



MANGALORE INSTITUTE OF TECHNOLOGY AND ENGINEERING
(An ISO 9001:2015 Certified Institution)

1.3.2. Average percentage of courses that include experiential learning through project work/field work/internship during last five years

ACADEMIC YEAR 2017-18

ELECTRONICS & COMMUNICATION ENGINEERING

Documents contains list and syllabus of courses that includes experiential learning through project works, internships and field work for the department.

Documents Enclosed

Sl. No	Particulars	Page Nos
1.	List of course that include experiential learning through project works, internships and field work	1-2
2.	Syllabus of the courses mapped	3-120

LIST OF COURSE THAT INCLUDE EXPERIENTIAL LEARNING

Total mapped U.G courses: 47

<u>S.No</u>	<u>Course Code</u>	<u>Course Name</u>
1	10MAT11	Engg. Mathematics - I
2	10PHY12	Engineering Physics
3	10ELE15	Basic Electrical Engg.
4	10WSL16	Workshop Practice
5	10PHYL17	Engg. Physics Lab
6	10CPH18	Constitution of India, Professional Ethics and Human Rights (CPH)
7	10CHE12	Engineering Chemistry
8	10MAT21	Engg. Mathematics - II
9	10PCD13	Computer Programming in C
10	10ELN15	Basic Electronics
11	10CHEL17	Engg. Chemistry Lab
12	10CIV18	Environmental Studies
13	10MAT31	Engg. Mathematics - III
14	10ES – 32	Analog Electronic Ckts
15	10ES – 34	Network Analysis
16	10IT– 35	Electronic Instrumentation
17	10ESL – 37	Analog Electronics Lab
18	10MAT-41	Engg. Mathematics - IV
19	10ES– 42	Microcontrollers
20	10ES – 43	Control Systems
21	10EC – 46	Linear ICs & Applications
22	10ESL – 47	Microcontrollers Lab
23	10AL51	Management and Entrepreneurship
24	10EC52	Digital Signal Processing
25	10EC53	Analog Communication
26	10EC54	Microwaves and Radar
27	10EC55	Information Theory and Coding

28	10ECL57	DSP Lab
29	10ECL58	Analog Communication Lab + LIC Lab
30	10EC61	Digital Communication
31	10EC62	Microprocessors
32	10EC63	Microelectronics Circuits
33	10EC64	Antennas and Propagation
34	10EC65	Operating Systems
35	10EC665	Data Structure Using C++
36	10ECL67	Advanced Communication Lab
37	10ECL68	Microprocessor Lab
38	10EC71	Computer Communication Networks
39	10EC72	Optical Fiber Communication
40	10EC73	Power Electronics
41	10EC74	Embedded System Design
42	10EC763	Image Processing
43	10ECL78	Power Electronics Lab
44	10EC81	Wireless Communication
45	10EC82	Digital Switching System
46	10EC843	GSM
47	10ECP85	Project Work

ENGINEERING MATHEMATICS – I

Sub Code	:	10MAT11	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART-A

UNIT – 1

Differential Calculus - 1

Determination of n^{th} derivative of standard functions-illustrative examples*. Leibnitz's theorem (without proof) and problems.

Rolle's Theorem – Geometrical interpretation. Lagrange's and Cauchy's mean value theorems. Taylor's and Maclaurin's series expansions of function of one variable (without proof).

6 Hours

UNIT – 2

Differential Calculus - 2

Indeterminate forms – L'Hospital's rule (without proof), Polar curves: Angle between polar curves, Pedal equation for polar curves. Derivative of arc length – concept and formulae without proof. Radius of curvature - Cartesian, parametric, polar and pedal forms.

7 Hours

UNIT – 3

Differential Calculus - 3

Partial differentiation: Partial derivatives, total derivative and chain rule, Jacobians-direct evaluation.

Taylor's expansion of a function of two variables-illustrative examples*. Maxima and Minima for function of two variables. Applications – Errors and approximations.

6 Hours

UNIT – 4

Vector Calculus

Scalar and vector point functions – Gradient, Divergence, Curl, Laplacian, Solenoidal and Irrotational vectors.

Vector Identities: $\text{div}(\nabla A)$, $\text{Curl}(\nabla A)$, $\text{Curl}(\text{grad } \phi)$, $\text{div}(\text{Curl} A)$, $\text{div}(A \times B)$ & $\text{Curl}(\text{Curl} A)$.

Orthogonal Curvilinear Coordinates – Definition, unit vectors, scale factors, orthogonality of Cylindrical and Spherical Systems. Expression for Gradient, Divergence, Curl, Laplacian in an orthogonal system and also in Cartesian, Cylindrical and Spherical System as particular cases – No problems

7 Hours

PART-B

UNIT – V

Integral Calculus

Differentiation under the integral sign – simple problems with constant limits. Reduction formulae for the integrals of $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$ and evaluation of these integrals with standard limits - Problems.

Tracing of curves in Cartesian, Parametric and polar forms – illustrative examples*. Applications – Area, Perimeter, surface area and volume.

Computation of these in respect of the curves – (i) Astroid: $x^{2/3} + y^{2/3} = a^{2/3}$
(ii) Cycloid: $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$ and (iii) Cardioid:
 $r = a(1 + \cos \theta)$

6 Hours

UNIT – VI

Differential Equations

Solution of first order and first degree equations: Recapitulation of the method of separation of variables with illustrative examples*. Homogeneous, Exact, Linear equations and reducible to these forms. Applications - orthogonal trajectories.

7 Hours

UNIT – VII

Linear Algebra-1

Recapitulation of Matrix theory. Elementary transformations, Reduction of the given matrix to echelon and normal forms, Rank of a matrix, consistency of a system of linear equations and solution. Solution of a system of linear homogeneous equations (trivial and non-trivial solutions). Solution of a system of non-homogeneous equations by Gauss elimination and Gauss – Jordan methods.

6 Hours

UNIT – VIII:

Linear Algebra -2

Linear transformations, Eigen values and eigen vectors of a square matrix, Similarity of matrices, Reduction to diagonal form, Quadratic forms, Reduction of quadratic form into canonical form, Nature of quadratic forms

7 Hours

Note: * In the case of illustrative examples, questions are not to be set.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers
2. Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Books:

1. B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
2. Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd.Publishers

ENGINEERING PHYSICS

Sub Code	: 10PHY12/10PHY22	IA Marks	: 25
Hrs/ Week	: 04	Exam Hours	: 03
Total Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT-1

Modern Physics

Introduction to Blackbody radiation spectrum, Photo-electric effect, Compton effect. Wave particle Dualism. de Broglie hypothesis – de Broglie wavelength, extension to electron particle. – Davisson and Germer Experiment.

Matter waves and their Characteristic properties. Phase velocity, group velocity and Particle velocity. Relation between phase velocity and group velocity. Relation between group velocity and particle velocity. Expression for deBroglie wavelength using group velocity.

7 Hours

UNIT-2

Quantum Mechanics

Heisenberg's uncertainty principle and its physical significance. Application of uncertainty principle (Non-existence of electron in the nucleus, Explanation for β -decay and kinetic energy of electron in an atom). Wave function. Properties and Physical significance of a wave function. Probability density and Normalisation of wave function. Setting up of a one dimensional, time independent Schrödinger wave equation. Eigen values and Eigen functions. Application of Schrödinger wave equation – Energy Eigen values for a free particle. Energy Eigen values of a particle in a potential well of infinite depth.

6 Hours

UNIT-3

Electrical Conductivity in Metals

Free-electron concept. Classical free-electron theory - Assumptions. Drift velocity. Mean collision time and mean free path. Relaxation time. Expression for drift velocity. Expression for electrical conductivity in metals. Effect of impurity and temperature on electrical resistivity of metals. Failures of classical free-electron theory.

Quantum free-electron theory - Assumptions. Fermi - Dirac Statistics. Fermi-energy – Fermi factor. Density of states (No derivation). Expression for electrical resistivity / conductivity. Temperature dependence of resistivity of metals. Merits of Quantum free – electron theory.

7 Hours

UNIT-4

Dielectric & Magnetic Properties of Materials

Dielectric constant and polarisation of dielectric materials. Types of polarisation. Equation for internal field in liquids and solids (one dimensional). Clausius – Mossotti equation. Ferro and Piezo – electricity (qualitative). Frequency dependence of dielectric constant. Important applications of dielectric materials. Classification of dia, para and ferromagnetic materials. Hysteresis in ferromagnetic materials. Soft and Hard magnetic materials. Applications.

7 Hours

PART – B

UNIT - 5

Lasers

Principle and production. Einstein's coefficients (expression for energy density). Requisites of a Laser system. Condition for Laser action. Principle, Construction and working of He-Ne and semiconductor Laser. Applications of Laser – Laser welding, cutting and drilling. Measurement of atmospheric pollutants. Holography – Principle of Recording and reconstruction of 3-D images. Selected applications of holography.

6 Hours

UNIT-6

Optical Fibers & Superconductivity

Propagation mechanism in optical fibers. Angle of acceptance. Numerical aperture. Types of optical fibers and modes of propagation. Attenuation. Applications – block diagram discussion of point to point communication.

Temperature dependence of resistivity in superconducting materials. Effect of magnetic field (Meissner effect). Type I and Type II superconductors - Temperature dependence of critical field. BCS theory (qualitative). High temperature superconductors. Applications of superconductors– Superconducting magnets, Maglev vehicles and squids

7 Hours

UNIT-7

Crystal Structure

Space lattice, Bravais lattice - unit cell, primitive cell. Lattice parameters. Crystal systems. Direction and planes in a crystal. Miller indices. Expression for inter-planar spacing. Co-ordination number. Atomic packing factor. Bragg's Law. Determination of crystal structure by Bragg's x-ray spectrometer. Crystal structures of NaCl, and diamond.

6 Hours

UNIT-8**Material Science**

Introduction to Nanoscience and Nanotechnology. Nanomaterials: Shapes of nanomaterials, Methods of preparation of nanomaterials, Wonders of nanotechnology: Discovery of Fullerene and carbon nanotubes, Applications. Ultrasonic non-destructive testing of materials. Measurements of velocity in solids and liquids, Elastic constants.

6 Hours**Text Books**

	Title		Author/s / Editor		Publishers
1	Solid State Physics – Sixth Edition	-	S.O. Pillai	-	New Age International
2	Engineering Physics	-	V. Rajendran	-	Tata Mc-Graw Hill Company Ltd., New Delhi

Reference Books

	Title		Author/s / Editor		Publishers
1	Nanosystems- Molecular Machinery, Manufacturing and Computation	-	K.Eric Drexler	-	John Wiley & Sons 2005 Ed.
2	Fundamentals and Applications of Ultrasonic Waves	-	J David N Cheeke and Cheeke N Cheeke	-	CRC Press
3	Nano Materials	-	Vishwanathan	-	Narosa Publications
4	Engineering Physics	-	G.K Shivakumar	-	Prism Books Pvt. Ltd.

ENGINEERING CHEMISTRY

Sub Code	: 10CHE12/ 10CHE 22	IA Marks	: 25
Hrs/ Week	: 04	Exam Hours	: 03
Total Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT – 1

Electrode Potential and Cells

Introduction, Differences between galvanic and electrolytic cells, Construction of galvanic cell, EMF of a cell, Origin of single electrode potential, Sign convention and cell notation, Standard electrode potential, Derivation of Nernst equation for single electrode potential.

Types of electrodes: Reference electrodes – Primary and secondary, Limitations of standard hydrogen electrode, Construction and working of calomel electrode and Ag – AgCl electrode, Measurement of single electrode potential, Numerical problems on electrode potential and EMF of a cell, Ion selective electrode: Glass electrode – Construction, Determination of pH of a solution using glass electrode, concentration cells, numerical problems.

7 Hours

UNIT - 2

Batteries and Fuel Cells

Basic concepts, Battery characteristics – primary, secondary and reserve batteries with examples, super capacitors

Classical batteries: Construction, working and applications of Zn – MnO₂, Lead acid storage and Ni – Cd batteries.

Modern batteries: Construction, working and applications of Zn – air, Ni – metal hydride and Li – MnO₂ batteries.

Fuel cells – Differences between battery and fuel cell, construction and working of H₂ – O₂ and CH₃OH– O₂ fuel cells.

6 Hours

UNIT - 3

Corrosion and its control

Electrochemical theory of corrosion, Galvanic series, Types of corrosion-Differential metal corrosion, Differential aeration corrosion (Pitting and water line corrosion), Stress corrosion (caustic embrittlement in boilers), Factors affecting the rate of corrosion

Corrosion control: Inorganic coatings – Anodizing and phosphating, Metal coatings – Galvanizing and Tinning, Corrosion inhibitors, cathodic protection.

7 Hours

UNIT - 4

Metal Finishing

Technological importance, Significance of Polarization, Decomposition potential and Overvoltage in electroplating, Theory of electroplating. Effect of plating variables on the nature of electrodeposit- Electroplating process, Electroplating of gold and Chromium.

Distinction between electroplating and electrolessplating, Electrolessplating of copper and nickel.

6 Hours

PART – B

UNIT – 5

Chemical fuels and Photovoltaic cells

Introduction, Classification of chemical fuels Calorific value – High and Low calorific values, Determination of calorific value –solid or liquid fuel using Bomb calorimeter - numerical problems .

Petroleum – Cracking by fluidized catalytic cracking process, Reformation of petrol, Octane and Cetane numbers. Knocking – mechanism and harmful effects. Antiknocking agents – TEL, Catalytic converters – Principle and working, Unleaded petrol, Power alcohol and Biodiesel.

Photovoltaic cells – Production of solar grade silicon, Doping of silicon, Construction and working of photovoltaic cell, Advantages.

7 Hours

UNIT – 6

The Phase rule and Instrumental methods of analysis

Statement of Gibb's phase rule and explanation of the terms involved, Phase diagram of one component system – water system, Condensed phase rule , Phase diagram of two component system- Eutectic Pb – Ag system and Fe – C system. Application – Desilverization of lead.

Instrumental methods of analysis- Theory , Instrumentation and applications of Colorimetry, Potentiometry , Conductometry and Flame photometry.

6 Hours

UNIT - 7

Polymers

Types of polymerization – Addition and Condensation, Mechanism of polymerization – Free radical mechanism taking ethylene as example. Glass transition temperature (T_g) , Structure – property relationship. Types of plastics – Thermosetting and thermoplastics. Manufacture of plastics by compression ,injection and extrusion moulding.

Synthesis and applications of Teflon, PMMA, Polyurethane and Phenol – formaldehyde resins.

Elastomers: Deficiencies of natural rubber, Vulcanization of rubber. Synthesis and applications of Neoprene and Butyl rubber, Silicone rubbers. Adhesives: Synthesis and applications of epoxy resins. Polymer composites - Synthesis and applications of Kevlar and Carbon fibers. Conducting polymers – Definition, Mechanism of conduction in Polyacetylene, applications.

7 Hours

UNIT - 8

Water Chemistry

Impurities in water ,Water analysis – Determination of different constituents in water – Hardness, alkalinity, chloride , fluoride , nitrate , sulphate and dissolved oxygen. Numerical problems on hardness and alkalinity. Sewage – BOD and COD, Numerical problems, Sewage treatment. Desalination of water – Reverse Osmosis and Electrodialysis

6 Hours

Text Books:

1. Chemistry for Engineering students by B.S. Jai Prakash, R.Venugopal, Sivakumaraiah and Pushpa Iyengar
2. Engineering Chemistry by O.G. Palanna, Tata McGraw Hill Publishing Pvt.Ltd. New Delhi 2009

Reference Books:

1. Principles of Physical Chemistry B.R. Puri , L.R.Sharma & M.S. Pathania, S. Nagin chand and Co.
2. A text book of Engineering Chemistry P.C. Jain and Monica Jain Dhanpatrai Publications , New Delhi.
- 1 Corrosion Engineering M.G. Fontana Mc. Graw Hill Publications.
- 2 Chemistry in Engineering and Technology (Vol. 1 &2) J.C. Kuriacose and J. Rajaram.
- 3 Polymer Science V.R. Gowariker , Wiley Eastern Ltd.

COMPUTER CONCEPTS AND C PROGRAMMING

Subject Code	: 10CCP13/10CCP23	IA Marks	: 25
Hrs/Week	: 04	Exam Hours	: 03
Total Hrs.	: 52	Exam Marks	: 100

PART – A

UNIT-1

Introduction to Computer Systems, Interacting with the Computer, Computer Organization

The Computer defined, Early history, Basic parts and structure of a computer, Categorizing Computers, Information Processing life cycle, Essential computer hardware, Essential computer software.

Keyboard, Mouse, Inputting data in other ways: Pen-based systems, Data scanning devices, Game controllers, Voice recognition devices, Microphone, Visual input devices, Video and sound, Monitors, Printers, Plotters, Data projectors, Sound systems. Number systems, ASCII, BCD, CPU, Buses, Mother Board, Chip sets, Microprocessors.

7 Hours

UNIT-2

Storage Device Concepts, Operating Systems, Networking

Storage media, Floppy drive, Hard disks, Optical media, CD-ROM, CD-R, CD-RW, DVD-ROM, Recordable DVD.

Software, Custom-made Software, Shrunken-wrapped software, Types of operating systems, Computer processing techniques, Functions of Operating Systems, Management of processor, Memory, Virtual storage, devices, and information.

Networking, Convergence of computing with communications, Networking basics, Need for networking, Basic components of a network.

7 Hours

UNIT-3

Fundamentals of Problem Solving, Introduction to C Language

Creating and running programs, System development, Software Engineering. Introduction to C Language: Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Programming example, Software Engineering, Tips and common programming errors.

6 Hours

UNIT-4

Structure of a C Program

Expressions, Precedence and associativity, Side effects, Evaluating expressions, Type conversion, Statements, Programming examples, Software Engineering, Tips and common programming errors.

6 Hours

PART - B

UNIT-5

Functions

Designing structured programs, Functions in C, User-defined Functions, Inter-function communication, Standard functions, Scope, Programming examples, Software Engineering, Tips and common programming errors.

6 Hours

UNIT-6

Selection – Making Decisions, Repetition

Logical data and operators, Two-way selection, Multiway-selection, Concept of a loop, pre-test and post-test loops, Initialization and updating, Event controlled and count controlled loops, Loops in C, Other statements related to looping, looping applications, Recursion, Programming examples, Software Engineering, Tips and common programming errors.

7 Hours

UNIT-7

Arrays, Strings

Concepts, Using arrays in C, Inter-function communication, Array applications, Bubble Sort, Binary search, Two-dimensional Arrays, Multi-dimensional arrays, String concepts, C strings, String input/output, Programming examples, Software Engineering, Tips and common programming errors.

7 Hours

UNIT-8

Basic Concepts of Parallel Programming

Motivating parallelism, Scope for parallel computing, Thread basics, Why threads? OpenMP: A standard for directive – based parallel programming, The OpenMP programming model, Specifying concurrent tasks in OpenMP, Synchronization constructs in OpenMP, Data handling in OpenMP, OpenMP library functions, Environment variables in OpenMP.

6 Hours

Text Books:

1. Vikas Gupta: Computer Concepts and C Programming, Dreamtech Press/Wiley India, 2009.
2. Behrouz A. Forouzan, Richard F. Gilberg: Computer Science - A Structured Approach Using C, 3rd Edition, Cengage Learning, 2007.
3. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar: Introduction to Parallel Computing, 2nd Edition, Pearson Education, 2003.

Reference Books:

1. Peter Norton: Introduction to Computers, 7th Edition, Tata McGraw Hill, 2010.
2. E. Balagurusamy: Programming in ANSI C, 4th Edition, Tata McGraw Hill, 2008.
3. Brian W. Kernighan and Dennis Ritchie: The C Programming Language, 2nd Edition, PHI, 1998.

Web Reference: <http://elearning.vtu.ac.in>

BASIC ELECTRICAL ENGINEERING

Sub Code	:	10ELE15/ 10ELE25	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART – A

UNIT-1

1-a) D. C. Circuits: Ohm's Law and Kirchoff's Laws, analysis of series, parallel and series- parallel circuits excited by independent voltage sources. Power and Energy. Illustrative examples.

4Hours

1-b) Electromagnetism: Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced emf's. Concept of self inductance, mutual inductance and coefficient of coupling. Energy stored in magnetic field. Illustrative examples.

3Hours

UNIT-2

2.Single-phase A.C. Circuits: Generation of sinusoidal voltage, definition of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities. Analysis, with phasor diagrams, of R, L, C, R-L, R-C and R-L-C circuits, real power, reactive power, apparent power and power factor. Illustrative examples involving series, parallel and series- parallel circuits.

7 Hours

UNIT-3

3 Three Phase Circuits: Necessity and advantages of three phase systems, generation of three phase power, definition of Phase sequence, balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced three-phase circuits, measurement of power by two-wattmeter method. Illustrative examples.

6 Hours

UNIT-4

4-a) Measuring Instruments: Construction and Principle of operation of dynamometer type wattmeter and single-phase induction type energy meter (problems excluded).

3 Hours

4-b) Domestic Wiring: Service mains, meter board and distribution board. Brief discussion on Cleat, Casing & Capping and conduit (concealed) wiring. Two-way and three-way control of a lamp. Elementary discussion on fuse and Miniature Circuit Breaker (MCB's). Electric shock, precautions against shock –Earthing: Pipe and Plate.

3 Hours

PART – B

UNIT-5

5.DC Machines: Working principle of DC machine as a generator and a motor. Types and constructional features. emf equation of generator, relation between emf induced and terminal voltage enumerating the brush drop and drop due to armature reaction. Illustrative examples.

DC motor working principle, Back emf and its significance, torque equation. Types of D.C. motors, characteristics and applications. Necessity of a starter for DC motor. Illustrative examples on back emf and torque.

7 Hours

UNIT-6

6. Transformers: Principle of operation and construction of single-phase transformers (core and shell types). emf equation, losses, efficiency and voltage regulation (Open Circuit and Short circuit tests, equivalent circuit and phasor diagrams are excluded). Illustrative problems on emf equation and efficiency only.

7 Hours

UNIT-7

7. Synchronous Generators: Principle of operation. Types and constructional features. emf equation. Concept of winding factor (excluding derivation of distribution and pitch factors). Illustrative examples on emf equation.

6 Hours

UNIT-8

8. Three Phase Induction Motors: Concept of rotating magnetic field. Principle of operation. Types and Constructional features. Slip and its significance. Applications of squirrel - cage and slip - ring motors. Necessity of a starter, star-delta starter. Illustrative examples on slip calculations.

6 Hours

Text Books:

1. “Basic Electrical Engineering”, D C Kulshreshtha, ,TMH,2009 Edition.
2. “Fundamentals of Electrical Engineering”, Rajendra Prasad, PHI, Second Edition, 2009.

Reference Books:

- 1 "Electrical Technology", E. Hughes International Students 9th Edition, Pearson, 2005.
- 2 "Basic Electrical Engineering", Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, TMH, First reprint 2009.
- 3 Problems in Electrical Engineering, Parker Smith, CBS Publishers and Distributors, 9th Edition, 2003.

BASIC ELECTRONICS

Sub Code	: 10ELN15 / 10ELN25	IA Marks	: 25
Hrs/ Week	: 04	Exam Hours	: 03
Total Hrs.	: 52	Exam Marks	: 100

PART - A

UNIT-1

SEMICONDUCTOR DIODES AND APPLICATIONS: p-n junction diode, Characteristics and Parameters, Diode approximations, DC load line, Temperature dependence of p-n characteristics, AC equivalent circuits, Zener diodes Half-wave diode rectifier, Ripple factor, Full-wave diode rectifier, Other full-wave circuits, Shunt capacitor filter - Approximate analysis of capacitor filters, Power supply performance, Zener diode voltage regulators, Numerical examples as applicable.

7 Hours

UNIT-2

TRANSISTORS: Bipolar Junction transistor, Transistor Voltages and currents, amplification, Common Base, Common Emitter and Common Collector Characteristics, DC Load line and Bias Point.

6 Hours

UNIT-3

BIASING METHODS: Base Bias, Collector to Base Bias, Voltage divider Bias, Comparison of basic bias circuits, Bias circuit design, Thermal Stability of Bias Circuits (Qualitative discussions only).

6 Hours

UNIT-4

OTHER DEVICES: Silicon Controlled Rectifier (S.C.R), SCR Control Circuits, More S.C.R applications; Unijunction transistor, UJT applications, Junction Field effect Transistors(Exclude Fabrication and Packaging), JFET Characteristics, FET Amplifications, Numerical examples as applicable.

7 Hours

PART - B

UNIT-5

AMPLIFIERS & OSCILLATORS: Decibels and Half power points, Single Stage CE Amplifier and Capacitor coupled two stage CE amplifier(Qualitative discussions only), Series voltage negative feedback and Additional effects of Negative feed back(Qualitative discussions only), The Barkhausen Criterion for Oscillations, BJT RC phase shift oscillator, Hartley, Colpitts and crystal oscillator (Qualitative discussions only) Numerical problems as applicable.

6 Hours

UNIT-6

INTRODUCTION TO OPERATIONAL AMPLIFIERS: Ideal OPAMP, Saturable property of an OP AMP, Inverting and Non Inverting OPAMP circuits, Need for OPAMP, Characteristics and applications - voltage follower, addition, subtraction, integration, differentiation; Numerical examples as applicable Cathode Ray Oscilloscope (CRO).

6 Hours

UNIT-7

COMMUNICATION SYSTEMS: Block diagram, Modulation, Radio Systems, Superhetrodyne Receivers, Numerical examples as applicable

NUMBER SYSTEMS: Introduction, decimal system, Binary, Octal and Hexadecimal number systems, addition and subtraction, fractional number, Binary Coded Decimal numbers.

7 Hours

UNIT-8

DIGITAL LOGIC:, Boolean algebra, Logic gates, Half-adder, Full-adder, Parallel Binary adder.

7 Hours

Text Books:

1. Electronic Devices and Circuits: David. A. Bell; Oxford University Press, 5th Edn., 2008.

Reference Books:

1. Electronic Devices and Circuits: Jacob Millman, Christos C. Halkias TMH, 1991 Reprint 2001.
2. Electronic Communication Systems, George Kennedy, TMH 4th Edition.
3. Digital Logic and Computer Design, Morris Mano, PHI, EEE.
4. Basic Eelctronics, RD Sudhaker Samuel, U B Mahadevaswamy, V. Nattarsu, Saguine-Pearson, 2007.

WORKSHOP PRACTICE

Sub Code	: 10WSL16/ 10WSL26	IA Marks	: 25
Hrs/ Week	: 03	Exam Hours	: 03
Total Hrs.	: 42	Exam Marks	: 50

1. Fitting

- i. Study of fitting tools
- ii. Study of fitting operations & joints
- iii. Minimum 5 models involving rectangular, triangular, semi circular and dovetail joints.

2. Welding

- iv. Study of electric arc welding tools & equipments
- v. Minimum 4 Models- electric arc welding-Butt joint, Lap joint, T-joint & L-joint.

3. Study and demonstration of Sheet metal and soldering work.

4. Study & demonstration of power Tools in Mechanical Engineering

Scheme of Examination:

Fitting	30 Marks
Welding	10 Marks
Viva Voce	10 marks

Reference Book:

1. The Elements of Workshop Technology -, Vol 1 & 2, S.K.H. Choudhury, A.K.H.Choudhury, Nirjhar Roy, 11th edition, 2001, Media Promoters and Publishers, Mumbai.

COMPUTER PROGRAMMING LABORATORY

Subject Code	: 10CPL16 / 10CPL26	IA Marks	: 25
Hrs/Week	: 03	Exam Hours	: 03
Total Hrs.	: 42	Exam Marks	: 50

PART – A

1. Design, develop and execute a program in C to find and output all the roots of a given quadratic equation, for non-zero coefficients.
2. Design, develop and execute a program in C to implement Euclid's algorithm to find the GCD and LCM of two integers and to output the results along with the given integers.
3. Design, develop and execute a program in C to reverse a given four digit integer number and check whether it is a palindrome or not. Output the given number with suitable message.
4. Design, develop and execute a program in C to evaluate the given polynomial $f(x) = a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$ for given value of x and the coefficients using Horner's method.
5. Design, develop and execute a program in C to copy its input to its output, replacing each string of one or more blanks by a single blank.
6. Design, develop and execute a program in C to input N integer numbers in ascending order into a single dimensional array and perform a binary search for a given key integer number and report success or failure in the form of a suitable message.
7. Design, develop and execute a program in C to input N integer numbers into a single dimensional array, sort them in ascending order using bubble sort technique and print both the given array and the sorted array with suitable headings.
8. Design, develop and execute a program in C to compute and print the word length on the host machine.

PART – B

9. Design, develop and execute a program in C to calculate the approximate value of $\exp(0.5)$ using the Taylor Series expansion for the exponential function. Use the terms in the expansion until the last term is less than the machine epsilon defined FLT_EPSILON in the header file <float.h>. Also print the value returned by the Mathematical function $\exp()$.
10. Design, develop and execute a program in C to read two matrices A (M x N) and B (P x Q) and compute the product of A and B if the matrices are compatible for multiplication. The program must print the input matrices and

the resultant matrix with suitable headings and format if the matrices are compatible for multiplication, otherwise the program must print a suitable message. (For the purpose of demonstration, the array sizes M, N, P, and Q can all be less than or equal to 3)

11. Design, develop and execute a parallel program in C to add, element-wise, two one-dimensional arrays A and B of N integer elements and store the result in another one-dimensional array C of N integer elements.

12. Design and develop a function `rightrot(x, n)` in C that returns the value of the integer x rotated to the right by n bit positions as an unsigned integer. Invoke the function from the main with different values for x and n and print the results with suitable headings.

13. Design and develop a function `isprime(x)` that accepts an integer argument and returns 1 if the argument is prime and 0 otherwise. The function must use plain division checking approach to determine if a given number is prime. Invoke this function from the main with different values obtained from the user and print appropriate messages.

14. Design, develop and execute a parallel program in C to determine and print the prime numbers which are less than 100 making use of algorithm of the Sieve of Eratosthenes.

15. Design and develop a function `reverses(s)` in C to reverse the string s in place. Invoke this function from the main for different strings and print the original and reversed strings.

16. Design and develop a function `match any(s1,s2)` which returns the first location in the string s1 where any character from the string s2 occurs, or - 1 if s1 contains no character from s2. Do not use the standard library function which does a similar job! Invoke the function `match any(s1, s2)` from the main for different strings and print both the strings and the return value from the function `match any(s1,s2)`.

Note: In the practical examination, the student has to answer two questions. One question from Part A and one question from Part B will be selected by the student by lots. All the questions listed in the syllabus have to be included in the lots. The change of question (Part A only / Part B only / Both Part A & Part B) has to be considered, provided the request is made for the same, within half an hour from the start of the examination. The allotment of marks is as detailed below:

Sl. No.	Activity		Max. Marks
1.	Procedure Writing program & procedure for the assigned problems along with algorithms / flowchart	Part A	5*
		Part B	5*
2.	Conduction Execution of the program and	Part A	10

	showing the results in proper format	Part B	20
3.	Viva-voce**		10
Total Max. Marks			50
Minimum passing Marks (40% of Max. Marks)			20

* To be considered as zero if student has been allowed change of question.

LABORATORY EXPERIMENTS IN ENGINEERING PHYSICS

Sub Code	: 10PHYL17/10PHYL27	IA Marks	: 25
Hrs/ Week	: 03	Exam Hours	: 03
Total Hrs.	: 10 (To be completed)	Exam Marks	: 50

EXPERIMENTS :

1. Series & Parallel LCR Circuits.(Determination of resonant frequency & quality factor)
2. I-V Characteristics of Zener Diode.(determination of knee voltage, zener voltage & forward resistance)
3. Characteristics of a Transistor.(Study of Input & Output characteristics and calculation of input resistance, output resistance & amplification factor)
4. Photo Diode Characteristics.(Study of I-V characteristics in reverse bias and variation of photocurrent as a function of reverse voltage & intensity)
5. Ultrasonic Interferometer (Measurement of velocity of sounds in solids/liquids).
6. Dielectric constant (Measurement of dielectric constant).
7. Magnetic properties (Study of retentivity and coercivity by B-H graph method).
8. Diffraction (Measurement of wavelength of laser / Hg source using diffraction grating).
9. Planck's constant (Using the principle of photoelectric effect/LED's).
10. Electrical Resistivity (Determination of resistivity in semiconductor by Four probe method).
11. Verification of Stefan's law.
12. Determination of Fermi energy.(Measurement of Fermi energy in copper)
13. Uniform Bending Experiment.(Determination of Youngs modulus of material bar)
14. Newtons Rings.(Determination of radius of curvature of planoconvex lens)

ENGINEERING CHEMISTRY LABORATORY

Sub Code	: 10CHEL17/10CHEL27	IA Marks	: 25
Hrs/ Week	: 03	Exam Hours	: 03
Total Hrs.	: 42	Exam Marks	: 50

PART – A

1. Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution
2. Colorimetric estimation of Copper
3. Conductometric estimation of an Acid mixture using standard NaOH solution
4. Flame Photometric estimation of Sodium and Potassium in the given sample of Water
5. Determination of pKa of a weak acid using pH Meter
6. Determination of Viscosity co-efficient of a given liquid using Ostwald's Viscometer.

PART – B

1. Determination of Total Hardness of a sample of Water using Disodium salt of EDTA.
2. Determination of 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 indicator method.
5. Determination of COD of the given Industrial Waste water sample.
6. Determination of Total Alkalinity of a given Water Sample using standard Hydrochloric acid.

References Books:

- 1) Laboratory manual in Engineering Chemistry Sudharani, Dhanpatrai Publishing Company.
- 2) Vogel's Text Book of Quantitative Chemical Analysis revised by G.H.Jeffery, J. Bassett, J. Mendham and R.C Denney.

Scheme of Examination:

One experiment from Part- A and another from Part - B shall be set. Different experiments may be set from Part- A and a common experiment from Part – B.

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS

Sub Code	: 10CIP18/10CIP28	IA Marks	:	25
Hrs/ Week	: 02	Exam Hours	:	02
Total Hrs.	: 26	Exam Marks	:	50

- 1 Preamble to the constitution of India. Fundamental rights under Part – III – details of Exercise of rights, Limitations & Important cases. **4 Hours**
- 2 Relevance of Directive principles of State Policy under Part – IV. Fundamental duties & their significance. **3 Hours**
- 3 Union Executive – President, Prime Minister, Parliament & the Supreme Court of India. **3 Hours**
- 4 State executive – Governors, Chief Minister, State Legislator and High Courts. **3 Hours**
- 5 Constitutional Provisions for Scheduled Castes & Tribes, Women & Children & Backward classes. Emergency Provisions. **4 Hours**
- 6 Electoral process, Amendment procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments. **3 Hours**
- 7 Scope & aims of engineering Ethics. Responsibility of Engineers. Impediments to responsibility. **3 Hours**
- 8 Honesty, Integrity and reliability, risks, safety & liability in engineering. **3 Hours**

Text Books:

1. Durga Das Basu: “Introduction to the Constitution of India” (Students Edn.) Prentice – Hall EEE, 19th/20th Edn., 2001.
2. “Engineering Ethics” by Charles E.Haries, Michael. S.Pritchard and Michael J.Robins Thompson Asia, 2003-08-05.

Reference Books:

1. “An Introduction to Constitution of India” by M.V.Pylee, Vikas Publishing, 2002.
2. “Engineering Ethics” by M. Govindarajan, S.Natarajan, V.S. Senthilkumar., Prentice – Hall of India Pvt. Ltd. New Delhi, 2004.

Scheme of examination:

Question paper is of objective type. Students have to pass this subject compulsorily. However, marks will not be considered for awarding class/rank.

ENVIRONMENTAL STUDIES

Sub Code	: 10CIV18/10CIV28	IA Marks	: 25
Hrs/ Week	: 02	Exam Hours	: 02
Total Hrs.	: 26	Exam Marks	: 50

PART – A

UNIT-1

Environment -_ Definition, Eco system -- Balanced ecosystem, Human activities - Food, Shelter, Economic and Social Security

3 Hours

UNIT-2

Effects of human activities on environment - Agriculture, Housing, Industry, Mining, and Transportation activities, Environmental Impact Assessment. Sustainable Development.

3 Hours

UNIT-3

Natural Resources - Water resources - Availability and Quality aspects. Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material Cycles - Carbon, Nitrogen and Sulphur Cycles.

4 Hours

UNIT-4

Energy - Different types of energy, Electro-magnetic radiation. Conventional and Non - Conventional sources - Hydro Electric, Fossil fuel based, Nuclear, Solar, Biomass and Bio-gas. Hydrogen as an alternative future source of Energy.

4 Hours

PART – B

UNIT-5

Environmental Pollution and their effects. Water pollution. Land pollution . Noise pollution . Public Health aspects.

3 Hours

UNIT-6

Current Environmental issues of importance:
Population Growth, Climate change and Global warming - Effects, Urbanization, Automobile pollution

3 Hours

UNIT-7

Acid Rain, Ozone layer depletion, Animal Husbandry

3 Hours

UNIT-8

Environmental Protection - Role of Government, Legal aspects, Initiatives by Non - Governmental Organizations (NGO), Environmental Education, Women Education.

3 Hours

Question paper is of objective type for 50 marks (**Fifty questions have to be set with 4 multiple choice answers**). Students have to pass the subject compulsorily. However, marks will not be considered for awarding class/rank.

Text Books:

- 1) Benny Joseph (2005), "Environmental Studies", Tata McGraw - Hill Publishing Company Limited
- 2) Ranjit Daniels R.J. and Jagdish Kirshnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi
- 3) Rajagopalan R. (2005), "Environmental Studies – From Crisis to Cure", Oxford University Press

Reference Books:

- 1) Raman Sivakumar, (2005), "Principles of Environmental Science and Engineering", Second Edition, Cengage learning, Singapore
- 2) Meenakshi P. (2006), "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi
- 3) Prakash S.M. (2007), "Environmental Studies", Elite Publishers, Mangalore
- 4) Erach Bharucha (2005), "Text Book of Environmental Studies", for UGC, University Press
- 5) Tyler Miller Jr. G. (2004), "Environmental Science – Working with the Earth", Tenth Edition, Thomson Brooks/Cole
- 6) Tyler Miller Jr. G. (2006), "Environmental Science – Working with the Earth", Eleventh Edition, Thomson Brooks/Cole
- 7) "Text Book of Environmental and Ecology" by Dr. Pratibha Sing, Dr. Anoop Singh and Dr. Piyush Malaviya. Acme Learning Pvt. Ltd., New Delhi.

ENGINEERING MATHEMATICS – II

Sub Code	:	10MAT21	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

PART-A

UNIT-1

Differential Equations - 1

Equations of first order and higher degree (p-y-x equations), Equations solvable for p-y-x. General and singular solutions, Clairaut's equation. Applications of differential equations of first order–illustrative examples*.

6 Hours

UNIT-2

Differential Equations – 2

Linear differential equations: Solution of second and higher order equations with constant coefficients by inverse differential operator method. Simultaneous differential equations of first order – Applications.

7 Hours

UNIT-3

Differential Equations – 3

Method of variation of parameters, Solutions of Cauchy's and Legendre's linear equations, Series solution of equations of second order, Frobenius method – simple problems.

6 Hours

UNIT-4

Partial Differential Equations (PDE)

Formation of Partial differential equations (PDE) by elimination of arbitrary constants/ functions. Solution of non-homogeneous PDE by direct integration. Solution homogeneous PDE involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Solution of PDE by the Method of separation of variables (first and second order equations)

7 Hours

PART-B

UNIT-5

Integral Calculus

Multiple Integrals – Evaluation of Double integrals and triple integrals. Evaluation of double integrals over a given region, by change of order of integration, by change of variables. Applications to area and volume – illustrative examples*.

Beta and Gamma Functions - Properties and problems

6 Hours

UNIT-6**Vector Integration**

Line integrals – definition and problems, Surface and volume integrals- definition. Green's theorem in a plane, Stoke's and Gauss divergence theorem (statements only).

6 Hours**UNIT-7****Laplace Transforms-1**

Definition, transforms of elementary functions, properties, Periodic function, Unit step function and unit impulse function.

7 Hours**UNIT-8****Laplace Transforms-2**

Inverse Laplace Transforms, Convolution theorem, solution of linear differential equations using Laplace transforms. Applications – illustrative examples*.

7 Hours

Note: * In the case of illustrative examples, questions are not to be set.

Text Books:

- 1) B.S. Grewal, Higher Engineering Mathematics, Latest edition, Khanna Publishers.
- 2) Erwin Kreyszig, Advanced Engineering Mathematics, Latest edition, Wiley Publications.

Reference Book:

- 1) B.V. Ramana, Higher Engineering Mathematics, Latest edition, Tata Mc. Graw Hill Publications.
- 2) Peter V. O'Neil, Engineering Mathematics, CENGAGE Learning India Pvt Ltd. Publishers.

ENGINEERING MATHEMATICS – III

Sub Code	:	10MAT31	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT 1:

Fourier Series

Periodic functions, Fourier expansions, Half range expansions, Complex form of Fourier series, Practical harmonic analysis.

UNIT 2:

Fourier Transforms

Finite and Infinite Fourier transforms, Fourier sine and cosine transforms, properties. Inverse transforms.

UNIT 3:

Partial Differential Equations (P.D.E)

Formation of P.D.E Solution of non homogeneous P.D.E by direct integration, Solution of homogeneous P.D.E involving derivative with respect to one independent variable only (Both types with given set of conditions) Method of separation of variables. (First and second order equations) Solution of Lagrange's linear P.D.E. of the type $Pp + Qq = R$.

UNIT 4:

Applications of P.D.E

Derivation of one dimensional wave and heat equations. Various possible solutions of these by the method of separation of variables. D'Alembert's solution of wave equation. Two dimensional Laplace's equation – various possible solutions. Solution of all these equations with specified boundary conditions. (Boundary value problems).

UNIT 5:

Numerical Methods

Introduction, Numerical solutions of algebraic and transcendental equations:- Newton-Raphson and Regula-Falsi methods. Solution of linear simultaneous equations : - Gauss elimination and Gauss Jordan methods. Gauss - Seidel

iterative method. Definition of eigen values and eigen vectors of a square matrix. Computation of largest eigen value and the corresponding eigen vector by Rayleigh's power method.

UNIT 6:

Finite differences (Forward and Backward differences) Interpolation, Newton's forward and backward interpolation formulae. Divided differences – Newton's divided difference formula. Lagrange's interpolation and inverse interpolation formulae. Numerical differentiation using Newton's forward and backward interpolation formulae. Numerical Integration – Simpson's one third and three eighth's value, Weddle's rule.
(All formulae / rules without proof).

UNIT 7:

Calculus of Variations

Variation of a function and a functional Extremal of a functional, Variational problems, Euler's equation, Standard variational problems including geodesics, minimal surface of revolution, hanging chain and Brachistochrone problems.

UNIT 8:

Difference Equations and Z-transforms

Difference equations – Basic definitions. Z-transforms – Definition, Standard Z-transforms, Linearity property, Damping rule, Shifting rule, Initial value theorem, Final value theorem, Inverse Z-transforms. Application of Z-transforms to solve difference equations.

Reference Books:

1. **Higher Engineering Mathematics** by B.V. Ramana (Tata-Macgraw Hill).
2. **Advanced Modern Engineering Mathematics** by Glyn James – Pearson Education.

**ANALOG ELECTRONIC CIRCUITS
(Common to EC/TC/EE/IT/BM/ML)**

Sub Code	:	10ES32	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT 1:

Diode Circuits: Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers.

UNIT 2:

Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization.

UNIT 3:

Transistor at Low Frequencies: BJT transistor modeling, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Analysis of circuits r_c model; analysis of CE configuration using h- parameter model; Relationship between h- parameter model of CE, CC and CE configuration.

UNIT 4:

Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects.

UNIT 5:

(a) General Amplifiers: Cascade connections, Cascode connections, Darlington connections.

(b) Feedback Amplifier: Feedback concept, Feedback connections type, Practical feedback circuits. Design procedures for the feedback amplifiers.

UNIT 6:

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. Designing of Power amplifiers.

UNIT 7:

NETWORK ANALYSIS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	:	10ES34	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT 1:

Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh.

UNIT 2:

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality.

UNIT 3:

Network Theorems – 1: Superposition, Reciprocity and Millman's theorems.

UNIT 4:**Network Theorems - II:**

Thevenin's and Norton's theorems; Maximum Power transfer theorem

UNIT 5: Resonant Circuits: Series and parallel resonance, frequency-response of series and Parallel circuits, Q –factor, Bandwidth.

UNIT 6:

Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.

UNIT 7:

Laplace Transformation & Applications : Solution of networks, step, ramp and impulse responses, waveform Synthesis

UNIT 8:

Two port network parameters: Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets.

TEXT BOOKS:

1. “**Network Analysis**”, M. E. Van Valkenburg, PHI / Pearson Education, 3rd Edition. Reprint 2002.
2. “**Networks and systems**”, Roy Choudhury, 2nd edition, 2006 re-print, New Age International Publications.

REFERENCE BOOKS:

1. “**Engineering Circuit Analysis**”, Hayt, Kemmerly and DurbinTMH 7th Edition, 2010
2. “**Basic Engineering Circuit Analysis**”, J. David Irwin / R. Mark Nelms, John Wiley, 8th ed, 2006.
3. “**Fundamentals of Electric Circuits**”, Charles K Alexander and Mathew N O Sadiku, Tata McGraw-Hill, 3 ed, 2009.

ELECTRONIC INSTRUMENTATION
(Common to EC/TC/IT/BM/ML)

Sub Code	:	10IT35	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT – 1:

Introduction

(a) Measurement Errors: Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures.

(b) Voltmeters and Multimeters Introduction, Multirange voltmeter, Extending voltmeter ranges, Loading, AC voltmeter using Rectifiers – Half wave and full wave, Peak responding and True RMS voltmeters.

UNIT – 2:

Digital Instruments

Digital Voltmeters – Introduction, DVM's based on $V - T$, $V - F$ and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multi-meters, Digital frequency meters, Digital measurement of time.

UNIT – 3:

Oscilloscopes

Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch.

UNIT – 4:

Special Oscilloscopes

Delayed time-base oscilloscopes, Analog storage, Sampling and Digital storage oscilloscopes.

UNIT – 5:

Signal Generators

Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator, Frequency synthesizer.

UNIT – 6:

Measurement of resistance, inductance and capacitance

Whetstone's bridge, Kelvin Bridge; AC bridges, Capacitance Comparison Bridge, Maxwell's bridge, Wein's bridge, Wagner's earth connection

UNIT – 7:

Transducers - I

Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, Differential output transducers and LVDT.

UNIT – 8:

Miscellaneous Topics

(a) Transducers - II –Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple .

(b) Display devices: Digital display system, classification of display, Display devices, LEDs, LCD displays.

(c) Bolometer and RF power measurement using Bolometer

(d) Introduction to Signal conditioning.

(e) Introduction to LabView.

TEXT BOOKS:

1. **“Electronic Instrumentation”**, H. S. Kalsi, TMH, 3rd 2010
2. **“Electronic Instrumentation and Measurements”**, David A Bell, PHI / Pearson Education, 2006.

REFERENCE BOOKS:

1. **“Principles of measurement systems”**, John P. Beatly, 3rd Edition, Pearson Education, 2000
2. **“Modern electronic instrumentation and measuring techniques”**, Cooper D & A D Helfrick, PHI, 1998.
3. **Electronics & electrical measurements**, A K Sawhney, , Dhanpat Rai & sons, 9th edition.

ANALOG ELECTRONICS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	:	10ESL37	IA Marks	:	25
Hrs/ Week	:	03	Exam Hours	:	03
Total Hrs.	:		Exam Marks	:	50

NOTE: Use the Discrete components to test the circuits. LabView can be used for the verification and testing along with the above.

1. Wiring of RC coupled Single stage FET & BJT amplifier and determination of the gain-frequency response, input and output impedances.
2. Wiring of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances (Single circuit) (One Experiment)
3. Wiring of a two stage BJT Voltage series feed back amplifier and determination of the gain, Frequency response, input and output impedances with and without feedback (One Experiment)
4. Wiring and Testing for the performance of BJT-RC Phase shift Oscillator for $f_0 \leq 10$ KHz
5. Testing for the performance of BJT – Hartley & Colpitts Oscillators for RF range $f_0 \geq 100$ KHz.
6. Testing for the performance of BJT -Crystal Oscillator for $f_0 > 100$ KHz
- 7 Testing of Diode clipping (Single/Double ended) circuits for peak clipping, peak detection
8. Testing of Clamping circuits: positive clamping /negative clamping.
9. Testing of a transformer less Class – B push pull power amplifier and determination of its conversion efficiency.
10. Testing of Half wave, Full wave and Bridge Rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency

ENGINEERING MATHEMATICS - IV

Sub Code	:	10MAT41	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT 1:

Numerical Methods

Numerical solutions of first order and first degree ordinary differential equations – Taylor’s series method, Modified Euler’s method, Runge – Kutta method of fourth order, Milne’s and Adams-Bashforth predictor and corrector methods (All formulae without Proof).

UNIT 2:

Complex Variables

Function of a complex variable, Limit, Continuity Differentiability – Definitions. Analytic functions, Cauchy – Riemann equations in cartesian and polar forms, Properties of analytic functions. Conformal Transformation – Definition. Discussion of transformations: $W = z^2$, $W = e^z$, $W = z + (1/z)$, $z \neq 0$ Bilinear transformations.

UNIT 3:

Complex Integration

Complex line integrals, Cauchy’s theorem, Cauchy’s integral formula. Taylor’s and Laurent’s series (Statements only) Singularities, Poles, Residues, Cauchy’s residue theorem (statement only).

UNIT 4:

Series solution of Ordinary Differential Equations and Special Functions

Series solution – Frobenius method, Series solution of Bessel’s D.E. leading to Bessel function of first kind. Equations reducible to Bessel’s D.E., Series solution of Legendre’s D.E. leading to Legendre Polynomials. Rodrigue’s formula.

UNIT 5:

Statistical Methods

Curve fitting by the method of least squares: $y = a + bx$, $y = a + bx + cx^2$, $y = ax^b$, $y = ab^x$, $y = ae^{bx}$, Correlation and Regression.

Probability: Addition rule, Conditional probability, Multiplication rule, Baye's theorem.

UNIT 6:

Random Variables (Discrete and Continuous) p.d.f., c.d.f. Binomial, Poisson, Normal and Exponential distributions.

UNIT 7:

Sampling, Sampling distribution, Standard error. Testing of hypothesis for means. Confidence limits for means, Student's t distribution, Chi-square distribution as a test of goodness of fit.

UNIT 8:

Concept of joint probability – Joint probability distribution, Discrete and Independent random variables. Expectation, Covariance, Correlation coefficient.

Probability vectors, Stochastic matrices, Fixed points, Regular stochastic matrices. Markov chains, Higher transition probabilities. Stationary distribution of regular Markov chains and absorbing states.

Text book:

1. **Higher Engineering Mathematics** by Dr. B.S. Grewal, 36th Edn. Kanna Publications.
2. **Probability** by Seymour Lipschutz (Schaum's series)

Reference Books:

1. **Higher Engineering Mathematics** by B.V. Ramana (Tata-Macgraw Hill).
2. **Advanced Modern Engineering Mathematics** by Glyn James – Pearson Education.

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MICROCONTROLLERS
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	:	10ES42	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT 1:

Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Computer software.

The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.

UNIT 2:

Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing , Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.

Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.

UNIT 3:

8051 programming: Assembler directives, Assembly language programs and Time delay calculations.

UNIT 4:

8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming

UNIT 5:

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C .

UNIT 6:

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C.

8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A.

Course Aim – The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultra-low power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

UNIT 7:

Motivation for MSP430 microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target applications (Single-chip, low cost, low power, high performance system design).

MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families.

Introduction to Code Composer Studio (CCS v4). Understanding how to use CCS for Assembly, C, Assembly+C projects for MSP430 microcontrollers. Interrupt programming.

Digital I/O – I/O ports programming using C and assembly, Understanding the muxing scheme of the MSP430 pins.

UNIT 8:

On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.

Using the Low-power features of MSP430. Clock system, low-power modes, Clock request feature, Low-power programming and Interrupt.

Interfacing LED, LCD, External memory. Seven segment LED modules interfacing. Example – Real-time clock.

Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces.

TEXT BOOKS:

1. “**The 8051 Microcontroller and Embedded Systems – using assembly and C**”-, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006
2. “**MSP430 Microcontroller Basics**”, John Davies, Elsevier, 2008.

REFERENCE BOOKS:

1. “**The 8051 Microcontroller Architecture, Programming & Applications**”, 2e Kenneth J. Ayala ;, Penram International, 1996 / Thomson Learning 2005.
2. “**The 8051 Microcontroller**”, V.Udayashankar and MalikarjunaSwamy, TMH, 2009
3. **MSP430 Teaching CD-ROM**, Texas Instruments, 2008 (can be requested <http://www.uniti.in>)
4. **Microcontrollers: Architecture, Programming, Interfacing and System Design**”,Raj Kamal, “Pearson Education, 2005

CONTROL SYSTEMS (Common to EC/TC/EE/IT/BM/ML)

Sub Code	:	10ES43	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT 1:

Modeling of Systems: Introduction to Control Systems, Types of Control Systems, Effect of Feedback Systems, Differential equation of Physical Systems -Mechanical systems, Friction, Translational systems (Mechanical accelerometer, systems excluded), Rotational systems, Gear trains, Electrical systems, Analogous systems

UNIT 2:

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded),

UNIT 3:

Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – state errors and error constants. Introduction to PID Controllers(excluding design)

UNIT 4:

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis; More on the Routh stability criterion.

UNIT 5:

Root–Locus Techniques: Introduction, The root locus concepts, Construction of root loci.

UNIT 6:

Frequency domain analysis: Correlation between time and frequency response, Bode plots, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots. Introduction to lead, lag and lead-lag compensating networks (excluding design).

UNIT 7:

Stability in the frequency domain: Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, Assessment of relative stability using Nyquist criterion, (Systems with transportation lag excluded).

UNIT 8:

Introduction to State variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations.

TEXT BOOK :

1. J. Nagarath and M.Gopal, “Control Systems Engineering”, New Age International (P) Limited, Publishers, Fourth edition – 2005

REFERENCE BOOKS:

1. **“Modern Control Engineering “**, K. Ogata, Pearson Education Asia/PHI, 4th Edition, 2002.
2. **“Automatic Control Systems”**, Benjamin C. Kuo, John Wiley India Pvt. Ltd., 8th Edition, 2008.
3. **“Feedback and Control System”**, Joseph J Distefano III et al., Schaum’s Outlines, TMH, 2nd Edition 2007.

SIGNALS & SYSTEMS
(Common to EC/TC/IT/BM/ML)

Sub Code	:	10EC44	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT 1:

Introduction: Definitions of a signal and a system, classification of signals, basic Operations on signals, elementary signals, Systems viewed as Interconnections of operations, properties of systems.

UNIT 2:

Time-domain representations for LTI systems – 1: Convolution, impulse response representation, Convolution Sum and Convolution Integral.

UNIT 3:

Time-domain representations for LTI systems – 2: Properties of impulse response representation, Differential and difference equation Representations, Block diagram representations.

UNIT 4:

Fourier representation for signals – 1: Introduction, Discrete time and continuous time Fourier series (derivation of series excluded) and their properties .

UNIT 5:

Fourier representation for signals – 2: Discrete and continuous Fourier transforms(derivations of transforms are excluded) and their properties.

LINEAR IC's & APPLICATIONS
(Common to EC/TC/IT/BM/ML)

Sub Code	:	10EC46	IA Marks	:	25
Hrs/ Week	:	04	Exam Hours	:	03
Total Hrs.	:	52	Exam Marks	:	100

UNIT 1:

Operational Amplifier Fundamentals: Basic Op-Amp circuit, Op-Amp parameters – Input and output voltage, CMRR and PSRR, offset voltages and currents, Input and output impedances, Slew rate and Frequency limitations; Op-Amps as DC Amplifiers- Biasing Op-Amps, Direct coupled -Voltage Followers, Non-inverting Amplifiers, Inverting amplifiers, Summing amplifiers, Difference amplifier.

UNIT 2:

Op-Amps as AC Amplifiers: Capacitor coupled Voltage Follower, High input impedance - Capacitor coupled Voltage Follower, Capacitor coupled Non-inverting Amplifiers, High input impedance - Capacitor coupled Non-inverting Amplifiers, Capacitor coupled Inverting amplifiers, setting the upper cut-off frequency, Capacitor coupled Difference amplifier, Use of a single polarity power supply.

UNIT 3:

Op-Amps frequency response and compensation: Circuit stability, Frequency and phase response, Frequency compensating methods, Band width, Slew rate effects, Z_{in} Mod compensation, and circuit stability precautions.

UNIT 4:

OP-AMP Applications: Voltage sources, current sources and current sinks, Current amplifiers, instrumentation amplifier, precision rectifiers, Limiting circuits.

UNIT 5:

More applications: Clamping circuits, Peak detectors, sample and hold circuits, V to I and I to V converters, Log and antilog amplifiers, Multiplier and divider, Triangular / rectangular wave generators, Wave form generator design, phase shift oscillator, Wein bridge oscillator.

UNIT 6:

Non-linear circuit applications: crossing detectors, inverting Schmitt trigger circuits, Monostable & Astable multivibrator, Active Filters –First and second order Low pass & High pass filters.

UNIT 7:

Voltage Regulators: Introduction, Series Op-Amp regulator, IC Voltage regulators, 723 general purpose regulator, Switching regulator.

UNIT 8:

Other Linear IC applications: 555 timer - Basic timer circuit, 555 timer used as astable and monostable multivibrator, Schmitt trigger; PLL-operating principles, Phase detector / comparator, VCO; D/A and A/ D converters – Basic DAC Techniques, AD converters.

TEXT BOOKS:

1. “Operational Amplifiers and Linear IC’s”, David A. Bell, 2nd edition, PHI/Pearson, 2004
2. “Linear Integrated Circuits”, D. Roy Choudhury and Shail B. Jain, 2nd edition, Reprint 2006, New Age International

REFERENCE BOOKS:

1. “Opamps- Design, Applications and Trouble Shooting”, Terrell, Elsevier, 3rd ed. 2006.
2. “Operational Amplifiers”, George Clayton and Steve Winder, Elsevier 5th ed., 2008

3. “Operational Amplifiers and Linear Integrated Circuits”, Robert. F. Coughlin & Fred.F. Driscoll, PHI/Pearson, 2006
4. “Design with Operational Amplifiers and Analog Integrated Circuits”, Sergio Franco, TMH, 3e, 2005

MICROCONTROLLERS LAB
(Common to EC/TC/EE/IT/BM/ML)

Sub Code	: 10ESL47	IA Marks	: 25
Hrs/ Week	: 03	Exam Hours	: 03
Total Hrs.	: 42	Exam Marks	: 50

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX .
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430.

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.

V SEMESTER

MANAGEMENT & ENTREPRENEURSHIP

Subject Code	: 10AL51	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

MANAGEMENT

UNIT - 1

MANAGEMENT: Introduction - Meaning - nature and characteristics of Management, Scope and functional areas of Management - Management as a Science, Art or Profession Management & Administration - Roles of Management, Levels of Management, Development of Management Thought-Early Management Approaches-Modern Management Approaches.

UNIT - 2

PLANNING: Nature, importance and purpose of planning process - Objectives - Types of plans (Meaning only) - Decision making - Importance of planning - steps in planning & planning premises - Hierarchy of plans.

UNIT - 3

ORGANISING AND STAFFING: Nature and purpose of organization - Principles of organization - Types of organization - Departmentation - Committees – Centralisation Vs Decentralisation of authority and responsibility - Span of control - MBO and MBE (Meaning only) Nature and importance of Staffing - Process of Selection & Recruitment (in brief).

UNIT - 4

DIRECTING & CONTROLLING: Meaning and nature of directing - Leadership styles, Motivation Theories, Communication - Meaning and importance – Coordination, meaning and importance and Techniques of Co - ordination. Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control.

ENTREPRENEURSHIP

UNIT - 5

ENTREPRENEUR: Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur - an emerging Class. Concept of Entrepreneurship - Evolution of

Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

UNIT - 6

SMALL SCALE INDUSTRY: Definition; Characteristics; Need and rationale: Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start an SSI - Government policy towards SSI; Different Policies of S.S.I.; Government Support for S.S.I. during 5 year plans, Impact of Liberalization, Privatization, Globalization on S.S.I., Effect of WTO/GATT Supporting Agencies of Government for S.S.I Meaning; Nature of Support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition only).

UNIT - 7

INSTITUTIONAL SUPPORT: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency: SISI; NSIC; SIDBI; KSFC.

UNIT - 8

PREPARATION OF PROJECT: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of Business Opportunities - Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.

TEXT BOOKS:

1. **Principles of Management** - P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4th Edition, 2010
2. **Dynamics of Entrepreneurial Development & Management** - Vasant Desai Himalaya Publishing House.
3. **Entrepreneurship Development** - Small Business Enterprises - Poornima M Charantimath - Pearson Education – 2006.

REFERENCE BOOKS:

1. **Management Fundamentals** - Concepts, Application, Skill Development Robert Lusier – Thomson.
2. **Entrepreneurship Development** - S S Khanka - S Chand & Co.
3. **Management** - Stephen Robbins - Pearson Education /PHI -17th Edition, 2003.

DIGITAL SIGNAL PROCESSING

Subject Code	: 10EC52	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

Discrete Fourier Transforms (DFT): Frequency domain sampling and reconstruction of discrete time signals. DFT as a linear transformation, its relationship with other transforms.

UNIT - 2

Properties of DFT, multiplication of two DFTs- the circular convolution, additional DFT properties.

UNIT - 3

Use of DFT in linear filtering, overlap-save and overlap-add method. Direct computation of DFT, need for efficient computation of the DFT (FFT algorithms).

UNIT - 4

Radix-2 FFT algorithm for the computation of DFT and IDFT—decimation-in-time and decimation-in-frequency algorithms. Goertzel algorithm, and chirp-z transform

UNIT - 5

IIR filter design: Characteristics of commonly used analog filters – Butterworth and Chebyshev filters, analog to analog frequency transformations.

UNIT - 6

Implementation of discrete-time systems: Structures for IIR and FIR systems- direct form I and direct form II systems, cascade, lattice and parallel realization.

UNIT - 7

FIR filter design: Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Bartlett and Kaiser windows, FIR filter design using frequency sampling technique.

UNIT - 8

Design of IIR filters from analog filters (Butterworth and Chebyshev) - impulse invariance method. Mapping of transfer functions: Approximation of derivative (backward difference and bilinear transformation) method, Matched z transforms, Verification for stability and linearity during mapping

TEXT BOOK:

1. **Digital signal processing – Principles Algorithms & Applications**, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.

REFERENCE BOOKS:

1. **Discrete Time Signal Processing**, Oppenheim & Schaffer, PHI, 2003.
2. **Digital Signal Processing**, S. K. Mitra, Tata Mc-Graw Hill, 3rd Edition, 2010.
3. **Digital Signal Processing**, Lee Tan: Elsevier publications, 2007

ANALOG COMMUNICATION

Subject Code	: 10EC53	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

RANDOM PROCESS: Random variables: Several random variables. Statistical averages: Function of Random variables, moments, Mean, Correlation and Covariance function: Principles of autocorrelation function, cross – correlation functions. Central limit theorem, Properties of Gaussian process.

UNIT - 2

AMPLITUDE MODULATION: Introduction, AM: Time-Domain description, Frequency – Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Double side band suppressed carrier modulation (DSBSC): Time-Domain description, Frequency-Domain representation, Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop.

UNIT - 3

SINGLE SIDE-BAND MODULATION (SSB): Quadrature carrier multiplexing, Hilbert transform, properties of Hilbert transform, Pre-envelope, Canonical representation of band pass signals, Single side-band modulation, Frequency-Domain description of SSB wave, Time-Domain description. Phase discrimination method for generating an SSB modulated wave, Time-Domain description. Phase discrimination method for generating an SSB modulated wave. Demodulation of SSB waves.

UNIT - 4

VESTIGIAL SIDE-BAND MODULATION (VSB): Frequency – Domain description, Generation of VSB modulated wave, Time - Domain description, Envelop detection of VSB wave plus carrier, Comparison of amplitude modulation techniques, Frequency translation, Frequency division multiplexing, Application: Radio broadcasting, AM radio.

UNIT - 5

ANGLE MODULATION (FM)-I: Basic definitions, FM, narrow band FM, wide band FM, transmission bandwidth of FM waves, generation of FM waves: indirect FM and direct FM.

UNIT - 6

ANGLE MODULATION (FM)-II: Demodulation of FM waves, FM stereo multiplexing, Phase-locked loop, Nonlinear model of the phase – locked loop, Linear model of the phase – locked loop, Nonlinear effects in FM systems.

UNIT - 7

NOISE: Introduction, shot noise, thermal noise, white noise, Noise equivalent bandwidth, Narrow bandwidth, Noise Figure, Equivalent noise temperature, cascade connection of two-port networks.

UNIT - 8

NOISE IN CONTINUOUS WAVE MODULATION SYSTEMS: Introduction, Receiver model, Noise in DSB-SC receivers, Noise in SSB receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, FM threshold effect, Pre-emphasis and De-emphasis in FM,.

TEXT BOOKS:

1. **Communication Systems**, Simon Haykins, 5th Edition, John Wiley, India Pvt. Ltd, 2009.
2. **An Introduction to Analog and Digital Communication**, Simon Haykins, John Wiley India Pvt. Ltd., 2008

REFERENCE BOOKS:

1. **Modern digital and analog Communication systems** B. P. Lathi, Oxford University Press., 4th ed, 2010,
2. **Communication Systems**, Harold P.E, Stern Samy and A Mahmond, Pearson Edn, 2004.
3. **Communication Systems: Singh and Sapre: Analog and digital** TMH 2nd , Ed 2007.

MICROWAVES AND RADAR

Subject Code	: 10EC54	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

MICROWAVE TRANSMISSION LINES: Introduction, transmission lines equations and solutions, reflection and transmission coefficients, standing waves and SWR, line impedance and line admittance. Smith chart, impedance matching using single stubs, Microwave coaxial connectors.

UNIT - 2

MICROWAVE WAVEGUIDES AND COMPONENTS: Introduction, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators.

UNIT - 3

MICROWAVE DIODES,

Transfer electron devices: Introduction, GUNN effect diodes – GaAs diode, RWH theory, Modes of operation, Avalanche transit time devices: READ diode, IMPATT diode, BARITT diode, Parametric amplifiers
Other diodes: PIN diodes, Schottky barrier diodes.

UNIT - 4

Microwave network theory and passive devices. Symmetrical Z and Y parameters, for reciprocal Networks, S matrix representation of multi port networks.

UNIT - 5

Microwave passive devices, Coaxial connectors and adapters, Phase shifters, Attenuators, Waveguide Tees, Magic tees.

UNIT - 6

STRIP LINES: Introduction, Microstrip lines, Parallèle strip lines, Coplanar strip lines, Shielded strip Lines.

UNIT - 7

AN INTRODUCTION TO RADAR: Basic Radar, The simple form of the Radar equation, Radar block diagram, Radar frequencies, application of Radar, the origins of Radar.

UNIT - 8

MTI AND PULSE DOPPLER RADAR: Introduction to Doppler and MTI Radar, delay line Cancellers, digital MTI processing, Moving target detector, pulse Doppler Radar.

TEXT BOOKS:

1. **Microwave Devices and circuits-** Liao / Pearson Education.
2. **Introduction to Radar systems-**Merrill I Skolnik, 3rd Ed, TMH, 2001.
3. **Microwave Engineering** – Annapurna Das, Sisir K Das TMH Publication, 2nd, 2010.

REFERENCE BOOK:

1. **Microwave Engineering** – David M Pozar, John Wiley India Pvt. Ltd., 3rd Edn, 2008.

INFORMATION THEORY AND CODING

Subject Code	: 10EC55	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

INFORMATION THEORY: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source.

UNIT - 2

SOURCE CODING: Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels.

UNIT - 3

FUNDAMENTAL LIMITS ON PERFORMANCE: Source coding theorem, Huffman coding, Discrete memory less Channels, Mutual information, Channel Capacity.

UNIT - 4

Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem.

UNIT - 5

INTRODUCTION TO ERROR CONTROL CODING: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding.

UNIT - 6

Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes.

UNIT - 7

RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes.

UNIT - 8

Convolution Codes, Time domain approach. Transform domain approach

TEXT BOOKS:

1. **Digital and analog communication systems**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 1996.
2. **Digital communication**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **ITC and Cryptography**, Ranjan Bose, TMH, II edition, 2007
2. **Digital Communications** - Glover and Grant; Pearson Ed. 2nd Ed 2008.
- 3.

CMOS SUBSYSTEM DESIGN: Architectural issues. Switch logic. Gate logic. Design examples – combinational logic. Clocked circuits. Other system considerations.

Clocking Strategies

UNIT - 6

CMOS SUBSYSTEM DESIGN PROCESSES: General considerations. Process illustration. ALU subsystem. Adders. Multipliers.

UNIT - 7

MEMORY, REGISTERS AND CLOCK: Timing considerations. Memory elements. Memory cell arrays.

UNIT - 8

TESTABILITY: Performance parameters. Layout issues. I/O pads. Real estate. System delays. Ground rules for design. Test and testability.

DIGITAL SIGNAL PROCESSING LABORATORY

Subject Code : **10ECL57**
No. of Practical Hrs/Week: 03
Total no. of Practical Hrs. : 42

IA Marks : 25
Exam Hours : 03
Exam Marks : 50

A LIST OF EXPERIMENTS USING MATLAB / SCILAB / OCTAVE / WAB

1. Verification of Sampling theorem.
2. Impulse response of a given system
3. Linear convolution of two given sequences.
4. Circular convolution of two given sequences
5. Autocorrelation of a given sequence and verification of its properties.
6. Cross correlation of given sequences and verification of its properties.
7. Solving a given difference equation.
8. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
9. Linear convolution of two sequences using DFT and IDFT.
10. Circular convolution of two given sequences using DFT and IDFT
11. Design and implementation of FIR filter to meet given specifications.
12. Design and implementation of IIR filter to meet given specifications.

B. LIST OF EXPERIMENTS USING DSP PROCESSOR

1. Linear convolution of two given sequences.
2. Circular convolution of two given sequences.
3. Computation of N- Point DFT of a given sequence
4. Realization of an FIR filter (any type) to meet given specifications .The input can be a signal from function generator / speech signal.
5. Audio applications such as to plot time and frequency (Spectrum) display of Microphone output plus a cosine using DSP. Read a wav file and match with their respective spectrograms
6. Noise: Add noise above 3kHz and then remove; Interference suppression using 400 Hz tone.
7. Impulse response of first order and second order system

REFERENCE BOOKS:

1. **Digital signal processing using MATLAB** - Sanjeet Mitra, TMH, 2001

MGH, 2000

3. **Digital Signal Processors**, B. Venkataramani and Bhaskar, TMH, 2002

ANALOG COMMUNICATION LAB + LIC LAB

Subject Code	: 10ECL58	IA Marks	: 25
No. of Practical Hrs/Week	: 03	Exam Hours	: 03
Total no. of Practical Hrs.	: 42	Exam Marks	: 50

**EXPERIMENTS USING DESCERTE COMPONENTS and LABVIEW
- 2009 CAN BE USED FOR VERIFICATION AND TESTING.**

1. Second order active LPF and HPF
2. Second order active BPF and BE
3. Schmitt Trigger Design and test a Schmitt trigger circuit for the given values of UTP and LTP
4. Frequency synthesis using PLL.
5. Design and test R-2R DAC using op-amp
6. Design and test the following circuits using IC 555
 - a. Astable multivibrator for given frequency and duty cycle
 - b. Monostable multivibrator for given pulse width W
7. IF amplifier design
8. Amplitude modulation using transistor/FET (Generation and detection)
9. Pulse amplitude modulation and detection
10. PWM and PPM
11. Frequency modulation using 8038/2206
12. Precision rectifiers – both Full Wave and Half Wave.

VI SEMESTER
DIGITAL COMMUNICATION

Subject Code	: 10EC61	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

Basic signal processing operations in digital communication. Sampling Principles: Sampling Theorem, Quadrature sampling of Band pass signal, Practical aspects of sampling and signal recovery.

UNIT - 2

PAM, TDM. Waveform Coding Techniques, PCM, Quantization noise and SNR, robust quantization.

UNIT - 3

DPCM, DM, applications. Base-Band Shaping for Data Transmission, Discrete PAM signals, power spectra of discrete PAM signals.

UNIT - 4

ISI, Nyquist's criterion for distortion less base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission.

UNIT - 5

DIGITAL MODULATION TECHNIQUES: Digital Modulation formats, Coherent binary modulation techniques, Coherent quadrature modulation techniques. Non-coherent binary modulation techniques.

UNIT - 6

Detection and estimation, Model of DCS, Gram-Schmidt Orthogonalization procedure, geometric interpretation of signals, response of bank of correlators to noisy input.

UNIT - 7

Detection of known signals in noise, correlation receiver, matched filter receiver, detection of signals with unknown phase in noise.

UNIT - 8

Spread Spectrum Modulation: Pseudo noise sequences, notion of spread spectrum, direct sequence spread spectrum, coherent binary PSK, frequency

hop spread spectrum, applications.

TEXT BOOK:

1. **Digital communications**, Simon Haykin, John Wiley India Pvt. Ltd, 2008.

REFERENCE BOOKS:

1. **Digital and Analog communication systems**, Simon Haykin, John Wiley India Pvt. Ltd, 2008
2. **An introduction to Analog and Digital Communication**, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 2008.
3. **Digital communications** - Bernard Sklar: Pearson education 2007

MICROPROCESSOR

Subject Code	: 10EC62	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

8086 PROCESSORS: Historical background, The microprocessor-based personal computer system, 8086 CPU Architecture, Machine language instructions, Instruction execution timing, The 8086

UNIT - 2

INSTRUCTION SET OF 8086: Assembler instruction format, data transfer and arithmetic, branch type, loop, NOP & HALT, flag manipulation, logical and shift and rotate instructions. Illustration of these instructions with example programs, Directives and operators

UNIT - 3

BYTE AND STRING MANIPULATION: String instructions, REP Prefix, Table translation, Number format conversions, Procedures, Macros, Programming using keyboard and video display

UNIT - 4

8086 INTERRUPTS: 8086 Interrupts and interrupt responses, Hardware interrupt applications, Software interrupt applications, Interrupt examples

UNIT - 5

8086 INTERFACING: Interfacing microprocessor to keyboard (keyboard types, keyboard circuit connections and interfacing, software keyboard interfacing, keyboard interfacing with hardware), Interfacing to alphanumeric displays (interfacing LED displays to microcomputer), Interfacing a microcomputer to a stepper motor

UNIT - 6

8086 BASED MULTIPROCESSING SYSTEMS: Coprocessor configurations, The 8087 numeric data processor: data types, processor architecture, instruction set and examples

UNIT - 7

SYSTEM BUS STRUCTURE: Basic 8086 configurations: minimum mode, maximum mode, Bus Interface: peripheral component interconnect (PCI) bus, the parallel printer interface (LPT), the universal serial bus (USB)

UNIT - 8

80386, 80486 AND PENTIUM PROCESSORS: Introduction to the 80386 microprocessor, Special 80386 registers, Introduction to the 80486 microprocessor, Introduction to the Pentium microprocessor.

TEXT BOOKS:

1. **Microcomputer systems-The 8086 / 8088 Family** – Y.C. Liu and G. A. Gibson, 2E PHI -2003
2. **The Intel Microprocessor, Architecture, Programming and Interfacing**-Barry B. Brey, 6e, Pearson Education / PHI, 2003

REFERENCE BOOKS:

1. **Microprocessor and Interfacing- Programming & Hardware**, Douglas hall, 2nd, TMH, 2006.
2. **Advanced Microprocessors and Peripherals** - A.K. Ray and K.M. Bhurchandi, TMH, 2nd, 2006.
3. **8088 and 8086 Microprocessors - Programming, Interfacing, Software, Hardware & Applications** - Triebel and Avtar Singh, 4e, Pearson Education, 2003

MICROELECTRONICS CIRCUITS

Subject Code : **10EC63**

No. of Lecture Hrs/Week : 04

Total no. of Lecture Hrs. : 52

IA Marks : 25

Exam Hours : 03

Exam Marks : 100

UNIT – 1

MOSFETS: Device Structure and Physical Operation, V-I Characteristics, MOSFET Circuits at DC, Biasing in MOS amplifier Circuits, Small Signal Operation and Models, MOSFET as an amplifier and as a switch, biasing in MOS amplifier circuits, small signal operation modes, single stage MOS amplifiers. MOSFET internal capacitances and high frequency modes, Frequency response of CS amplifiers, CMOS digital logic inverter, detection type MOSFET.

UNIT -2

Single Stage IC Amplifier: IC Design philosophy, CoUmparison of MOSFET and BJT, Current sources, Current mirrors and Current steering circuits, high frequency response.

UNIT – 3

Single Stage IC amplifiers (continued): CS and CF amplifiers with loads, high frequency response of CS and CF amplifiers, CG and CB amplifiers with active loads, high frequency response of CG and CB amplifiers, Cascade amplifiers. CS and CE amplifiers with source (emitter) degeneration source and emitter followers, some useful transfer parings, current mirrors with improved performance. SPICE examples.

UNIT – 4

Differences and Multistage Amplifiers: The MOS differential pair, small signal operation of MOS differential pair, the BJT differences pair, other non-ideal characteristics and differential pair, Differential amplifier with active loads, frequency response and differential amplifiers. Multistage amplifier. SPICE examples.

UNIT – 5

Feedback. General Feedback structure. Properties of negative feedback. Four basic feedback topologies. Series-Shunt feedback. Determining the loop gain. Stability problem. Effect of feedback an amplifier poles. Stability study using Bode plots. Frequency compensation. SPICE examples.

UNIT - 6

Operational Amplifiers: The two stage CMOS Op-amp, folded cascade CMOS op-amp, 741 op-amp circuit, DC analysis of the 741, small signal analysis of 741, gain, frequency response and slew rate of 741. Data Converters. A-D and D-A converters.

UNIT – 7 & 8

Digital CMOS circuits. Overview. Design and performance analysis of CMOS inverter. Logic Gate Circuits. Pass-transistor logic. Dynamic Logic Circuits. SPICE examples.

Text Book:

1. “**Microelectronic Circuits**”, Adel Sedra and K.C. Smith, 5th Edition, Oxford University Press, Interantional Version, 2009.

Reference Book:

1. “**Fundamentals of Microelectronics**”, Behzad Razavi, John Wiley India Pvt. Ltd, 2008.
2. “**Microelectronics – Analysis and Design**”, Sundaram Natarajan, Tata McGraw-Hill, 2007

ANTENNAS AND PROPAGATION

Subject Code	: 10EC64	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

ANTENNA BASICS: Introduction, basic Antenna parameters, patterns, beam area, radiation intensity, beam efficiency, diversity and gain, antenna apertures, effective height, bandwidth, radiation, efficiency, antenna temperature and antenna filed zones.

UNIT - 2

POINT SOURCES AND ARRAYS: Introduction, point sources, power patterns, power theorem, radiation intensity, filed patterns, phase patterns. Array of two isotropic point sources. Endfire array and Broadside array.

UNIT - 3

ELECTRIC DIPOLES AND THIN LINEAR ANTENNAS: Introduction, short electric dipole, fields of a short dipole(no derivation of field components), radiation resistance of short dipole, radiation resistances of $\lambda/2$ Antenna, thin linear antenna, micro strip arrays, low side lobe arrays, long wire antenna, folded dipole antennas.

UNIT - 4 & 5

LOOP, SLOT, PATCH AND HORN ANTENNA: Introduction, small loop, comparison of far fields of small loop and short dipole, loop antenna general case, far field patterns of circular loop, radiation resistance, directivity, slot antenna, Babinet’s principle and complementary antennas,

impedance of complementary and slot antennas, patch antennas, horn antennas, rectangular horn antennas.

UNIT - 6

ANTENNA TYPES: Helical Antenna, Yagi-Uda array, corner reflectors, parabolic reflectors, log periodic antenna, lens antenna, antenna for special applications – sleeve antenna, turnstile antenna, omni directional antennas, antennas for satellite antennas for ground penetrating radars, embedded antennas, ultra wide band antennas, plasma antenna, high-resolution data, intelligent antennas, antenna for remote sensing.

UNIT - 7 & 8

RADIO WAVE PROPAGATION: Introduction, Ground wave propagation, free space propagation, ground reflection, surface wave, diffraction.

TROPOSPHERE WAVE PROPAGATION: Troposcopic scatter, Ionosphere propagation, electrical properties of the ionosphere, effects of earth's magnetic field.

TEXT BOOKS:

1. **Antennas and Wave Propagation**, John D. Krauss, 4th Edn, McGraw-Hill International edition, 2010.
2. **Antennas and Wave Propagation** - Harish and Sachidananda: Oxford Press 2007

REFERENCE BOOKS:

1. **Antenna Theory Analysis and Design** - C A Balanis, 3rd Edn, John Wiley India Pvt. Ltd, 2008
2. **Antennas and Propagation for Wireless Communication Systems** - Sineon R Saunders, John Wiley, 2003.
3. **Antennas and wave propagation** - G S N Raju: Pearson Education 2005

OPERATING SYSTEMS

Subject Code	: 10EC65	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

INTRODUCTION AND OVERVIEW OF OPERATING SYSTEMS:

Operating system, Goals of an O.S, Operation of an O.S, Resource allocation and related functions, User interface related functions, Classes of operating

systems, O.S and the computer system, Batch processing system, Multi programming systems, Time sharing systems, Real time operating systems, distributed operating systems.

UNIT - 2

STRUCTURE OF THE OPERATING SYSTEMS: Operation of an O.S, Structure of the supervisor, Configuring and installing of the supervisor, Operating system with monolithic structure, layered design, Virtual machine operating systems, Kernel based operating systems, and Microkernel based operating systems.

UNIT - 3

PROCESS MANAGEMENT: Process concept, Programmer view of processes, OS view of processes, Interacting processes, Threads, Processes in UNIX, Threads in Solaris.

UNIT - 4

MEMORY MANAGEMENT: Memory allocation to programs, Memory allocation preliminaries, Contiguous and noncontiguous allocation to programs, Memory allocation for program controlled data, kernel memory allocation.

UNIT - 5

VIRTUAL MEMORY: Virtual memory basics, Virtual memory using paging, Demand paging, Page replacement, Page replacement policies, Memory allocation to programs, Page sharing, UNIX virtual memory.

UNIT - 6

FILE SYSTEMS: File system and IOCS, Files and directories, Overview of I/O organization, Fundamental file organizations, Interface between file system and IOCS, Allocation of disk space, Implementing file access, UNIX file system.

UNIT - 7

SCHEDULING: Fundamentals of scheduling, Long-term scheduling, Medium and short term scheduling, Real time scheduling, Process scheduling in UNIX.

UNIT - 8

MESSAGE PASSING: Implementing message passing, Mailboxes, Inter process communication in UNIX.

TEXT BOOK:

1. “**Operating Systems - A Concept based Approach**”, D. M. Dhamdhare, TMH, 3rd Ed, 2010.

REFERENCE BOOK:

1. **Operating Systems Concepts**, Silberschatz and Galvin, John Wiley India Pvt. Ltd, 5th Edition, 2001.
2. **Operating System – Internals and Design Systems**, Willaim Stalling, Pearson Education, 4th Ed, 2006.
3. **Design of Operating Systems**, Tennambhaum, TMH, 2001.

ADVANCED COMMUNICATION LAB

Subject Code	: 10ECL67	IA Marks	: 25
No. of Practical Hrs/Week:	03	Exam Hours	: 03
Total no. of Practical Hrs.:	42	Exam Marks	: 50

LIST OF EXPERIMENTS USING DESCERTE COMPONENTS and LABVIEW – 2009 can be used for verification and testing.

1. TDM of two band limited signals.
2. ASK and FSK generation and detection
3. PSK generation and detection
4. DPSK generation and detection
5. QPSK generation and detection
6. PCM generation and detection using a CODEC Chip
7. Measurement of losses in a given optical fiber (propagation loss, bending loss) and numerical aperture
8. Analog and Digital (with TDM) communication link using optical fiber.
9. Measurement of frequency, guide wavelength, power, VSWR and attenuation in a microwave test bench
10. Measurement of directivity and gain of antennas: Standard dipole (or printed dipole), microstrip patch antenna and Yagi antenna (printed).
11. Determination of coupling and isolation characteristics of a stripline (or microstrip) directional coupler
12. (a) Measurement of resonance characteristics of a microstrip ring resonator and determination of dielectric constant of the substrate.

(b) Measurement of power division and isolation characteristics of a microstrip 3 dB power divider.

MICROPROCESSOR LAB

Subject Code	: 10ECL68	IA Marks	: 25
No. of Practical Hrs/Week:	03	Exam Hours	: 03
Total no. of Practical Hrs. :	42	Exam Marks	: 50

I) Programs involving

- 1) Data transfer instructions like:
 - i] Byte and word data transfer in different addressing modes.
 - ii] Block move (with and without overlap)
 - iii] Block interchange

- 2) Arithmetic & logical operations like:
 - i] Addition and Subtraction of multi precision nos.
 - ii] Multiplication and Division of signed and unsigned Hexadecimal nos.
 - iii] ASCII adjustment instructions
 - iv] Code conversions
 - v] Arithmetic programs to find square cube, LCM, GCD, factorial

- 3) Bit manipulation instructions like checking:
 - i] Whether given data is positive or negative
 - ii] Whether given data is odd or even
 - iii] Logical 1's and 0's in a given data
 - iv] 2 out 5 code
 - v] Bit wise and nibble wise palindrome

- 4) Branch/Loop instructions like:
 - i] Arrays: addition/subtraction of N nos.
Finding largest and smallest nos.
Ascending and descending order
 - ii] Near and Far Conditional and Unconditional jumps, Calls and Returns

- 5) Programs on String manipulation like string transfer, string reversing, searching for a string, etc.

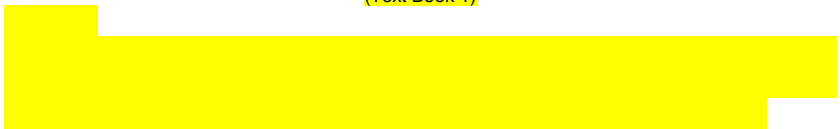
- 6) Programs involving Software interrupts
 Programs to use DOS interrupt INT 21h Function calls for
 Reading a Character from keyboard, Buffered Keyboard input,
 Display of character/ String on console
- II) Experiments on interfacing 8086 with the following interfacing modules
 through DIO (Digital Input/Output-PCI bus compatible) card
 - a) Matrix keyboard interfacing
 - b) Seven segment display interface
 - c) Logical controller interface
 - d) Stepper motor interface
- III) Other Interfacing Programs
 - a) Interfacing a printer to an X86 microcomputer
 - b) PC to PC Communication



Subject Code : **10EC661**
 No. of Lecture Hrs/Week : 04
 Total no. of Lecture Hrs. : 52

IA Marks : 25
 Exam Hours : 03
 Exam Marks : 100

(Text Book 1)



DATA STRUCTURE USING C++

Subject Code : **10EC665**
No. of Lecture Hrs/Week : 04

IA Marks : 25
Exam Hours : 03

UNIT - 1

INTRODUCTION: Functions and parameters, Dynamic memory allocation classis, Testing and debugging. Data Representation, Introduction, Linear lists, Formula-based representation linked representation, Indirect addressing simulating pointers.

UNIT - 2

ARRAYS AND MATRICES: Arrays, Matrices, Special matrices spare matrices.

UNIT - 3

STACKS: The abstract data types, Derived classed and inheritance, Formula-based representation, Linked representation, Applications.

UNIT - 4

Queues: The abstract data types, Derived classes and inheritance, Formula-based representation, Linked Linked representation, Applications.

UNIT - 5

SKIP LISTS AND HASHING: Dictionaries, Linear representation, Skip list presentation, Hash table representation.

UNIT - 6

BINARY AND OTHER TREES: Trees, Binary trees, Properties and representation of binary trees, Common binary tree operations, Binary tree traversal the ADT binary tree, ADT and class extensions.

UNIT - 7

PRIORITY QUEUES: Linear lists, Heaps, Leftist trees.

UNIT-8

Search Trees: Binary search trees, B-trees, Applications.

TEXT BOOK:

1. **Data structures, Algorithms, and applications in C++** - Sartaj Sahni, McGraw Hill.2000.

REFERENCE BOOKS:

1. **Object Oriented Programming in C++** - Balaguruswamy. TMH, 1995.
 2. **Programming in C++** - Balaguruswamy. TMH, 4th, 2010 .
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VII SEMESTER
COMPUTER COMMUNICATION NETWORKS

Subject Code : **10EC71**
No. of Lecture Hrs/Week : 04
Total no. of Lecture Hrs. : 52

IA Marks : 25
Exam Hours : 03
Exam Marks : 100

UNIT - 1

Layered tasks, OSI Model, Layers in OSI model, TCP/IP Suite, Addressing, Telephone and cable networks for data transmission, Telephone networks, Dial up modem, DSL, Cable TV for data transmission.

UNIT - 2

DATA LINK CONTROL: Framing, Flow and error control, Protocols, Noiseless channels and noisy channels, HDLC.

UNIT - 3

MULTIPLE ACCESSES: Random access, Controlled access, Channelisation.

UNIT - 4

Wired LAN, Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11

UNIT - 5

Connecting LANs, Backbone and Virtual LANs, Connecting devices, Backbone Networks, Virtual LANs

UNIT - 6

Network Layer, Logical addressing, Ipv4 addresses, Ipv6 addresses, Ipv4 and Ipv6 Transition from Ipv4 to Ipv6.

UNIT - 7

Delivery, Forwarding, Unicast Routing Protocols, Multicast Routing protocols

UNIT - 8

Transport layer Process to process Delivery, UDP, TCP, Domain name system, Resolution

TEXT BOOK:

1. **Data Communication and Networking**, B Forouzan, 4th Ed, TMH 2006

REFERENCE BOOKS:

1. **Computer Networks**, James F. Kurose, Keith W. Ross: Pearson education, 2nd Edition, 2003
2. **Introduction to Data communication and Networking**, Wayne Tomasi: Pearson education 2007

OPTICAL FIBER COMMUNICATION

Subject Code	: 10EC72	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

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), single mode fiber, cutoff wave length, mode field diameter. Optical Fibers: fiber materials, photonic crystal, fiber optic cables specialty fibers.

UNIT - 2

TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS: Introduction, Attenuation, absorption, scattering losses, bending loss, dispersion, Intra model dispersion, Inter model dispersion.

UNIT - 3

OPTICAL SOURCES AND DETECTORS: Introduction, LED's, LASER diodes, Photo detectors, Photo detector noise, Response time, double hetero junction structure, Photo diodes, comparison of photo detectors.

UNIT - 4

FIBER COUPLERS AND CONNECTORS: Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.

UNIT - 5

OPTICAL RECEIVER: Introduction, Optical Receiver Operation, receiver sensitivity, quantum limit, eye diagrams, coherent detection, burst mode receiver, operation, Analog receivers

UNIT - 6

ANALOG AND DIGITAL LINKS: Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links, microwave photonics.

Digital links – Introduction, point-to-point links, System considerations, link power budget, resistive budget, short wave length band, transmission distance for single mode fibers, Power penalties, nodal noise and chirping.

UNIT - 7

WDM CONCEPTS AND COMPONENTS: WDM concepts, overview of WDM operation principles, WDM standards, Mach-Zehnder interferometer, multiplexer, Isolators and circulators, direct thin film filters, active optical components, MEMS technology, variable optical attenuators, tunable optical fibers, dynamic gain equalizers, optical drop multiplexers, polarization controllers, chromatic dispersion compensators, tunable light sources.

UNIT - 8

Optical Amplifiers and Networks – optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA.

OPTICAL NETWORKS: Introduction, SONET / SDH, Optical Interfaces, SONET/SDH rings, High – speed light – waveguides.

TEXT BOOKS:

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

REFERENCE BOOK:

1. **Fiber Optic Communication** - Joseph C Palais: 4th Edition, Pearson Education.

POWER ELECTRONICS

Subject Code	: 10EC73	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

Introduction, Applications of power electronics, Power semiconductor devices, Control characteristics, Types of power electronics circuits, Peripheral effects.

UNIT - 2

POWER TRANSISTOR: Power BJT's, Switching characteristics, Switching limits, Base drive control, Power MOSFET's, Switching characteristics, Gate drive, IGBT's, Isolation of gate and base drives.

UNIT - 3

INTRODUCTION TO THYRISTORS: Principle of operation states anode-cathode characteristics, Two transistor model. Turn-on Methods, Dynamic Turn-on and turn-off characteristics, Gate characteristics, Gate trigger circuits, di / dt and dv / dt protection, Thyristor firing circuits.

UNIT - 4

CONTROLLED RECTIFIERS: Introduction, Principles of phase controlled converter operation, 1ϕ fully controlled converters, Dual converters, 1ϕ semi converters (all converters with R & RL load).

UNIT - 5

Thyristor turn off methods, natural and forced commutation, self commutation, class A and class B types, Complementary commutation, auxiliary commutation, external pulse commutation, AC line commutation, numerical problems.

UNIT - 6

AC VOLTAGE CONTROLLERS: Introduction, Principles of on and off control, Principles of phase control, Single phase controllers with resistive loads and Inductive loads, numerical problems.

UNIT - 7

DC CHOPPERS: Introduction, Principles of step down and step up choppers, Step down chopper with RL loads, Chopper classification, Switch mode regulators – buck, boost and buck – boost regulators.

UNIT - 8

INVERTORS: Introduction, Principles of operation, Performance parameters, 1ϕ bridge inverter, voltage control of 1ϕ invertors, current source invertors, Variable DC link inverter.

TEXT BOOKS:

1. **“Power Electronics”** - M. H. Rashid 3rd edition, PHI / Pearson publisher 2004.
2. **“Power Electronics”** - M. D. Singh and Kanchandani K.B. TMH publisher, 2nd Ed. 2007.

REFERENCE BOOKS:

1. **“Power Electronics, Essentials and Applications”, L Umanand,** John Wiley India Pvt. Ltd, 2009.
2. **“Power Electronics”** , Daniel W. Hart, McGraw Hill, 2010.
3. **“Power Electronics”**, V Nattarasu and R.S. Anandamurhty, Pearson/Sanguine Pub. 2006.

EMBEDDED SYSTEM DESIGN

Subject Code	: 10EC74	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT 1:

Introduction to Embedded System: Introducing Embedded Systems, Philosophy, Embedded Systems, Embedded Design and Development Process.

UNIT 2:

The Hardware Side: An Introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers-A First Look, Embedded Systems-An Instruction Set View, Embedded Systems-A Register View, Register View of a Microprocessor
 The Hardware Side: Storage Elements and Finite-State Machines (2 hour)
 The concepts of State and Time, The State Diagram, Finite State Machines- A Theoretical Model.

UNIT 3:

Memories and the Memory Subsystem: Classifying Memory, A General Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, Terminology, A Memory Interface in Detail, SRAM Design, DRAM Design, DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Designing a Cache System, Dynamic Memory Allocation.

UNIT 4:

Embedded Systems Design and Development : System Design and Development, Life-cycle Models, Problem Solving-Five Steps to Design, The

Design Process, Identifying the Requirements, Formulating the Requirements Specification, The System Design Specification, System Specifications versus System Requirements, Partitioning and Decomposing a System, Functional Design, Architectural Design, Functional Model versus Architectural Model, Prototyping, Other Considerations, Archiving the Project.

UNIT 5 & 6:

Real-Time Kernels and Operating Systems: Tasks and Things, Programs and Processes, The CPU is a resource, Threads – Lightweight and heavyweight, Sharing Resources, Foreground/Background Systems, The operating System, The real time operating system (RTOS), OS architecture, Tasks and Task control blocks, memory management revisited

UNIT 7 & 8:

Performance Analysis and Optimization: Performance or Efficiency Measures, Complexity Analysis, The methodology, Analyzing code, Instructions in Detail, Time, etc. – A more detailed look, Response Time, Time Loading, Memory Loading, Evaluating Performance, Thoughts on Performance Optimization, Performance Optimization, Tricks of the Trade, Hardware Accelerators, Caches and Performance

Text Book:

1. Embedded Systems – A contemporary Design

Tool, James K. Peckol, John Wiley India Pvt. Ltd, 2008

Reference Books:

1. **Embedded Systems: Architecture and Programming**, Raj Kamal, TMH. 2008
2. **Embedded Systems Architecture – A Comprehensive Guide for Engineers and Programmers**, Tammy Noergaard, Elsevier Publication, 2005
3. **Programming for Embedded Systems**, Dreamtech Software Team, John Wiley India Pvt. Ltd, 2008

Subject Code
No. of Practical Hrs/Week : 03
Total no. of Practical Hrs. : 42

IA Marks : 25
Exam Hours : 03
Exam Marks : 50

POWER ELECTRONICS LAB

: 10ECL78

Subject
Code

No. of Practical Hrs/Week: 03

Total no. of Practical Hrs. :
42

IA Marks : 25
Exam Hours : 03
Exam Marks : 50

Any five converter circuits experiment from the below list **must be** simulated using the **spice-simulator**.

1. Static characteristics of SCR and DIAC.
2. Static characteristics of MOSFET and IGBT.
3. Controlled HWR and FWR using RC triggering circuit
4. SCR turn off using i) LC circuit ii) Auxiliary Commutation
5. UJT firing circuit for HWR and FWR circuits.
6. Generation of firing signals for thyristors/ triacs using digital circuits / microprocessor.
7. AC voltage controller using triac – diac combination.
8. Single phase Fully Controlled Bridge Converter with R and R-L loads.
9. Voltage (Impulse) commutated chopper both constant frequency and variable frequency operations.
10. Speed control of a separately excited DC motor.
11. Speed control of universal motor.

ELECTIVE-3 (GROUP-C) PROGRAMMING IN C++

Subject Code	: 10EC761	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

C++, AN OVERVIEW: Getting started, the C++ program, Preprocessor Directives, The Built-In Array Data Type, Dynamic Memory Allocation and Pointers, An Object – based Design, An Object-Oriented Design, An Exception – based Design, An array.

UNIT - 2

THE BASIC LANGUAGE: Literal Constant, Variables, Pointer Type, String Types, const Qualifier, Reference Types, the bool type, Enumeration types, Array types. The vector container type.

UNIT - 3

OPERATORS: Arithmetic Operators, Equality, Relational and Logical operators, Assignment operators, Increment and Decrement operator, The conditional Operator, Bitwise operator, bitset operations. Statements: if, switch, for Loop, while, break, goto, continue statements.

UNIT - 4

FUNCTIONS: Prototype, Argument passing, Recursion and linear function.

UNIT - 5

EXCEPTION HANDLING: Throwing an Exception, Catching an exception, Exception Specification and Exceptions and Design Issues.

UNIT - 6

CLASSES: Definition, Class Objects, Class Initialization, Class constructor, The class destructor, Class Object Arrays and Vectors.

UNIT - 7

Overload Operators, Operators ++ and --, Operators new and delete.

UNIT - 8

Multiple Inheritances, public, private & protected inheritance, Class scope under Inheritance.

TEXT BOOK:

1. **C++ Primer**, S. B. Lippman & J. Lajoie, 3rd Edition, Addison Wesley, 2000.

REFERENCE BOOKS:

1. **C++ Program Design: An Introduction to Programming and Object- Oriented Design**. Cohoon and Davidson, 3rd Edn. TMH publication. 2004.
2. **Object Oriented Programming using C++**, R. Lafore, Galgotia Publications, 2004.

REAL-TIME SYSTEMS

Subject Code	: 10EC762	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

INTRODUCTION TO REAL-TIME SYSTEMS: Historical background, RTS Definition, Classification of Real-time Systems, Time constraints, Classification of Programs.

UNIT - 2

CONCEPTS OF COMPUTER CONTROL: Introduction, Sequence Control, Loop control, Supervisory control, Centralised computer control, Distributed system, Human-computer interface, Benefits of computer control systems.

UNIT - 3

COMPUTER HARDWARE REQUIREMENTS FOR RTS: Introduction, General purpose computer, Single chip microcontroller, Specialized processors, Process-related Interfaces, Data transfer techniques, Communications, Standard Interface.

UNIT - 4

IMAGE PROCESSING

Subject Code	: 10EC763	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

DIGITAL IMAGE FUNDAMENTALS: What is Digital Image Processing. fundamental Steps in Digital Image Processing, Components of an Image processing system, elements of Visual Perception.

UNIT - 2

Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.

UNIT - 3

IMAGE TRANSFORMS: Two-dimensional orthogonal & unitary transforms, properties of unitary transforms, two dimensional discrete Fourier transform.

UNIT - 4

Discrete cosine transform, sine transform, Hadamard transform, Haar transform, Slant transform, KL transform.

UNIT - 5

IMAGE ENHANCEMENT: Image Enhancement in Spatial domain, Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations.

UNIT - 6

Basics of Spatial Filtering Image enhancement in the Frequency Domain filters, Smoothing Frequency Domain filters, Sharpening Frequency Domain filters, homomorphic filtering.

UNIT - 7

Model of image degradation/restoration process, noise models, Restoration in the Presence of Noise, Only-Spatial Filtering Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, inverse filtering, minimum mean square error (Weiner) Filtering

UNIT - 8

Color Fundamentals. Color Models, Pseudo color Image Processing., processing basics of full color image processing

TEXT BOOK:

1. **“Digital Image Processing”**, Rafael C.Gonzalez, Richard E. Woods, etl , TMH , 2nd Edition 2010.

REFERENCE BOOKS:

1. **“Fundamentals of Digital Image Processing”**, Anil K. Jain, Pearson Education, 2001.
2. **“Digital Image Processing and Analysis”**, B. Chanda and D. Dutta Majumdar, PHI, 2003.

RADIO FREQUENCY INTEGRATED CIRCUITS

Subject Code	: 10EC764	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

OVERVIEW OF WIRELESS PRINCIPLES: A brief history of wireless systems, Noncellular wireless applications, Shannon, Modulations & Alphabet Soup, Propagation.

PASSIVE RLC NETWORKS: Introduction, Parallel RLC Tank, Series RLC Networks, Other RLC networks, RLC Networks as impedance Transformers.

UNIT - 2

CHARACTERISTICS OF PASSIVE IC COMPONENTS: Introduction, Interconnect at radio frequencies: Skin effect, resistors, Capacitors, Inductors, Transformers, Interconnect options at high frequency.

UNIT - 3

A REVIEW OF MOS DEVICE PHYSICS: Introduction, A little history, FETs, MOSFET physics, The long – channels approximation, operation in weak inversion (sub threshold), MOS device physics in the short – channel regime, Other effects.

DISTRIBUTED SYSTEMS: Introduction, Link between lumped and distributed regimes driving-point impedance of iterated structures,

Transmission lines in more detail, Behavior of Finite – length transmission lines, summary of transmission line equations, artificial lines.

UNIT - 4

THE SMITH CHART AND S-PARAMETERS: Introduction, The smith chart, S-parameters, Band Width Estimation Techniques, Introduction, The method of open – circuit time constant, The method of short circuit time constant, Risetime, Delay and bandwidth.

UNIT - 5

HIGH FREQUENCY AMPLIFIER DESIGN: Introduction, Zeros as bandwidth Enhancers, The shunt –series amplifier, Bandwidth Enhancement with f_T Doublers, Tuned amplifiers, Neutralization and unilateralization, Cascaded amplifiers, AM – PM conversion.

UNIT - 6

VOLTAGE REFERENCES AND BIASING: Introduction, Review of diode behavior, Diodes and bipolar transistors in CMOS technology, Supply –independent bias circuits, Bandgap voltage reference, Constant g_m bias. **Noise:** Introduction, Thermal noise, Shot noise, Flicker noise, Popcorn noise, Classical two- port noise theory, Examples of noise calculations, A handy rule of thumb, Typical noise performance.

UNIT - 7

LOW NOISE AMPLIFIER DESIGN: Introduction, Derivation of intrinsic MOSFET two-port noise parameters, LNA topologies: Power match versus noise match, Power-constrained noise optimization, Design examples, linearity and large signal performance, Spurious – free Dynamic range. **Mixers:** Introduction, Mixer fundamental, Nonlinear systems as linear mixers.

UNIT - 8

Multiplier – based mixers, Sub sampling mixers, Diode ring mixers, RF power amplifiers, Introduction, general considerations, Class A, AB, B and C power amplifier, Class D amplifiers, Class E amplifiers Class F amplifiers, Modulation of power amplifiers, summary of PA characteristics, RF PA design examples, additional design considerations, Design summary.

TEXT BOOK:

1. **The design of CMOS radio-frequency integrated circuit**, Thomas H. Lee, 2nd edition Cambridge, 2004.

REFERENCE BOOK:

1. **Design of Analog CMOS integrated circuit**, Behzad Razavi, Tata Mc Graw Hill, 2005.

VIII SEMESTER
WIRELESS COMMUNICATION

Subject Code	: 10EC81	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

Introduction to wireless telecommunication systems and Networks, History and Evolution Different generations of wireless cellular networks 1G, 2g,3G and 4G networks.

UNIT - 2

Common Cellular System components, Common cellular network components, Hardware and software, views of cellular networks, 3G cellular systems components, Cellular component identification Call establishment.

UNIT - 3

Wireless network architecture and operation, Cellular concept Cell fundamentals, Capacity expansion techniques, Cellular backbone networks, Mobility management, Radio resources and power management Wireless network security

UNIT - 4

GSM and TDMA techniques, GSM system overview, GSM Network and system Architecture, GSM channel concepts, GSM identifiers

UNIT - 5

GSM system operation, Traffic cases, Cal handoff, Roaming, GSM protocol architecture. TDMA systems

UNIT - 6

CDMA technology, CDMA overview, CDMA channel concept CDMA operations.

UNIT - 7

Wireless Modulation techniques and Hardware, Characteristics of air interface, Path loss models, wireless coding techniques, Digital modulation techniques, OFDM, UWB radio techniques, Diversity techniques, Typical GSM Hardware.

UNIT - 8

Introduction to wireless LAN 802.11X technologies, Evolution of Wireless LAN Introduction to 802.15X technologies in PAN Application and architecture Bluetooth Introduction to Broadband wireless MAN, 802.16X technologies.

TEXT BOOK:

1. **Wireless Telecom Systems and networks**, Mullet: Thomson Learning 2006.

REFERENCE BOOKS:

1. **Mobile Cellular Telecommunication**, Lee W.C.Y, MGH, 2nd, 2009.
2. **Wireless communication** - D P Agrawal: 2nd Edition Thomson learning 2007.
3. **Fundamentals of Wireless Communication**, David Tse, Pramod Viswanath, Cambridge 2005.
4. S. S. Manvi, M. S. Kakkasageri, “**Wireles and Mobile Network concepts and protocols**”, John Wiley India Pvt. Ltd, 1st edition, 2010.
5. “**Wireless Communication – Principles & Practice**”, T.S. Rappaport, PHI 2001.

DIGITAL SWITCHING SYSTEMS

Subject Code	: 10EC82	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

Developments of telecommunications, Network structure, Network services, terminology, Regulation, Standards. Introduction to telecommunications transmission, Power levels, Four wire circuits, Digital transmission, FDM, TDM, PDH and SDH, Transmission performance.

UNIT - 2

EVOLUTION OF SWITCHING SYSTEMS: Introduction, Message switching, Circuit switching, Functions of switching systems, Distribution systems, Basics of crossbar systems, Electronic switching, Digital switching systems.

DIGITAL SWITCHING SYSTEMS: Fundamentals : Purpose of analysis, Basic central office linkages, Outside plant versus inside plant, Switching system hierarchy, Evolution of digital switching systems, Stored program control switching systems, Digital switching system fundamentals, Building blocks of a digital switching system, Basic call processing.

UNIT - 3

TELECOMMUNICATIONS TRAFFIC: Introduction, Unit of traffic, Congestion, Traffic measurement, Mathematical model, lost call systems, Queuing systems.

UNIT - 4

SWITCHING SYSTEMS: Introduction, Single stage networks, Gradings, Link Systems, GOS of Linked systems.

UNIT - 5

TIME DIVISION SWITCHING: Introduction, space and time switching, Time switching networks, Synchronisation.

UNIT - 6

SWITCHING SYSTEM SOFTWARE: Introduction, Scope, Basic software architecture, Operating systems, Database Management, Concept of generic program, Software architecture for level 1 control, Software architecture for level 2 control, Software architecture for level 3 control, Digital switching system software classification, Call models, Connect sequence, Software linkages during call, Call features, Feature flow diagram, Feature interaction.

UNIT - 7

MAINTENANCE OF DIGITAL SWITCHING SYSTEM: Introduction, Scope, Software maintenance, Interface of a typical digital switching system central office, System outage and its impact on digital switching system reliability, Impact of software patches on digital switching system maintainability, Embedded patcher concept, Growth of digital switching system central office, Generic program upgrade, A methodology for proper maintenance of digital switching system, Effect of firmware deployment on digital switching system, Firmware-software coupling, Switching system maintainability metrics, Upgrade process success rate, Number of patches applied per year, Diagnostic resolution rate, Reported critical and major faults corrected, A strategy improving software quality, Program for software process improvement, Software processes improvement, Software processes, Metrics, Defect analysis, Defect analysis.

UNIT - 8

A GENERIC DIGITAL SWITCHING SYSTEM MODEL: Introduction, Scope, Hardware architecture, Software architecture, Recovery strategy, Simple call through a digital system, Common characteristics of digital switching systems. Analysis report. Reliability analysis.

TEXT BOOKS:

1. **Telecommunication and Switching, Traffic and Networks** - J E Flood: Pearson Education, 2002.
2. **Digital Switching Systems**, Syed R. Ali, TMH Ed 2002.

REFERENCE BOOK:

1. **Digital Telephony** - John C Bellamy: Wiley India India Pvt. Ltd, 3rd Ed, 2008.

ELECTIVE –4 (GROUP D)

DISTRIBUTED SYSTEM

Subject Code	: 10EC831	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

CHARACTERIZATION OF DISTRIBUTED SYSTEMS: Introduction, Examples of distributed systems, Resource sharing and the web, Challenges.

UNIT - 2

SYSTEM MODELS: Introduction, Architectural models, Fundamental mode.

UNIT - 3

INTERPROCESS COMMUNICATION: Introduction, The API for the internet protocols, External data representation and marshalling, Client-server communication, Group communication.

UNIT - 4

DISTRIBUTED OBJECTS AND REMOTE INVOCATION: Introduction, Communication between distributed objects, Remote procedure call, Events and notifications.

UNIT - 5

SECURITY: Introduction, Overview of security technique cryptographic algorithms, Digital signature, Cryptography pragmatics.

UNIT - 6

TIME & GLOBAL STATES: Introduction, Clocks, Events, Process states, Synchronizing physical clocks, Global states, Distributed debugging.

UNIT - 7

COORDINATION AND AGREEMENT: Distributed mutual exclusion, Elections, Multicast communication.

UNIT - 8

CORBA CASE STUDY: Introduction, CORBA RMI, CORBA Services.

TEXT BOOK:

1. **“Distributed Systems, Concepts & Design”**, George Coulouris, Jeam Dollimore, Tim Kindberg, fourth edition, 2006. Pearson education.

REFERENCE BOOK:

1. **“Distributed System Architecture, a Middleware Approach”** Arno puder, Kay Romer, Frank Pilhofer, Morgan Kaufmann publishers.

NETWORK SECURITY

Subject Code	: 10EC832	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

Services, mechanisms and attacks, The OSI security architecture, A model for network security.

UNIT - 2

SYMMETRIC CIPHERS: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Simplified DES, Data encryption standard (DES), The strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of Operation, Evaluation Criteria for Advanced Encryption Standard, The AES Cipher.

UNIT - 3

Principles of Public-Key Cryptasystems, The RSA algorithm, Key Management, Diffie - Hellman Key Exchange, Elliptic Curve Arithmetic, Authentication functions, Hash Functions.

UNIT - 4

Digital signatures, Authentication Protocols, Digital Signature Standard.

UNIT - 5

Web Security Consideration, Security socket layer (SSL) and Transport layer security, Secure Electronic Transaction.

UNIT - 6

Intruders, Intrusion Detection, Password Management.

UNIT - 7

MALICIOUS SOFTWARE: Viruses and Related Threats, Virus Countermeasures.

UNIT - 8

Firewalls Design Principles, Trusted Systems.

TEXT BOOK:

1. **Cryptography and Network Security**, William Stalling, Pearson Education, 2003.

REFERENCE BOOKS:

1. **Cryptography and Network Security**, Behrouz A. Forouzan, TMH, 2007.
2. **Cryptography and Network Security**, Atul Kahate, TMH, 2003.

OPTICAL NETWORKS

Subject Code

: **10EC833**

IA Marks

: 25

UNIT - 1

INTRODUCTION TO OPTICAL NETWORKS: Telecommunication networks, First generation optical networks, Multiplexing techniques, Second generation optical networks, System and network evolution. Non linear effects SPM, CPM, four wave mixing, Solitons.

UNIT - 2

COMPONENTS: Couplers, isolators and Circulators, Multiplexes and filters Optical amplifiers.

UNIT - 3

Transmitters, detectors, Switches, Wavelength converters.

UNIT - 4

TRANSMISSION SYSTEM ENGINEERING: System model, Power penalty, Transmitter, receiver, optical amplifiers, Crosstalk, Dispersion, Overall design Consideration.

UNIT - 5

FIRST GENERATION NETWORKS: SONET/SDH, Computer interconnects, Mans, Layered architecture for SONET and second generation networks.

UNIT - 6

WAVELENGTH ROUTING NETWORKS: Optical layer, Node design, Network design and operation, routing and wavelength assignment architectural variations.

UNIT - 7

VIRTUAL TOPOLOGY DESIGN: Virtual topology design problem, Combines SONET/WDM network design, an ILP formulation, Regular virtual topologies, Control and management, Network management configuration management, Performance management, fault management.

UNIT - 8

ACCESS NETWORKS: Network architecture overview, present and future access networks, HFC, FTTC, Optical access networks Deployment

considerations, Photonic packet switching, OTDM, Multiplexing and demultiplexing Synchronisation.

TEXT BOOK:

1. **Optical networks: A practical perspective** Kumar Sivarajan and Rajiv Ramaswamy: Morgan Kauffman 1998.

REFERENCE BOOKS:

1. **Optical Communication Networks:** Biswajit Mukherjee: TMG 1998.
2. **Optical Networks,** Ulysees Black: Pearson education 2007.

HIGH PERFORMANCE COMPUTER NETWORKS

Subject Code	: 10EC834	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

History of Communication Networks, Networking principles, Future networks Internet, Pure TAM Network, Cable Network, Wireless.

UNIT - 2

NETWORK SERVICES AND LAYERED ARCHITECTURE:

Applications, Traffic characterization and quality of services, Network services, High performance networks, Network Elements., Layered applications, Open data network model, Network architectures, Network bottlenecks.

UNIT - 3

INTERNET AND TCP/IP NETWORKS: Multicast IP, Mobile IP, TCP and UDP, Applications, FTP, SMTP. Internet success and limitations, Performance of TCP/IP Networks, Performance of circuit switched networks.

UNIT - 4

SONET, DWDM, FTH, DSL, Intelligent networks CATV.

UNIT - 5

ATM: Main features of ATM, Addressing, signaling and Routing, ATM header structure, ATM AAL, Internetworking with ATM.

UNIT - 6

WIRELESS NETWORKS: Link level design, Channel Access, Network design, Wireless networks today, Future networks, ad hoc networks, High speed Digital cellular, Home RF and Bluetooth.

UNIT - 7

Control of networks, Objectives and methods of control, Circuit switched networks, Datagram Networks Network economics, Derived demand for network services, ISPs, subscriber demand model, Empirical model.

UNIT - 8

OPTICAL NETWORKS: WDM systems, Optical cross connects, Optical LANs, Optical paths and networks.

TEXT BOOK:

1. **High Performance Communication Networks**, Warland and Varaiya: Morgan Kauffman/ Elsevier 2nd Edition 2000.

REFERENCE BOOKS:

1. **High-Speed Networks and Internet: Performance and Quality of service**, William Stallings, Pearson Edu., 2001.
2. **Building High-Speed Networks**, Tere Parnell, TMGH, 2000.

INTERNET ENGINEERING

Subject Code	: 10EC835	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

INTRODUCTION: Communication model, Communication software, and communication protocol: Representation, Development methods, Protocol engineering process. **NETWORK REFERENCE MODEL:** Layered architecture, Network services and interfaces, protocol functions, OSI model, TCP/IP protocol suite, Application protocols.

UNIT - 2

PROTOCOL SPECIFICATION: Communication service specification, Protocol entity specification, Interface specifications, Interactions, Multimedia protocol specifications, Internet protocol specifications.

UNIT - 3

SPECIFICATION AND DESCRIPTION LANGUAGE (SDL): A protocol specification language: SDL.

UNIT - 4

Examples of SDL based protocol specifications, Other protocol specification languages. Protocol Verification And Validation, Protocol verification, Verification of a protocol using finite state machines.

UNIT - 5

Protocol validation, Protocol design errors, and protocol validation approaches, SDL based protocol verification, SDL based protocol validation.

UNIT - 6

PROTOCOL CONFORMANCE TESTING: Conformance testing methodology and framework, Conformance test architectures, Test sequence generation methods, Distribute architecture by local methods, Conformance testing with TTCN, Conformance testing of RIP, Multimedia applications testing, SDL based tools for conformance testing.

UNIT - 7

PROTOCOL PERFORMANCE TESTING: SDL based performance testing of TCP, OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using bridge, Scalability testing.

UNIT - 8

PROTOCOL SYNTHESIS: Synthesis methods, interactive synthesis algorithms, automatic synthesis algorithm, automatic synthesis of SDL from MSC protocol re synthesis.

TEXT BOOK:

1. **Communication Protocol Engineering**, P. Venkatarm and S. S. Manvi, PHI, 2004.

REFERENCES BOOKS:

1. **The Internet and its Protocols**, Adrian Farrel, Elsevier, 2006.

2. **TCP/IP Protocol Stack**, B A Forouzan, TMH, 2006.

ELECTIVE –5 (GROUP E)

MULTIMEDIA COMMUNICATIONS

Subject Code	: 10EC841	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

MULTIMEDIA COMMUNICATIONS: Introduction, multimedia information representation, multimedia networks, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS application QoS.

UNIT - 2

MULTIMEDIA INFORMATION REPRESENTATION: Introduction, digital principles, text, images, audio, video.

UNIT - 3

TEXT AND IMAGE COMPRESSION: Introduction, compression principles, text compression, image compression.

UNIT - 4

AUDIO AND VIDEO COMPRESSION: Introduction, audio compression, DPCM, ADPCM, APC, LPC, video compression, video compression principles, H.261, H.263, MPEG, MPEG-1, MPEG-2, and MPEG-4.

UNIT - 5

MULTIMEDIA INFORMATION NETWORKS: Introduction, LANs, Ethernet, Token ring, Bridges, FDDI High-speed LANs, LAN protocol.

UNIT - 6

THE INTERNET: Introduction, IP Datagrams, Fragmentation, IP Address, ARP and RARP, QoS Support, IPv8.

UNIT - 7

BROADBAND ATM NETWORKS: Introduction, Cell format, Switfh and Protocol Architecture ATM LANs.

UNIT - 8

TRANSPORT PROTOCOL: Introduction, TCP/IP, TCP, UDP, RTP and RTCP.

TEXT BOOK:

1. **Multimedia Communications: Applications, Networks, Protocols and Standards**, Fred Halsall, Pearson Education, Asia, Second Indian reprint 2002.

REFERENCE BOOKS:

1. **Multimedia Information Networking**, Nalin K. Sharda, PHI, 2003.
2. **“Multimedia Fundamentals: Vol 1 - Media Coding and Content Processing”**, Ralf Steinmetz, Klara Narstedt, Pearson Education, 2004.
3. **“Multimedia Systems Design”**, Prabhat K. Andleigh, Kiran Thakrar, PHI, 2004.

REAL TIME OPERATING SYSTEMS

Subject Code	: 10EC842	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

Introduction to Real-Time Embedded Systems: Brief history of Real Time Systems, A brief history of Embedded Systems.

System Resources: Resource Analysis, Real-Time Service Utility, Scheduling Classes, The Cyclic Executive, Scheduler Concepts, Preemptive Fixed Priority Scheduling Policies, Real-Time OS, Thread Safe Reentrant Functions.

Processing: Preemptive Fixed-Priority Policy, Feasibility, Rate Monotonic least upper bound, Necessary and Sufficient feasibility, Deadline – Monotonic Policy, Dynamic priority policies.

I/O Resources:

Worst-case Execution time, Intermediate I/O, Execution efficiency, I/O Architecture.

Memory:

Physical hierarchy, Capacity and allocation, Shared Memory, ECC Memory, Flash filesystems.

Multiresource Services:

Blocking, Deadlock and livelock, Critical sections to protect shared resources, priority inversion.

Soft Real-Time Services:

Missed Deadlines, QoS, Alternatives to rate monotonic policy, Mixed hard and soft real-time services.

Embedded System Components:

Firmware components, RTOS system software mechanisms, Software application components.

Debugging Components:

Exceptions assert, Checking return codes, Single-step debugging, kernel scheduler traces, Test access ports, Trace ports, Power-On self test and diagnostics, External test equipment, Application-level debugging.

Performance Tuning:

Basic concepts of drill-down tuning, hardware – supported profiling and tracing, Building performance monitoring into software, Path length, Efficiency, and Call frequency, Fundamental optimizations.

High availability and Reliability Design:

Reliability and Availability, Similarities and differences, Reliability, Reliable software, Available software, Design trade offs, Hierarchical applications for Fail-safe design.

Design of RTOS – PIC microcontroller. (Chap 13 of book Myke Predko)

References:

1. “**Real-Time Embedded Systems and Components**”, Sam Siewert, Cengage Learning India Edition, 2007.
2. “**Programming and Customizing the PIC microcontroller**”, Myke Predko, 3rd Ed, TMH, 2008

GSM

Subject Code	: 10EC843	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

GSM ARCHITECTURE AND INTERFACES: Introduction, GSM frequency bands, GSM PLMN, Objectives of a GSM PLMN, GSM PLMN Services, GSM Subsystems, GSM Subsystems entities, GSM interfaces, The radio interface (MS to BSC), A_{bits} interface (BTS to BSC), A interface (BSC to MSC), Interfaces between other GSM entities, Mapping of GSM layers onto OSI layers.

UNIT - 2

RADIO LINK FEATURES IN GSM SYSTEMS: Introduction, Radio link measurements, Radio link features of GSM, Dynamic power control, Discontinuous transmission (DTX), SFH, Future techniques to reduce interface in GSM, Channel borrowing, Smart antenna.

UNIT - 3

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, GSM bursts, Normal burst, Synchronization burst, Frequency correction channel burst, Access burst, Data encryption in GSM, Mobility management, Location registration, Mobile identification.

UNIT - 4

SPEECH CODING IN GSM: Introduction, Speech coding methods, Speech code attributes, Transmission bit rate, Delay, Complexity, Quality, LPAS, ITU-T standards, Bit rate, Waveform coding, Time domain waveform coding, Frequency domain waveform coding, Vocoders, Full-rate vocoder, Half-rate vocoder. **MESSAGES, SERVICES, AND CALL FLOWS IN GSM:** Introduction, GSM PLMN services.

UNIT - 5

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, Introduction, Data interworking, GSM data services, Interconnection for switched data, Group 3 fax, Packet data on the signaling channel, User-to-user signaling, SMS, GSM GPRS.

UNIT - 6

PRIVACY AND SECURITY IN GSM: Introduction, Wireless security requirements, Privacy of communications, Authentication requirements, System lifetime requirements, Physical requirements, SIM cards, Security algorithms for GSM, Token-based authentication, Token-based registration, Token-based challenge.

UNIT - 7

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, 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.

UNIT - 8

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, NM interface and functionality, NMS functionality, OMC functionality, Management of GSM network, TMN applications, GSM information model, GSM containment tree, Future work items.

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.

ADHOC WIRELESS NETWORKS

Subject Code	: 10EC844	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

AD HOC NETWORKS: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet.

UNIT - 2

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, Classification of MAC protocols.

UNIT - 3

Contention - based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, Other MAC protocols.

UNIT - 4

ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS: Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Table drive routing protocol, On-demand routing protocol.

UNIT - 5

Hybrid routing protocol, Routing protocols with effective flooding mechanisms, Hierarchical routing protocols, Power aware routing protocols.

UNIT - 6

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.

UNIT - 7

SECURITY: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning.

UNIT - 8

QUALITY OF SERVICE IN AD HOC WIRELESS NETWORKS: Introduction, Issues and challenges in providing QoS in Ad hoc wireless Networks, Classification of QoS solutions.

TEXT BOOK:

1. “Ad hoc wireless Networks”, C. Siva Ram Murthy & B. S. Manoj, Pearson Education, 2nd Edition, reprint 2005.

REFERENCE BOOKS:

1. “Ad hoc wireless Networks”, Ozan K. Tonguz and Gianguigi Ferrari, Wiley
2. “Ad hoc wireless Networking”, Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du, Kluwer Academic publishers.

OPTICAL COMPUTING

Subject Code	: 10EC845	IA Marks	: 25
No. of Lecture Hrs/Week	: 04	Exam Hours	: 03
Total no. of Lecture Hrs.	: 52	Exam Marks	: 100

UNIT - 1

MATHEMATICAL AND DIGITAL IMAGE FUNDAMENTALS: Introduction, Fourier Transform, discrete Fourier transform, basic diffraction theory, Fourier transform property of lens , sampling and quantization, image enhancement, image restoration.

UNIT - 2

LINER OPTICAL PROCESSING: Introduction, photographic film, spatial filtering using binary filters, holography, inverse filtering, Deblurring.

UNIT - 3

ANALOG OPTICAL ARITHMETIC: Introduction, Halftone processing, nonlinear optical processing, Arithmetic operations.

UNIT - 4

RECOGNITION USING ANALOG OPTICAL SYSTEMS: Introduction, Matched filter, Joint transform correlation, Phase-only filter, Amplitude modulated recognition filters, Generalized correlation filter, Mellin transform based correlation.

UNIT - 5

DIGITAL OPTICAL COMPUTING DEVICES: Introduction, Nonlinear devices, Integrated optics, Threshold devices, Spatial high modulators, Theta modulation devices.

UNIT - 6

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, POSC image processing, Symbolic substitutions, Optical implementation of symbolic substitution, Limitations and challenges.

UNIT - 7

OPTICAL MATRIX PROCESSING: Introduction, Multiplication, Multiplication using convolution, Matrix operations, Cellular logic architecture, Programmable logic array.

UNIT - 8

ARTIFICIAL INTELLIGENT COMPUTATIONS: Introduction, Neural networks, Associative memory, Optical implementations, Interconnections, Artificial Intelligence.

TEXT BOOK:

1. **“Optical Computing An Introduction”**, Mohammed A. Karim, John Wiley & Sons, 1992.

REFERENCE BOOKS:

1. **Optical Signal Processing** by Vanderlugt John willy & sons NY 1992.
2. **Signal Processing in Optics** - Bradly G Boore Oxford University Press 1998.

LIST OF COURSE THAT INCLUDE EXPERIENTIAL LEARNING

M.Tech in VLSI Design & Embedded Systems

Total Mapped Courses-10

S.No	Course Code	Course Name
1	16EVE12	Digital VLSI Design
2	16EVE13	Advanced Embedded System
3	16EVEL16	VLSI and ES Lab -1
4	16EVE21	Design of Analog and Mixed mode VLSI Circuits
5	16EVE22	VLSI Testing
6	16EVE23	Advances in VLSI Design
7	16EVEL26	VLSI and ES Lab -2
8	16EVE34	Evaluation of Project phase -1
9	16EVE43	Evaluation of Project phase -2
10	16EVE44	Evaluation of Project and Viva-Voce

DIGITAL VLSI DESIGN			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER –I			
Subject Code	16EVE12	IA Marks	20
Number	04	Exam Marks	80
Total Number of	50	Exam Hours	03
CREDITS – 04			
<p>Course objectives: This course will enable students to:</p> <ol style="list-style-type: none"> 1. Explain VLSI Design Methodologies 2. Learn Static and Dynamic operation principles, analysis and design of inverter circuit. 3. Infer state of the art Semiconductors Memory circuits. 4. Outline the comprehensive coverage of Methodologies and Design practice that are used to reduce the Power Dissipation of large scale digital circuits. 5. Illustrate VLSI and ASIC design. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1			
<p>MOS Transistor: The Metal Oxide Semiconductor (MOS) Structure, The MOS System under External Bias, Structure and Operation of MOS Transistor, MOSFET Current-Voltage Characteristics, MOSFET Scaling and Small-Geometry Effects.</p> <p>MOS Inverters-Static Characteristics: Introduction, Resistive-Load Inverter, Inverters with n_Type MOSFET Load.</p>		10 Hours	L1, L2
Module -2			

<p>MOS Inverters-Static Characteristics: CMOS Inverter.</p> <p>MOS Inverters: Switching Characteristics and Interconnect Effects: Introduction, Delay-Time Definition, Calculation of Delay Times, Inverter Design with Delay Constraints, Estimation of Interconnect Parasitics, Calculation of Interconnect Delay, Switching Power Dissipation of CMOS Inverters.</p>	<p>10 Hours</p>	<p>L2, L3</p>
<p>Module -3</p>		
<p>Semiconductor Memories: Introduction, Dynamic Random Access Memory (DRAM), Static Random Access Memory (SRAM), Nonvolatile Memory, Flash Memory, Ferroelectric Random Access Memory (FRAM).</p>	<p>10 Hours</p>	<p>L1, L2, L3</p>
<p>Module -4</p>		
<p>Dynamic Logic Circuits: Introduction, Basic Principles of Pass Transistor Circuits, Voltage Bootstrapping, Synchronous Dynamic Circuit Techniques, Dynamic CMOS Circuit Techniques, High Performance Dynamic CMOS Circuits.</p> <p>BiCMOS Logic Circuits: Introduction, Bipolar Junction Transistor (BJT): Structure and Operation, Dynamic Behavior of BJTs, Basic BiCMOS Circuits: Static Behavior, Switching Delay in BiCMOS Logic Circuits, BiCMOS Applications.</p>	<p>10 Hours</p>	<p>L1,L2, L3, L4</p>
<p>Module -5</p>		
<p>Chip Input and Output (I/O) Circuits: Introduction, ESD Protection, Input Circuits, Output Circuits and L(di/dt) Noise, On-Chip Clock Generation and Distribution, Latch-Up and Its Prevention.</p> <p>Design for Manufacturability: Introduction, Process Variations, Basic Concepts and Definitions, Design of Experiments and Performance Modeling.</p>	<p>10 Hours</p>	<p>L2, L3</p>

Course outcomes:

After studying this course, students will be able to:

1. Analyse issues of On-chip interconnect Modelling and Interconnect delay calculation.
2. Analyse the Switching Characteristics in Digital Integrated Circuits.
3. Use the Dynamic Logic circuits in state of the art VLSI chips.
4. Study critical issues such as ESD protection, Clock distribution, Clock buffering, and Latch phenomenon
5. Use Bipolar and Bi-CMOS circuits in very high speed design.

Graduate Attributes (as per NBA):

- Engineering Knowledge.
- Problem Analysis.
- Design / development of solutions (partly).
- Interpretation of data.

Question Paper Pattern

- The question paper will have 10 full questions carrying equal marks.
- Each full question consists of 16 marks with a maximum of four sub questions.
- There will be 2 full questions from each module covering all the topics of the module
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

Sung Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis and Design", Tata McGraw-Hill, Third Edition.

Reference Books:

1. Neil Weste and K. Eshragian, "Principles of CMOS VLSI Design: A System Perspective", Second Edition, Pearson Education (Asia) Pvt. Ltd. 2000.
2. Wayne, Wolf, "Modern VLSI Design: System on Silicon" Prentice Hall PTR/Pearson Education, Second Edition, 1998.
3. Douglas A Pucknell & Kamran Eshragian, "Basic VLSI Design" PHI 3rd Edition (original Edition – 1994).

ADVANCED EMBEDDED SYSTEM			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – I			
Subject Code	16EVE13	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 04			
<p>Course objectives: This course will enable students to:</p> <ul style="list-style-type: none"> • Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system. • Describe the hardware software co-design and firmware design approaches • Explain the architectural features of ARM CORTEX M3, a 32 bit microcontroller including memory map, interrupts and exceptions. • Program ARM CORTEX M3 using the various instructions, for different applications 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1			
<p>Embedded System: Embedded vs General computing system, classification, application and purpose of ES. Core of an Embedded System, Memory, Sensors, Actuators, LED, Optocoupler, Communication Interface, Reset circuits, RTC, WDT, Characteristics and Quality Attributes of Embedded Systems (Selected Topics from Ch -1, 2, 3 of Text 1).</p>		10 Hours	L1, L2, L3
Module -2			
<p>Hardware Software Co-Design, embedded firmware design approaches, computational models, embedded firmware development languages, Integration and testing of Embedded Hardware and firmware, Components in embedded system development environment (IDE), Files generated during compilation, simulators, emulators and debugging (Selected Topics From Ch-7, 9, 12, 13 of Text 1).</p>		10 Hours	L1, L2, L3, L4

Module -3		
ARM-32 bit Microcontroller: Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence (Ch 1, 2, 3 of Text 2).	10 Hours	L1, L2, L3
Module -4		
Instruction Sets: Assembly basics, Instruction list and description, useful instructions, Memory Systems, Memory maps, Cortex M3 implementation overview, pipeline and bus interface (Ch-4, 5, 6 of Text 2).	10 Hours	L1, L2, L3, L4
Module -5		
Exceptions, Nested Vector interrupt controller design, SysTick Timer, Cortex-M3 Programming using assembly and C language, CMSIS (Ch-7, 8, 10 of Text 2).	10 Hours	L1, L2, L3
<p>Course Outcomes: After studying this course, students will be able to:</p> <ul style="list-style-type: none"> • Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system. • Explain the hardware software co-design and firmware design approaches. • Acquire the knowledge of the architectural features of ARM CORTEX M3, a 32 bit microcontroller including memory map, interrupts and exceptions. • Apply the knowledge gained for Programming ARM CORTEX M3 for different applications. 		
<p>Graduate Attributes (as per NBA)</p> <ul style="list-style-type: none"> • Engineering Knowledge. • Problem Analysis. • Design/Development of solutions 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 10 full questions carrying equal marks. • Each full question consists of 16 marks with a maximum of four sub questions. • There will be 2 full questions from each module covering all the topics of the module • The students will have to answer 5 full questions, selecting one full question from each module. 		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. K. V. Shibu, "Introduction to embedded systems", TMH education Pvt. Ltd. 2009. 2. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", 2nd edn, Newnes, (Elsevier), 2010. 		
<p>Reference Book: James K. Peckol, "Embedded systems- A contemporary design tool", John Wiley, 2008.</p>		

LOW POWER VLSI DESIGN

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER –I

Subject Code	16EVE14	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04**Course objectives:** This course will enable students to:

- Know the basics and advanced techniques in low power design which is a hot topic in today's market where the power plays a major role.
- Describe the various power reduction and the power estimation methods.
- Explain power dissipation at all layers of design hierarchy from technology, circuit, logic, architecture and system
- Apply State-of-the art approaches to power estimation and reduction.
- Practice the low power techniques using current generation design style and process technology

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
<p>Introduction: Need for low power VLSI chips, charging and discharging capacitance, short circuit current in CMOS leakage current, static current, basic principles of low power design, low power figure of merits.</p> <p>Simulation power analysis: SPICE circuit simulation, discrete transistor modeling and analysis, gate level logic simulation, architecture level analysis, data correlation analysis in DSP systems, Monte Carlo simulation.</p>	10 Hours (Text1)	L1, L2
Module -2		

<p>Probabilistic power analysis: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy.</p> <p>Circuit: Transistor and gate sizing, equivalent pin ordering, network restructuring and reorganization, special latches and flip flops, low power digital cell library, adjustable device threshold voltage.</p>	<p>10 Hours (Text 1)</p>	<p>L1, L2, L3</p>
<p>Module -3</p>		
<p>Logic: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic (Text 1).</p> <p>Low power Clock Distribution: Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co design of clock network (Text 2).</p>	<p>10 Hours</p>	<p>L1, L2, L3</p>
<p>Module -4</p>		
<p>Low power Architecture & Systems: Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation (Text 1).</p> <p>Low power arithmetic components: Introduction, circuit design style, adders, multipliers, division (Text 2).</p>	<p>10 Hours</p>	<p>L1- L4</p>
<p>Module -5</p>		
<p>Low power memory design: Introduction, sources and reductions of power dissipation in memory subsystem, sources of power dissipation in DRAM and SRAM (Text 2).</p> <p>Algorithm & Architectural Level Methodologies: Introduction, design flow, Algorithmic level analysis & optimization, Architectural level estimation & synthesis (Text 2).</p> <p>Advanced Techniques: Adiabatic computation, pass transistor, Asynchronous circuits (Text 1).</p>	<p>10 Hours</p>	<p>L1-L4</p>

Course outcomes:

After studying this course, students will be able to:

- Identify the sources of power dissipation in CMOS circuits.
- Perform power analysis using simulation based approaches and probabilistic analysis.
- Use optimization and trade-off techniques that involve power dissipation of digital circuits.
- Make the power design a reality by making power dimension an integral part of the design process
- Use practical low power design techniques and their analysis at various levels of design abstraction and analyse how these are being captured in the latest design automation environments.

Graduate Attributes (as per NBA):

- Engineering Knowledge.
- Problem Analysis.
- Design / development of solutions (partly).
- Interpretation of data.

Question paper pattern:

- The question paper will have 10 full questions carrying equal marks.
- Each full question consists of 16 marks with a maximum of four sub questions.
- There will be 2 full questions from each module covering all the topics of the module
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Gary K. Yeap, "Practical Low Power Digital VLSI Design", Kluwer Academic, 1998.
2. Jan M.Rabaey, Massoud Pedram, "Low Power Design Methodologies" Kluwer Academic, 2010.

Reference Books:

1. Kaushik Roy, Sharat Prasad, "Low-Power CMOS VLSI Circuit Design" Wiley, 2000
2. A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design", Kluwer Academic,1995.
3. A Bellamour and M I Elmasri, " Low power VLSI CMOS circuit design", Kluwer Academic,1995.

DIGITAL SYSTEM DESIGN USING VERILOG
 [As per Choice Based Credit System (CBCS) scheme]
 SEMESTER – I

Subject Code	16EVE151	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			
<p>Course objectives: This course will enable students to:</p> <ul style="list-style-type: none"> • Understand the concepts of Verilog Language • Design the digital systems as an activity in a larger systems design context. • Study the design and operation of semiconductor memories frequently used in application specific digital system. • Inspect how effectively IC's are embedded in package and assembled in PCB's for different application • Design and diagnosis of processors and I/O controllers they can be used in embedded systems 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1			
Introduction and Methodology: Digital Systems and Embedded Systems, Binary representation and Circuit Elements, Real-World Circuits, Models, Design Methodology.		8 Hours	L1, L2
Module -2			
Number Basics: Unsigned and Signed Integers, Fixed and Floating-point Numbers. Sequential Basics: Storage elements, Counters, Sequential Data paths and Control, Clocked Synchronous Timing Methodology.		8 Hours	L1, L2
Module -3			
Memories: Concepts, Memory Types, Error Detection and Correction. Implementation Fabrics: ICs, PLDs, Packaging and Circuit Boards, Interconnection and Signal Integrity.		8 Hours	L1, L2
Module -4			

<p>Processor Basics: Embedded Computer Organization, Instruction and Data, Interfacing with memory. I/O interfacing: I/O devices, I/O controllers, Parallel Buses, Serial Transmission, I/O software.</p>	<p>8 Hours</p>	<p>L2, L3</p>
<p>Module -5</p>		
<p>Accelerators: Concepts, case study, Verification of accelerators. Design Methodology: Design flow, Design optimization, Design for test.</p>	<p>8 Hours</p>	<p>L2, L3</p>
<p>Course outcomes: After studying this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Design embedded systems, using small microcontrollers, larger CPUs/DSPs, or hard or soft processor cores. 2. Design & Construct the combinational circuits using discrete gates and programmable logic devices. 3. Describe Verilog model for sequential circuits and test pattern generation 4. Explore the different types of semiconductor memories and their usage for specific chip design 5. Design and synthesis of different types of processor and I/O controllers that are used in embedded system design 		
<p>Graduate Attributes (as per NBA):</p> <ul style="list-style-type: none"> o Engineering Knowledge. o Problem Analysis. o Design / development of solutions (partly). o Interpretation of data. 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 10 full questions carrying equal marks. • Each full question consists of 16 marks with a maximum of four sub questions. • There will be 2 full questions from each module covering all the topics of the module • The students will have to answer 5 full questions, selecting one full question from each module. 		
<p>Text Book: Peter J. Ashenden, “Digital Design: An Embedded Systems Approach Using VERILOG”, Elsevier, 2010.</p>		
<p>Reference Book: Verilog HDL: A Guide to Digital Design and Synthesis, Second Edition by Samir Palnitkar.</p>		

VLSI and ES LAB - 1

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – I

Laboratory Code	16EVEL16	IA Marks	20
Number of Lecture Hours/Week	01Hr Tutorial (Instructions) + 02 Hours Laboratory	Exam Marks	80
		Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students to:

- Learn Verilog Code Programming for the design of digital circuits
- Use FPGA/CPLD board and Logic Analyzer or Chipscope to verify the results
- Learn Assembly language programming for different applications using ARM-Cortex M3 Kit and Keil uvision- 4 tool.
- Learn C language programming for different applications using ARM- Cortex M3 Kit and Keil uvision-4 tool.

Laboratory Experiments:

**Revised
Bloom's
Taxonomy**

- 1) **Digital Design Experiments:** Using Verilog code and any Compiler. Download code to FPGA/CPLD board and verify the output using Logic Analyzer or Chipscope
- a) Design and verify an 8 to 3 programmable priority encoder
 - b) Design and verify 3-bit Arbitrary Counter and repeat the given sequence
 - c) Design and Verify BCD adder and subtractor
 - d) Design and verify a sequential block to generate a sequence (say 11101) using appropriate FSM.
 - e) Design and verify 8 bit Ripple carry adder and Carry skip adder.
 - f) Design and verify a Linear feedback shift register based on a given polynomial expression
 - g) Design and verify the following 8 bit multipliers. Also report on area delay trade-off
 - i) Serial Multiplier
 - ii) Parallel Multiplier
 - h) Design and verify a parameterized FIFO
 - i) Design and verify register file which has 32-entry 3-ports having explicit address decoder. The ports are dedicated for read and write and will take one clock cycle for read or write operation

L2,L3,L4,L5

<p>2) ARM Cortex M3 Programs: (Programming to be done using Keil uvision 4 and download the program on to a M3 evaluation board such as NXP LPC1768 or ATMEL ATSAM3U)</p> <ol style="list-style-type: none"> a) Write an Assembly language program to calculate the sum and display the result for the addition of first ten numbers. SUM = 10+9+8+.....+1 b) Write a Assembly language program to link multiple object files and link them together c) Write an Assembly language program to store data in RAM d) Write a C program to Output the “Hello World” message using UART e) Write a C program to Design a Stopwatch using interrupts 	<p>L2,L3,L4</p>
<p>Course outcomes: On the completion of this laboratory course, the students will be able to:</p> <ul style="list-style-type: none"> • Develop Verilog Code for the design of digital circuits • Use FPGA/CPLD board and Logic Analyzer or Chipscope to verify the results • Develop Assembly language programs for different applications using ARM-Cortex M3 Kit and Keiluvision-4 tool. • Develop C language programs for different applications using ARM-Cortex M3 Kit and Keil uvision-4 tool 	
<p>Graduate Attributes (as per NBA)</p> <ul style="list-style-type: none"> • Engineering Knowledge. • Problem Analysis. • Design/Development of solutions. 	
<p>Conduct of Practical Examination:</p> <ul style="list-style-type: none"> • All laboratory experiments are to be included for practical examination. • For examination, two questions using different tool to be set. • Students are allowed to pick one experiment from the lot. • Strictly follow the instructions as printed on the cover page of answer script for breakup of marks. • Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero. 	