Information theory, Biology-inspired concepts; Biological Networks, Neuronal cells on silicon, Modelling of neuronal cells by VLSI, Neuronal networks with local adaptation and Distributed data processing. 3 Hours

MODULE II

Biochemical and quantum – mechanical computers: DNA computer, Quantum Computer. 2 Hours

Parallel Architectures for Nanosystems: Architectural principles, Mono and multiprocessor systems, parallel data processing; Influece of delay time; power dissipation and parallelism.
Architectures for parallel processing in nanosystems. 3 Hours

Soft computing in Nanoelectronics: Methods of soft computing; characteristics of Neural Networks in Nanoelectronics. 3 Hours

Complex Integrated Systems and their properties; Nanosystems as Information – Processing machines, System Design and Interfaces; Evolutionary Hardware, Requirements of Nanosystems. 2 Hours

MODULE III

Integrated switches and Basic circuits: Switches and wiring; Classic Integrated switches and their Basic circuits. 2 Hours

Quantum Electronics: QEDs; examples of QEDs. 2 Hours

Bioelectronics and Molecular Electronics. 2 Hours

Nanoelectronics with Tunneling Devices: Tunneling Element; Technology of RTD; Digital circuit design based on RTDs; Digital circuit design based on RTBT. 4 Hours

MODULE IV

Single Electron Transistor (SET): Principle and circuit design of SET; Comparison between FET and SET circuit designs. 2 Hours

Nanoelectronics with Superconducting Devices: Basics, Superconducting switching Devices, Elementary circuits, Flux Quantum Device, Applications. 3 Hours

Limits of Integrated Electronics: A survey about the limits, Replacement of Technologies; Energy supply and Heat Dissipation; Parameter spread as limiting Effect; Limits due to thermal particle motion, Reliability as limiting Factor; Physical limits. 3 Hours

Final objectives of Integrated Electronic Systems: removal of uncertainties by Nanomachines, uncertainties in Nanosystems, uncertainties in the development of Nanoelectronics. 2 Hours

TEXT BOOKS

1. Nanoelectronics and Nanosystems by K. Goser, P. Glosekotter and J. Dienstuhl – Springer International Edition

REFERENCE BOOKS

1. Nanotechnology by M. Ratner and D. Tatner, Pearson Education.
2. Nanotechnology by M. Wilson ,et al.
3. Nanometer Structures by A. Lakhtakia (ed.), Prentice Hall of India.
4. Nanotechnology by R. Booker, E. Boysen, Wiley-dreamtech India Pvt. Ltd

7.5.5 OPTICAL NETWORKING

MODULE I

First Generation Optical Networks: (4 hours)
SONET/SDH, Computer Interconnects, Metropolitan Area Networks, Layered Architecture

Broadcast and Select Networks : (6 hours)
Topologies for Broadcast Networks, Media Access Control (MAC) Protocols, Scheduling Protocols.

MODULE II

Wavelength Routing Networks : (7 hours)
The Optical layer, Node Designs, Network design and operation, Routing and Wavelength Assignment.

Virtual Topology Design: (3 hours)
Virtual Topology Design Problems, Combined SONET/WDN, Network Design, Integer Linear Programming formulation, Regular virtual topologies.

MODULE III

Control and Management: (6 hours)
Network Management Functions, Configuration management, Performance Management, Fault Management, Ring Networks , Mesh Networks.

Access Networks : (4 hours)
Network Architecture Overview, Optical Access Network Architecture

MODULE IV

Photonic Packet Switching : (6 hours)

OTDM, Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM Networks, Switch based Networks

(4 hours)

Next Generation Optical Internet Networks :
Optical circuit switching, Optical burst switching, MPLS in WDM Networks.

TEXT BOOKS:

1. Optical Networks : A Practical Perspective by Raju Ramaswami, Kumar Sivarajan, Morgan Kauffmann
2. WDM Optical Networks: Concepts, Design and Algorithms by C.Siva Ram Murthy, Mohan Guruswamy, Prentice Hall of India

REFERENCE BOOKS :

1. Optical Networks : Third Generation Transport Systems by Ulysses Black, Pearson Education
2. Optical Communication Networks: Biswajit Mukherjee: TMG 1998.
3. Optical Networking and WDM by Walter Goralski, Tata Mcgraw Hill
4. WDM Technologies : Optical Networks by Achyut G Dutta, Niloy K Dutta, Masahiko Fujiwara.

7.5.6 ADAPTIVE SIGNAL PROCESING

MODULE I

Adaptive Systems: Definition and characteristics; general properties; open- and closed – loop adaptation, Example. 3 Hours

Adaptive Linear Combiner: Input signal and weight vectors; Desired response and error; Performance function; Gradient and minimum mean-square error; Example, Alternative expression of the gradient; Decorrelation of error and input components 3 Hours

Adaptation with Stationary signals: Properties of the quadratic performance surface; Eigen values and the eigen factors of the input correlation matrix; their geometrical significance; Examples. 4 Hours

MODULE II

Searching the Performance Surface: Methods of searching, Gradient Search methods; Gradient Search Algorithm and its solution 2 Hours

Stability and rate of convergence; the learning curve, Gradient Search by Newton's method: Newton's method in multidimensional space; Gradient Search by Steepest Descent method; Comparison of learning curves. 3 Hours

Gradient Estimation and its Effects on Adaptation; Estimation by Derivative measurement: Performance penalty; Derivative measurement and performance penalties by multiple weights; Variance of the gradient estimate; Effects on the weight-vector solution, Excess mean-square error and time constants; Misadjustment; Comparative performance of Newton's and Steepest-Descent methods; Total Misadjustment and other practical considerations 5 Hours

MODULE III

Adaptive Algorithms and structures: The LMS Algorithm; its derivation, Convergence of the Weight vector, Example of Convergence, Learning Curve, Noise in the weight – vector resolution, Misadjustment Performance. 3 Hours

The Z-transform in Adaptive signal Processing: the Z-transform , Right– and Left-handed sequence, Transfer functions, Frequency response, Impulse response and stability, Inverse Z-transform, Correlation functions and Power Spectra, Performance Function; Examples 4 Hours

Other Adaptive Algorithms: The LMS/Newton Algorithm, its properties; Sequential Regression Algorithm; Adaptative Recursive Filters, Random-Search Algorithms 3 Hours

MODULE IV

Lattice Structures, Adaptive lattice Predictor; Adaptive filters with orthogonal signals 2 Hours

Applications: Adaptive Modeling and System Identification, general description; Adaptive modeling of a Multipath Communication Channel, Adaptive modeling in Geophysical Exploration, Adaptive modeling in FIR Digital Filter Synthesis. 3Hours

Inverse Adaptive Modeling, Equalization and Deconvoluion; General description of Inverse Modeling, Examples; Adaptive Equalization of Telephone Channels; Adapting poles and zeros for IIR Digital Filter Synthesis. 3 Hours

Adaptative Control Systems: Adaptive Model Control, Adaptive Inverse Control, Examples; Plant noise and the Filtered-x LMS Algorithm; Inverse Control using the Filtered-x LMS Algorithm 2 Hours

TEXT BOOK:

1. Adaptative Signal Processing B. Widrow and S. D. Stearns, Pearson Education

REFERENCE BOOKS:

1. Digital Signal Processing – A.V. Oppenheim and R. W. Schafer, Prentice Hall India
2. B. C. Kuo, Automatic Control Systems, Prentice Hall India

8.1 SATELLITE AND TELEVISION ENGINEERING

MODULE I

Satellite orbits and inclination: Synchronous orbit, orbital parameters, satellite location with respect to earth, look angles, earth coverage and slant range, eclipse effects, placement in geostationary orbit, station keeping, stabilization. 3 Hour

Satellite subsystems: Power, altitude and orbit control, propulsion, repeaters, antennas, Telemetry, Tracking & Command (TTC), thermal control, structure. 3 Hour

Earth station: Design requirements, subsystems, small earth stations, VSATs, mobile and transportable earth stations. 3 Hour

Applications of satellite communication. 1 Hour

MODULE II

Frequency allocations and spectrum. Link design: Design equations, system noise temperature, C/N and G/T ratio, atmospheric and ionospheric effects, interference effects, earth station parameters. 3 Hour

SCPC system, MCPC System, Multiple Access Techniques: TDMA: Frame structure, burst structure, frame efficiency, super frame, frame acquisition and synchronization, comparison with FDMA, burst time plan, multiple beam (Satellite switched) system, beam hopping TDMA. 3 Hour

Demand Assignment Multiple Access Techniques: DA-FDMA (Spade) system, DA-TDMA, Spread spectrum techniques and CDMA: Direct sequence spread spectrum, PN sequences, DS CDMA, frequency hopping system, FH-SS CDMA, Synchronization.

4 Hours

MODULE III

Basic television system: Sound and picture transmission, scanning methods, interlaced scanning, number of scanning lines, vertical and horizontal resolution, evaluation of bandwidth of baseband signal. 2 Hour

Composite video signal: Video signal levels, need for synchronization, details of synchronizing and equalizing pulses, scanning sequence details. 2 Hour

Television cameras: Principle of working and construction of Vidicon, CCD image sensors, gamma correction. 2 Hour

Signal transmission: AM and FM channel bandwidth, vestigial sideband transmission, VSB correction, VHF and UHF bands. TV transmitter block diagram. 1 Hour

Signal reception: TV receiver block diagram, construction of picture tube and their control circuits, RF tuner, IF amplifier, IF response curve, Trap circuits, sync separators, video detector, AGC and AFC schemes, Audio detector, horizontal and vertical deflection systems, high and Extra High Tension (EHT) circuits. 3 Hour

MODULE IV

Colour television: Principles of additive and subtractive colour mixing, chromaticity diagram, compatibility, luminance, hue and saturation, luminance signal, generation of colour difference signal, polarity of colour difference signal. 1 Hour

Colour television display tubes: Delta gun picture tube, PIL picture tube, Trinitron picture tube, purity and convergence, static and dynamic convergence, automatic degaussing, grey scale tracking, pincushion distortion, S correction. 2 Hour

Colour signal transmission and reception: Frequency interleaving, bandwidth for colour signal transmission, modulation of colour difference signal, generation of chrominance signal. 2 Hour

NTSC colour TV system: I and Q signals, selection of colour subcarrier frequency, NTSC encoder and decoder, limitation of NTSC system. 2 Hour

PAL colour television system: Main features of PAL system, cancellation of phase errors, PAL encoder, PAL decoder, PAL-D. 2 Hour

Introduction to advanced Television Systems: HDTV, LCD TV, Plasma TV, LED TV, NHK, MUSE System, Direct- to- Home TV.

1 Hr

TEXT BOOKS:

a. Satellite communication by D.C. Aggarwal, Khanna publications.
b. Satellite communications by T. Pratt, C.W. Bostian, Wiley and sons.
c. Monochrome and colour television by R.R.Gulati, New Age International Pvt. Limited

REFERENCE BOOKS:

1. Electronic communication systems by W. Tomasi, Pearson Education, Asia.
2. Television and Video Engineering by A.M.Dhake, Tata McGraw Hill publishing Company limited.
3. Satellite communication systems by Dennis Roddy, (third edition), Pearson Education, Asia.
4. Satellite communications, R.M. Gagliardi, CBS Publishers & Distributors, New Delhi
5. The satellite communication applications hand book by Bruce R.Elbert, Artech House Boston, 1997
6. Satellite communication systems engineering by Wilbur L.Pritchard, Hendri G.Suyderhood, Robert A.Nelson, II Edition, Prentice Hall, New Jersey.1993
7. Digital satellite communication by Tri T.Ha, 2nd edition, McGraw Hill, New york.1990.
8. Digital communication satellite / earth station engineering by K.Feher, Prentice Hall Inc, New Jersey, 1983
9. Basic Television & video systems by Grob & Herndon, Glencoe Mc Graw Hill, 6th edition.
10. Television electronics – theory and servicing by Milton Kiver & Milton Kaufman, CBS publishers & distributors, New Delhi.
11. Colour television – theory & practice by R.R. Gulati, New Age International Ltd.
12. Colour television – theory & practice by S.P.Bali, Tata Mc Graw Hill.

8.2.1 CONSUMER ELECTRONICS

MODULE I

Electro acoustical Transducers: Microphones, Loudspeakers, Pick-up characteristics, specifications and applications. 3 hrs

Sound Recording and Reproduction: Principle and Block schematic of disc recording system, magnetic recording system, optical recording system, compact disc and video recording. 4 hrs

Audio Amplifier and subsystems: Audio mixers, tone controls, Graphic equalizers, Features of Hi-Fi and stereo systems, Dolby system, Public Address systems. 3 hrs

MODULE II

Testing, Alignment & Servicing of Television Receivers: Testing &Alignment of TV receivers, TV Wobbuloscope, Video Pattern Generators, Television Test Charts, Marker Generator, Colour bar generator, Vectroscope, Tuners. 3 hrs

Cable Television: Modern cable TV system, cable TV converter, Cable systems, Satellite Television, Direct to home TV, LED TV. 2 hrs

Digital television: Digital Television Systems, Digital TV Signals, Digitized video parameters, tramision of Digital TV Signals, Bit rate reduction. 2 hrs

Projection Television: Basic projection television systems, front and rear projection, LCD & Laser Projection system 2 hrs

High Definition television systems: HDTV Systems, HDTV standards and compatibility. 1 hr

MODULE III

Modern home appliances with electronic control: Microwave oven, washing machine, Air-conditioner, DVD, MP3 player, Digital Camera, Remote control, CVT, Inverters, UPS, Refrigerator, Iron, Kittle, Mobile handset up-gradation and repairing. 4 hrs

Working principle of photocopying, scanner, fax machine, risograph, solar water heater and solar cooling. 2 hrs

Maintenance and safety measures: 1 hrs

Electricity in home: electric lighting, electric heating.
Dangers of Electricity & Safety Precautions. 3 hrs

MODULE IV

Marketing planning: Importance of marketing planning, steps involved in marketing planning process scanning the marketing environment and spotting the business opportunities, setting the market objectives. 3 hrs

Marketing strategy: the meaning & significance of marketing strategy, formulating the marketing strategy.
Techniques and Practices for mass production for reliable production. 3 hrs
Costing: overview of costing and marketing communication.
Entrepreneurship Awareness,Entrepreneural spirit, Entrepreneurship development center.
Introduction to Energy auditing.
Patents: Introduction to patents.
Industrial Discipline.

TEXT BOOKS :

1. Consumer Electronics-Gupta B R.
2. Television Engineering –A M Dhake.
3. Marketing management planning, implementation and control, 2nd edition-V S Ramaswamy, J Namakumari.
4. Electronics for Today and Tomorrow-Tom Duncan.
5. Personal Management &industrial Relations-Dr.M.M.Varma & Aggarwal.

REFERENCE BOOKS:

1. Digital Consumer Electronics Engineering Handbook-Ronald Jurgen.
2. Audio Encyclopedia-Triman.
3. .High Quality Sound Recording and Reproduction-Olson.
4. .Phillips handbook.
5. Everything You Ever wanted to know about DVD-Jim Taylor

8.2.2 SPEECH SIGNAL PROCESSING

MODULE I

Production and Classification of Speech Signals:
Introduction, Anatomy and Physiology of Speech production, Spectrographic Analysis of Speech, Categorization of speech sounds, Prosody: The Melody of speech, Speech Perception (8 hours)

Acoustics of Speech Production:
A Discrete time model based on tube concatenation. (2 hours)

MODULE II

Analysis and Synthesis of Pole Zero Speech Models :
Introduction, All Pole Modeling of Deterministic Signals, Levinson Recursion and its associated properties, Criterion of Goodness. (5 hours)

Homomorphic Signal Processing :
Introduction, Concept, Homomorphic system for convolution, Complex spectrum of speech like sequences, Short time homomorphic analysis of periodic sequences, Short term speech analysis, Analysis/Synthesis structures. (5 hours)

MODULE III

Filter Bank Analysis Synthesis :
Introduction, Phase Vocoder, Phase Coherence in the Vocoder, Auditory Modelling (3 hours)

Sinusoidal Analysis/Synthesis :

Sinusoidal Speech Models, Estimation of Sinewave parameters. (2 hours)

Frequency Domain Pitch Estimation:
Correlation based pitch estimator, Pitch estimation based on comb filter, Pitch estimation based on Harmonic Sinewave Model. (5 hours)

MODULE IV

Speech Coding :
Introduction, Statistical Models, Scalar Quantization, Vector Quantization, Frequency Domain Coding, Model based Coding. (7 hours)

Speaker Recognition :
Introduction, Spectral Features for Speaker Recognition, Speaker Recognition Algorithms. (3 hours)

TEXTBOOK:

1. Discrete-Time Speech Signal Processing: Principles and Practice by Thomas Quatieri , Prentice Hall

REFERENCE BOOKS :

1. Digital Processing of Speech Signals by L.R.Rabiner, A.W.Schafer, Pearson Education
2. Principles of Computer Speech , I.H.Witten Academic Press.
3. Fundamentals of Speech Recognition by Lawrence Rabiner, Bing Hwang Juang, Prentice Hall
4. Speech and Audio Signal Processing : Processing and Perception of Speech and Music by Ben Gold, Nelson Morgan, John Wiley and Sons

8.2.3 MOBILE COMPUTING

MODULE I

Mobile devices and systems, architectures:

Mobile phones, Digital Music Players, Handheld Pocket Computers, Handheld Devices, Operating Systems, Smart Systems, Limitations of Mobile Devices, Automotive Systems. (5 Hours)

Wireless Medium Access Control And CDMA – Based Communication:

Medium Access Control (2 Hours)

Introduction to CDMA – based Systems (2 hours)

OFDM (1 Hour)

MODULE II

Mobile IP network layer, mobile transport layer:

IP and Mobile IP Network Layers Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, Dynamic Host Configuration Protocol. (4 hours)

Indirect TCP, Snooping TCP, Mobile TCP, Other Methods of TCP – layer Transmission for Mobile Networks. (2 Hours)

Databases:

Database Hoarding Techniques, Data Caching, Client – Server Computing and Adaptation, Transactional Models (2 Hours)

Query Processing, Data Recovery Process, Issues relating to Quality of Service. (2 Hours)

MODULE III

Data dissemination and broadcasting systems**:**

Communication Asymmetry, Classification of Data – Delivery Mechanisms (2 hours),

Data Dissemination Broadcast Models, Selective Tuning and Indexing Techniques, Digital Audio Broadcasting, Digital video Broadcasting. (2hours)

Data synchronization in mobile computing systems:

Synchronization, Synchronization Protocols (2 hours)

SyncML – Synchronization Language for Mobile Computing, Synchronized Multimedia Markup Language (SMIL). (4 Hours)

MODULE IV

Mobile devices, server and management, wireless LAN, Mobile Internet Connectivity And Personal Area Network:

Mobile agent, Application Server, Gateways, Portals, Service Discovery, Device Management, Mobile File Systems. (2 hours)

Wireless LAN (WiFi) Architecture and Protocol Layers, WAP 1.1 and WAP 2.0 Architectures, Bluetooth – enabled Devices Network, Zigbee. (3 hours)

Mobile application languages – XML, JAVA, J2ME AND JAVACARD, MOBILE operating systems:

Introduction, XML, JAVA, Java 2 Micro Edition (J2ME) (3 hours)

JavaCard. Operating System, PalmOS, Windows CE, Symbian OS, Linux for Mobile Devices. (2 Hours)

TEXT BOOK:

1. Mobile Computing – Raj Kamal, Oxford University Press, 2007.

REFERENCE BOOKS:

1. Mobile Computing: Technology, Applications and Service Creation, Asoke K. Talkukder, Roopa R Yavaga, Tata McGraw Hill, 2005.
2. Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML, Reza B'Far, 5th Edition, Cambridge University press, 2006.
3. Principles of Mobile Computing– Uwe Hansmann, Lothat Merk, Martin S Nicklous and Thomas Stober, 2nd Edition, Springer International Edition, 2003.

8.2.4 INTRODUCTION TO ROBOTICS

MODULE I

Basic Concepts in (Fundamentals of) robotics: Automation and robotics, robot anatomy, Basic structure of robots, Degree of Freedom. Robot motions, resolution, accuracy and repeatability. 4 hrs

Classification and structure of robotic systems: Point to point and continuous path systems, Grippers, Design of grippers. 2hrs

Drives and Control systems: Hydraulic and pneumatic systems, Control loop of robotic systems, Control approaches utilizing current and voltage amplifiers, Robot joint control design 4hrs

MODULE II

Electromechanical Components for Robots:
Force sensing and control of robots, control of robot movements
stability considerations and trajectory optimization. 3hrs

Robot arm drive units. Revolute and prismatic drives.
Electric drives – DC Servometers, Stepping motors, classification, methods of control and comparison. 2 hrs

Sensors in Robotics: Touch sensors, Force and torque sensors. 1hr
Acoustic sensors, Slip sensors, Proximity & Range sensors 1hr
Potentiometers and optical encoders – resolution and range. 1hr
Absolute position encoders, incremental position encoders, dc tachometers. 1hr
Contact and noncontact sensors. 1hr

MODULE III

Robot Programming: Lead through programming methods, Robot program as a path in space, Motion interpolation, WAIT, SIGNAL and DELAY commands., Branching, Programming the maker robot- The teach pendant, Moving the robot, Teaching Points, Teaching programs. 5hrs

Robot Language : Robot language structure, constants, variables & other data objects, Motion commands, End effectors and sensor commands, Computations & operations, Program control and subroutines, Communications & data processing, Monitor mode commands, VAL II. 5hrs

MODULE IV

Machine Vision: Introduction, Sensing & digitizing function, Imaging devices, Lighting techniques, Image storage, Image processing and analysis, Image data reduction, segmentation, Feature extraction, Object recognition, Training the vision system , Robotic applications 5hrs

Mobile robots**:** Introduction, Key issues for locomotion, Legged mobile robots, Leg configuration and stability, Types, Wheeled mobile robots, Path planning – configuration space, Road map path planning, Cell decomposition path planning, Obstacle avoidance-bug algorithm, Vector field histogram 5hrs

TEXT BOOKS :

1. M.P.Groover, M.Weiss, R.N.Nagel, N.G.Odrey Industrial Robotics Technology, programming and Applications.
2. K.S.Fu, R.C.Gonzalex, C.S.G.Lee: Robotics Control Sensing, Vision and Intelligence, McGraw Hill Book co.
3. Yoram Korean: Robotics for engineers, McGraw Hill Co.
4. Hartenberg and Denavit: Kinematics and Synthesis of linkages, McGraw Hill Book Co.

REFERENCE BOOKS:

1. Roland Siegwart & Illah R. Nourbakhsh: Introduction to Autonomous Mobile Robots, Prentice hall of India.
2. Sabrie Solomon: Sensors & control systems in manufacturing, McGraw Hill Professional Publishing.
3. John J. Craig: Introduction to Robotics, Mechanics & Control, Pearson Education Inc.
4. Mittal: Robotics, John Wiley

8.2.5 ASIC DESIGN AND FPGA

MODULE I

Introduction to ASIC: - Types of ASICs, Design flow and Economics of ASICs Introduction to FPGA's, Design flow and FPGA economics 2hrs

Programmable Asics: - Antifuse, static RAM, EPROM and EEPROM technology, PREP benchmarks. 4hrs

Programmable ASIC Logic Cells:-Actel ACT -Xilinx LCA - Altera FLEX - Altera MAX 4hrs

MODULE II

Programmable ASIC I/O Cells: - DC output, CMOS complementary output buffer, AC output, A tri-state Bus, DC input, AC input, Metastability, Clock & Power inputs, Xilinx I/O blocks 3hrs

Programmable ASIC Interconnect:-Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 – Altera FLEX 4hrs

Programmable ASIC Design Software:-Design systems, Logic Synthesis, Half gate ASIC 3hrs

MODULE III

Low Level Design Entry:-Schematic entry - Low level design language - PLA tools - EDIF- CFI design representation 3 hrs

Logic Synthesis: - VHDL and Verilog Synthesis, FSM synthesis. 3hrs

Simulation:-Types, Logic Systems, Cell Models, Delay Models, Static Timing analysis, Formal verification, Switch level and transistor level Simulation 4hrs

MODULE IV

ASIC Construction:- System partitioning, Estimating ASIC Size, Power Dissipation - FPGA partitioning - partitioning methods, Constructive and iterative partitioning, Kernighan-Lin Algorithm, Ratio-Cut Algorithm, Look Ahead algorithm 4hrs

Floor Planning and Placement:- Goals and objective, placement algorithms, Min-Cut algorithm, Eigen-value algorithm, Iterative placement improvement methods, physical design flow 3hrs

Routing: - global routing - detailed routing Left Edge Algorithm- special routing, Clock Routing, Power routing- circuit extraction - DRC. 3hrs

TEXTBOOK

1. M.J.S .Smith, - " Application - Specific Integrated Circuits " - Addison -Wesley Longman Inc.,1997

REFERENCE BOOKS

1. Charles W. Mckay, “Digital Circuits a proportion for microprocessors”, Prentice Hall
2. John F. Wakherly, “ Digital Design: Principles and Practices”, 2nd Edn 1994, Prentice Hall International Edn

8.2.6 MICROWAVE NETWORKS AND APPLICATIONS

MODULE I

Microwave network analysis: Impedance and equivalent voltage and currents, Impedance and admittance matrices, scattering matrix, transmission (ABCD) matrix 5 hours
Microwave Resonators: Series and parallel resonant circuits, transmission line resonators 5 hours

MODULE II

Power dividers and Directional couplers: Basic Properties, T-junction power divider, Wilkinson Power divider, Quadrature Hybrid, 180 degree hybrid 5 hours
Microwave filters: Periodic structures, filter design by image parameter method and insertion loss method, filter transformations. 5 hours

MODULE III

Ferromagnetic components**:** Ferrite isolators, Ferrite phase shifters, Ferrite Circulators 4 hours
Microwave Integrated Circuits**:** Planar transmission lines, lumped elements for MIC, substrates for MIC, Hybrid MIC, Monolithic MIC, Methods of Analysis of planar transmission lines: conformal transformation, variational approach. 6 hours

MODULE IV

Microstrip Antennas**:** Introduction: Basic characteristics, feeding methods, methods of analysis, Rectangular patch, Circular Patch, Quality factor, bandwidth and efficiency, input impedance, coupling, array and feed networks. 7 hours
Microwave systems: Wireless communication systems, radiometer systems, microwave heating, power transfer, biological effects and safety. 3hours

TEXT BOOKS:

1. Microwave Engineering: David Pozar, Third edition, Wiley India
2. Antenna Theory: Analysis & Design: Constantine Balanis, Second Edition, Wiley India

REFERENCE BOOKS:

1. Striplinelike transmission lines for microwave integrated circuits: Bharathi Bhat,Shiban Koul, John Wiley and Sons
2. Computer aided design of Microwave circuits: K. C. Gupta, Rakesh chadha, Ramesh Garg, Artech House Publishers
3. Microstrip lines and slot lines: Prakash Bhartia, K. C. Gupta, Ramesh Garg, inder Bahl
4. Microwave integrated circuits: K. C. Gupta, Amarjit Singh

8.2.7 ERROR CONTROL CODING

MODULE I

Introduction to Algebra: Groups, Fields, Binary field arithmetic, basic properties of a galios field, Computations using galois field GF(2_m) Arithmetic, Vector spaces, matrices (4 hrs)
Cyclic Codes: Description of cyclic codes, generator and parity check matrices of cyclic codes, Encoding of cyclic codes. (2 hrs)
Syndrome Computation and error Detection, decoding of cyclic codes. (2 hrs)
Cyclic Hamming Codes, Error- Trapping Decoding. (2 hrs)

MODULE II

Concatenated Coding, Code Decomposition, and Multistage Decoding:
Single-Level Concatenated Codes, Multilevel Concatenated Codes (3 hrs)
A soft-decision Multistage decoding, Decomposition of codes. (2 hrs)
Turbo Coding: Introduction to Turbo Coding (2 hrs)
Distance properties of Turbo Codes. (2 hrs)
Design of Turbo Codes. (1hrs)

MODULE III

Low-Density Parity-Check Codes: Introduction to LDPC Codes, tanner graphs for linear block Codes (2 hrs)
Geometric construction of LDPC codes, Decoding of LDPC Codes (3 hrs)
Code construction by row and column Splitting, breaking cycles in Tanner graphs. (2 hrs)
Construction of Gallager LDPC Codes, Random LDPC Codes, Irregular LDPC Codes (2 hrs)
Construction of LDPC Codes based on balanced incomplete block designs (1 hr)

MODULE IV

Burst - Error- Correcting Codes:
Decoding of Single-Burst-Error-Correcting cyclic Codes, Single-Burst-Error-Correcting Codes. (3 hrs)
Phased-Burst-Error-Correcting Codes, Burst-and random-Error-Correcting Convolutional codes. (2 hrs)
Burst - Error- Correcting Convolutional Codes:
Bounds on Burst-Error-Correcting Capability, Burst-Error-Correcting Convolutional Codes. (2 hrs)
Interleaved Convolutional Codes, Burst-and-random-Error-Correcting Convolutional Codes.

(3 hrs)

TEXT BOOK:

1. Error Control Coding- Fundamentals and Applications -- Shu Lin & Daniel J. Costello, Pearson/Prentice Hall, Second Edition.

REFERENCE BOOKS:

1. Error Control Coding : From Theory to Practice by Peter Sweeney, John Wiley & Sons Ltd.
2. Theory and Practice of Error Control Codesby Blahut, R.E Addison Wesley
3. Introduction to Error Control Codes by Alvatore Gravano, OxforUniversity Press
4. Fundamentals of Error Correcting Codes by W Cary Huffman & Ver Pless, Cambridge University Press
5. Mathematics of Coding Theory**:** Information**,** Compression**,** Error Correction**,** and Finite Fields by Paul Garrett, Prentice Hall
6. Error Correction Coding : Mathematical methods and Algorithms by Todd K Moon, John Wiley and Sons

8.3.1 ELECTRONIC COMMERCE

MODULE I

Introduction to Electronic Commerce, benefits and limitations, types of Electronic Commerce, reasons for going online, Internet and Networking technologies (3 hr)
Intranet and supply chain management: Supply chain management fundamentals, pull v/s push supply chain models (3 hrs)
Elements of supply chain management, integrating functions in a supply chain (2 hrs)
Electronic data interchange (EDI), benefits of EDI (2 hrs)

MODULE II

(2 hrs)
Security on the Internet, threats and challenges on the Internet (2 hrs)
Secret key encryption, public key encryption (2 hrs)
Authentication, digital signature, integrity (2 hrs)
Privacy on Internet, Public Key Infrastructure (PKI) (2 hrs)
Client based security, server based security

MODULE III

HTML: Essential HTML, working with text, presenting and arranging text, working with images, links and lists, creating tables (2 hrs)
Working with frames, multimedia, style sheets, creating Forms and HTML controls (3 hrs)
JavaScript: Essential JavaScript, putting JavaScript to work. (2 hrs)

XML: Essential XML, Data Binding and record sets. (3 hrs)

MODULE IV

Electronic payment systems-Limitations of traditional payment instruments, digital cash, electronic cheques, online credit card based systems (3 hrs)
PayPal, SET (Secure Electronic Transaction) protocol, debit cards, smart cards, preventing double spending. (3 hrs)
Marketing strategies on the web, web design, attracting visitors, virtual societies, advertising
One-to-one marketing, direct marketing, choosing ISP.

TEXT BOOKS:

1. The e-Business (R) evolution by Daniel Amor, Pearson education
2. Electronic Commerce- A Manager's guide by Ravi Kalakota, Andrew Whinston, Pearson

education
3. Web Commerce Technology Handbook by Daniel Minoli, Emma Minoli, TataMcGraw Hill

REFERENCE BOOKS:

1. Network Security-Private communication in public world by Charlie Kaufman, Radia Perlman, Mike Speliner, Pearson education
2. E-Commerce Strategy, Technologies and approaches by David Whiteley, TataMcGraw Hill
3. HTML-Black Book by Steven Holzner published by dreamTech Press

8.3.2 BIOMEDICAL ELECTRONICS AND INSTRUMENTATION

MODULE I

Nervous system: Nerve fibers, neuron system; heart potentials: bioelectric resting action; Electrodes: basic electrode theory, Nernst equation, biopotential electrodes, biochemical transducers, PH meter, blood gas electrode. (5 hrs)
Introduction to biosensors; Biomedical transducer: tissue blood flow-ultrasonic & laser Doppler, instrument design principles, calibration and standardization of laser Doppler. (5 hrs)

MODULE II

Measuring and monitoring systems: EEG, ECG, EMG with block diagrams,Vector cardiography, Holter monitoring.
Blood pressure monitoring: direct and indirect measurement; thermal array recorders; (5 hrs)
Patient monitoring system; spirometry;
Patient safety :Intensive care system, electric shock hazards,
leakage currents; testing instruments for checking safety parameters of biomedical electronic equipment, blood banking and transfusion medicine. (5 hrs)

MODULE III

Controller and stimulators: Electroneurography;
pacemakers: properties, lead wires and electrodes , synchronous pacemaker; (3 hrs)
Defibrillators:ac and dc ; eye and vision, ear and hearing. Audiometers, EOG ; Block diagram of Heart lung machine; (2 hrs)
surgical diathermy; microwave diathermy; laser therapy, physiotherapy and cryotheraphy. (3 hrs)
Biomedical telemetry:wireless,single channel,multi channel,multipatient.TDM &FDM radiometry. (2 hrs)

MODULE IV

Medical imaging equipments : x-rays ,CT scan ,MRI scan ,Ultrasonic imaging, medical thermography;endoscopy ,laproscopy. (4 hrs)
Nuclear medical imaging: Positron Emission Tomography(PET), Single Positron Emission computed tomography (SPECT), Handling precautions for radioisotopes and biomedical waste. (4 hrs)
Robotic application in medical field; Application of software for medical applications. (2 hrs)

TEXT BOOKS:

1. Biomedical instrumentation – R.S Khandpur.
2. Biomedical instrumentation –Leslie Cromwell.
3. Medical instrumentation – Application & Design– J.G Webster.
4. Systems approach to biomedicine-W.Blesser(McGraw Hill).

REFERENCE BOOKS:

1. Biomedical transducers and instruments-Tatsuo Togawa,Toshiyo Tamura, Ake Oberg.
2. Introduction to medical electronics-S.K Guha(Bharati Bhavan).
3. Biomedical telemetry- C.A Caceress(Academic press).
4. Principles of applied biomedical instrumentation-L. Graddes and L. Baker.
5. A Guide to Patient Care Technology: A Review of Medical Equipment (Hardcover)By Laurence J Street, Publisher: Taylor & Francis

8.3.3 DIGITAL IMAGE PROCESSING

MODULE I

Digital Image Fundamentals And Transforms:
Elements of visual perception – Image sampling and quantization, Basic relationship between pixels - Basic geometric transformations. (4 hrs)

Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform –(3 hrs)
FFT – Separable Image Transforms -Walsh – Hadamard – Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms. (3 hrs)

MODULE II

Image Enhancement Techniques:
Spatial Domain methods: Basic grey level transformation – Histogram equalization – Image subtraction – Image averaging. (3 hrs)
Spatial filtering: Smoothing, sharpening filters – Laplacian filters – (4hrs)
Frequency domain filters : Smoothing – Sharpening filters – Homomorphic filtering (3 hrs)

MODULE III

Image Restoration:
Model of Image Degradation/restoration process – Noise models . (3 hrs)
Inverse filtering -Least mean square filtering – Constrained least mean square filtering (3 hrs)
Blind image restoration – Pseudo inverse – Singular value decomposition. (4 hrs)

MODULE IV

Image Compression: Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding-DPCM. (3 hrs)
Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG,Basics of Vector quantization. (3 hrs)
Image Segmentation: Edge detection – Thresholding - Region Based segmentation – Boundary representation: chair codes- Polygonal approximation – Boundary segments – boundary descriptors: Simple descriptors-Fourier descriptors - Regional descriptors – Simple descriptors- Texture (4hrs)

TEXT BOOK:

1. Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - PearsonEducation 2003.

REFERENCE BOOKS:

1. William K Pratt, Digital Image Processing John Willey (2001)
2. Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac,Roger Boyle, Broos/colic, Thompson Learniy (1999).
3. A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital Image Processing.
4. Chanda Dutta Magundar – Digital Image Processing and Applications, Prentice Hall of India, 2000

(3 hrs)

8.3.4 ELECTROMAGNETIC INTERFERENCE/ ELECTROMAGNETIC COMPATIBILITY

MODULE I

Introduction: Electromagnetic environment; concepts of EMI, EMC and definitions. (1 hour)
Practical experiences and concerns; frequency spectrum conservation. (1 hour)
Natural and nuclear sources of EMI: Celestial electromagnetic noise; lighting discharge; electrostatic discharge, (2 hours)
Electromagnetic pulse. EMI from apparatus and circuits: Electromagnetic emissions; noise from relays and switches; nonlinearities in circuits; (3 hours)
passive intermodulation. Cross-talk in transmission lines (1 hour)
transients in power supply lines, Electromagnetic interference. (2 hours)

MODULE II

Probabilistic and statistical physical models: Probability considerations; statistical physical models; modeling of interferences; statistical EMI/EMC models. (5hours)

Open-area test sites: Open-area test site measurements; measurement precautions; open area test site; terrain roughness; normalized site attenuation; measurement of test site imperfections; antenna factor measurement; measurement errors. (5 hours)

MODULE III

Radiated interference measurements: Anechoic chamber; transverse electromagnetic cell; reverberating chamber; Giga-hertz TEM cell; comparison of test facilities. Conducted interference measurements: Characterization of conduction currents/voltages conducted EM noise on power supply lines; conducted EMI from equipment. Immunity to conducted EMI; detectors and measurement. (5 hours)

Pulsed interference immunity: Pulsed EMI immunity; electrostatic discharge; electrical fast transients/burst; electrical surges. (2 hours)

Grounding, shielding & bonding: EMC technology; grounding; shielding; electrical bonding. EMI filters: Characteristics of filters; power line filter design; filter installation; filter evaluation. Cables, connectors and components : EMI suppression cables; EMC connectors; EMC gaskets; isolation transformers; opto-isolators; transientand surgg suppression devices. (3 hours)

MODULE IV

Frequency assignment and spectrum conservation: Frequency allocation and frequency assignment; modulation techniques; spectrum conservation. (5 hours)
EMC standards: Standards for EMI/EMC; MIL-STD-461/462; IEEE/ANSI standards; CISPR/IEC standards; FCC regulations; British standards; VDE standards; Euro norms; EMI/EMC standards in Japan; performance standards - some comparisons. (4 hours)
Special EMI Problems in Medical Electronics (1 hour)

TEXT BOOKS:

1. V Prasad Kodali: Engineering Electromagnetic Compatibility Principles, Measurements and Technologies;S Chand & Co
2. William D. Kimmel & Daryl D. Gerke: Electromagnetic Compatibility in Medical Equipment: A Guide for Designers and Installers; (Interpharm Press or IEEE Press)

REFERENCE BOOKS:

1. Archambeault, Bruce R., Ramahi, Omar M., Brench, Colin: EMI/EMC Computational Modeling Handbook (@nd Edition); (The Springer International Series in Engineering and Computer Science)
2. William D. Kimmel & Daryl D. Gerke: EMI Syuprresion Handbook – Communiques from the Trenches; (Seven Mountain Scientific, Inc)
3. Bruce R. Archambeault, James Drewniak: PCB Design for Real- World EMI Control; (The Springer International Series in Enginnering and Computer Science)

8.3.5 ADHOC WIRELESS NETWORKS

MODULE I

Ad Hoc Networks:
Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. (1 hour)

MAC Protocols For Ad Hoc Wireless Networks:
Introduction, Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks (4 hours)
Classification of MAC protocols, Contention based protocols with reservation mechanisms. (5 hours)

MODULE II

MAC protocols :
Contention - based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, Other MAC protocols. (4 hours)

Routing Protocols For Ad Hoc Wireless Networks:
Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks (3 hours)

Classification of routing protocols, Table drive routing protocol, On demand routing protocol. (3 hours)

MODULE III

Hybrid routing protocol, Routing protocols with effective flooding mechanisms, Hierarchical routing protocols, Power aware routing protocols. (4 hours)

Transport Layer Protocols For Ad Hoc Wireless Networks:
Introduction, Issues in designing a transport layer protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks. (3 hours)
Classification of transport layer solutions, TCP over Ad hoc wireless Networks, Other transport layer protocols for Ad hoc wireless Networks. (3 hours)

MODULE IV

Security:
Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning. (2 hours)
Network security attacks, Key management, Secure routing in Ad hoc wireless Networks. (3 hours)

Quality Of Service In Ad Hoc Wireless Networks:

Introduction, Issues and challenges in providing QoS in Ad hoc wireless Networks (2 hours)

Classification of QoS solutions, MAC layer solutions, network layer solutions. (3 hours)

TEXT BOOK:

1. **"**Adhoc Wireless Networks**"**, C. Siva Ram Murthy & B. S. Manoj, Pearson Education, 2nd Edition.

REFERENCE BOOKS:

1. **"**Adhoc wireless Networks**"**, Ozan K. Tonguz and Gianguigi Ferrari, Wiley
2. **"**Adhoc wireless Networking**"**, Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du, Kluwer Academic Publishers.

8.3.6 GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

MODULE I

GSM Architecture And Interfaces:
Introduction, GSM frequency bands, GSM PLMN, Objectives of a GSM PLMN, GSM PLMN Services, GSM Subsystems (2 hours)
GSM Subsystems entities, GSM interfaces, The radio interface (MS to BSC), Abis interface (BTS to BSC), A interface (BSC to MSC), Interfaces between other GSM entities (2 hours)
Mapping of GSM layers onto OSI layers. (1 hour)

Radio link features in GSM systems:
Introduction, Radio link measurements, Radio link features of GSM, Dynamic power control, Discontinuous transmission (DTX), SFH (3hours)
Future techniques to reduce interface in GSM, Channel borrowing, Smart antenna. (2 hours)

MODULE II

GSM logical channels and frame structure:
Introduction, GSM logical channels, Allowed logical channel combinations, TCH multi frame for TCH/H, CCH multi frame, GSM frame structure. (3 hours)
GSM bursts, Normal burst, Synchronization burst, Frequency correction channel burst, Access burst, Data encryption in GSM, Mobility management, Location registration, Mobile identification. (3 hours)
Speech coding in GSM:
Introduction, Speech coding methods, Speech code attributes, Transmission bit rate, Delay, Complexity, Quality, LPAS, ITU-T standards, Bit rate (2 hours)
Waveform coding, Time domain waveform coding, Frequency domain waveform coding, Vocoders, Full-rate vocoder, Half-rate vocoder. (2 hours)

MODULE III

Messages, Services And Call Flows in GSM :
GSM messages, MS-BS interface, BS to MSC messages on the A interface, MSC to VLR and HLR, GSM call setup by an MS, Mobile-Terminated call, Call release, Handover.
Data services. (3 hours)
Data services in GSM :
Introduction, Data internetworking, GSM data services, Interconnection for switched data, Group 3 fax, Packet data on the signaling channel, User-to-user signaling, SMS,
GSM GPRS. (2 hours)

Privacy and security in GSM:

Introduction, Wireless security requirements, Privacy of communications, Authentication requirements, System lifetime requirements, Physical requirements, SIM cards (3 hours)

Security algorithms for GSM, Token-based authentication, Token-based registration, Token-based challenge. (2 hours)

MODULE IV

Planning and design of a GSM wireless network:

Introduction, Tele traffic models, Call model, Topology model, Mobility in cellular / PCS networks, Application of a fluid flow model, Planning of a wireless network. (2 hours)

Radio design for a cellular / PCS network, Radio link design, Coverage planning, Design of a wireless system, Service requirements, Constraints for hardware implementation, Propagation path loss, System requirements, Spectral efficiency of a wireless system, Receiver sensitivity and link budget, Selection of modulation scheme, Design of TDMA frame, Relationship between delay spread and symbol rate, Design example for a GSM system. (3 hours)

Management of GSM networks:

Introduction, Traditional approaches to NM, TMN, TMN layers, TMN nodes, TMN interface, TMN management services, Management requirements for wireless networks, Management of radio resources, Personal mobility management, Terminal mobility, Service mobility management, Platform-centered management, SNMP, OSI systems management. (3 hours)

NM interface and functionality, NMS functionality, OMC functionality, Management of GSM network, TMN applications, GSM information model, GSM containment tree. (2 hours)

TEXT BOOK:

1. **"**Principles of Applications of GSM**"**, Vijay K. Garg & Joseph E. Wilkes, Pearson education/ PHI, 1999.

REFERENCE BOOKS:

1. GSM: Evolution towards 3rd Generation Systems, (Editor), Z. Zvonar Peter Jung, Karl Kammerlander Springer; 1st edition 1998

2. GSM & UMTS: The Creation of Global Mobile Communication**,** Friedhelm Hillebrand, John Wiley & Sons' 2001.

8.3.7 MOBILE PHONE PROGRAMMING

MODULE I

Introduction to Mobile Phone Programming **:**
Evolution of Mobile Phones, Networks and Services, Wireless Technologies and Architecture, Mobile Application Deployment. (2 hour)

Python for Symbian Phones **:** Introduction, writing a Python script, A short python Syntax lesson, Overview of Python for S60 modules, Modules and How to program Python for S60 scripts, Creating Stand alone applications, Creating Python extensions in C++. (3 hours)

Symbian:
Introduction, Symbian OS in a nutshell, Wireless Communication Technologies (1 hour)

Windows Mobile Programming :
Introduction, .Net and C# in a Nutshell, .Net Compact Framework, Using the Windows Mobile Control, Network Functionality. (2 hour)

Service Discovery :
Service Discovery in Real Life, Service Discovery in Computer Networks (2 hour)

MODULE II

The Walkie Talkie Application :
Introduction, The Software, Bluetooth IP Integration. (2 hour)

Cooperative Wireless Networking:
Introduction , Challenges, Cooperative Principles in Wireless Networks, Cooperation in Heteregenous Networks. (2 hours)

Cross Layer Protocol Design for Wireless Communication:
Introduction, Crosslayer Protocol design, (1 hour)

Cross Layer Examples for Multimedia Services over Bluetooth:
Introduction, Adaptive Header Compression for Bluetooth (2 hours)

Convergence of Mobile Devices and Wireless Sensor Networks :
Introduction, Classification of Different Convergence forms, First Demonstrator (1 hour)

Using In-built RFID/NFC, Cameras, and 3D Accelerometers as Mobile Phone Sensors
Using RFID/NFC on Mobile Phones, Using Cameras on Mobile Phones, Motion Interfaces using 3D Sensors
(2 hours)

MODULE III

(2 hours)

Energy Efficiency of Video Decoder Implementations:
Introduction, Mobile Video Applications, Software Interfacing Issues

Optimizing Mobile Software with Built-in Power Profiling **:**
S60 Power Profiling Application, Carbide.c++ Power-Performance Profiling, Energy-Efficient Design Guidelines (3 hours)

Google Android:
Background , An Open Platform for Mobile Development , Native Android Applications, Android SDK Features ,Introducing the Open Handset Alliance, Introducing the Development Framework (3 hours)

Android Development :Developing for Android, Developing for Mobile Devices, Android Development Tools (2 hours)

MODULE IV

Creating Applications and Activities :What Makes an Android Application?, Introducing the Application Manifest, Using the Manifest Editor, The Android Application Life Cycle, Understanding Application Priority and Process States, Externalizing Resources , A Closer
Look at Android Activities (2 hours)

Intents, Broadcast Receivers, Adapters, and the Internet:
Introducing Intents, Introducing Adapters, Using Internet Resources, Introducing Dialogs, Creating an Earthquake Viewer (2 hours)

Data Storage, Retrieval, and Sharing :
Saving Simple Application Data, Saving and Loading Files, Databases in Android, Introducing Content Providers. (2 hours)

Maps, Geocoding, and Location-Based Services :
Using Location-Based Services, Setting up the Emulator with Test Providers, Finding Your Location, Using the Geocoder, Creating MapBased Activities, Mapping Earthquakes Example
(2 hours)

Peer-to-Peer Communication:
Introducing Android Instant Messaging, Introducing SMS (2 hours)

TEXT BOOKS :

1. Mobile Phone Programming and its Application to Wireless Networking by Frank H.P. Fitzek, Frank Reichert, Springer
2. Professional Android Application Development by Reto Meier, Wiley Publishing Inc.

REFERENCE BOOKS :

a. Android : A Programmer's Guide by Jerome DiMarzio, McGraw Hill Inc.
b. Symbian OS C++ for Mobile Phones by Richard Harrison, John Wiley & Sons
c. Mobile Phone Programming by Saurabh Jain, BPB Publications
d. Mobile Phones and Mobile Communication by Rich Ling, Polity Press
e. Hello, Android: Introducing Google's Mobile Development Platform by Ed Burnett, Pragmatic Bookshelf
f. Android Application Development: Programming with the Google SDK by Rick Rogers, John Lombardo, Zigurd Mednieks, O'Reilly Media
g. Pro Android: Developing Mobile Applications for G1 and Other Google Phones by Sayed Y Hashimi, Satya Komatineni, Apress Publications
h. Android Essentials by Chris Haseman, Apress Publications

8.4 WIRELESS COMMUNICATION

MODULE I

Introduction to 2G, 2.5G and 3G Wireless Networks. 1 Hour

Three basic Propagation mechanism – reflection, diffraction and scattering. 2 Hours

Impulse response model of Multi path channel, Relationship between Bandwidth and received power. 2 Hours

Small scale multipath measurements, Rayleigh and Ricean Distribution. 1 Hour

Statistical models for multipath fading channels, Clarke's model for flat fading, Spectral shape due to Doppler spread. 2 Hours

Simulation of Clarke and Gans Fading model, Level crossing and Fading statistics, Two ray Raleigh fading model. 2 Hours

MODULE II

Equalization, Diversity and Channel coding, Training a generic adaptive equalizer, Equalizers in Communication receivers, Linear and non linear equalizers, Algorithms for adaptive equalizers. 3 Hours

Diversity techniques, Practical space diversity considerations, Polarization diversity, Interleaving. 2 Hours

Global System for Mobile Communications (GSM): GSM Services and Features, GSM System Architeture, GSM Radio Subsystem, GSM Channel types, Example of a GSM Call, Frame structure for GSM. 3 hours

CDMA Digital Cellular Standard : Frequency and Channel specifications, Forward CDMA Channel, Reverse CDMA Channel 2 hours

MODULE III

Wireless location and tracking using RFID technology: Elements of RFID system, RFID tags, Readers, Antennas and Radio, RFID network, Coupling range and Penetration, Circuit level Design of RFID systems. 4 Hours

Comparison of RFID with Bluetooth and Wi-Fi networks and Zig-Bee. 3 Hours

Implementation RFID in Pharmacy, Healthcare, Library and tracking livestock. Applications. 3 Hours

MODULE IV

Elements of Sensor network, Localization and Sensing models. 1 Hour

Acoustic amplitude sensor, DOA sensor, Performance comparison and Metrics. 1 Hour

Distributed Tracking, Tracking multiple objects, Media Access Control. 2 Hour

Geographic Energy aware routing, Unicast Geographic Routing, Planarizationg Routing Graph, Attribute based Routing, Directed Diffusion, Rumor Routing, Geographic Hash tables. 3 Hour

Ranging Techniques, Range based localization algorithms, Information based sensor tasking, Query, Sensor node hardware, Clustering, Time synchronization. Applications of

sensor networks. 3 Hour

TEXT BOOKS:

1. Wireless Communication Principals and Practice, Theodore Rappaport, Pearson Education.
2. RFID Application, Security and Privacy, Simson Garfienkel and Beth Rosenberg, Pearson Education.
3. Wireless Sensor Networks, an information Processing Approach, Feng Zhao and Leonides Guibas, Elsevier.

REFERENCE BOOKS

1. Fundamentals of Wireless Communication, David Tse and Pramod Vishwanath, Cambridge University Press.