

# ANNA UNIVERSITY, CHENNAI

## AFFILIATED INSTITUTIONS

### R - 2008

#### I SEMESTER CURRICULA AND SYLLABI

(Common to all B.E. / B.Tech Programmes except B.E. Marine Engineering)

#### SEMESTER I

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	HS2111	<a href="#">Technical English - I</a>	3	1	0	4
2.	MA2111	<a href="#">Mathematics - I</a>	3	1	0	4
3.	PH2111	<a href="#">Engineering Physics - I</a>	3	0	0	3
4.	CY2111	<a href="#">Engineering Chemistry - I</a>	3	0	0	3
5.	GE2111	<a href="#">Engineering Graphics</a>	2	3	0	5
6.	GE2112	<a href="#">Fundamentals of Computing and Programming</a>	3	0	0	3
<b>PRACTICAL</b>						
7.	GE2115	<a href="#">Computer Practice Laboratory -I</a>	0	0	3	2
8.	GE2116	<a href="#">Engineering Practices Laboratory</a>	0	0	3	2
9.		* <a href="#">Physics &amp; Chemistry Laboratory I</a>	0	0	3	-
<b>TOTAL : 26 CREDITS</b>						

\* Laboratory classes on alternate weeks for Physics and Chemistry. The lab examinations will be held only in the second semester (Including the first semester experiments also).

**AIM:**

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

**OBJECTIVES:**

1. To help students develop listening skills for academic and professional purposes.
2. To help students acquire the ability to speak effectively in English in real-life situations.
3. To inculcate reading habit and to develop effective reading skills.
4. To help students improve their active and passive vocabulary.
5. To familiarize students with different rhetorical functions of scientific English.
6. To enable students write letters and reports effectively in formal and business situations.

**UNIT I****12**

General Vocabulary - changing words from one form to another - Adjectives, comparative adjectives – Adverbs - Active and passive voice – Tenses - simple present, present continuous - Adverb forms – Nouns – compound nouns - Skimming and scanning - Listening and transfer of information – bar chart, flowchart - Paragraph writing, description – Discussing as a group and making an oral report on the points discussed, conversation techniques - convincing others.

**Suggested activities:**

1. Matching words & meanings - Using words in context – Making sentences.
2. Changing sentences from active to passive voice & vice versa.
3. Skimming, cloze exercises, exercises transferring information from text to graphic form – bar charts, flow charts.
4. Writing descriptions using descriptive words & phrases, and technical vocabulary.
5. Role play, conversation exercises, discussions, oral reporting exercises  
Any other related relevant classroom activity.

**UNIT II****12**

Vocabulary – prefixes & suffixes – simple past tense - Spelling and punctuation – ‘wh’ Question forms - Scanning, inference - Listening & note-taking - Paragraph writing - comparison and contrast - Creative thinking and speaking.

**Suggested Activities:**

1. a. Vocabulary activities using prefixes and suffixes.  
b. Exercises using questions – asking & answering questions.
2. Scanning the text for specific information
3. Listening guided note-taking - Writing paragraphs using notes, giving suitable headings and subheadings for paragraphs. Using expressions of comparison and contrast.
4. Discussion activities and exploring creative ideas.  
Any other related relevant classroom activity

**UNIT III****12**

Tenses - simple past, simple future and past perfect - Reading in Context -Listening & note-taking – single line – Definitions – sequencing of sentences – instruction - Persuasive speaking.

**Suggested activities:**

1. a. Providing appropriate context for the use of tenses
2. Listening and note-taking
3. (a) Writing sentence definitions, instructions  
(b) Identifying the discourse links and sequencing jumbled sentences / writing instructions.
4. Speaking exercises, discussions, role play exercises using explaining, convincing and persuasive strategies  
Any other related relevant classroom activity

**UNIT IV****12**

Modal verbs and Probability – Concord subject verb agreement – Correction of errors - Cause and effect expressions – Extended Definition - Speaking about the future plans.

**Suggested activities:**

1. a. Making sentences using modal verbs to express probability  
b. Gap filling using relevant grammatical form of words.
2. Writing extended definitions
3. Speaking - role play activities, discussions, extempore speaking exercises speculating about the future.
4. Any other related relevant classroom activity

**UNIT V****12**

'If' conditionals – Gerunds - Intensive reading - Speaking – Presentation of problems & solutions - Itinerary – planning for an industrial visit - Formal Letter writing – Letter to the editor, invitation letter, accepting, declining letter and permission letter.

**Suggested activities:**

1. a) Sentence completion exercises using 'If' conditionals.  
b) Gap filling exercises using gerunds and present participle forms
2. Reading comprehension exercises.
3. Role play, discussion, debating and speaking activities for stating, discussing problems and suggesting solutions.
4. Planning a tour, Writing a travel itinerary. Writing letters to officials and to the editor in formal/official contexts.  
Any other related relevant classroom activity

**TOTAL : 60 PERIODS****TEXT BOOK:**

1. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 1 – 4 (Resources, Energy, Computer, Transport)

**REFERENCES:**

1. Meenakshi Raman and Sangeeta Sharma, 'Technical Communication English skills for Engineers', Oxford University Press, 2008.
2. Andrea, J. Rutherford, 'Basic Communication Skills for Technology', Second Edition, Pearson Education, 2007.

**EXTENSIVE READING:**

1. A.P.J.Abdul Kalam with Arun Tiwari, 'Wings of Fire' An Autobiography, University Press (India) Pvt. Ltd.,1999, 30<sup>th</sup> Impression 2007.

**NOTE:**

The book given under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

**MA2111****MATHEMATICS – I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**UNIT I MATRICES****12**

Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

**UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY****12**

Equation of a sphere – Plane section of a sphere – Tangent Plane – Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

**UNIT III DIFFERENTIAL CALCULUS****12**

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolute as envelope of normals.

**UNIT IV FUNCTIONS OF SEVERAL VARIABLES****12**

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor's expansion – Maxima and Minima – Method of Lagrangian multipliers.

**UNIT V MULTIPLE INTEGRALS****12**

Double integration – Cartesian and polar coordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates – Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral

**TOTAL: 60 PERIODS****TEXT BOOK:**

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", Third edition, Laxmi Publications(p) Ltd.,(2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40<sup>th</sup> Edition, Khanna Publications, Delhi, (2007).

**REFERENCES:**

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, "Advanced Engineering Mathematics", 7<sup>th</sup> Edition, Pearson Education, (2007).
3. Jain R.K and Iyengar S.R.K," Advanced Engineering Mathematics", 3<sup>rd</sup> Edition, Narosa Publishing House Pvt. Ltd., (2007).

**PH2111****ENGINEERING PHYSICS – I****L T P C  
3 0 0 3****UNIT I ULTRASONICS****9**

Introduction – Production – magnetostriction effect - magnetostriction generator- piezoelectric effect - piezoelectric generator- Detection of ultrasonic waves properties – Cavitations - Velocity measurement – acoustic grating - Industrial applications – drilling, welding, soldering and cleaning – SONAR - Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications - Sonograms

**UNIT II LASERS****9**

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einsteins A and B coefficients - derivation. Types of lasers – He-Ne, CO<sub>2</sub>, Nd-YAG, Semiconductor lasers (homojunction & heterojunction) Qualitative Industrial Applications - Lasers in welding, heat treatment, cutting – Medical applications - Holography (construction & reconstruction).

**UNIT III FIBER OPTICS & APPLICATIONS****9**

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – Double crucible technique of fibre drawing - Splicing, Loss in optical fibre – attenuation, dispersion, bending - Fibre optical communication system (Block diagram) - Light sources - Detectors - Fibre optic sensors – temperature & displacement - Endoscope.

**UNIT IV QUANTUM PHYSICS****9**

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton effect. Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

## UNIT V CRYSTAL PHYSICS

9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – Polymorphism and allotropy - Crystal defects – point, line and surface defects- Burger vector.

**TOTAL: 45 PERIODS**

### TEXT BOOKS:

1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi(2003)
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics', S.Chand and company, Ltd., New Delhi, 2005.

### REFERENCES:

1. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6<sup>th</sup> Edition, Thomson Brooks/Cole, Indian reprint (2007)
2. Rajendran, V and Marikani A, 'Engineering Physics' Tata McGraw Hill Publications Ltd, III Edition, New Delhi, (2004).
3. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai, (2007).
4. Jayakumar. S, 'Engineering Physics', R.K. Publishers, Coimbatore, (2003).
5. Chitra Shadrach and Sivakumar Vadivelu, 'Engineering Physics', Pearson Education, New Delhi, (2007).

CY2111

ENGINEERING CHEMISTRY – I

L T P C  
3 0 0 3

### AIM

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

### OBJECTIVES

- The student should be conversant with the principles water characterization and treatment of potable and industrial purposes.
- Principles of polymer chemistry and engineering applications of polymers
- Industrial applications of surface chemistry
- Conventional and non-conventional energy sources and energy storage devices and Chemistry of engineering materials

## UNIT I WATER TECHNOLOGY

9

Characteristics – alkalinity – types of alkalinity and determination – hardness – types and estimation by EDTA method (problems); Domestic water treatment – disinfection methods (Chlorination, ozonation. UV treatment) – Boiler feed water – requirements – disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning – demineralization process – desalination and reverse osmosis.

**UNIT II POLYMERS AND COMPOSITES 9**

Polymers-definition – polymerization – types – addition and condensation polymerization – free radical polymerization mechanism – Plastics, classification – preparation, properties and uses of PVC, Teflon, polycarbonate, polyurethane, nylon-6,6, PET-Rubber -vulcanization of rubber, synthetic rubbers – buty1 rubber, SBR, Composites – definition, types polymer matrix composites – FRP only.

**UNIT III SURFACE CHEMISTRY 9**

Adsorption – types – adsorption of gases on solids – adsorption isotherms – Freundlich and Langmuir isotherms – adsorption of solutes from solution – role of adsorbents in catalysis, ion-exchange adsorption and pollution abatement.

**UNIT IV NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES 9**

Nuclear energy – fission and fusion reactions and light water nuclear reactor for power generation (block diagram only) – breeder reactor – solar energy conversion – solar cells – wind energy – fuel cells – hydrogen – oxygen fuel cell – batteries – alkaline batteries – lead–acid, nickel–cadmium and lithium batteries.

**UNIT V ENGINEERING MATERIALS 9**

Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina, magnesite and zirconia bricks, Abrasives – natural and synthetic abrasives – quartz, corundum, emery, garnet, diamond, silicon carbide and boron carbide. Lubricants – mechanism of lubrication, liquid lubricants, - properties – viscosity index, flash and fire points, cloud and pour points, oilyness) – solid lubricants – graphite and molybdenum sulphide. Nanomaterials – introduction to nanochemistry – carbon nanotubes and their applications

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S. Dara “A text book of engineering chemistry” S.Chand & Co.Ltd., New Delhi (2006).

**REFERENCES:**

1. B.K.Sharma “Engineering chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).

**AIM**

To develop graphic skills in students.

**OBJECTIVES**

To develop in students graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

**Concepts and conventions (Not for Examination)****1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

**UNIT I PLANE CURVES AND FREE HAND SKETCHING****15****Curves used in engineering practices:**

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

**Free hand sketching:**

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES****14**

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

**UNIT III PROJECTION OF SOLIDS****15**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

**UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES****15**

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

**UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS****15**

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

Perspective projection of prisms, pyramids and cylinders by visual ray method.

**TOTAL: 75 PERIODS**

**TEXT BOOKS:**

1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46<sup>th</sup> Edition, (2003).

**REFERENCES:**

1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006).
2. M.S. Kumar, "Engineering Graphics", D.D. Publications, (2007).
3. K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008).
4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005).
5. K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications (1998).
6. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited (2008).
7. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

**Publication of Bureau of Indian Standards:**

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

**Special points applicable to University Examinations on Engineering Graphics:**

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. Whenever the total number of candidates in a college exceeds 150, the University Examination in that college will be conducted in two sessions (FN and AN on the same day) for 50 percent of student (approx) at a time.



**LIST OF EXERCISES****a) Word Processing** **15**

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart

**b) Spread Sheet** **15**

5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
8. Sorting and Import / Export features.

**Simple C Programming \*** **15**

9. Data types, Expression Evaluation, Condition Statements.
10. Arrays
11. Structures and Unions
12. Functions

**TOTAL: 45 PERIODS**

\* For programming exercises Flow chart and pseudocode are essential

**HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS****Hardware**

- . LAN System with 33 nodes (OR) Standalone PCs – 33 Nos.
- . Printers – 3 Nos.

**Software**

- . OS – Windows / UNIX Clone
- . Application Package – Office suite
- . Compiler – C

**OBJECTIVES**

To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

**GROUP A (CIVIL & MECHANICAL)****I CIVIL ENGINEERING PRACTICE****9****Buildings:**

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

**Plumbing Works:**

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise:
  - Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

**Carpentry using Power Tools only:**

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise:
  - Wood work, joints by sawing, planing and cutting.

**II MECHANICAL ENGINEERING PRACTICE****13****Welding:**

- (a) Preparation of arc welding of butt joints, lap joints and tee joints.
- (b) Gas welding practice

**Basic Machining:**

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

**Sheet Metal Work:**

- (a) Forming & Bending:
- (b) Model making – Trays, funnels, etc.
- (c) Different type of joints.

**Machine assembly practice:**

- (a) Study of centrifugal pump
- (b) Study of air conditioner

**Demonstration on:**

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

## **GROUP B (ELECTRICAL & ELECTRONICS)**

- III ELECTRICAL ENGINEERING PRACTICE 10**
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
  2. Fluorescent lamp wiring.
  3. Stair case wiring
  4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
  5. Measurement of energy using single phase energy meter.
  6. Measurement of resistance to earth of an electrical equipment.
- IV ELECTRONICS ENGINEERING PRACTICE 13**
1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
  2. Study of logic gates AND, OR, EOR and NOT.
  3. Generation of Clock Signal.
  4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
  5. Measurement of ripple factor of HWR and FWR.

**TOTAL: 45 PERIODS**

### **REFERENCES:**

1. K.Jeyachandran, S.Natarajan & S, Balasubramanian, “A Primer on Engineering Practices Laboratory”, Anuradha Publications, (2007).
2. T.Jeyapoovan, M.Saravanapandian & S.Pranitha, “Engineering Practices Lab Manual”, Vikas Pupliching House Pvt.Ltd, (2006)
3. H.S. Bawa, “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, (2007).
4. A.Rajendra Prasad & P.M.M.S. Sarma, “Workshop Practice”, Sree Sai Publication, (2002).
5. P.Kannaiah & K.L.Narayana, “Manual on Workshop Practice”, Scitech Publications, (1999).

### **SEMESTER EXAMINATION PATTERN**

The Laboratory examination is to be conducted for Group A & Group B, allotting 90 minutes for each group, with a break of 15 minutes. Both the examinations are to be taken together in sequence, either in the FN session or in the AN session. The maximum marks for Group A and Group B lab examinations will be 50 each, totaling 100 for the Lab course. The candidates shall answer either I or II under Group A and either III or IV under Group B, based on lots.

## Engineering Practices Laboratory

### List of equipment and components

(For a Batch of 30 Students)

#### CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
3. Standard woodworking tools 15 Sets.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools: (a) Rotary Hammer 2 Nos  
(b) Demolition Hammer 2 Nos  
(c) Circular Saw 2 Nos  
(d) Planer 2 Nos  
(e) Hand Drilling Machine 2 Nos  
(f) Jigsaw 2 Nos

#### MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
8. Power Tool: Angle Grinder 2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner One each.

#### ELECTRICAL

1. Assorted electrical components for house wiring 15 Sets
2. Electrical measuring instruments 10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each
4. Megger (250V/500V) 1 No.
5. Power Tools: (a) Range Finder 2 Nos  
(b) Digital Live-wire detector 2 Nos

#### ELECTRONICS

1. Soldering guns 10 Nos.
2. Assorted electronic components for making circuits 50 Nos.
3. Small PCBs 10 Nos.
4. Multimeters 10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

## PHYSICS LABORATORY – I

L T P C  
0 0 3 -

### LIST OF EXPERIMENTS

1. (a) Particle size determination using Diode Laser  
(b) Determination of Laser parameters – Wavelength, and angle of divergence.  
(c) Determination of acceptance angle in an optical fiber.
2. Determination of thickness of a thin wire – Air wedge method
3. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
4. Determination of wavelength of mercury spectrum – spectrometer grating.
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
6. Determination of Hysteresis loss in a ferromagnetic material

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

## CHEMISTRY LABORATORY – I

L T P C  
0 0 3 -

### LIST OF EXPERIMENTS

1. Estimation of hardness of Water by EDTA
2. Estimation of Copper in brass by EDTA
3. Determination of DO in water ( Winkler's method)
4. Estimation of Chloride in Water sample (Argentometric)
5. Estimation of alkalinity of Water sample
6. Determination of molecular weight and degree of polymerization using viscometry.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**



# ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

**R 2008**

**B.E. ELECTRONICS AND COMMUNICATION ENGINEERING**

**II - VIII SEMESTERS CURRICULA AND SYLLABI**

**SEMESTER II**

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	HS2161	<u>Technical English – II*</u>	3	1	0	4
2.	MA2161	<u>Mathematics – II*</u>	3	1	0	4
3.	PH2161	<u>Engineering Physics – II*</u>	3	0	0	3
4.	CY2161	<u>Engineering Chemistry – II*</u>	3	0	0	3
5. a	ME2151	<u>Engineering Mechanics</u> <b>(For non-circuit branches)</b>	3	1	0	4
5. b	EE2151	<u>Circuit Theory</u> <b>(For branches under Electrical Faculty)</b>	3	1	0	4
5. c	EC2151	<u>Electric Circuits and Electron Devices</u> <b>(For branches under I &amp; C Faculty)</b>	3	1	0	4
6. a	GE2151	<u>Basic Electrical &amp; Electronics Engineering</u> <b>(For non-circuit branches)</b>	4	0	0	4
6. b	GE2152	<u>Basic Civil &amp; Mechanical Engineering</u> <b>(For circuit branches)</b>	4	0	0	4
<b>PRACTICAL</b>						
7.	GE2155	<u>Computer Practice Laboratory-II*</u>	0	1	2	2
8.	GS2165	<u>Physics &amp; Chemistry Laboratory - II*</u>	0	0	3	2
9. a	ME2155	<u>Computer Aided Drafting and Modeling Laboratory</u> <b>(For non-circuits branches)</b>	0	1	2	2
9. b	EE2155	<u>Electrical Circuits Laboratory</u> <b>(For branches under Electrical Faculty)</b>	0	0	3	2
9. c	EC2155	<u>Circuits and Devices Laboratory</u> <b>(For branches under I &amp; C Faculty)</b>	0	0	3	2
<b>TOTAL : 28 CREDITS</b>						
10.	-	<u>English Language Laboratory</u> <sup>+</sup>	0	0	2	-

\* Common to all B.E. / B.Tech. Programmes

+ Offering English Language Laboratory as an additional subject (with no marks) during 2<sup>nd</sup> semester may be decided by the respective Colleges affiliated to Anna University Chennai.

### **A. CIRCUIT BRANCHES**

#### **I Faculty of Electrical Engineering**

1. B.E. Electrical and Electronics Engineering
2. B.E. Electronics and Instrumentation Engineering
3. B.E. Instrumentation and Control Engineering

#### **II Faculty of Information and Communication Engineering**

1. B.E. Computer Science and Engineering
2. B.E. Electronics and Communication Engineering
3. B.E. Bio Medical Engineering
4. B.Tech. Information Technology

### **B. NON – CIRCUIT BRANCHES**

#### **I Faculty of Civil Engineering**

1. B.E. Civil Engineering

#### **II Faculty of Mechanical Engineering**

1. B.E. Aeronautical Engineering
2. B.E. Automobile Engineering
3. B.E. Marine Engineering
4. B.E. Mechanical Engineering
5. B.E. Production Engineering

#### **III Faculty of Technology**

1. B.Tech. Chemical Engineering
2. B.Tech. Biotechnology
3. B.Tech. Polymer Technology
4. B.Tech. Textile Technology
5. B.Tech. Textile Technology (Fashion Technology)
6. B.Tech. Petroleum Engineering
7. B.Tech. Plastics Technology

### SEMESTER III

(Applicable to the students admitted from the Academic year 2008–2009 onwards)

CODE NO.	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
MA 2211	<u>Transforms and Partial Differential Equations</u>	3	1	0	4
EC 2201	<u>Electrical Engineering</u>	3	0	0	3
EC 2202	<u>Data Structures and Object Oriented Programming in C++</u>	3	0	0	3
EC 2203	<u>Digital Electronics</u>	3	1	0	4
EC 2204	<u>Signals and systems</u>	3	1	0	4
EC 2205	<u>Electronic Circuits- I</u>	3	1	0	4
<b>PRACTICAL</b>					
EC 2207	<u>Digital Electronics Lab</u>	0	0	3	2
EC 2208	<b><u>Electronic Circuits Lab I</u></b>	0	0	3	2
EC 2209	<u>Data structures and Object Oriented Programming Lab</u>	0	0	3	2
	<b>TOTAL</b>	<b>18</b>	<b>4</b>	<b>9</b>	<b>28</b>

### SEMESTER IV

(Applicable to the students admitted from the Academic year 2008–2009 onwards)

CODE NO.	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
MA 2261	<u>Probability and Random Processes</u>	3	1	0	4
EC 2251	<u>Electronic Circuits II</u>	3	1	0	4
EC 2252	<u>Communication Theory</u>	3	1	0	4
EC 2253	<u>Electromagnetic Fields</u>	3	1	0	4
EC 2254	<u>Linear Integrated Circuits</u>	3	0	0	3
EC 2255	<u>Control Systems</u>	3	0	0	3
<b>PRACTICAL</b>					
EC 2257	<u>Electronics circuits II and simulation lab</u>	0	0	3	2
EC 2258	<u>Linear Integrated Circuit Lab</u>	0	0	3	2
EC 2259	<u>Electrical Engineering and Control System Lab</u>	0	0	3	2
	<b>TOTAL</b>	<b>18</b>	<b>4</b>	<b>9</b>	<b>28</b>

## SEMESTER V

(Applicable to the students admitted from the Academic year 2008–2009 onwards)

CODE NO.	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
EC2301	<u>Digital Communication</u>	3	0	0	3
EC2302	<u>Digital Signal Processing</u>	3	1	0	4
EC2303	<u>Computer Architecture and Organization</u>	3	0	0	3
EC2305	<u>Transmission Lines and Wave guides</u>	3	1	0	4
GE2021	<u>Environmental Science and Engineering</u>	3	0	0	3
EC2304	<u>Microprocessors and Microcontrollers</u>	3	1	0	4
<b>PRACTICAL</b>					
EC2306	<u>Digital Signal Processing Lab</u>	0	0	3	2
EC2307	<u>Communication System Lab</u>	0	0	3	2
EC2308	<u>Microprocessors and Microcontrollers Lab</u>	0	0	3	2
	<b>TOTAL</b>	<b>18</b>	<b>3</b>	<b>9</b>	<b>27</b>

## SEMESTER VI

(Applicable to the students admitted from the Academic year 2008–2009 onwards)

CODE NO.	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
MG2351	<u>Principles of Management</u>	3	0	0	3
EC2351	<u>Measurements and Instrumentation</u>	3	0	0	3
EC2352	<u>Computer Networks</u>	3	0	0	3
EC2353	<u>Antenna and Wave Propagation</u>	3	1	0	4
EC2354	<u>VLSI Design</u>	3	0	0	3
	Elective I	3	0	0	3
<b>PRACTICAL</b>					
EC2356	<u>Computer Networks Lab</u>	0	0	3	2
EC2357	<u>VLSI Design Lab</u>	0	0	3	2
GE2321	<u>Communication Skills Lab</u>	0	0	4	2
	<b>TOTAL</b>	<b>18</b>	<b>1</b>	<b>10</b>	<b>25</b>

**SEMESTER VII**

(Applicable to the students admitted from the Academic year 2008–2009 onwards)

CODE NO.	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
EC2401	<u>Wireless Communication</u>	3	0	0	3
EC2402	<u>Optical Communication and Networks</u>	3	0	0	3
EC2403	<u>RF and Microwave Engineering</u>	3	0	0	3
	Elective II	3	0	0	3
	Elective III	3	0	0	3
	Elective IV	3	0	0	3
<b>PRACTICAL</b>					
EC2404	<u>Electronics System Design Lab</u>	0	0	3	2
EC2405	<u>Optical &amp; Microwave Lab</u>	0	0	3	2
<b>TOTAL</b>		<b>18</b>	<b>0</b>	<b>6</b>	<b>22</b>

**SEMESTER VIII**

(Applicable to the students admitted from the Academic year 2008–2009 onwards)

CODE NO.	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
	Elective V	3	0	0	3
	Elective VI	3	0	0	3
<b>PRACTICAL</b>					
EC2451	Project Work	0	0	12	6
<b>TOTAL</b>		<b>6</b>	<b>0</b>	<b>12</b>	<b>12</b>

**LIST OF ELECTIVES**  
**SEMESTER VI – Elective I**

CODE NO.	COURSE TITLE	L	T	P	C
EC2021	<u>Medical Electronics</u>	3	0	0	3
EC2022	<u>Operating Systems</u>	3	0	0	3
EC2023	<u>Solid State Electronic Devices</u>	3	0	0	3
IT2064	<u>Speech Processing</u>	3	0	0	3
MA2264	<u>Numerical Methods</u>	3	1	0	4
CS2021	<u>Multicore Programming</u>	3	0	0	3

**SEMESTER VII - Elective II**

CODE NO.	COURSE TITLE	L	T	P	C
EC2030	<u>Advanced Digital Signal Processing</u>	3	0	0	3
GE2022	<u>Total Quality Management</u>	3	0	0	3
EC2035	<u>Cryptography and Network Security</u>	3	0	0	3
EC2036	<u>Information Theory</u>	3	0	0	3
GE2071	<u>Intellectual Property Rights</u>	3	0	0	3
GE2025	<u>Professional Ethics in Engineering</u>	3	0	0	3

**SEMESTER VII - Elective III**

<b>CODE NO.</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
EC2027	<u>Advanced Microprocessors</u>	3	0	0	3
EC2028	<u>Internet and Java</u>	3	0	0	3
CS2060	<u>High Speed Networks</u>	3	0	0	3
CS2053	<u>Soft Computing</u>	3	0	0	3
EC2037	<u>Multimedia Compression and Communication</u>	3	0	0	3
EC2039	<u>Parallel and Distributed Processing</u>	3	0	0	3

**SEMESTER VII - Elective IV**

<b>CODE NO.</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
EC2029	<u>Digital Image Processing</u>	3	0	0	3
EC2031	<u>Electromagnetic Interference and Compatibility</u>	3	0	0	3
EC2033	<u>Power Electronics</u>	3	0	0	3
EC2034	<u>Television and Video Engineering</u>	3	0	0	3
EC2038	<u>Nano Electronics</u>	3	0	0	3
EC2041	<u>Avionics</u>	3	0	0	3

**SEMESTER VIII - Elective V**

<b>CODE NO.</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
EC2042	<u>Embedded and Real Time Systems</u>	3	0	0	3
EC2046	<u>Advanced Electronic system design</u>	3	0	0	3
EC2047	<u>Optoelectronic devices</u>	3	0	0	3
EC2050	<u>Mobile Adhoc Networks</u>	3	0	0	3
EC2051	<u>Wireless Sensor Networks</u>	3	0	0	3
EC2052	<u>Remote Sensing</u>	3	0	0	3
EC2053	<u>Engineering Acoustics</u>	3	0	0	3

**SEMESTER VIII - Elective VI**

<b>CODE NO.</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
EC2043	<u>Wireless networks</u>	3	0	0	3
EC2044	<u>Telecommunication Switching and Networks</u>	3	0	0	3
EC2045	<u>Satellite Communication</u>	3	0	0	3
EC2048	<u>Telecommunication System Modeling and Simulation</u>	3	0	0	3
EC2049	<u>Radar and Navigational Aids</u>	3	0	0	3
EC2054	<u>Optical Networks</u>	3	0	0	3

**AIM:**

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

**OBJECTIVES:**

1. To help students develop listening skills for academic and professional purposes.
2. To help students acquire the ability to speak effectively in English in real-life situations.
3. To inculcate reading habit and to develop effective reading skills.
4. To help students improve their active and passive vocabulary.
5. To familiarize students with different rhetorical functions of scientific English.
6. To enable students write letters and reports effectively in formal and business situations.

**UNIT I****12**

Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading & predicting content, Reading and interpretation, extended definitions, Process description

**Suggested activities:**

1. Exercises on word formation using the prefix 'self' - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings
4. and predicting the content – Reading advertisements and interpretation.
5. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

**UNIT II****12**

Phrases / Structures indicating use / purpose – Adverbs-Skimming – Non-verbal communication - Listening – correlating verbal and non-verbal communication -Speaking in group discussions – Formal Letter writing – Writing analytical paragraphs.

**Suggested activities:**

1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categorise data in tables.
3. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

**UNIT III****12**

Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations .

**Suggested activities:**

1. Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. ( Eg: object –verb / object – noun )
2. Speaking exercises involving the use of stress and intonation – Group discussions–analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, Multiple choice question.
4. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – Writing recommendations.

**UNIT IV****12**

Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV / Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

**Suggested Activities:**

1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking - Role play – group discussions – Activities giving oral instructions.
5. Writing descriptions, expanding hints – Writing argumentative paragraphs – Writing formal letters – Writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages.

**UNIT V****9**

Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

**Suggested Activities:**

1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

**TOTAL: 60 PERIODS****TEXT BOOK**

1. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

**REFERENCES**

1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007.
2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007).
3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.

**EXTENSIVE READING:**

1. Robin Sharma, 'The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

**NOTE:**

The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

**MA2161****MATHEMATICS – II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**UNIT I            ORDINARY DIFFERENTIAL EQUATIONS            12**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

**UNIT II            VECTOR CALCULUS            12**

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

**UNIT III           ANALYTIC FUNCTIONS            12**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping :  $w = z + c$ ,  $cz$ ,  $1/z$ , and bilinear transformation.

**UNIT IV           COMPLEX INTEGRATION            12**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

**UNIT V            LAPLACE TRANSFORM            12**

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.

Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

**TOTAL : 60 PERIODS****TEXT BOOKS**

1. Bali N. P and Manish Goyal, "Text book of Engineering Mathematics", 3<sup>rd</sup> Edition, Laxmi Publications (p) Ltd., (2008).
2. Grewal. B.S, "Higher Engineering Mathematics", 40<sup>th</sup> Edition, Khanna Publications, Delhi, (2007).

**REFERENCES:**

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, "Advanced Engineering Mathematics", 3<sup>rd</sup> Edition, Pearson Education, (2007).
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 7<sup>th</sup> Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3<sup>rd</sup> Edition, Narosa Publishing House Pvt. Ltd., (2007).

**PH2161****ENGINEERING PHYSICS – II****L T P C  
3 0 0 3****UNIT I CONDUCTING MATERIALS****9**

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

**UNIT II SEMICONDUCTING MATERIALS****9**

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect – Determination of Hall coefficient – Applications.

**UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS****9**

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives. Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High T<sub>c</sub> superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

**UNIT IV DIELECTRIC MATERIALS****9**

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

**UNIT V MODERN ENGINEERING MATERIALS****9**

Metallic glasses: preparation, properties and applications.

Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA

Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications.

Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Charles Kittel ' Introduction to Solid State Physics', John Wiley & sons, 7<sup>th</sup> edition, Singapore (2007)
2. Charles P. Poole and Frank J.Owren, 'Introduction to Nanotechnology', Wiley India(2007) (for Unit V)

**REFERENCES:**

1. Rajendran, V, and Marikani A, 'Materials science'Tata McGraw Hill publications, (2004) New delhi.
2. Jayakumar, S. 'Materials science', R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, 'Materials science', Scitech publications(India) Pvt. LTd., Chennai, second Edition(2007)
4. M. Arumugam, 'Materials Science' Anuradha publications, Kumbakonam, (2006).

**CY2161****ENGINEERING CHEMISTRY – II****L T P C  
3 0 0 3****AIM**

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

**OBJECTIVES:**

- The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
- Principles of corrosion control
- Chemistry of Fuels and combustion
- Industrial importance of Phase rule and alloys
- Analytical techniques and their importance.

**UNIT I ELECTROCHEMISTRY****9**

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode –Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox -  $\text{Fe}^{2+}$  vs dichromate and precipitation –  $\text{Ag}^+$  vs  $\text{Cl}^-$  titrations) and conduct metric titrations (acid-base – HCl vs, NaOH) titrations,

**UNIT II CORROSION AND CORROSION CONTROL****9**

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

**UNIT III FUELS AND COMBUSTION 9**

Calorific value – classification – Coal – proximate and ultimate analysis metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and fractions – cracking – catalytic cracking and methods-knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels-water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

**UNIT IV PHASE RULE AND ALLOYS 9**

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

**UNIT V ANALYTICAL TECHNIQUES 9**

Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006).

**REFERENCES:**

1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).

**ME2151**

**ENGINEERING MECHANICS**

**L T P C  
3 1 0 4**

**OBJECTIVE**

At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.



**EE2151**

**CIRCUIT THEORY**  
(Common to EEE, EIE and ICE Branches)

**L T P C**  
**3 1 0 4**

**UNIT I BASIC CIRCUITS ANALYSIS 12**

Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

**UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS: 12**

Network reduction: voltage and current division, source transformation – star delta conversion.

Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

**UNIT III RESONANCE AND COUPLED CIRCUITS 12**

Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

**UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12**

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

**UNIT V ANALYSING THREE PHASE CIRCUITS 12**

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

**TOTAL : 60 PERIODS**

**TEXT BOOKS**

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6<sup>th</sup> edition, New Delhi, (2002).
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill, (2007).

**REFERENCES**

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996).
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi (2001).
3. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, (1999).
4. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, (2003).



**GE2151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C**  
(Common to branches under Civil, Mechanical and Technology faculty) **3 0 0 3**

**UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS 12**

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

**UNIT II ELECTRICAL MECHANICS 12**

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

**UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12**

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

**UNIT IV DIGITAL ELECTRONICS 12**

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

**UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12**

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.

Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

**TOTAL : 60 PERIODS**

**TEXT BOOKS**

1. V.N. Mittle "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 1990.
2. R.S. Sedha, "Applied Electronics" S. Chand & Co., 2006.

**REFERENCES**

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press (2005).
3. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, (2002).
5. Premkumar N, "Basic Electrical Engineering", Anuradha Publishers, (2003).

**A – CIVIL ENGINEERING****UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15**

**Surveying:** Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

**Civil Engineering Materials:** Bricks – stones – sand – cement – concrete – steel sections.

**UNIT II BUILDING COMPONENTS AND STRUCTURES 15**

**Foundations:** Types, Bearing capacity – Requirement of good foundations.

**Superstructure:** Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

**TOTAL : 30 PERIODS****B – MECHANICAL ENGINEERING****UNIT III POWER PLANT ENGINEERING 10**

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

**UNIT IV I C ENGINES 10**

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

**UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10**

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

**TOTAL: 30 PERIODS****REFERENCES**

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi, (1996).
2. Ramamrutham. S, "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. (1999).
3. Seetharaman S. "Basic Civil Engineering", Anuradha Agencies, (2005).
4. Venugopal K and Prahuraja V, "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, (2000).
5. Shantha Kumar S R J., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, (2000).

GE2155

COMPUTER PRACTICE LABORATORY – II

L T P C  
0 1 2 2

LIST OF EXPERIMENTS

**1. UNIX COMMANDS** **15**

Study of Unix OS - Basic Shell Commands - Unix Editor

**2. SHELL PROGRAMMING** **15**

Simple Shell program - Conditional Statements - Testing and Loops

**3. C PROGRAMMING ON UNIX** **15**

Dynamic Storage Allocation-Pointers-Functions-File Handling

**TOTAL : 45 PERIODS**

**HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS**

**HARDWARE**

- . 1 UNIX Clone Server
- . 33 Nodes (thin client or PCs)
- . Printer – 3 Nos.

**SOFTWARE**

- . OS – UNIX Clone (33 user license or License free Linux)
- . Compiler - C

GS2165

PHYSICS LABORATORY – II

L T P C  
0 0 3 2

**LIST OF EXPERIMENTS**

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer dispersive power of a prism.
6. Determination of Young's modulus of the material – uniform bending.
7. Torsional pendulum – Determination of rigidity modulus.

- **A minimum of FIVE experiments shall be offered.**
- **Laboratory classes on alternate weeks for Physics and Chemistry.**
- **The lab examinations will be held only in the second semester.**

**LIST OF EXPERIMENTS**

1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using  $\text{BaCl}_2$  vs  $\text{Na}_2\text{SO}_4$
4. Potentiometric Titration ( $\text{Fe}^{2+}$  /  $\text{KMnO}_4$  or  $\text{K}_2\text{Cr}_2\text{O}_7$ )
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.

- A minimum of FIVE experiments shall be offered.
- Laboratory classes on alternate weeks for Physics and Chemistry.
- The lab examinations will be held only in the second semester.

**ME2155 COMPUTER AIDED DRAFTING AND MODELING LABORATORY L T P C  
0 1 2 2****List of Exercises using software capable of Drafting and Modeling**

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building ( Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

**Note: Plotting of drawings must be made for each exercise and attached to the records written by students.**

**List of Equipments for a batch of 30 students:**

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

**EE2155**

**ELECTRICAL CIRCUIT LABORATORY**  
(Common to EEE, EIE and ICE)

**L T P C**  
**0 0 3 2**

**LIST OF EXPERIMENTS**

1. Verification of ohm's laws and kirchoff's laws.
2. Verification of Thevemin's and Norton's Theorem
3. Verification of superposition Theorem
4. Verification of maximum power transfer theorem.
5. Verification of reciprocity theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis.
8. Transient response of RL and RC circuits for DC input.
9. Frequency response of series and parallel resonance circuits.
10. Frequency response of single tuned coupled circuits.

**TOTAL: 45 PERIODS**

**EC2155**

**CIRCUITS AND DEVICES LABORATORY**

**L T P C**  
**0 0 3 2**

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.
5. Frequency response of series and parallel resonance circuits.
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET
11. Characteristics of Diac and Triac.
12. Characteristics of Photodiode and Phototransistor.

**TOTAL : 45 PERIODS**

**ENGLISH LANGUAGE LABORATORY (Optional)**

**L T P C**  
**0 0 2 -**

**1. LISTENING:**

**5**

Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

## **2. SPEAKING:**

**5**

Pronouncing words & sentences correctly – word stress – Conversation practice.

## **CLASSROOM SESSION**

**20**

1. Speaking: Introducing oneself, Introducing others, Role play, Debate- Presentations:  
Body language, gestures, postures. Group Discussions etc
2. Goal setting – interviews – stress time management – situational reasons

### **Evaluation**

- (1) Lab Session – 40 marks
  - Listening – 10 marks
  - Speaking – 10 marks
  - Reading – 10 marks
  - Writing – 10 marks
- (2) Classroom Session – 60 marks
  - Role play activities giving real life context – 30 marks
  - Presentation – 30 marks

### **Note on Evaluation**

1. Examples for role play situations:
  - a. Marketing engineer convincing a customer to buy his product.
  - b. Telephone conversation – Fixing an official appointment / Enquiry on availability of flight or train tickets / placing an order. etc.
2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics or visuals could be provided and students could be asked to talk about it.

### **REFERENCES**

1. Hartley, Peter, Group Communication, London: Routledge, (2004).
2. Doff, Adrian and Christopher Jones, Language in Use – (Intermediate level), Cambridge University Press, (1994).
3. Gammidge, Mick, Speaking Extra – A resource book of multi-level skills activities , Cambridge University Press, (2004).
4. Craven, Miles, Listening Extra - A resource book of multi-level skills activities, Cambridge, Cambridge University Press, (2004).
5. Naterop, Jean & Rod Revell, Telephoning in English, Cambridge University Press, (1987).

### **LAB REQUIREMENTS**

1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders.

**OBJECTIVES**

The course objective is to develop the skills of the students in the areas of Transforms and Partial Differential Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

**UNIT I FOURIER SERIES 9 + 3**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

**UNIT II FOURIER TRANSFORMS 9+3**

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

**UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9+3**

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

**UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9 + 3**

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

**UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS 9 + 3**

Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem - Formation of difference equations – Solution of difference equations using Z-transform.

**LECTURES: 45 TUTORIALS : 15 TOTAL : 60 PERIODS**

**TEXT BOOK:**

1. Grewal, B.S, "Higher Engineering Mathematic", 40<sup>th</sup> Edition, Khanna publishers, Delhi, (2007)

**REFERENCES**

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematic", 7<sup>th</sup> Edition, Laxmi Publications(P) Ltd. (2007)
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi (2007).
3. Glyn James, "Advanced Modern Engineering Mathematics", 3<sup>rd</sup> Edition, Pearson Education (2007).
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8<sup>th</sup> edition, Wiley India (2007).

**AIM**

To expose the students to the concepts of various types of electrical machines and transmission and distribution of electrical power .

**OBJECTIVES**

- To impart knowledge on Constructional details, principle of operation, performance, starters and testing of D.C. machines.
- Constructional details, principle of operation and performance of transformers.
- Constructional details, principle of operation and performance of induction motors.
- Constructional details and principle of operation of alternators and special machines.
- Power System transmission and distribution.

**UNIT I D.C. MACHINES 9**

Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Principle of operation of D.C. motor – Back emf and torque equation – Characteristics of series, shunt and compound motors - Starting of D.C. motors – Types of starters - Testing, brake test and Swinburne’s test – Speed control of D.C. shunt motors.

**UNIT II TRANSFORMERS 9**

Constructional details – Principle of operation – emf equation – Transformation ratio – Transformer on no load – Parameters referred to HV/LV windings – Equivalent circuit – Transformer on load – Regulation - Testing – Load test, open circuit and short circuit tests.

**UNIT III INDUCTION MOTORS 9**

Construction – Types – Principle of operation of three-phase induction motors – Equivalent circuit – Performance calculation – Starting and speed control – Single-phase induction motors (only qualitative treatment).

**UNIT IV SYNCHRONOUS AND SPECIAL MACHINES 9**

Construction of synchronous machines-types – Induced emf – Voltage regulation; emf and mmf methods – Brushless alternators – Reluctance motor – Hysteresis motor – Stepper motor.

**UNIT V TRANSMISSION AND DISTRIBUTION 9**

Structure of electric power systems – Generation, transmission and distribution systems - EHVAC and EHVDC transmission systems – Substation layout – Insulators – cables.

**TOTAL = 45 PERIODS****TEXT BOOKS**

1. D.P.Kothari and I.J.Nagrath, ‘Basic Electrical Engineering’, Tata McGraw Hill publishing company ltd, second edition, 2007 (Reprint).
2. C.L. Wadhwa, ‘Electrical Power Systems’, New Age International, fourth edition, 2007.

**REFERENCES**

1. S.K.Bhattacharya, ‘Electrical Machines’, Tata McGraw Hill Publishing company ltd, second edition, 2007.
2. V.K.Mehta and Rohit Mehta, ‘Principles of Power System’, S.Chand and Company Ltd, second edition, 2006.

**AIM**

To provide an in-depth knowledge in problem solving techniques and data structures.

**OBJECTIVES**

- To learn the systematic way of solving problems
- To understand the different methods of organizing large amounts of data
- To learn to program in C++
- To efficiently implement the different data structures
- To efficiently implement solutions for specific problems

<b>UNIT I</b>	<b>PRINCIPLES OF OBJECT ORIENTED PROGRAMMING</b>	<b>9</b>
Introduction- Tokens-Expressions-contour Structures –Functions in C++, classes and objects, constructors and destructors ,operators overloading and type conversions .		
<b>UNIT II</b>	<b>ADVANCED OBJECT ORIENTED PROGRAMMING</b>	<b>9</b>
Inheritance, Extending classes, Pointers, Virtual functions and polymorphism, File Handling Templates ,Exception handling, Manipulating strings.		
<b>UNIT III</b>	<b>DATA STRUCTURES &amp; ALGORITHMS</b>	<b>9</b>
Algorithm, Analysis, Lists, Stacks and queues, Priority queues-Binary Heap-Application, Heaps–hashing-hash tables without linked lists		
<b>UNIT IV</b>	<b>NONLINEAR DATA STRUCTURES</b>	<b>9</b>
Trees-Binary trees, search tree ADT, AVL trees, Graph Algorithms-Topological sort, shortest path algorithm network flow problems-minimum spanning tree - Introduction to NP - completeness.		
<b>UNIT V</b>	<b>SORTING AND SEARCHING</b>	<b>9</b>
Sorting – Insertion sort, Shell sort, Heap sort, Merge sort, Quick sort, Indirect sorting, Bucket sort, Introduction to Algorithm Design Techniques –Greedy algorithm (Minimum Spanning Tree), Divide and Conquer (Merge Sort), Dynamic Programming (All pairs Shortest Path Problem).		

**TOTAL = 45 PERIODS**

**TEXT BOOKS**

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 3<sup>rd</sup> ed, Pearson Education Asia, 2007.
2. E. Balagurusamy, “ Object Oriented Programming with C++”, McGraw Hill Company Ltd., 2007.

**REFERENCES**

1. Michael T. Goodrich, “Data Structures and Algorithm Analysis in C++”, Wiley student edition, 2007.
2. Sahni, “Data Structures Using C++”, The McGraw-Hill, 2006.
3. Seymour, “Data Structures”, The McGraw-Hill, 2007.
4. Jean – Paul Tremblay & Paul G.Sorenson, An Introduction to data structures with applications, Tata McGraw Hill edition, II Edition, 2002.
5. John R.Hubbard, Schaum’s outline of theory and problem of data structure with C++,McGraw-Hill, New Delhi, 2000.
6. Bjarne Stroustrup, The C++ Programming Language, Addison Wesley, 2000
7. Robert Lafore, Object oriented programming in C++, Galgotia Publication

**AIM**

To learn the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.

**OBJECTIVES**

- To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of synchronous and asynchronous sequential circuits

**UNIT I            MINIMIZATION TECHNIQUES AND LOGIC GATES            12**

**Minimization Techniques:** Boolean postulates and laws – De-Morgan's Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions - Quine-McCluskey method of minimization.

**Logic Gates:** AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR- Implementations of Logic Functions using gates, NAND-NOR implementations – Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

**UNIT II            COMBINATIONAL CIRCUITS            12**

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor - Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators - code converters - Magnitude Comparator.

**UNIT III           SEQUENTIAL CIRCUITS            12**

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram-State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo-n counter, Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

**UNIT IV            MEMORY DEVICES            12**

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell –Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

## UNIT V            SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 12

**Synchronous Sequential Circuits:** General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits

**Asynchronous Sequential Circuits:** Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits. Design of Combinational and Sequential circuits using VERILOG

**TUTORIAL =15, TOTAL : 60 PERIODS**

### TEXT BOOKS

1. M. Morris Mano, Digital Design, 3<sup>rd</sup> Edition, Prentice Hall of India Pvt. Ltd., 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 3<sup>rd</sup> Edition., Vikas Publishing House Pvt. Ltd, New Delhi, 2006

### REFERENCES

1. John F.Wakerly, Digital Design, Fourth Edition, Pearson/PHI, 2006
2. John.M Yarbrough, Digital Logic Applications and Design, Thomson Learning, 2002.
3. Charles H.Roth. Fundamentals of Logic Design, Thomson Learning, 2003.
4. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6<sup>th</sup> Edition, TMH, 2003.
5. William H. Gothmann, Digital Electronics, 2<sup>nd</sup> Edition, PHI, 1982.
6. Thomas L. Floyd, Digital Fundamentals, 8<sup>th</sup> Edition, Pearson Education Inc, New Delhi, 2003
7. Donald D.Givone, Digital Principles and Design, TMH, 2003.

**EC 2204**

**SIGNALS AND SYSTEMS**

**L T P C**  
**3 1 0 4**

### AIM

To study and analyse characteristics of continuous, discrete signals and systems.

### OBJECTIVES

- To study the properties and representation of discrete and continuous signals.
- To study the sampling process and analysis of discrete systems using z-transforms.
- To study the analysis and synthesis of discrete time systems.

### UNIT I            CLASSIFICATION OF SIGNALS AND SYSTEMS

**9**

Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and aperiodic, random signals, CT systems and DT systems, Basic properties of systems - Linear Time invariant Systems and properties.

### UNIT II            ANALYSIS OF CONTINUOUS TIME SIGNALS

**9**

Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and Laplace Transform in Signal Analysis.

**UNIT III            LINEAR TIME INVARIANT –CONTINUOUS TIME SYSTEMS            9**

Differential equation, Block diagram representation, Impulse response, Convolution integral, frequency response , Fourier and Laplace transforms in analysis, State variable equations and matrix representation of systems

**UNIT IV            ANALYSIS OF DISCRETE TIME SIGNALS            9**

Sampling of CT signals and aliasing, DTFT and properties, Z-transform and properties of Z-transform.

**UNIT V            LINEAR TIME INVARIANT - DISCRETE TIME SYSTEMS            9**

Difference equations, Block diagram representation, Impulse response, Convolution sum,LTI systems analysis using DTFT and Z-transforms , State variable equations and matrix representation of systems.

**TOTAL : 45 + 15 = 60 PERIODS**

**TEXT BOOKS:**

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Signals and Systems, Pearson Education, 2007.
2. Edward W Kamen & Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education, 2007.

**REFERENCES:**

1. H P Hsu, Rakesh Ranjan“ Signals and Systems”, Schaum's Outlines, Tata McGraw Hill, Indian Reprint, 2007
2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, McGraw Hill International/TMH, 2007.
3. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons , Inc, 2004.
4. Robert A. Gabel and Richard A.Roberts, Signals & Linear Systems, John Wiley, III edition, 1987.
5. Rodger E. Ziemer, William H. Tranter, D. Ronald Fannin. Signals & systems, Fourth Edition, Pearson Education, 2002.

**EC 2205**

**ELECTRONIC CIRCUITS I**

**L T P C**

**3 1 0 4**

**AIM:**

The aim of this course is to familiarize the student with the analysis and design of basic transistor Amplifier circuits and power supplies.

**OBJECTIVES:**

- On completion of this course the student will understand
- The methods of biasing transistors
- Design of simple amplifier circuits
- Midband analysis of amplifier circuits using small - signal equivalent circuits to determine gain input impedance and output impedance
- Method of calculating cutoff frequencies and to determine bandwidth
- Design of power amplifiers
- Analysis and design of power supplies.



**REFERENCES:**

1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 9<sup>th</sup> Edition, Pearson Education / PHI, 2007.
2. David A. Bell, Electronic Devices & Circuits, 4<sup>th</sup> Edition, PHI, 2007
3. Floyd, Electronic Devices, Sixth Edition, Pearson Education, 2002.
4. I.J. Nagrath, Electronic Devices and Circuits, PHI, 2007.
5. Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006.
6. B.P. Singh and Rekha Singh, Electronic Devices and Integrated Circuits, Pearson Education, 2006.
7. Rashid M, Microelectronics Circuits, Thomson Learning, 2007.

**EC 2207****DIGITAL ELECTRONICS LAB****L T P C  
0 0 3 4**

1. Design and implementation of Adder and Subtractor using logic gates.
2. Design and implementation of code converters using logic gates
  - (i) BCD to excess-3 code and vice versa
  - (ii) Binary to gray and vice-versa
3. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
4. Design and implementation of 2 bit Magnitude Comparator using logic gates 8 Bit Magnitude Comparator using IC 7485
5. Design and implementation of 16 bit odd/even parity checker generator using IC74180.
6. Design and implementation of Multiplexer and De-multiplexer using logic gates and study of IC74150 and IC 74154
7. Design and implementation of encoder and decoder using logic gates and study of IC7445 and IC74147
8. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters
9. Design and implementation of 3-bit synchronous up/down counter
10. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops
11. Design of experiments 1, 6, 8 and 10 using Verilog Hardware Description Language

**LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 30 STUDENTS  
(2 PER BATCH)**

S.No	Name of the equipments / Components	Quzntity Required	Remarks
1	Digital IC Tester	2 Nos	
2	Power Supply	10	5V DC
3	Multimeter	10	Digital
4	Computer with HDL software Installed	2	
Consumables (Minimum of 25 Nos. each)			
1	IC7400	25	
2	IC7404	25	
3	IC74682	25	
4	IC7402	25	
5	IC7408	25	
6	IC7411	25	
7	IC7432	25	
8	IC7483	25	
9	IC7485	25	
10	IC7486	25	
11	IC74150	25	
12	IC74151	25	
13	IC74147	25	
14	IC7445	25	
15	IC7474	25	
16	IC7476	25	
17	IC7491	25	
18	IC7494	25	
19	IC7447	25	
20	IC74180	25	
21	IC555	25	
22	Seven Segment Display	25	
23	LEDs	25	
24	Bread Board	25	
25	Wires		

**EC 2208**

**ELECTRONIC CIRCUITS LAB I  
(Common to ECE & Bio Medical Engineering)**

**L T P C  
0 0 3 2**

**Expt No.1** Fixed Bias amplifier circuit using BJT

1. Waveforms at input and output without bias.
2. Determination of bias resistance to locate Q-point at center of load line.
3. Measurement of gain.
4. Plot the frequency response & Determination of Gain Bandwidth Product

**Expt No.2** Design and construct BJT Common Emitter Amplifier using voltage divider bias (self-bias) with and without bypassed emitter resistor.

1. Measurement of gain.
2. Plot the frequency response & Determination of Gain Bandwidth Product

**Expt No.3** Design and construct BJT Common Collector Amplifier using voltage divider bias (self-bias).

1. Measurement of gain.
2. Plot the frequency response & Determination of Gain Bandwidth Product

**Expt No.4** Darlington Amplifier using BJT.

1. Measurement of gain and input resistance. Comparison with calculated values.
2. Plot the frequency response & Determination of Gain Bandwidth Product

**Expt No.5** Source follower with Bootstrapped gate resistance

1. Measurement of gain, input resistance and output resistance with and without Bootstrapping. Comparison with calculated values.

**Expt No.6** Differential amplifier using BJT

1. Measurement of CMRR.

**Expt No.7** Class A Power Amplifier

1. Observation of output waveform.
2. Measurement of maximum power output.
3. Determination of efficiency.
4. Comparison with calculated values.

**Expt No.8** Class B Complementary symmetry power amplifier

1. Observation of the output waveform with crossover Distortion.
2. Modification of the circuit to avoid crossover distortion.
3. Measurement of maximum power output.
4. Determination of efficiency.
5. Comparison with calculated values.

**Expt No.9** Power Supply circuit - Half wave rectifier with simple capacitor filter.

1. Measurement of DC voltage under load and ripple factor, Comparison with calculated values.
2. Plot the Load regulation characteristics using Zener diode.

**Expt No.10** Power Supply circuit - Full wave rectifier with simple capacitor filter

1. Measurement of DC voltage under load and ripple factor, Comparison with calculated values.
2. Measurement of load regulation characteristics. Comparison with calculated values.

**LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 30 STUDENTS  
(3 per Batch)**

S.No	Name of the equipments / Components	Quantity Required	Remarks
1	Variable DC Power Supply	8	(0-30V)
2	CRO	10	30MHz
4	Multimeter	6	Digital
6	Function Generator	8	1 MHz
7	DC Ammeter	10	

8	DC Voltmeter	10	
<b>Consumables (Minimum of 25 Nos. each)</b>			
9	BC107, BC147, BC 108, BC 148, BC547, BC 548, SL 100, SK100 or Equivalent transistors.		
10	Resistors 1/4 Watt Assorted		
11	Capacitors		
12	Inductors		
13	Diodes, Zener Diodes		
14	Bread Boards		
15	Transformers	4	

**EC 2209**

**DATA STRUCTURES AND OBJECT ORIENTED  
PROGRAMMING LAB**

**L T P C  
0 0 3 2**

1. Basic Programs for C++ Concepts
2. Array implementation of List Abstract Data Type (ADT)
3. Linked list implementation of List ADT
4. Cursor implementation of List ADT
5. Stack ADT - Array and linked list implementations

The next two exercises are to be done by implementing the following source files

- (a) Program source files for Stack Application 1
- (b) Array implementation of Stack ADT
- (c) Linked list implementation of Stack ADT
- (d) Program source files for Stack Application 2

An appropriate header file for the Stack ADT should be #included in (a) and (d)

5. Implement any Stack Application using array implementation of Stack ADT (by implementing files (a) and (b) given above) and then using linked list implementation of Stack ADT (by using files (a) and implementing file (c))
7. Queue ADT – Array and linked list implementations
8. Search Tree ADT - Binary Search Tree
9. Heap Sort
10. Quick Sort

**LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 30 STUDENTS  
( 1 per Batch)**

S.No	Name of the equipments / Components	Quzntity Required	Remarks
1	P IV Computer Variable DC Power Supply	30 Nos	
2	C and C++ Compiler	30 Users	
<b>Consumables (Minimum of 25 Nos. each)</b>			
	Nil		



**REFERENCES:**

1. Miller, S.L and Childers, S.L, "Probability and Random Processes with applications to Signal Processing and Communications", Elsevier Inc., First Indian Reprint 2007.
2. H. Stark and J.W. Woods, "Probability and Random Processes with Applications to Signal Processing", Pearson Education (Asia), 3<sup>rd</sup> Edition, 2002.
3. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw-Hill edition, New Delhi, 2004.
4. Leon-Garcia, A, "Probability and Random Processes for Electrical Engineering", Pearson Education Asia, Second Edition, 2007
5. Yates and D.J. Goodman, "Probability and Stochastic Processes", John Wiley and Sons, Second edition, 2005.

**EC 2251****ELECTRONIC CIRCUITS II****L T P C****3 1 0 4****AIM**

The aim of this course is to familiarize the student with the analysis and design of feed back amplifiers, oscillators, tuned amplifiers, wave shaping circuits, multivibrators and blocking oscillators.

**OBJECTIVES:**

On completion of this course the student will understand

- The advantages and method of analysis of feedback amplifiers
- Analysis and design of LC and RC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, blocking oscillators and time base generators.

**UNIT I FEEDBACK AMPLIFIERS****9**

Block diagram, Loop gain, Gain with feedback, Effects of negative feedback – Sensitivity and desensitivity of gain, Cut-off frequencies, distortion, noise, input impedance and output impedance with feedback, Four types of negative feedback connections – voltage series feedback, voltage shunt feedback, current series feedback and current shunt feedback, Method of identifying feedback topology and feedback factor, Nyquist criterion for stability of feedback amplifiers.

**UNIT II OSCILLATORS****9**

Classification, Barkhausen Criterion - Mechanism for start of oscillation and stabilization of amplitude, General form of an Oscillator, Analysis of LC oscillators - Hartley, Colpitts, Clapp, Franklin, Armstrong, Tuned collector oscillators, RC oscillators - phase shift – Wienbridge - Twin-T Oscillators, Frequency range of RC and LC Oscillators, Quartz Crystal Construction, Electrical equivalent circuit of Crystal, Miller and Pierce Crystal oscillators, frequency stability of oscillators.

**UNIT III TUNED AMPLIFIERS****9**

Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers - Analysis of capacitor coupled single tuned amplifier – double tuned amplifier - effect of cascading single tuned and double tuned amplifiers on bandwidth – Stagger tuned amplifiers – large signal tuned amplifiers – Class C tuned amplifier – Efficiency and applications of Class C tuned amplifier - Stability of tuned amplifiers – Neutralization - Hazeltine neutralization method.

**UNIT IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9**  
RC & RL Integrator and Differentiator circuits – Storage, Delay and Calculation of Transistor Switching Times – Speed-up Capacitor - Diode clippers, Diode comparator - Clampers. Collector coupled and Emitter coupled Astable multivibrator - Monostable multivibrator - Bistable multivibrators - Triggering methods for Bistable multivibrators - Schmitt trigger circuit.

**UNIT V BLOCKING OSCILLATORS AND TIMEBASE GENERATORS 9**  
UJT sawtooth waveform generator, Pulse transformers – equivalent circuit – response - applications, Blocking Oscillator – Free running blocking oscillator - Astable Blocking Oscillators with base timing – Push-pull Astable blocking oscillator with emitter timing, Frequency control using core saturation, Triggered blocking oscillator – Monostable blocking oscillator with base timing – Monostable blocking oscillator with emitter timing, Time base circuits - Voltage-Time base circuit, Current-Time base circuit - Linearization through adjustment of driving waveform.

**TUTORIAL= 15 TOTAL : 60 PERIODS**

**TEXT BOOKS:**

1. Sedra / Smith, Micro Electronic Circuits Oxford University Press, 2004.
2. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2<sup>nd</sup> Edition, TMH, 2007.

**REFERENCES:**

1. Millman J. and Taub H., Pulse Digital and Switching Waveforms, TMH, 2000.
2. Schilling and Belove, Electronic Circuits, 3<sup>rd</sup> Edition, TMH, 2002.
- 3 Robert L. Boylestad and Louis Nasheresky, Electronic Devices and Circuit Theory, 9<sup>th</sup> Edition, Pearson Education / PHI, 2002.
4. David A. Bell, Solid State Pulse Circuits, Prentice Hall of India, 1992.
5. Millman and Halkias. C., Integrated Electronics, TMH, 1991.

**EC 2252**

**COMMUNICATION THEORY**

**L T P C  
3 1 0 4**

**AIM**

To study the various analog communication fundamentals viz., Amplitude modulation and demodulation, angle modulation and demodulation. Noise performance of various receivers and information theory with source coding theorem are also dealt.





**UNIT V ELECTROMAGNETIC WAVES****9**

Derivation of Wave Equation – Uniform Plane Waves – Maxwell's equation in Phasor form – Wave equation in Phasor form – Plane waves in free space and in a homogenous material.

Wave equation for a conducting medium – Plane waves in lossy dielectrics – Propagation in good conductors – Skin effect.

Linear, Elliptical and circular polarization – Reflection of Plane Wave from a conductor – normal incidence – Reflection of Plane Waves by a perfect dielectric – normal and oblique incidence. Dependence on Polarization. Brewster angle.

**TUTORIAL 15 TOTAL : 60 PERIODS****TEXT BOOKS:**

1. W H.Hayt & J A Buck : "Engineering Electromagnetics" TATA McGraw-Hill, 7<sup>th</sup> Edition 2007 (Unit I,II,III ).
3. E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems." Pearson Education/PHI 4<sup>nd</sup> edition 2006. (Unit IV, V).

**REFERENCES:**

1. Matthew N.O.Sadiku: "Elements of Engineering Electromagnetics" Oxford University Press, 4th edition, 2007
2. Narayana Rao, N : "Elements of Engineering Electromagnetics" 6<sup>th</sup> edition, Pearson Education, New Delhi, 2006.
3. Ramo, Whinnery and Van Duzer: "Fields and Waves in Communications Electronics" John Wiley & Sons ,3<sup>rd</sup> edition 2003.
4. David K.Cheng: "Field and Wave Electromagnetics - Second Edition-Pearson Edition, 2004.
5. G.S.N. Raju, Electromagnetic Field Theory & Transmission Lines, Pearson Education, 2006

**EC 2254****LINEAR INTEGRATED CIRCUITS****L T P C  
3 0 0 3****AIM**

To teach the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

**OBJECTIVES**

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To teach the theory of ADC and DAC
- To introduce the concepts of waveform generation and introduce some special function ICs.

**UNIT I IC FABRICATION AND CIRCUIT CONFIGURATION FOR LINEAR IC 9**

Advantages of Ics over discrete components – Manufacturing process of monolithic Ics – Construction of monolithic bipolar transistor – Monolithic diodes – Integrated Resistors – Monolithic Capacitors – Inductors. Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.

**UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9**

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

**UNIT III ANALOG MULTIPLIER AND PLL 9**

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell - Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

**UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 8**

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode  $R-2R$  Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type - Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.

**UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs 9**

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators - Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Sergio Franco, Design with operational amplifiers and analog integrated circuits, 3<sup>rd</sup> Edition, Tata McGraw-Hill, 2007.
2. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000.

**REFERENCES:**

1. B.S.Sonde, System design using Integrated Circuits , New Age Pub, 2nd Edition, 2001
2. Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 2005.
3. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall / Pearson Education, 4<sup>th</sup> Edition, 2001.
4. J.Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1996.
5. William D.Stanley, Operational Amplifiers with Linear Integrated Circuits, Pearson Education, 2004.
6. K Lal Kishore, Operational Amplifier and Linear Integrated Circuits, Pearson Education, 2006.
7. S.Salivahanan & V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008.

**AIM**

To familiarize the students with concepts related to the operation analysis and stabilization of control systems

**OBJECTIVES**

- To understand the open loop and closed loop (feedback ) systems
- To understand time domain and frequency domain analysis of control systems required for stability analysis.
- To understand the compensation technique that can be used to stabilize control systems

**UNIT I CONTROL SYSTEM MODELING 9**

Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph

**UNIT II TIME RESPONSE ANALYSIS 9**

Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

**UNIT III FREQUENCY RESPONSE ANALYSIS 9**

Frequency Response - Bode Plot, Polar Plot, Nyquist Plot - Frequency Domain specifications from the plots - Constant M and N Circles - Nichol's Chart - Use of Nichol's Chart in Control System Analysis. Series, Parallel, series-parallel Compensators - Lead, Lag, and Lead Lag Compensators, Analysis using MATLAB.

**UNIT IV STABILITY ANALYSIS 9**

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability, Analysis using MATLAB

**UNIT V STATE VARIABLE ANALYSIS & DIGITAL CONTROL SYSTEMS 9**

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations - Concepts of Controllability and Observability – State space representation for Discrete time systems. Sampled Data control systems – Sampling Theorem – Sample & Hold – Open loop & Closed loop sampled data systems.

**TOTAL : 45 PERIODS**

**TEXTBOOKS:**

1. J.Nagrath and M.Gopal," Control System Engineering", New Age International Publishers, 5<sup>th</sup> Edition, 2007.
2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2<sup>nd</sup> Edition, 2002.

**REFERENCES:**

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7<sup>th</sup> Edition, 1995.
2. M.Gopal, Digital Control and State Variable Methods, 2<sup>nd</sup> Edition, TMH, 2007. Schaum's Outline Series, 'Feedback and Control Systems' Tata McGraw-Hill, 2007.
3. John J.D'azzo & Constantine H.Houpis, 'Linear control system analysis and design', Tata McGraw-Hill, Inc., 1995.
4. Richard C. Dorf & Robert H. Bishop, "Modern Control Systems", Addison – Wesley, 1999.

**EC 2257****ELECTRONICS CIRCUITS II AND SIMULATION LAB****L T P C  
0 0 3 2****DESIGN OF FOLLOWING CIRCUITS**

1. Series and Shunt feedback amplifiers:
2. Frequency response, Input and output impedance calculation
3. RC Phase shift oscillator, Wien Bridge Oscillator
4. Hartley Oscillator, Colpitts Oscillator
5. Tuned Class C Amplifier
6. Integrators, Differentiators, Clippers and Clampers
7. Astable, Monostable and Bistable multivibrators

**SIMULATION USING PSPICE:**

1. Differential amplifier
2. Active filters : Butterworth 2<sup>nd</sup> order LPF, HPF (Magnitude & Phase Response)
3. Astable, Monostable and Bistable multivibrator - Transistor bias
4. D/A and A/D converters (Successive approximation)
5. Analog multiplier
6. CMOS Inverter, NAND and NOR

**LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 30 STUDENTS  
(3 per Batch)**

S.No	Name of the equipments / Components	Quantity Required	Remarks
1	Variable DC Power Supply	8	(0-30V)
2	Fixed Power Supply	4	+ / - 12V
3	CRO	6	30MHz
4	Multimeter	6	Digital
5	Multimeter	2	Analog
6	Function Generator	6	1 MHz
7	Digital LCR Meter	1	
8	PC with SPICE Simulation Software	6	
<b>Consumables (Minimum of 25 Nos. each)</b>			
9	BC107, BF195, 2N2222, BC147		
10	Resistors 1/4 Watt Assorted		

11	Capacitors		
12	Inductors		
13	Diodes, Zener Diodes		
14	Bread Boards		

**EC 2258**

**LINEAR INTEGRATED CIRCUITS LAB**

**L T P C**  
**0 0 3 2**

**Design and testing of**

1. Inverting, Non inverting and Differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active lowpass, Highpass and bandpass filters.
5. Astable & Monostable multivibrators and Schmitt Trigger using op-amp.
6. Phase shift and Wien bridge oscillators using op-amp.
7. Astable and monostable multivibrators using NE555 Timer.
8. PLL characteristics and its use as Frequency Multiplier.
9. DC power supply using LM317 and LM723.
10. Study of SMPS.
11. Simulation of Experiments 3, 4, 5, 6 and 7 using PSpice netlists.

**Note:** Op-Amps  $\mu$ A741, LM 301, LM311, LM 324 & AD 633 may be used

**LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 30 STUDENTS  
(3 per Batch)**

S.No	Name of the equipments / Components	Quantity Required	Remarks
1	Dual ,(0-30V) variable Power Supply	10	-
2	CRO	9	30MHz
3	Digital Multimeter	10	Digital
4	Function Generator	8	1 MHz
5	IC Tester (Analog)	2	
6	Bread board	10	
7	Computer (PSPICE installed)	1	
<b>Consumables (Minimum of 25 Nos. each)</b>			
1	IC 741	25	
2	IC NE555	25	
3	LED	25	
4	LM317	25	

5	LM723	25	
6	ICSG3524 / SG3525	25	
7	Transistor – 2N3391	25	
8	Diodes,	25	IN4001,BY126
9	Zener diodes	25	
10	Potentiometer		
11	Step-down transformer	1	230V/12-0-12V
12	Capacitor		
13	Resistors 1/4 Watt Assorted	25	
14	Single Strand Wire		

**EC 2259 ELECTRICAL ENGINEERING AND CONTROL SYSTEM LAB L T P C  
0 0 3 2**

**AIM**

1. To expose the students to the basic operation of electrical machines and help them to develop experimental skills.
2. To study the concepts, performance characteristics, time and frequency response of linear systems.
3. To study the effects of controllers.
4. Open circuit and load characteristics of separately excited and self excited D.C. generator.
5. Load test on D.C. shunt motor.
6. Swinburne's test and speed control of D.C. shunt motor.
7. Load test on single phase transformer and open circuit and short circuit test on single phase transformer
8. Regulation of three phase alternator by EMF and MMF methods.
9. Load test on three phase induction motor.
10. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
11. Study of D.C. motor and induction motor starters.
12. Digital simulation of linear systems.
13. Stability Analysis of Linear system using Mat lab.
14. Study the effect of P, PI, PID controllers using Mat lab.
15. Design of Lead and Lag compensator.
16. Transfer Function of separately excited D.C. Generator.
17. Transfer Function of armature and Field Controller D.C. Motor.

**TOTAL: 45 PERIODS**

1. **Open circuit and load characteristics of separately excited and self excited D.C. generator.**

Sl. No.	Apparatus	Range	Quantity
1	Motor Generator set	-	1
2	Rheostat	200 $\Omega$ , 5A 175 $\Omega$ , 1.5A	1 2
3	Voltmeter DC	300V 30V	1 1
4	Ammeter DC	30A 2A	1 2
5	DPST switch		2
6	Three point starter		1
7	Tachometer		1

**2. Load test on D.C. shunt motor.**

Sl. No.	Apparatus	Range	Quantity
1	DC Motor	-	1
2	Rheostat	175 $\Omega$ , 1.5A	1
3	Voltmeter DC	300V	1
4	Ammeter DC	30A	1
5	DPST switch		1
6	Three point starter		1
7	Tachometer		1

**3. Swinburne's test and speed control of D.C. shunt motor**

Sl. No.	Apparatus	Range	Quantity
1	DC Motor	-	1
2	Rheostat	100 $\Omega$ , 5A 175 $\Omega$ , 1.5A	1 1
3	Voltmeter DC	300V	1
4	Ammeter DC	5A 2A	1 1
5	DPST switch		1
6	Tachometer		1

**4. Load test on single-phase transformer and open circuit and short circuit test on single-phase transformer.**

Sl. No.	Apparatus	Range	Quantity
1	Single phase Transformer	-	1
2	Wattmeter	300V, 5A,UPF 300V, 5A,LPF	1 1
3	Voltmeter AC	300V	2
4	Ammeter AC	5A 30A	1 1
5	Single phase auto-transformer		1
6	Resistive load		1

5. Regulation of three-phase alternator by EMF and MMF method.

Sl. No.	Apparatus	Range	Quantity
1	Motor Alternator set	-	1
2	Rheostat	200 $\Omega$ , 5A 175 $\Omega$ , 1.5A	1 1
3	Voltmeter DC Voltmeter AC	300V 600V	1 1
4	Ammeter DC Ammeter AC	2A 30A	1 1
5	DPST switch TPST switch		1 1
6	Tachometer		1

6. Load test on three phase Induction motor.

Sl. No.	Apparatus	Range	Quantity
1	Three Phase Induction Motor	-	1
2	Wattmeter	600V, 10A,UPF	2
3	Voltmeter AC	600V	1
4	Ammeter AC	10A	1
5	Brake drum arrangement		
6	Star delta starter		1
7	Tachometer		1

7. No load and blocked rotor test on three-phase induction motor (Determination of equivalent circuit parameters)

Sl. No.	Apparatus	Range	Quantity
1	Three Phase Induction Motor	-	1
2	Wattmeter	600V, 10A,UPF 600V, 5A,LPF	2 2
3	Voltmeter AC	600V 150V	1 1
4	Ammeter AC	10A 5A	1 1
5	Brake drum arrangement		
6	Three phase auto-transformer		1

8. Study of D.C. motor and Induction motor starters.

Sl. No.	Apparatus	Quantity
1	Three point starter	1
2	Four point starter	1
3	Star-delta starter	1
4	DOL starter	1
5	Three phase auto-transformer	1

**9. Digital simulation of linear systems.**

Simulink software for minimum 3 users license

**10. Stability analysis of linear system using Mat lab.**

Matlab software for minimum 3 users license

**11. Study of effect of P, PI, PID controllers using Mat lab.**

Matlab software for minimum 3 users license

**12. Design of lead and lag compensator.**

Sl. No.	Apparatus
1	Resistor
2	Capacitor
3	Function generator
4	Bread Board

**13. Transfer function of separately excited D.C. generator.**

Sl. No.	Apparatus	Range	Quantity
1	Motor Generator set	-	1
2	Rheostat	200 $\Omega$ , 5A 175 $\Omega$ , 1.5A	1 2
3	Voltmeter DC	300V 30V	1 1
4	Ammeter DC	30A 2A	1 2
5	DPST switch		2
6	Three point starter		1
7	Tachometer		1

**14. Transfer function of armature and field controller D.C. motor.**

Sl. No.	Apparatus	Range	Quantity
1	DC Motor	-	1
2	Rheostat	175 $\Omega$ , 1.5A	1
3	Voltmeter DC	300V	1
4	Ammeter DC	30A	1
5	DPST switch		1
6	Three point starter		1
7	Tachometer		1

**AIM:**

To introduce the basic concepts of Digital Communication in baseband and passband domains and to give an exposure to error control coding techniques.

**OBJECTIVES:**

- To study signal space representation of signals and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- To understand baseband and bandpass signal transmission and reception techniques.
- To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.

**UNIT I DIGITAL COMMUNICATION SYSTEM 8**

Introduction to Analog Pulse Communication Systems – Digital Communication Systems – Functional description, Channel classification, Performance Measure; Geometric representation of Signals, Bandwidth, Mathematical Models of Communication Channel.

**UNIT II BASEBAND FORMATTING TECHNIQUES 10**

Sampling – Impulse sampling, Natural Sampling, Sampler Implementation; Quantisation – Uniform and Non-uniform; Encoding Techniques for Analog Sources- Temporal waveform encoding, Spectral waveform encoding, Model-based encoding, Comparison of speech encoding methods.

**UNIT III BASEBAND CODING TECHNIQUES 9**

Error Control Codes - Block Codes, Convolutional Codes, Concept of Error Free Communication; Classification of line codes, desirable characteristics and power spectra of line codes.

**UNIT IV BASEBAND RECEPTION TECHNIQUES 9**

Noise in Communication Systems; Receiving Filter – Correlator type, Matched Filter type; Equalising Filter - Signal and system design for ISI elimination, Implementation, Eye Pattern analysis; Synchronisation; Detector – Maximum Likelihood Detector, Error Probability, Figure-of-Merit for Digital Detection.

**UNIT V BANDPASS SIGNAL TRANSMISSION AND RECEPTION 9**

Memory less modulation methods - Representation and Spectral characteristics, ASK, PSK, QAM, QPSK, FSK; Bandpass receiving filter, Error performance – Coherent and Non-coherent detection systems.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Amitabha Bhattacharya, "Digital Communications", Tata McGraw Hill, 2006.
2. Simon Haykin, "Digital Communications", John Wiley, 2006.

**REFERENCES:**

1. John.G. Proakis, "Fundamentals of Communication Systems", Pearson Education, 2006.
2. Michael. B. Purrusley, "Introduction to Digital Communication", Pearson Education, 2006.
3. Bernard Sklar, Digital Communication, 2<sup>nd</sup> Edition, Paerson Education, 2006

4. Herbert Taub & Donald L Schilling – Principles of Communication Systems ( 3<sup>rd</sup> Edition ) – Tata McGraw Hill, 2008.
5. Leon W. Couch, Digital and Analog Communication Systems, 6<sup>th</sup> Edition, Pearson Education, 2001.

**EC2302**

**DIGITAL SIGNAL PROCESSING**

**L T P C**  
**3 1 0 4**

**AIM**

To study the signal processing methods and processors.

**OBJECTIVES:**

- To study DFT and its computation
- To study the design techniques for digital filters
- To study the finite word length effects in signal processing
- To study the non-parametric methods of power spectrum estimations
- To study the fundamentals of digital signal processors.

**UNIT I DISCRETE FOURIER TRANSFORM 9**

DFT and its properties, Relation between DTFT and DFT, FFT computations using Decimation in time and Decimation in frequency algorithms, Overlap-add and save methods

**UNIT II INFINITE IMPULSE RESPONSE DIGITAL FILTERS: 9**

Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Realization using direct, cascade and parallel forms.

**UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS 9**

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Hamming, Hanning and Blackmann Windows – Frequency sampling method – Realization of FIR filters – Transversal, Linear phase and Polyphase structures.

**UNIT IV FINITE WORD LENGTH EFFECTS 9**

Fixed point and floating point number representations – Comparison – Truncation and Rounding errors - Quantization noise – derivation for quantization noise power – coefficient quantization error – Product quantization error - Overflow error – Roundoff noise power - limit cycle oscillations due to product roundoff and overflow errors - signal scaling

**UNIT V MULTIRATE SIGNAL PROCESSING 9**

Introduction to Multirate signal processing-Decimation-Interpolation-Polyphase implementation of FIR filters for interpolator and decimator -Multistage implementation of sampling rate conversion- Design of narrow band filters - Applications of Multirate signal processing.

**L: 45, T: 15, TOTAL= 60 PERIODS**

**TEXT BOOKS:**

1. John G Proakis and Manolakis, “ Digital Signal Processing Principles, Algorithms and Applications”, Pearson, Fourth Edition, 2007.
2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw Hill International, 2007

**REFERENCES:**

1. E.C. Ifeachor and B.W. Jervis, " Digital signal processing – A practical approach", Second edition, Pearson, 2002.
2. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata Mc Graw Hill, 1998.
3. P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993.
4. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006.

**EC2303****COMPUTER ARCHITECTURE AND ORGANIZATION****L T P C****3 0 0 3****AIM**

To discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

**OBJECTIVES:**

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study in detail the different types of control and the concept of pipelining.
- To study the hierarchical memory system including cache memories and virtual memory.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.

**UNIT I INTRODUCTION****9**

Computing and Computers, Evolution of Computers, VLSI Era, System Design- Register Level, Processor Level, CPU Organization, Data Representation, Fixed – Point Numbers, Floating Point Numbers, Instruction Formats, Instruction Types. Addressing modes.

**UNIT II DATA PATH DESIGN****9**

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non-restoring division algorithm, Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline Design, Modified booth's Algorithm

**UNIT III CONTROL DESIGN****9**

Hardwired Control, Microprogrammed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

**UNIT IV MEMORY ORGANIZATION****9**

Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

**UNIT V SYSTEM ORGANIZATION****9**

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IO interface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, Superscalar and vector processor.

**TOTAL= 45 PERIODS****TEXTBOOKS:**

1. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998.
2. V.Carl Hamacher, Zvonko G. Varanescic and Safat G. Zaky, "Computer Organisation", V edition, McGraw-Hill Inc, 1996.

**REFERENCES:**

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Paraami, "Computer Architecture", BEH R002, Oxford Press.
3. P.Pal Chaudhuri, , "Computer organization and design", 2<sup>nd</sup> Ed., Prentice Hall of India, 2007.
4. G.Kane & J.Heinrich, ' MIPS RISC Architecture ', Englewood cliffs, New Jersey, Prentice Hall, 1992.

**EC2305****TRANSMISSION LINES AND WAVEGUIDES****L T P C****3 1 0 4****AIM**

To lay a strong foundation on the theory of transmission lines and wave guides by highlighting their applications.

**OBJECTIVES**

- To become familiar with propagation of signals through lines
- Understand signal propagation at Radio frequencies
- Understand radio propagation in guided systems
- To become familiar with resonators

**UNIT I FILTERS****9**

The neper - the decibel - Characteristic impedance of Symmetrical Networks – Current and voltage ratios - Propagation constant, - Properties of Symmetrical Networks - Filter fundamentals – Pass and Stop bands. Behaviour of the Characteristic impedance. Constant K Filters - Low pass, High pass band, pass band elimination filters - m - derived sections – Filter circuit design – Filter performance – Crystal Filters.

**UNIT II TRANSMISSION LINE PARAMETERS****9**

A line of cascaded T sections - Transmission lines - General Solution, Physical Significance of the equations, the infinite line, wavelength, velocity, propagation, Distortion line, the telephone cable, Reflection on a line not terminated in  $Z_0$ , Reflection Coefficient, Open and short circuited lines, Insertion loss.

**UNIT III THE LINE AT RADIO FREQUENCY 9**

Parameters of open wire line and Coaxial cable at RF – Line constants for dissipation - voltages and currents on the dissipation less line - standing waves – nodes - standing wave ratio - input impedance of open and short circuited lines - power and impedance measurement on lines –  $\lambda / 4$  line, Impedance matching – single and double-stub matching circle diagram, smith chart and its applications – Problem solving using Smith chart.

**UNIT IV GUIDED WAVES BETWEEN PARALLEL PLANES 9**

Application of the restrictions to Maxwell's equations – transmission of TM waves between Parallel plans – Transmission of TE waves between Parallel planes. Transmission of TEM waves between Parallel planes – Manner of wave travel. Velocities of the waves – characteristic impedance - Attenuators

**UNIT V WAVEGUIDES 9**

Application of Maxwell's equations to the rectangular waveguide. TM waves in Rectangular guide. TE waves in Rectangular waveguide – Cylindrical waveguides. The TEM wave in coaxial lines. Excitation of wave guides. Guide termination and resonant cavities.

**L: 45, T: 15, TOTAL= 60 PERIODS**

**TEXT BOOK**

1. John D.Ryder, "Networks, lines and fields", Prentice Hall of India, 2<sup>nd</sup> Edition, 2006.

**REFERENCES**

1. E.C.Jordan, K.G. Balmain: "E.M.Waves & Radiating Systems", Pearson Education, 2006.
2. Joseph Edminister, Schaum's Series, Electromagnetics, TMH, 2007.
3. G S N Raju, Electromagnetic Field Theory and Transmission Lines, Pearson Education, 2006.

**GE 2021 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C  
3 0 0 3**

**AIM**

- The aim of this course is to create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional Endeavour that they participates.

**OBJECTIVE**

- At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

## **UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY**

**14**

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

## **UNIT II ENVIRONMENTAL POLLUTION**

**8**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

## **UNIT III NATURAL RESOURCES**

**10**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

## **UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**

**7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

**UNIT V HUMAN POPULATION AND THE ENVIRONMENT****6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2<sup>nd</sup> edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).

**REFERENCES BOOKS:**

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005)

**EC2304****MICROPROCESSOR AND MICROCONTROLLER****L T P C****3 1 0 4**

**AIM:** To learn the architecture, programming, interfacing and rudiments of system design of microprocessors and microcontrollers.

**OBJECTIVES**

- To introduce microprocessors and basics of system design using microprocessors.
- To introduce h/w architecture, instruction set and programming of 8085 microprocessor.
- To introduce the h/w architecture, instruction set and programming of 8086 microprocessor.
- To introduce the peripheral interfacing of microprocessors.
- To introduce through case studies, the system design principles using 8085 and 8086.
- To introduce the h/w architecture, instruction set, programming and interfacing of 8051 microcontroller.

**UNIT I INTRODUCTION TO 8 BIT AND 16 BIT MICROPROCESSORS – H/W ARCHITECTURE****9**

Introduction to microprocessor, computer and its organization, Programming system, Address bus, data bus and control bus, Tristate bus, clock generation, Connecting Microprocessor to I/O devices, Data transfer schemes, Architectural advancements of microprocessors. Introductory System design using microprocessors, 8086 – Hardware Architecture, External memory addressing, Bus cycles, some important Companion Chips, Maximum mode bus cycle, 8086 system configuration, Memory Interfacing, Minimum mode system configuration, Maximum mode system configuration, Interrupt processing, Direct memory access.

**UNIT II 16 BIT MICROPROCESSOR INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING 9**

Programmer's model of 8086, operand types, operand addressing, assembler directives, instruction set - Data transfer group, Arithmetic group, logical group, control transfer group, miscellaneous instruction groups, programming.

**UNIT III MICROPROCESSOR PERIPHERAL INTERFACING 9**

Introduction, Generation of I/O Ports, Programmable Peripheral Interface (PPI)-Intel 8255, Sample-and-Hold Circuit and Multiplexer, Keyboard and Display Interface, Keyboard and Display Controller (8279), Programmable Interval timers (Intel 8253, 8254), D-to-A converter, A-to-D converter, CRT Terminal Interface, Printer Interface.

**UNIT IV 8 BIT MICROCONTROLLER- H/W ARCHITECTURE, INSTRUCTION SET AND PROGRAMMING 9**

Introduction to 8051 Micro-controller, Architecture, Memory organization, Special function registers, Port Operation, Memory Interfacing, I/O Interfacing, Programming 8051 resources, interrupts, Programmer's model of 8051, Operand types, Operand addressing, Data transfer instructions, Arithmetic instructions, Logic instructions, Control transfer instructions, Programming

**UNIT V SYSTEM DESIGN USING MICRO PROCESSOR & MICROCONTROLLER 9**

Case studies – Traffic light control, washing machine control, RTC Interfacing using I2C Standard- Motor Control- Relay, PWM, DC & Stepper Motor.

**L: 45, T: 15, TOTAL: 60 PERIODS**

**TEXT BOOKS**

1. Krishna Kant, "MICROPROCESSORS AND MICROCONTROLLERS Architecture, programming and system design using 8085, 8086, 8051 and 8096". PHI 2007.
2. Douglas V Hall, "MICROPROCESSORS AND INTERFACING, PROGRAMMING AND HARDWARE" TMH, 2006.

**REFERENCES**

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay The 8051 Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008.
2. Kenneth J. Ayala, "The 8086 Microprocessor: Programming & Interfacing The PC", Delmar Publishers, 2007.
3. A K Ray, K M Bhurchandi, Advanced Microprocessors and Peripherals, TMH, 2007.

**EC2306 DIGITAL SIGNAL PROCESSING LABORATORY L T P C  
0 0 3 2**

**AIM**

To introduce the student to various digital Signal Processing techniques using TMS 320c5x family processors and MATLAB.

**OBJECTIVES:**

- To implement the processing techniques using the instructions of TMS320C5X/TMS320C 67XX/ADSP 218X/219X/BS531/532/561
- To implement the IIR and FIR filter using MATLAB.

**USING TMS320C5X/TMS320C 67XX/ADSP 218X/219X/BS531/532/561**

1. Study of various addressing modes of DSP using simple programming examples
2. Implementation of Linear and Circular Convolution
3. Sampling of input signal and display
4. Waveform generation
5. Implementation of FIR filter

**USING MATLAB**

1. Generation of Signals
2. Linear and circular convolution of two sequences
3. Sampling and effect of aliasing
4. Design of FIR filters
5. Design of IIR filters
6. Calculation of FFT of a signal
7. Decimation by polyphase decomposition.

**TOTAL:45 PERIODS****REQUIREMENT FOR A BATCH OF 30 STUDENTS**

<b>S.No.</b>	<b>Description of Equipment</b>	<b>Quantity required</b>	<b>Quantity available</b>	<b>Deficiency %</b>
	PCs with Fixed / Floating point DSP Processors (Kit / Add-on Cards)	15 Units (2 students per system)		
	<b>List of software required:</b> MATLAB with Simulink and Signal Processing Tool Box	10 Users license		
	Function Generators (1MHz)	15		
	CRO (20MHz)	15		

**EC2307****COMMUNICATION SYSTEMS LABORATORY****L T P C  
0 0 3 2**

1. Amplitude modulation and Demodulation.
2. Frequency Modulation and Demodulation
3. Pulse Modulation – PAM / PWM / PPM
4. Pulse Code Modulation
5. Delta Modulation, Adaptive Delta Modulation.
6. Digital Modulation & Demodulation – ASK, PSK, QPSK, FSK (Hardware & MATLAB)
7. Designing, Assembling and Testing of Pre-Emphasis / De-emphasis Circuits.
8. PLL and Frequency Synthesizer
9. Line Coding

10. Error Control Coding using MATLAB.
11. Sampling & Time Division Multiplexing.
12. Frequency Division Multiplexing,

**TOTAL:45 PERIODS**

**REQUIREMENT FOR A BATCH OF 30 STUDENTS**

S.No.	Description of Equipment	Quantity required	Quantity available	Deficiency %
	CRO – 20 MHz	15		
	Function Generator (1 MHz )	15		
	Power Supply ( 0 - 30 Volts Variable ) ( IC Power supply)	15		
	Bread Board	10		
	AM Transceiver Kit	2		
	FM Transceiver Kit	2		
	PAM,PPM,PWM Trainer Kits	2		
	PCM /DM/ ADM Trainer Kit	2		
	Line Coding & Decoding Kit	2		
	ASK,PSK,FSK,QPSK Trainer Kits	2		
	Sampling & TDM trainer kit	2		
	Mat lab (Communication tool box)	5 user license		
<b>Consumables</b>				
	IC 565,566,567,741	Minimum of 50 No. each		
	BC 107			
	BFW10			
	OA79			
	Resistors ( Various ranges )			
	Capacitors ( Various ranges )			
	Decade Inductance box			

**EC2308 MICROPROCESSOR AND MICROCONTROLLER LAB**

**L T P C  
0 0 3 2**

1. Programs for 16 bit Arithmetic operations (Using 8086).
2. Programs for Sorting and Searching (Using 8086).
3. Programs for String manipulation operations (Using 8086).
4. Programs for Digital clock and Stop watch (Using 8086).
5. Interfacing ADC and DAC.
6. Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255.
7. Interfacing and Programming 8279, 8259, and 8253.
8. Serial Communication between two MP Kits using 8251.
9. Interfacing and Programming of Stepper Motor and DC Motor Speed control.
10. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.

11. Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
12. Communication between 8051 Microcontroller kit and PC.

**TOTAL= 45 PERIODS**

**REQUIREMENT FOR A BATCH OF 30 STUDENTS**

<b>S.No.</b>	<b>Description of Equipment</b>	<b>Quantity required</b>	<b>Quantity available</b>	<b>Deficiency %</b>
	8086 Trainer	15 Nos.		
	8051 Trainer	15 Nos.		
	8255 Interfacing Card	3 Nos.		
	8279 Interfacing Card	3 Nos.		
	8259 Interfacing card	3 Nos.		
	8251 Interfacing Card	3 Nos.		
	ADC Interfacing card	3 Nos.		
	DAC Interfacing Card	3 Nos.		
	Stepper motor Interfacing card	3 Nos.		
	DC motor Interfacing card	3 Nos.		

Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students' overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

**OBJECTIVES:**

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

<b>I. PC based session</b>	<b>(Weightage 40%)</b>	<b>24 periods</b>
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**1. English Language Lab (18 Periods)**

**1. Listening Comprehension:** (6)  
Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.

**2. Reading Comprehension:** (6)  
Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

**3. Speaking:** (6)  
Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English.

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

**B. Discussion of audio-visual materials (6 periods)**  
**(Samples are available to learn and practice)**

**1. Resume / Report Preparation / Letter Writing** (1)  
Structuring the resume / report - Letter writing / Email Communication - Samples.

**2. Presentation skills:** (1)  
Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. **Soft Skills:** (2)  
Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples
4. **Group Discussion:** (1)  
Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD –Video samples
5. **Interview Skills:** (1)  
Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews- Video samples.

- |  |   |                   |
|--|---|-------------------|
|  | <b>II. Practice Session (Weightage – 60%)</b> | <b>24 periods</b> |
|--|---|-------------------|
1. own resume and report. (2)
  2. **Presentation Skills:** Students make presentations on given topics. (8)
  3. **Group Discussion:** Students participate in group discussions. (6)
  4. **Interview Skills:** Students participate in Mock Interviews (8)

**REFERENCES:**

1. Anderson, P.V, **Technical Communication**, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash, P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., Second Edition, New Delhi, 2004.
3. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi, 2004.
4. Evans, D, **Decisionmaker**, Cambridge University Press, 1997.
5. Thorpe, E, and Thorpe, S, **Objective English**, Pearson Education, Second Edition, New Delhi, 2007.
6. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addison Wesley Longman Ltd., Indian reprint 1998.

**LAB REQUIREMENTS:**

1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software

**GE2321**

**COMMUNICATION SKILLS LABORATORY**

1. A batch of 60 / 120 students is divided into two groups – one group for the PC-based session and the other group for the Class room session.
2. The English Lab (2 Periods) will be handled by a faculty member of the **English Department**. The Career Lab (2 Periods) may be handled by any competent teacher, **not necessarily from English Department**
3. **Record Notebook:** At the end of each session of English Lab, review exercises are given for the students to answer and the computer evaluated sheets are to be compiled as record notebook. Similar exercises for the career lab are to be compiled in the record notebook.



## REFERENCES:

1. Hellriegel, Slocum & Jackson, 'Management - A Competency Based Approach', Thomson South Western, 10th edition, 2007.
2. Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management – A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 12<sup>th</sup> edition, 2007.
3. Andrew J. Dubrin, 'Essentials of Management', Thomson Southwestern, 7th edition, 2007.

**EC2351**

**MEASUREMENTS AND INSTRUMENTATION**

**L T P C  
3 0 0 3**

### AIM:

To introduce the concept of measurement and the related instrumentation requirement as a vital ingredient of electronics and communication engineering.

### OBJECTIVES:

To learn

- Basic measurement concepts
- Concepts of electronic measurements
- Importance of signal generators and signal analysers in measurements
- Relevance of digital instruments in measurements
- The need for data acquisition systems
- Measurement techniques in optical domains.

### **UNIT I BASIC MEASUREMENT CONCEPTS 9**

Measurement systems – Static and dynamic characteristics – units and standards of measurements – error :- accuracy and precision, types, statistical analysis – moving coil, moving iron meters – multimeters – Bridge measurements : – Maxwell, Hay, Schering, Anderson and Wien bridge.

### **UNIT II BASIC ELECTRONIC MEASUREMENTS 9**

Electronic multimeters – Cathode ray oscilloscopes – block schematic – applications – special oscilloscopes :- delayed time base oscilloscopes, analog and digital storage oscilloscope, sampling oscilloscope – Q meters – Vector meters – RF voltage and power measurements – True RMS meters.

### **UNIT III SIGNAL GENERATORS AND ANALYZERS 9**

Function generators – pulse and square wave generators, RF signal generators – Sweep generators – Frequency synthesizer – wave analyzer – Harmonic distortion analyzer – spectrum analyzer :- digital spectrum analyzer, Vector Network Analyzer – Digital L,C,R measurements, Digital RLC meters.

### **UNIT IV DIGITAL INSTRUMENTS 9**

Comparison of analog and digital techniques – digital voltmeter – multimeters – frequency counters – measurement of frequency and time interval – extension of frequency range – Automation in digital instruments, Automatic polarity indication, automatic ranging, automatic zeroing, fully automatic digital instruments, Computer controlled test systems, Virtual instruments.

## **UNIT V DATA ACQUISITION SYSTEMS AND FIBER OPTIC MEASUREMENTS**

Elements of a digital data acquisition system – interfacing of transducers – multiplexing – data loggers – computer controlled instrumentation – IEEE 488 bus – fiber optic measurements for power and system loss – optical time domains reflectometer.

**TOTAL : 45 PERIODS**

### **TEXT BOOKS:**

1. Albert D. Helfrick and William D. Cooper – Modern Electronic Instrumentation and Measurement Techniques, Pearson / Prentice Hall of India, 2007.
2. Ernest O. Doebelin, Measurement Systems- Application and Design, TMH, 2007.

### **REFERENCES:**

1. Joseph J. Carr, Elements of Electronics Instrumentation and Measurement, Pearson Education, 2003.
2. Alan. S. Morris, Principles of Measurements and Instrumentation, 2<sup>nd</sup> Edition, Prentice Hall of India, 2003.
3. David A. Bell, Electronic Instrumentation and measurements, Prentice Hall of India Pvt Ltd, 2003.
4. B.C. Nakra and K.K. Choudhry, Instrumentation, Measurement and Analysis, 2<sup>nd</sup> Edition, TMH, 2004.
5. James W. Dally, William F. Riley, Kenneth G. McConnell, Instrumentation for Engineering Measurements, 2<sup>nd</sup> Edition, John Wiley, 2003.

**EC2352**

**COMPUTER NETWORKS**

**L T P C**  
**3 0 0 3**

### **AIM**

To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.

### **OBJECTIVES:**

- To introduce the students the functions of different layers.
- To introduce IEEE standard employed in computer networking.
- To make students to get familiarized with different protocols and network components.

### **UNIT I PHYSICAL LAYER**

**9**

Data Communications – Networks - Networks models – OSI model – Layers in OSI model – TCP / IP protocol suite – Addressing – Guided and Unguided Transmission media

Switching: Circuit switched networks – Data gram Networks – Virtual circuit networks  
Cable networks for Data transmission: Dialup modems – DSL – Cable TV – Cable TV for Data transfer.

### **UNIT II DATA LINK LAYER**

**10**

Data link control: Framing – Flow and error control – Protocols for Noiseless and Noisy Channels – HDLC

Multiple access: Random access – Controlled access

Wired LANS : Ethernet – IEEE standards – standard Ethernet – changes in the standard – Fast Ethernet – Gigabit Ethernet.

Wireless LANS : IEEE 802.11–Bluetooth.

Connecting LANS: Connecting devices - Backbone networks - Virtual LANS

Virtual circuit networks: Architecture and Layers of Frame Relay and ATM.

**UNIT III NETWORK LAYER 9**

Logical addressing: IPv4, IPv6 addresses

Internet Protocol: Internetworking – IPv4, IPv6 - Address mapping – ARP, RARP, BOOTP, DHCP, ICMP, IGMP, Delivery - Forwarding - Routing – Unicast, Multicast routing protocols.

**UNIT IV TRANSPORT LAYER 7**

Process-to-Process delivery - User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QoS) – Techniques to improve QoS.

**UNIT V APPLICATION LAYER 10**

Domain Name System (DNS) – E-mail – FTP – WWW – HTTP – Multimedia Network Security: Cryptography – Symmetric key and Public Key algorithms - Digital signature – Management of Public keys – Communication Security – Authentication Protocols.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Behrouz A. Foruzan, “Data communication and Networking”, Tata McGraw-Hill, 2006: Unit I-IV
2. Andrew S. Tannenbaum, “Computer Networks”, Pearson Education, Fourth Edition, 2003: Unit V

**REFERENCES:**

1. Wayne Tomasi, “Introduction to Data Communication and Networking”, 1/e, Pearson Education.
2. James .F. Kurose & W. Rouse, “Computer Networking: A Topdown Approach Featuring”, 3/e, Pearson Education.
3. C.Sivaram Murthy, B.S.Manoj, “Ad hoc Wireless Networks – Architecture and Protocols”, Second Edition, Pearson Education.
4. Greg Tomshon, Ed Tittel, David Johnson. “Guide to Networking Essentials”, fifth edition, Thomson India Learning, 2007.
5. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2000.

**EC2353 ANTENNAS AND WAVE PROPAGATION L T P C  
3 1 0 4**

**AIM:**

To enable the student to study the various types of antennas and wave propagation.

**OBJECTIVES:**

- To study radiation from a current element.
- To study antenna arrays
- To study aperture antennas
- To learn special antennas such as frequency independent and broad band antennas.
- To study radio wave propagation.

**UNIT I ELECTROMAGNETIC RADIATION AND ANTENNA FUNDAMENTALS 9**

Review of electromagnetic theory: Vector potential, Solution of wave equation, retarded case, Hertzian dipole. Antenna characteristics: Radiation pattern, Beam solid angle, Directivity, Gain, Input impedance, Polarization, Bandwidth, Reciprocity, Equivalence of Radiation patterns, Equivalence of Impedances, Effective aperture, Vector effective length, Antenna temperature.

**UNIT II WIRE ANTENNAS AND ANTENNA ARRAYS 9**

Wire antennas: Short dipole, Radiation resistance and Directivity, Half wave Dipole, Monopole, Small loop antennas. Antenna Arrays: Linear Array and Pattern Multiplication, Two-element Array, Uniform Array, Polynomial representation, Array with non-uniform Excitation-Binomial Array

**UNIT III APERTURE ANTENNAS 9**

Aperture Antennas: Magnetic Current and its fields, Uniqueness theorem, Field equivalence principle, Duality principle, Method of Images, Pattern properties, Slot antenna, Horn Antenna, Pyramidal Horn Antenna, Reflector Antenna-Flat reflector, Corner Reflector, Common curved reflector shapes, Lens Antenna.

**UNIT IV SPECIAL ANTENNAS AND ANTENNA MEASUREMENTS 9**

Special Antennas: Long wire, V and Rhombic Antenna, Yagi-Uda Antenna, Turnstile Antenna, Helical Antenna- Axial mode helix, Normal mode helix, Biconical Antenna, Log periodic Dipole Array, Spiral Antenna, Microstrip Patch Antennas.  
Antenna Measurements: Radiation Pattern measurement, Gain and Directivity Measurements, Anechoic Chamber measurement.

**UNIT V RADIO WAVE PROPAGATION 9**

Calculation of Great Circle Distance between any two points on earth, Ground Wave Propagation, Free-space Propagation, Ground Reflection, Surface waves, Diffraction, Wave propagation in complex Environments, Tropospheric Propagation, Tropospheric Scatter. Ionospheric propagation: Structure of ionosphere, Sky waves, skip distance, Virtual height, Critical frequency, MUF, Electrical properties of ionosphere, Effects of earth's magnetic fields, Faraday rotation, Whistlers.

**TUTORIAL = 15 TOTAL =45 + 15 :60 PERIODS**

**TEXTBOOKS:**

1. E.C.Jordan and Balmain, "Electromagnetic waves and Radiating Systems", Pearson Education / PHI, 2006
2. A.R.Harish, M.Sachidanada, "Antennas and Wave propagation", Oxford University Press, 2007.

**REFERENCES:**

1. John D.Kraus, Ronald J Marhefka and Ahmad S Khan, "Antennas for all Applications",
2. Tata McGraw-Hill Book Company, 3 ed, 2007.
3. G.S.N.Raju, Antenna Wave Propagation, Pearson Education, 2004.
4. Constantine A. Balanis, Antenna Theory Analysis and Design, John Wiley, 2<sup>nd</sup> Edition, 2007.
5. R.E.Collins, "Antenna and Radiowave propagation",
6. W.L Stutzman and G.A. Thiele, "Antenna analysis and design", John Wiley, 2000.

**AIM:**

To introduce the technology, design concepts and testing of Very Large Scale Integrated Circuits.

**OBJECTIVES:**

- To learn the basic CMOS circuits.
- To learn the CMOS process technology.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI subsystems.
- To learn the concepts of modeling a digital system using Hardware Description Language.

**UNIT I CMOS TECHNOLOGY 9**

A brief History-MOS transistor, Ideal I-V characteristics, C-V characteristics, Non ideal I-V effects, DC transfer characteristics - CMOS technologies, Layout design Rules, CMOS process enhancements, Technology related CAD issues, Manufacturing issues

**UNIT II CIRCUIT CHARACTERIZATION AND SIMULATION 9**

Delay estimation, Logical effort and Transistor sizing, Power dissipation, Interconnect, Design margin, Reliability, Scaling- SPICE tutorial, Device models, Device characterization, Circuit characterization, Interconnect simulation

**UNIT III COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN 9**

Circuit families –Low power logic design – comparison of circuit families – Sequencing static circuits, circuit design of latches and flip flops, Static sequencing element methodology- sequencing dynamic circuits – synchronizers

**UNIT IV CMOS TESTING 9**

Need for testing- Testers, Test fixtures and test programs- Logic verification- Silicon debug principles- Manufacturing test – Design for testability – Boundary scan

**UNIT V SPECIFICATION USING VERILOG HDL 9**

Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL, structural gate level switch level modeling, Design hierarchies, Behavioral and RTL modeling, Test benches, Structural gate level description of decoder, equality detector, comparator, priority encoder, half adder, full adder, Ripple carry adder, D latch and D flip flop.

**TOTAL = 45 PERIODS**

**TEXT BOOKS:**

1. Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education, 2005
2. Uyemura J.P: Introduction to VLSI circuits and systems, Wiley 2002.

**REFERENCES:**

1. D.A Pucknell & K.Eshraghian Basic VLSI Design, Third edition, PHI, 2003
2. Wayne Wolf, Modern VLSI design, Pearson Education, 2003
3. M.J.S.Smith: Application specific integrated circuits, Pearson Education, 1997
4. J.Bhasker: Verilog HDL primer, BS publication,2001
5. Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India, 2003

1. PC to PC Communication
2. Parallel Communication using 8 bit parallel cable
3. Serial communication using RS 232C
4. Ethernet LAN protocol
5. To create scenario and study the performance of CSMA/CD protocol through simulation
6. Token bus and token ring protocols
7. To create scenario and study the performance of token bus and token ring protocols through simulation
8. Wireless LAN protocols
9. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
3. Implementation and study of stop and wait protocol
4. Implementation and study of Goback-N and selective repeat protocols
5. Implementation of distance vector routing algorithm
6. Implementation of Link state routing algorithm
10. Implementation of Data encryption and decryption
11. Transfer of files from PC to PC using Windows / Unix socket processing

1. Design Entry and simulation of combinational logic circuits (8 bit adders, 4 bit multipliers, address decoders, multiplexers), Test bench creation, functional verification, and concepts of concurrent and sequential execution to be highlighted.
2. Design Entry and simulation of sequential logic circuits (counters, PRBS generators, accumulators). Test bench creation, functional verification, and concepts of concurrent and sequential execution to be highlighted.
3. Synthesis, P&R and Post P&R simulation for all the blocks/codes developed in Expt. No. 1 and No. 2 given above. Concepts of FPGA floor plan, critical path, design gate count, I/O configuration and pin assignment to be taught in this experiment.
4. Generation of configuration/fuse files for all the blocks/codes developed as part of Expt.1. and Expt. 2. FPGA devices must be configured and hardware tested for the blocks/codes developed as part of Expt. 1. and Expt. 2. The correctness of the inputs and outputs for each of the blocks must be demonstrated atleast on oscilloscopes (logic analyzer preferred).
5. Schematic Entry and SPICE simulation of MOS differential amplifier. Determination of gain, bandwidth, output impedance and CMRR.
6. Layout of a simple CMOS inverter, parasitic extraction and simulation.
7. Design of a 10 bit number controlled oscillator using standard cell approach, simulation followed by study of synthesis reports.
8. Automatic layout generation followed by post layout extraction and simulation of the circuit studied in Expt. No.7

**Note 1.** For Expt. 1 To 4 can be carried out using Altera (Quartus) / Xilinx (Alliance) / ACTEL (Libero) tools.

**Note 2.** For expt. 5-8 introduce the student to basics of IC design. These have to be carried out using atleast 0.5u CMOS technology libraries. The S/W tools needed Cadence / MAGMA / Tanner.

**AIM**

To introduce the concepts of wireless / mobile communication using cellular environment. To make the students to know about the various modulation techniques, propagation methods, coding and multi access techniques used in the mobile communication. Various wireless network systems and standards are to be introduced.

**OBJECTIVES:**

- It deals with the fundamental cellular radio concepts such as frequency reuse and handoff. This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems.
- It presents different ways to radio propagation models and predict the large – scale effects of radio propagation in many operating environment. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measures and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multi-path channel.
- It provides idea about analog and digital modulation techniques used in wireless communication.
- It also deals with the different types of equalization techniques and diversity concepts.. It provides an introduction to speech coding principles which have driven the development of adaptive pulse code modulation and linear predictive coding techniques.
- It deals with advanced transceiver schemes and second generation and third generation wireless networks.

**UNIT I SERVICES AND TECHNICAL CHALLENGES 9**

Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access Schemes.

**UNIT II WIRELESS PROPAGATION CHANNELS 9**

Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models.

**UNIT III WIRELESS TRANSCEIVERS 9**

Structure of a wireless communication link, Modulation and demodulation – Quadrature Phase Shift Keying,  $\pi/4$ -Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels.

**UNIT IV SIGNAL PROCESSING IN WIRELESS SYSTEMS 9**

Principle of Diversity, Macrodiversity, Microdiversity, Signal Combining Techniques, Transmit diversity, Equalisers- Linear and Decision Feedback equalisers, Review of Channel coding and Speech coding techniques.

**UNIT V ADVANCED TRANSCEIVER SCHEMES 9**

Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, Orthogonal Frequency Division Multiplexing – Principle, Cyclic Prefix, Transceiver implementation, Second Generation(GSM, IS-95) and Third Generation Wireless Networks and Standards

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.
2. Simon Haykin & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.

**REFERENCES:**

1. Rappaport. T.S., "Wireless communications", Pearson Education, 2003.
2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd., 2001.
3. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.

**EC2402****OPTICAL COMMUNICATION AND NETWORKING****L T P C  
3 0 0 3****AIM**

- To introduce the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
- To study about various optical sources and optical detectors and their use in the optical communication system. Finally to discuss about digital transmission and its associated parameters on system performance.

**OBJECTIVES**

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
- To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

**UNIT I INTRODUCTION****9**

Introduction, Ray theory transmission- Total internal reflection-Acceptance angle – Numerical aperture – Skew rays – Electromagnetic mode theory of optical propagation – EM waves – modes in Planar guide – phase and group velocity – cylindrical fibers – SM fibers.

**UNIT II TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS****9**

Attenuation – Material absorption losses in silica glass fibers – Linear and Non linear Scattering losses - Fiber Bend losses – Midband and farband infra red transmission – Intra and inter Modal Dispersion – Over all Fiber Dispersion – Polarization- non linear Phenomena. Optical fiber connectors, Fiber alignment and Joint Losses – Fiber Splices – Fiber connectors – Expanded Beam Connectors – Fiber Couplers.

**UNIT III SOURCES AND DETECTORS 9**

Optical sources: Light Emitting Diodes - LED structures - surface and edge emitters, mono and hetero structures - internal - quantum efficiency, injection laser diode structures - comparison of LED and ILD

Optical Detectors: PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise -Noise sources , Signal to Noise ratio , Detector response time.

**UNIT IV FIBER OPTIC RECEIVER AND MEASUREMENTS 9**

Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration – Probability of Error – Quantum limit.

Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements.

**UNIT V OPTICAL NETWORKS 9**

Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks – Wavelength Routed Networks – Non linear effects on Network performance – Performance of WDM + EDFA system – Solitons – Optical CDMA – Ultra High Capacity Networks.

**TOTAL : 45 PERIODS**

**TEXT BOOKS**

1. Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition. 2007
2. Optical Fiber Communication – Gerd Keiser – Mc Graw Hill – Third Edition. 2000

**REFERENCES**

1. J.Gower, “Optical Communication System”, Prentice Hall of India, 2001
2. Rajiv Ramaswami, “Optical Networks “ , Second Edition, Elsevier , 2004.
3. Govind P. Agrawal, “ Fiber-optic communication systems”, third edition, John Wiley & sons, 2004.
4. R.P. Khare, “Fiber Optics and Optoelectronics”, Oxford University Press, 2007.

**EC2403 RF AND MICROWAVE ENGINEERING L T P C  
3 0 0 3**

**AIM:**

To enable the student to become familiar with active & passive microwave devices & components used in Microwave communication systems.

**OBJECTIVES:**

- To study about multi- port RF networks and RF transistor amplifiers
- To study passive microwave components and their S- Parameters.
- To study Microwave semiconductor devices & applications.
- To study Microwave sources and amplifiers.

**UNIT I TWO PORT RF NETWORKS-CIRCUIT REPRESENTATION 9**

Low frequency parameters-impedance ,admittance, hybrid and ABCD. High frequency parameters-Formulation of S parameters, properties of S parameters-Reciprocal and lossless networks, transmission matrix, Introduction to component basics, wire, resistor, capacitor and inductor, applications of RF

**UNIT II RFTRANSISTOR AMPLIFIER DESIGN AND MATCHING NETWORKS 9**

Amplifier power relation, stability considerations, gain considerations noise figure, impedance matching networks, frequency response, T and  $\Pi$  matching networks, microstripline matching networks

**UNIT III MICROWAVE PASSIVE COMPONENTS 9**

Microwave frequency range, significance of microwave frequency range - applications of microwaves. Scattering matrix -Concept of N port scattering matrix representation- Properties of S matrix- S matrix formulation of two-port junction. Microwave junctions - Tee junctions -Magic Tee - Rat race - Corners - bends and twists - Directional couplers - two hole directional couplers- Ferrites - important microwave properties and applications – Termination - Gyrator- Isolator-Circulator - Attenuator - Phase changer – S Matrix for microwave components – Cylindrical cavity resonators.

**UNIT IV MICROWAVE SEMICONDUCTOR DEVICES 9**

Microwave semiconductor devices- operation - characteristics and application of BJTs and FETs -Principles of tunnel diodes - Varactor and Step recovery diodes - Transferred Electron Devices -Gunn diode- Avalanche Transit time devices- IMPATT and TRAPATT devices. Parametric devices -Principles of operation - applications of parametric amplifier .Microwave monolithic integrated circuit (MMIC) - Materials and fabrication techniques

**UNIT V MICROWAVE TUBES AND MEASUREMENTS 9**

Microwave tubes- High frequency limitations - Principle of operation of Multicavity Klystron, Reflex Klystron, Traveling Wave Tube, Magnetron. Microwave measurements: Measurement of power, wavelength, impedance, SWR, attenuation, Q and Phase shift.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Samuel Y Liao, "Microwave Devices & Circuits" , Prentice Hall of India, 2006.
2. Reinhold.Ludwig and Pavel Bretshko 'RF Circuit Design", Pearson Education, Inc., 2006

**REFERENCES:**

1. Robert. E.Collin-Foundation of Microwave Engg –Mc Graw Hill.
2. Annapurna Das and Sisir K Das, "Microwave Engineering", Tata Mc Graw Hill Inc., 2004.
3. M.M.Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007.
4. Robert E.Colin, 2ed "Foundations for Microwave Engineering", McGraw Hill, 2001
5. D.M.Pozar, "Microwave Engineering.", John Wiley & sons, Inc., 2006.

**1. Design of a 4-20 mA transmitter for a bridge type transducer.**

Design the Instrumentation amplifier with the bridge type transducer (Thermistor or any resistance variation transducers) and convert the amplified voltage from the instrumentation amplifier to 4 – 20 mA current using op-amp. Plot the variation of the temperature Vs output current.

**2. Design of AC/DC voltage regulator using SCR**

Design a phase controlled voltage regulator using full wave rectifier and SCR, vary the conduction angle and plot the output voltage.

**3. Design of process control timer**

Design a sequential timer to switch on & off at least 3 relays in a particular sequence using timer IC.

**4. Design of AM / FM modulator / demodulator**

Design AM signal using multiplier IC for the given carrier frequency and modulation index and demodulate the AM signal using envelope detector. Design FM signal using VCO IC NE566 for the given carrier frequency and demodulate the same using PLL NE 565.

**5. Design of Wireless data modem.**

Design a FSK modulator using 555/XR 2206 and convert it to sine wave using filter and transmit the same using IR LED and demodulate the same PLL NE 565/XR 2212.

**6. PCB layout design using CAD**

Drawing the schematic of simple electronic circuit and design of PCB layout using CAD

**7. Microcontroller based systems design**

Design of microcontroller based system for simple applications like security systems combination lock.

**8. DSP based system design**

Design a DSP based system for echo cancellation, using TMS/ADSP DSP kit.

**9. Psuedo-random Sequence Generator****11. Arithmetic Logic Unit Design**

**Note:** Kits should not be used. Instead each experiment may be given as mini project.

**MICROWAVE EXPERIMENTS:**

1. Reflex Klystron – Mode characteristics
2. Gunn Diode – Characteristics
3. VSWR, Frequency and Wave Length Measurement
4. Directional Coupler – Directivity and Coupling Coefficient – S – parameter measurement
5. Isolator and Circulator – S - parameter measurement
6. Attenuation and Power measurement
7. S - matrix Characterization of E-Plane T, H-Plane T and Magic T.
8. Radiation Pattern of Antennas.
9. Antenna Gain Measurement

**OPTICAL EXPERIMENTS:**

1. DC characteristics of LED and PIN Photo Diode.
2. Mode Characteristics of Fibers
3. Measurement of Connector and Bending Losses.
4. Fiber Optic Analog and Digital Link
5. Numerical Aperture Determination for Fibers
6. Attenuation Measurement in Fibers

**AIM**

To make students to understand the applications of electronics in diagnostic and therapeutic area.

**OBJECTIVES**

- To study the methods of recording various biopotentials
- To study how to measure biochemical and various physiological information
- To understand the working of units which will help to restore normal functioning
- To understand the use of radiation for diagnostic and therapy
- To understand the need and technique of electrical safety in Hospitals

**UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9**

The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

<b>UNIT II</b>	<b>BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT</b>	<b>9</b>
PH, PO <sub>2</sub> , PCO <sub>2</sub> , PHCO <sub>3</sub> , Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.		
<b>UNIT III</b>	<b>ASSIST DEVICES AND BIO-TELEMETRY</b>	<b>9</b>
Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.		
<b>UNIT IV</b>	<b>RADIOLOGICAL EQUIPMENTS</b>	<b>9</b>
Ionising radiation, Diagnostic x-ray equipments, use of Radio Isotope in diagnosis, Radiation Therapy.		
<b>UNIT V</b>	<b>RECENT TRENDS IN MEDICAL INSTRUMENTATION</b>	<b>9</b>
Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Electrical safety in medical equipment.		

**TOTAL : 45 PERIODS**

**TEXT BOOK**

1. Leslie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2007.

**REFERENCES**

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2003.
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical equipment Technology", John Wiley and Sons, New York, 2004.

<b>EC2022</b>	<b>OPERATING SYSTEMS</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**AIM**

To have a through knowledge of the scheduling, memory management, I/O and File System in a Operating system. To have an introduction to distributed operating system.

**OBJECTIVES**

- To have an overview of components of an operating systems
- To have a thorough knowledge of Process management, Storage management, I/O and File Management.
- To have an understanding of a distributed operating systems.

<b>UNIT I</b>	<b>OPERATING SYSTEM OVERVIEW</b>	<b>9</b>
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Introduction – Multiprogramming – Time sharing – Multi-user Operating systems – System Call – Structure of Operating Systems

<b>UNIT II</b>	<b>PROCESS MANAGEMENT</b>	<b>9</b>
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Concept of Processes – Interprocess Communication – Racing – Synchronizations – Mutual Exclusion – Scheduling – Implementation Issues – IPC in Multiprocessor System – Threads

<b>UNIT III</b>	<b>MEMORY MANAGEMENT</b>	<b>9</b>
Partition – paging – segmentation – virtual memory concepts – relocation algorithms – buddy systems – Free space management – Case study.		
<b>UNIT IV</b>	<b>DEVICE MANAGEMENT AND FILE SYSTEMS</b>	<b>9</b>
File concept – access methods – directory structure – File system mounting – file sharing – protection – file system implementation – I/O Hardware – Application I/O Interface – Kernel I/O subsystem – Transforming I/O to Hardware Operations – Streams – Disk Structure – Disk Scheduling Management – RAID structure		
<b>UNIT V</b>	<b>MODERN OPERATING SYSTEMS</b>	<b>9</b>
Concepts of distributed operating systems – Real time operating system – Case studies: UNIX, LINUX and Windows 2000.		

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Abraham Silberschatz, Peter Galvin and Gagne, 'Operating System Concepts', Seventh Edition, John Wiley, 2007.
2. William Stallings, 'Operating Systems – Internals and Design Principles', Fifth Edition, Prentice Hall India, 2005.

**REFERENCES:**

1. Andrew Tanenbaum, 'Modern Operating Systems', 2<sup>nd</sup> Edition, Prentice Hall, 2003.
2. Deital.H.M, "Operating Systems - A Modern Perspective", Second Edition, Addison Wesley, 2004.
3. Mukesh Singhal, Niranjana G.Shivaratri, "Advanced Concepts in Operating Systems", Tata McGraw Hill, 2001.
4. D.M.Dhamdhere, "Operating Systems – A Concept based Approach", Second Edition, Tata McGraw Hill, 2006.
5. Crowley.C, "Operating Systems: A Design – Oriented Approach", Tata McGraw Hill, 1999.
6. Ellen Siever, Aaron Weber, Stephen Figgins, 'LINUX in a Nutshell', Fourth Edition, O'reilly, 2004.

<b>EC2023</b>	<b>SOLID STATE ELECTRONIC DEVICES</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**AIM:**

To have fundamental knowledge about structure and V-I characteristics of PN Junction diode, Zener diode, MOSFET, BJT, Opto electronic devices, high frequency devices and high power devices.

**OBJECTIVES:**

- To learn crystal structures of elements used for fabrication of semiconductor devices.
- To study energy band structure of semiconductor devices.
- To understand fermi levels, movement of charge carriers, Diffusion current and Drift current.
- To study behavior of semiconductor junction under different biasing conditions. Fabrication of different semiconductor devices, Varactor diode, Zener diode, Schottky diode, BJT, MOSFET, etc.

- To study VI Characteristics of devices and its limitations in factors like current, power frequency.
- To learn photoelectric effect and fabrication of opto electronic devices.
- To learn high frequency and high power devices.

### **UNIT I CRYSTAL PROPERTIES AND GROWTH OF SEMICONDUCTORS 9**

Semiconductor materials - Periodic Structures - Crystal Lattices - Cubic lattices - Planes and Directions - Diamond lattice - Bulk Crystal Growth - Starting Materials - Growth of Single Crystal Ingots - Wafers - Doping - Epitaxial Growth - Lattice Matching in Epitaxial Growth - Vapor - Phase Epitaxy - Atoms and Electrons - Introduction to Physical Models - Experimental Observations - Photoelectric Effect - Atomic spectra - Bohr model - Quantum Mechanics - Probability and Uncertainty Principle - Schrodinger Wave Equation - Potential Well Equation - Potential well Problem - Tunneling.

### **UNIT II ENERGY BANDS AND CHARGE CARRIERS IN SEMICONDUCTORS AND JUNCTIONS 9**

Energy bands in Solids, Energy Bands in Metals, Semiconductors, and Insulators - Direct and Indirect Semiconductors - Variation of Energy Bands with Alloy Composition - Charge Carriers in Semiconductors - Electrons and Holes - Electrons and Holes in Quantum Wells - Carrier Concentrations - Fermi Level - Electron and Hole Concentrations at Equilibrium - Temperature Dependence of Carrier Concentrations - Compensation and Space Charge Neutrality - Drift of Carrier in Electric and Magnetic Fields conductivity and Mobility - Drift and Resistance - Effects of Temperature and Doping on Mobility - High field effects - Hall Effect - invariance of Fermi level at equilibrium - Fabrication of p-n junctions, Metal semiconductor junctions.

### **UNIT III METAL OXIDE SEMICONDUCTOR FET 9**

GaAs MESFET - High Electron Mobility Transistor - Short channel Effects - Metal Insulator Semiconductor FET - Basic Operation and Fabrication - Effects of Real Surfaces - Threshold Voltage - MOS capacitance Measurements - current - Voltage Characteristics of MOS Gate Oxides - MOS Field Effect Transistor - Output characteristics - Transfer characteristics - Short channel MOSFET V-I characteristics - Control of Threshold Voltage - Substrate Bias Effects - Sub threshold characteristics - Equivalent Circuit for MOSFET - MOSFET Scaling and Hot Electron Effects - Drain - Induced Barrier Lowering - short channel and Narrow Width Effect - Gate Induced Drain Leakage.

### **UNIT IV OPTOELECTRONIC DEVICES 9**

Photodiodes - Current and Voltage in illuminated Junction - Solar Cells - Photo detectors - Noise and Bandwidth of Photo detectors - Light Emitting Diodes - Light Emitting Materials - Fiber Optic Communications Multilayer Heterojunctions for LEDs - Lasers - Semiconductor lasers - Population Inversion at a Junction Emission Spectra for p-n junction - Basic Semiconductor lasers - Materials for Semiconductor lasers.

### **UNIT V HIGH FREQUENCY AND HIGH POWER DEVICES 9**

Tunnel Diodes, IMPATT Diode, operation of TRAPATT and BARITT Diodes, Gunn Diode - transferred - electron mechanism, formation and drift of space charge domains, p-n-p-n Diode, Semiconductor Controlled Rectifier, Insulated Gate Bipolar Transistor.

**TOTAL : 45 PERIODS**

#### **TEXT BOOK**

1. Ben. G. Streetman & Sanjan Banerjee, Solid State Electronic Devices, 5<sup>th</sup> Edition, PHI, 2003.

## REFERENCES

1. Donald A. Neaman, Semiconductor Physics and Devices, 3<sup>rd</sup> Edition, TMH, 2002.
2. Yannis Tsvividis, Operation & Mode line of MOS Transistor, 2<sup>nd</sup> Edition, Oxford University Press, 1999.
3. Nandita Das Gupta & Aamitava Das Gupta, Semiconductor Devices Modeling a Technology, PHI, 2004.
3. D.K. Bhattacharya & Rajinish Sharma, Solid State Electronic Devices, Oxford University Press, 2007.

IT 2064

SPEECH PROCESSING

L T P C  
3 0 0 3

## AIM

To introduce the characteristics of Speech signals and the related time and frequency domain methods for speech analysis and speech compression

## OBJECTIVES

- To introduce the models for speech production
- To develop time and frequency domain techniques for estimating speech parameters
- To introduce a predictive technique for speech compression
- To understand speech recognition, synthesis and speaker identification.

## UNIT I MECHANICS OF SPEECH 9

Speech production: Mechanism of speech production, Acoustic phonetics - Digital models for speech signals - Representations of speech waveform: Sampling speech signals, basics of quantization, delta modulation, and Differential PCM - Auditory perception: psycho acoustics.

## UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

Time domain parameters of Speech signal – Methods for extracting the parameters Energy, Average Magnitude, Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function.

## UNIT III FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING 9

Short Time Fourier analysis: Fourier transform and linear filtering interpretations, Sampling rates - Spectrographic displays - Pitch and formant extraction - Analysis by Synthesis - Analysis synthesis systems: Phase vocoder, Channel Vocoder - Homomorphic speech analysis: Cepstral analysis of Speech, Formant and Pitch Estimation, Homomorphic Vocoders.

## UNIT IV LINEAR PREDICTIVE ANALYSIS OF SPEECH 9

Basic Principles of linear predictive analysis – Auto correlation method – Covariance method – Solution of LPC equations – Cholesky method – Durbin's Recursive algorithm, – Application of LPC parameters – Pitch detection using LPC parameters – Formant analysis – VELP – CELP.

**UNIT V APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING 9**

Algorithms: Dynamic time warping, K-means clustering and Vector quantization, Gaussian mixture modeling, hidden Markov modeling - Automatic Speech Recognition: Feature Extraction for ASR, Deterministic sequence recognition, Statistical Sequence recognition, Language models - Speaker identification and verification – Voice response system – Speech synthesis: basics of articulatory, source-filter, and concatenative synthesis – VOIP

**TOTAL : 45 PERIODS****TEXT BOOK:**

1. Thomas F, Quatieri, Discrete-Time Speech Signal Processing, Prentice Hall / Pearson Education, 2004.

**REFERENCES:**

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc., Singapore, 2004
2. L.R.Rabiner and R.W.Schaffer – Digital Processing of Speech signals – Prentice Hall 1979
3. L.R. Rabiner and B. H. Juang, Fundamentals of Speech Recognition, Prentice Hall, 1993.
4. J.R. Deller, J.H.L. Hansen and J.G. Proakis, Discrete Time Processing of Speech Signals, John Wiley, IEEE Press, 1999.

**MA2264****NUMERICAL METHODS****L T P C****3 1 0 4****AIM:**

With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

**OBJECTIVES:**

At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

- I. The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.
- II. When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
- III. The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- IV. Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

**UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9**  
Solution of equation –Fixed point iteration:  $x=g(x)$  method - Newton’s method – Solution of linear system by Gaussian elimination and Gauss-Jordon method– Iterative method - Gauss-Seidel method - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

**UNIT II INTERPOLATION AND APPROXIMATION 9**  
Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton’s forward and backward difference formulas.

**UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9**  
Differentiation using interpolation formulae –Numerical integration by trapezoidal and Simpson’s 1/3 and 3/8 rules – Romberg’s method – Two and Three point Gaussian quadrature formulae – Double integrals using trapezoidal and Simpsons’s rules.

**UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9**  
Single step methods: Taylor series method – Euler method for first order equation – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne’s and Adam’s predictor and corrector methods.

**UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9**  
Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

**L = 45 T = 15 TOTAL = 60 PERIODS**

**TEXT BOOKS**

1. Veerarjan, T and Ramachandran, T. ‘Numerical methods with programming in ‘C’ Second Edition, Tata McGraw-Hill Publishing.Co.Ltd. (2007).
2. Sankara Rao K, ‘Numerical Methods for Scientists and Engineers’ – 3<sup>rd</sup> edition Printice Hall of India Private Ltd, New Delhi, (2007).

**REFERENCES**

1. Chapra, S. C and Canale, R. P. “Numerical Methods for Engineers”, 5<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P.O., “Applied Numerical Analysis”, 6<sup>th</sup> Edition, Pearson Education Asia, New Delhi, 2006.
3. Grewal, B.S. and Grewal,J.S., “ Numerical methods in Engineering and Science”, 6<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2004

**UNIT I INTRODUCTION TO MULTIPROCESSORS  
AND SCALABILITY ISSUES 9**

Scalable design principles – Principles of processor design – Instruction Level Parallelism, Thread level parallelism. Parallel computer models – Symmetric and distributed shared memory architectures – Performance Issues – Multi-core Architectures - Software and hardware multithreading – SMT and CMP architectures – Design issues – Case studies – Intel Multi-core architecture – SUN CMP architecture.

**UNIT II PARALLEL PROGRAMMING 9**

Fundamental concepts – Designing for threads – scheduling - Threading and parallel programming constructs – Synchronization – Critical sections – Deadlock. Threading APIs.

**UNIT III OPENMP PROGRAMMING 9**

OpenMP – Threading a loop – Thread overheads – Performance issues – Library functions. Solutions to parallel programming problems – Data races, deadlocks and livelocks – Non-blocking algorithms – Memory and cache related issues.

**UNIT IV MPI PROGRAMMING 9**

MPI Model – collective communication – data decomposition – communicators and topologies – point-to-point communication – MPI Library.

**UNIT V MULTITHREADED APPLICATION DEVELOPMENT 9**

Algorithms, program development and performance tuning.

**TOTAL : 45 PERIODS****TEXT BOOKS**

1. Shameem Akhter and Jason Roberts, “Multi-core Programming”, Intel Press, 2006.
2. Michael J Quinn, Parallel programming in C with MPI and OpenMP, Tata Mcgraw Hill, 2003.

**REFERENCES**

1. John L. Hennessey and David A. Patterson, “ Computer architecture – A quantitative approach”, Morgan Kaufmann/Elsevier Publishers, 4<sup>th</sup>. edition, 2007.
2. David E. Culler, Jaswinder Pal Singh, “Parallel computing architecture : A hardware/ software approach” , Morgan Kaufmann/Elsevier Publishers, 1999.

**AIM**

To learn the architecture and programming of advanced microprocessors.

**OBJECTIVES**

- To introduce the concepts of advanced microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of Pentium family of processors.
- To introduce the architecture programming and interfacing of advanced microprocessors.
- To introduce the concepts and architecture of RISC processor.

**UNIT I 80186, 80286, 80386 AND 80486 MICROPROCESSORS 9**  
80186 Architecture, Enhancements of 80186 – 80286 Architecture – Real and Virtual Addressing Modes – 80386 Architecture – Special Registers – Memory Management – Memory Paging Mechanism – 80486 Architecture – Enhancements – Cache Memory Techniques – Exception Handling – Comparison of Microprocessors (8086 – 80186 – 80286 – 80386 – 80486).

**UNIT II PENTIUM MICROPROCESSORS 9**  
Pentium Microprocessor Architecture – Special Pentium Registers – Pentium Memory Management – New Pentium Instructions – Pentium Pro Microprocessor Architecture – Special features – Pentium II Microprocessor Architecture – Pentium III Microprocessor Architecture – Pentium III Architecture – Pentium IV Architecture – Comparison of Pentium Processors.

**UNIT III RISC PROCESSORS I 9**  
PowerPC620 – Instruction fetching – Branch Prediction – Fetching – Speculation, Instruction dispatching – dispatch stalls – Instruction Execution – Issue stalls- Execution Parallelism – Instruction completion – Basics of P6 micro architecture – Pipelining – out-of-order core pipeline – Memory subsystem.

**UNIT IV RISC PROCESSORS II(SUPERSCALAR PROCESSORS) 9**  
Intel i960 – Intel IA32- MIPS R8000 – MIPS R10000 – Motorola 88110 – Ultra SPARC processor- SPARC version 8 – SPARC version 9.

**UNIT V PC HARDWARE OVERVIEW 9**  
Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4 Bus Interface- ISA- EISA- VESA- PCI- PCIX. Peripheral Interfaces and Controller, Memory and I/O Port Addresses.

**TOTAL : 45 PERIODS**

**TEXT BOOKS**

1. B.B.Brey The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 80486 PENTIUM, PENTIUM Pro, PII, PIII & IV Archietecture, Programming & Interfacing, Pearson Education , 2004.
2. John Paul Shen, Mikko H.Lipasti, “Modern Processor Design”, Tata Mcgraw Hill, 2006.

**REFERENCES:**

1. Douglas V.Hall, "Microprocessors and Interfacing", Tata McGraw Hill, II Edition 2006
2. Mohamed Rafiquzzaman, "Microprocessors and Microcomputer Based System Design", II Edition, CRC Press, 2007.

**EC2028****INTERNET AND JAVA****L T P C  
3 0 0 3****AIM**

To learn the basics of Internetworking, Routing, World Wide Web, Java Programming with simple case studies.

**OBJECTIVES:**

- To learn Internetworking with TCP/IP.
- To learn routing for high speed multimedia traffic
- To learn the fundamentals in WWW, HTML and XML.
- To learn Java for Networking application
- To understand the basic concepts in E-com, Network operating system and Web design.

**UNIT I INTERNETWORKING WITH TCP / IP 9**

Review of network technologies, Internet addressing, Address resolution protocols (ARP / RARP), Routing IP datagrams, Reliable stream transport service (TCP) TCP / IP over ATM networks, Internet applications - E-mail, Telnet, FTP, NFS, Internet traffic management.

**UNIT II INTERNET ROUTING 9**

Concepts of graph theory, Routing protocols, Distance vector protocols (RIP), Link state protocol (OSPP), Path vector protocols (BGP and IDRP), Routing for high speed multimedia traffic, Multicasting, Resource reservation (RSVP), IP switching.

**UNIT III WORLD WIDE WEB 9**

HTTP protocol, Web browsers netscape, Internet explorer, Web site and Web page design, HTML, Dynamic HTML, CGI, Java script.

**UNIT IV INTRODUCTION TO JAVA 9**

The java programming environment, Fundamental Programming structures, Objects and Classes, Inheritance, Event handling, Exceptions and Debugging, Multithreading , RMI.

**UNIT V JAVA PROGRAMMING 9**

Networking with Java, Swing: Applets and Applications, Menu's & Tool Bars, Java and XML – Creating packages, Interfaces, JAR files & Annotations, Javabeans, JDBC.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Douglas E.Comer, "Internetworking with TCP/IP", Vol. I: 5<sup>th</sup> edition, Pearson Education, 2007 (Unit – I &II)
2. Robert W.Sebesta, "Programming the worldwide web", 3/e, Pearson Education. (Unit-III), 2007.
3. Steven Holzner et. al, "Java 2 Programming" , Black Book, Dreamtech Press, 2006. (Unit –IV & V)

**REFERENCES:**

1. Cay S.Hortsmann, Gary Cornwell, "Core Java 2", Vol I, Pearson Education, 7/e, 2005.
2. W. Richard Stevens, " TCP/IP Illustrated, The Protocol" , Vol I , Pearson Education, 1<sup>st</sup> Edition, 2006.
3. Behrouz A. Farouzon , "TCP/IP Protocol Suite, 3<sup>rd</sup> edition , Tata McGraw Hill, 2007
4. Chris Bates, " Web Programming Building Internet Applications", Wiley Publications.
5. Kogent Solutions Inc., " Java Server Programming", Black Book, Dreamtech Press, 2007 Platinum edition.

**EC2029****DIGITAL IMAGE PROCESSING****L T P C  
3 0 0 3****AIM**

To introduce the student to various image processing techniques.

**OBJECTIVES**

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To study the image segmentation and representation techniques.

**UNIT I DIGITAL IMAGE FUNDAMENTALS****9**

Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

**UNIT II IMAGE ENHANCEMENT****9**

Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

**UNIT III IMAGE RESTORATION****9**

Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

**UNIT IV IMAGE SEGMENTATION 9**  
 Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

**UNIT V IMAGE COMPRESSION 9**  
 Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

**TOTAL : 45 PERIODS**

**TEXTBOOK**

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson 2002.

**REFERENCES**

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. D.E. Dudgeon and RM. Mersereau, , Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, , Digital Image Processing' , John Wiley, New York, 2002
5. Milan Sonka et al, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,

**EC2030 ADVANCED DIGITAL SIGNAL PROCESSING L T P C**  
**3 0 0 3**

**AIM**

To introduce the student to advanced digital signal processing techniques.

**OBJECTIVES**

- To study the parametric methods for power spectrum estimation.
- To study adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- To introduce the student to wavelet transforms.

**UNIT I DISCRETE RANDOM PROCESS 9**  
 Discrete random process – Ensemble averages, Stationary and ergodic processes, Autocorrelation and Autocovariance properties and matrices, White noise, Power Spectral Density, Spectral Factorization, Innovations Representation and Process, Filtering random processes, ARMA, AR and MA processes.

**UNIT II SPECTRAL ESTIMATION 9**  
 Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion.

<b>UNIT III</b>	<b>LINEAR ESTIMATION AND PREDICTION</b>	<b>9</b>
Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters, Discrete Kalman filter.		
<b>UNIT IV</b>	<b>ADAPTIVE FILTERS</b>	<b>9</b>
Principles of adaptive filter – FIR adaptive filter – Newton’s Steepest descent algorithm – Derivation of first order adaptive filter – LMS adaptation algorithms – Adaptive noise cancellation, Adaptive equalizer, Adaptive echo cancellors.		
<b>UNIT V</b>	<b>ADVANCED TRANSFORM TECHNIQUES</b>	<b>9</b>
2-D Discrete Fourier transform and properties– Applications to image smoothing and sharpening – Continuous and Discrete wavelet transforms – Multiresolution Analysis – Application to signal compression.		

**TOTAL : 45 PERIODS**

**TEXT BOOKS**

1. Monson H Hayes, "Statistical Digital Signal processing and Modeling", Wiley Student Edition, John Wiley and Sons, 2004.
2. R.C. Gonzalez and R.E. Woods, "Digital Image Processing", Pearson, Second Edition, 2004.

**REFERENCES**

1. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2007.
2. Sophocles J. Orfanidis, Optimum Signal Processing, An Introduction, McGraw Hill, 1990.

**EC2031 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY**      **L T P C**  
**3 0 0 3**

**AIM**

To understand different electromagnetic Interference problems occurring in Intersystem and in inter system and their possible mitigation techniques in Electronic design

**OBJECTIVES**

- To understand EMI Sources, EMI problems and their solution methods in PCB level / Subsystem and system level design.
- To measure the emission. immunity level from different systems to couple with the prescribed EMC standards

**UNIT I BASIC CONCEPTS**      **9**  
 Definition of EMI and EMC with examples, Classification of EMI/EMC - CE, RE, CS, RS, Units of Parameters, Sources of EMI, EMI coupling modes - CM and DM, ESD Phenomena and effects, Transient phenomena and suppression.

**UNIT II EMI MEASUREMENTS**      **9**  
 Basic principles of RE, CE, RS and CS measurements, EMI measuring instruments- Antennas, LISN, Feed through capacitor, current probe, EMC analyzer and detection technique open area site, shielded anechoic chamber, TEM cell.



**UNIT III TCP AND ATM CONGESTION CONTROL 11**

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

**UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES 8**

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

**UNIT V PROTOCOLS FOR QOS SUPPORT 9**

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

**TOTAL : 45 PERIODS**

**TEXT BOOK**

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002.

**REFERENCES**

1. Warland, Pravin Varaiya, "High performance communication networks", Second Edition, Jean Harcourt Asia Pvt. Ltd., , 2001.
2. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.
3. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004.

**EC2033**

**POWER ELECTRONICS**

**L T P C  
3 0 0 3**

**AIM**

Application of Electronic knowledge in industry for rectification of polyphase supply voltage and for control of motor speed and for thermal heating.

**OBJECTIVES**

- To study about power electronic circuits for voltage and current control and protection.
- To learn the switching characteristics of transistors and SCRs. Series and parallel functions of SCRs, Programmable triggering methods of SCR.
- To learn controlled rectification AC supplies.
- To study of converters and inverters.
- To learn about motor control, charges, SMPS and UPS.

**UNIT I POWER ELECTRONICS DEVICES 9**

Characteristics of power devices – characteristics of SCR, diac, triac, SCS, GTO, PUJT – power transistors – power FETs – LASCR – two transistor model of SCR – Protection of thyristors against over voltage – over current, dv/dt and di/dt.

<b>UNIT II</b>	<b>TRIGGERING TECHNIQUES</b>	<b>9</b>
Turn on circuits for SCR – triggering with single pulse and train of pulses – synchronizing with supply – triggering with microprocessor – forced commutation – different techniques – series and parallel operations of SCRs.		
<b>UNIT III</b>	<b>CONTROLLED RECTIFIERS</b>	<b>9</b>
Converters – single phase – three phase – half controlled and fully controlled rectifiers – Waveforms of load voltage and line current under constant load current – effect of transformer leakage inductance – dual converter.		
<b>UNIT IV</b>	<b>INVERTERS</b>	<b>9</b>
Voltage and current source inverters, resonant, Series inverter, PWM inverter. AC and DC choppers – DC to DC converters – Buck, boost and buck – boost.		
<b>UNIT V</b>	<b>INDUSTRIAL APPLICATIONS</b>	<b>9</b>
DC motor drives – Induction and synchronous motor drives – switched reluctance and brushless motor drives – Battery charger – SMPS – UPS – induction and dielectric heating.		

**TOTAL : 45 PERIODS**

**TEXT BOOKS**

1. Muhamed H.Rashid : Power Electronics Circuits, Devices and Applications, 3<sup>rd</sup> Edition. 2004 PHI.
2. M.D. Singh and K.B. Kanchandani, Power Electronics, 2<sup>nd</sup> Edition, TMH, 2007.

**REFERENCES**

1. Sen: Power Electronics, TMH, 1987.
2. Dubey: Thyristorised Power Controllers, Wiley Eastern 1986.
3. Vithayathil: Power Electronics – Principles and Applications, McGraw-Hill, 1995.
4. Lander: Power Electronics, 3<sup>rd</sup> Edition, McGraw-Hill, 1994.
5. Jacob, Power Electronics, Thomson Learning, 2002.
6. V.R. Moorthy, Power Electronics, Oxford University Press, 2005.

<b>EC2034</b>	<b>TELEVISION AND VIDEO ENGINEERING</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**AIM**

Television Technology has now become a vital tool to the information revolution that is sweeping across the countries of the world. The syllabus aims at a comprehensive coverage of Television Systems with all the new developments in Television Engineering

**OBJECTIVES**

- To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes
- To study the principles of Monochrome Television Transmitter and Receiver systems.
- To study the various Color Television systems with a greater emphasis on PAL system.
- To study the advanced topics in Television systems and Video Engineering



**UNIT I INTRODUCTION TO NANOTECHNOLOGY 9**

Background to nanotechnology: Types of nanotechnology and nanomachines – periodic table – atomic structure – molecules and phases – energy – molecular and atomic size – surface and dimensional space – top down and bottom up; Molecular Nanotechnology: Electron microscope – scanning electron microscope – atomic force microscope – scanning tunnelling microscope – nanomanipulator – nanotweezers – atom manipulation – nanodots – self assembly – dip pen nanolithography. Nanomaterials: preparation – plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling – applications of nanomaterials;

**UNIT II FUNDAMENTALS OF NANOELECTRONICS 9**

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation:- power dissipation limit – dissipation in reversible computation – the ultimate computer.

**UNIT III SILICON MOSFETs & QUANTUM TRANSPORT DEVICES 9**

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts.

Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

**UNIT IV CARBON NANOTUBES 9**

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic properties – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of an all carbon nanotube nanoelectronics.

**UNIT V MOLECULAR ELECTRONICS 9**

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices.

**TOTAL: 45 PERIODS****TEXTBOOKS**

1. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard
2. Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002
3. T. Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2007
4. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003

**UNIT I FUZZY SET THEORY 10**

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

**UNIT II OPTIMIZATION 8**

Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

**UNIT III ARTIFICIAL INTELLIGENCE 10**

Introduction, Knowledge Representation – Reasoning, Issues and Acquisition: Propositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning Under Uncertainty Basic knowledge Representation Issues Knowledge acquisition – Heuristic Search: Techniques for Heuristic search Heuristic Classification - State Space Search: Strategies Implementation of Graph Search Search based on Recursion Patent-directed Search Production System and Learning.

**UNIT IV NEURO FUZZY MODELING 9**

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

**UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE 8**

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

**TOTAL: 45 PERIODS****TEXT BOOKS**

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.

**REFERENCES**

1. Elaine Rich & Kevin Knight, Artificial Intelligence, Second Edition, Tata Mcgraw Hill Publishing Comp., 2006, New Delhi.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
5. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.
6. Amit Konar, "Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain", CRC Press, 2008.

**UNIT I INTRODUCTION 9**

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

**UNIT II TQM PRINCIPLES 9**

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

**UNIT III TQM TOOLS & TECHNIQUES I 9**

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

**UNIT IV TQM TOOLS & TECHNIQUES II 9**

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

**UNIT V QUALITY SYSTEMS 9**

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

**TOTAL : 45 PERIODS****TEXT BOOK**

1. Dale H.Besterfield, et al., “Total Quality Management”, Pearson Education Asia, 3<sup>rd</sup> Edition, Indian Reprint (2006).

**REFERENCES**

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 6<sup>th</sup> Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S., “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3<sup>rd</sup> Edition, 2003.
3. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman, B and Gopal, R.K, “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd., 2006.

**AIM:**

To understand the principles of encryption algorithms; conventional and public key cryptography. To have a detailed knowledge about authentication, hash functions and application level security mechanisms.

**OBJECTIVES:**

- To know the methods of conventional encryption.
- To understand the concepts of public key encryption and number theory
- To understand authentication and Hash functions.
- To know the network security tools and applications.
- To understand the system level security used.

**UNIT I INTRODUCTION****10**

OSI Security Architecture - Classical Encryption techniques – Cipher Principles – Data Encryption Standard – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES – Placement of Encryption Function – Traffic Confidentiality

**UNIT II PUBLIC KEY CRYPTOGRAPHY****10**

Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography - Introduction to Number Theory – Confidentiality using Symmetric Encryption – Public Key Cryptography and RSA.

**UNIT III AUTHENTICATION AND HASH FUNCTION****9**

Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols – Digital Signature Standard

**UNIT IV NETWORK SECURITY****8**

Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME - IP Security – Web Security.

**UNIT V SYSTEM LEVEL SECURITY****8**

Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

**TOTAL : 45 PERIODS****TEXT BOOKS**

1. William Stallings, "Cryptography And Network Security – Principles and Practices", Pearson Education, Third Edition, 2003.
2. Behrouz A. Foruzan, "Cryptography and Network Security", Tata McGraw-Hill, 2007



**TEXT BOOK:**

1. Elements of Information theory – Thomas Cover, Joy Thomas : Wiley 1999

**REFERENCE:**

1. Information theory, inference & learning algorithms – David Mackay year?

**EC2037      MULTIMEDIA COMPRESSION AND COMMUNICATION      L T P C**  
**3 0 0 3**

**AIM**

To introduce the fundamental concepts of information theory.

**OBJECTIVES**

- To have a complete understanding of error–control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.

**UNIT I      MULTIMEDIA COMPONENTS      9**

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

**UNIT II      AUDIO AND VIDEO COMPRESSION      9**

Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, 4.

**UNIT III      TEXT AND IMAGE COMPRESSION      9**

Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding –source encoding -text compression –static Huffman coding dynamic coding –arithmetic coding –Lempel ziv-welsh Compression-image compression

**UNIT IV      VOIP TECHNOLOGY      9**

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods- VOIP applicability

**UNIT V      MULTIMEDIA NETWORKING      9**

Multimedia networking -Applications-streamed stored and audio-making the best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

**TEXT BOOKS:**

1. Fred HAlshall “Multimedia communication - applications, networks, protocols and standards”, Pearson education, 2007.
2. Tay Vaughan, “Multideai: making it work”, 7/e, TMH 2007
3. Kurose and W.Ross” Computer Networking “a Top down approach, Pearson education.

## REFERENCES:

1. Marcus goncalves "Voice over IP Networks", Mcgaraw hill
2. KR. Rao,Z S Bojkovic, D A Milovanovic, "Multimedia Communication Systems: Techniques, Standards, and Networks", Pearson Education 2007
3. R. Steimnetz, K. Nahrstedt, "Multimedia Computing, Communications and Applications", Pearson Education
4. Ranjan Parekh, "Principles of Multimedia", TMH 2006

**EC2038**

**NANO ELECTRONICS**

**L T P C**

**3 0 0 3**

### **UNIT I INTRODUCTION TO NANOTECHNOLOGY 9**

Background to nanotechnology: Types of nanotechnology and nanomachines – periodic table – atomic structure – molecules and phases – energy – molecular and atomic size – surface and dimensional space – top down and bottom up; Molecular Nanotechnology: Electron microscope – scanning electron microscope – atomic force microscope – scanning tunnelling microscope – nanomanipulator – nanotweezers – atom manipulation – nanodots – self assembly – dip pen nanolithography. Nanomaterials: preparation – plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling – applications of nanomaterials;

### **UNIT II FUNDAMENTALS OF NANOELECTRONICS 9**

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation:- power dissipation limit – dissipation in reversible computation – the ultimate computer.

### **UNIT III SILICON MOSFETs & QUANTUM TRANSPORT DEVICES 9**

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts.

Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

### **UNIT IV CARBON NANOTUBES 9**

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic properties – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of an all carbon nanotube nanoelectronics.



**UNIT III DISTRIBUTED COMPUTING – MESSAGE PASSING AND RPC MODEL 9**

Message-passing model, General model, programming model, PVM, Remote procedure calls (RPC), Parameter passing, JAVA Remote Method Invocation, Distributed computing environment(DCE), Developing Applications in DCE.

**UNIT IV DEBUGGING PARALLEL PROGRAMS AND OTHER PARALLELISM PARADIGMS 9**

Debugging Techniques, Debugging Message passing parallel programs and shared memory parallel programs, Dataflow computing, systolic architectures, functional and logic paradigms, distributed shared memory.

**UNIT V DISTRIBUTED DATABASES AND DISTRIBUTED OPERATING SYSTEMS 9**

Reasons for and objectives of distributed databases, issues and systems, distribution options, concurrency control, DDBMS structure. Need for Distributed operating systems, network operating systems, distributed OS, Goals of DOS and Design issues.

**TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. M.Sasikumar, D.Shikhare and P. Ravi Prakash, "Introduction to Parallel processing".PHI 2006.
2. Rajaraman, C. Siva Ram Murthy, "Parallel computers: Architecture and programming", PHI 2006.

**REFERENCES**

1. Harry F. Jordan, Gita Alaghband, "Fundamentals of parallel processing", PHI 2006.
2. Quinn, M.J., "Designing Efficient Algorithms for Parallel Computers", McGraw-Hill, 1995.
3. Culler, D.E., "Parallel Computer Architecture", A Hardware – Software approach, Harcourt Asia Pte. Ltd., 1999

**EC2041**

**AVIONICS**

**L T P C  
3 0 0 3**

**UNIT I INTRODUCTION 9**

Introduction to aircraft – Axes system – Parts, importance and role of Avionics – systems which interface directly with pilot – Aircraft state sensor systems – Navigation systems – External world sensor systems – task automation systems. Avionics architecture evolution. Avionics Data buses - MIL STD 1553, ARINC 429, ARINC 629.

**UNIT II RADIO NAVIGATION 9**

Types of Radio Navigation – ADF, DME, VOR, LORAN, DECCA, OMEGA. ILS, MLS

**UNIT III INERTIAL AND SATELLITE NAVIGATION SYSTEMS 9**

Inertial sensors – Gyroscopes, Accelerometers, Inertial navigation systems – Block diagram, Platform and strap down INS. Satellite Navigation - GPS

**UNIT IV AIR DATA SYSTEMS AND AUTOPILOT 9**

Air data quantities – Altitude, Airspeed, Mach no., Vertical speed, Total Air temperature, Stall warning, Altitude warning. Autopilot – basic principles – longitudinal and lateral autopilot.

**UNIT V AIRCRAFT DISPLAYS 9**

Display technologies – LED, LCD, CRT, Flat Panel Display. Primary Flight parameter displays - Head Up Display, Helmet Mounted Display, Night vision goggles, Head Down Display, MFD, MFK, Virtual cockpit.

**TOTAL= 45 PERIODS**

**TEXT BOOKS**

1. Albert Helfrick. D, 'Principles of Avionics', Avionics communications Inc., 2004
2. Collinson, R.P.G, 'Introduction to Avionics', Chapman and Hall, 1996.

**REFERENCES**

1. Middleton, D.H, 'Avionics Systems', Longman Scientific and Technical, Longman Group UK Ltd, England, 1989.
2. Spitzer, C.R. 'Digital Avionics Systems', Prentice Hall, Englewood Cliffs, N.J., USA 1993.
3. Spitzer, C.R, 'The Avionics Handbook', CRC Press, 2000.
4. Pallet, E.H.J, 'Aircraft Instruments and Integrated Systems', Longman Scientific

**GE2071 INTELLECTUAL PROPERTY RIGHTS (IPR) LT PC  
3 0 0 3**

**UNIT I 5**

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).

**UNIT II 10**

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.

**UNIT III 10**

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

**UNIT IV 10**

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

**UNIT V 10**

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. Subbaram N.R. " Handbook of Indian Patent Law and Practice ", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.

**REFERENCES:**

1. Eli Whitney, United States Patent Number : 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707\_gibbs.html.

**GE2025                      PROFESSIONAL ETHICS IN ENGINEERING                      L T P C**  
**3 0 0 3**

**UNIT I                      ENGINEERING ETHICS                      9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

**UNIT II                      ENGINEERING AS SOCIAL EXPERIMENTATION                      9**

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

**UNIT III                      ENGINEER'S RESPONSIBILITY FOR SAFETY                      9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

**UNIT IV                      RESPONSIBILITIES AND RIGHTS                      9**

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

**UNIT V                      GLOBAL ISSUES                      9**

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

**TOTAL :45 PERIODS**

**TEXT BOOKS:**

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2000.

## REFERENCES:

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)

**EC2042**

**EMBEDDED AND REAL TIME SYSTEMS**

**L T P C**

**3 0 0 3**

## AIM

To give sufficient background for undertaking embedded and real time systems design.

## OBJECTIVES

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To explain programming concepts and embedded programming in C and C++.
- To explain real time operating systems and inter-task communication.

## **UNIT I INTRODUCTION TO EMBEDDED COMPUTING 9**

Complex systems and microprocessors – Design example: Model train controller – Embedded system design process – Formalism for system design – Instruction sets Preliminaries – ARM Processor – CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption.

## **UNIT II COMPUTING PLATFORM AND DESIGN ANALYSIS 9**

CPU buses – Memory devices – I/O devices – Component interfacing – Design with microprocessors – Development and Debugging – Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Analysis and optimization of execution time, power, energy, program size – Program validation and testing.

## **UNIT III PROCESS AND OPERATING SYSTEMS 9**

Multiple tasks and multi processes – Processes – Context Switching – Operating Systems –Scheduling policies - Multiprocessor – Inter Process Communication mechanisms – Evaluating operating system performance – Power optimization strategies for processes.

## **UNIT IV HARDWARE ACCELERATES & NETWORKS 9**

Accelerators – Accelerated system design – Distributed Embedded Architecture – Networks for Embedded Systems – Network based design – Internet enabled systems.

## **UNIT V CASE STUDY 9**

Hardware and software co-design - Data Compressor - Software Modem – Personal Digital Assistants – Set-Top-Box. – System-on-Silicon – FOSS Tools for embedded system development.

**TOTAL: 45 PERIODS**

**TEXT BOOK:**

1. Wayne Wolf, "Computers as Components - Principles of Embedded Computer System Design", Morgan Kaufmann Publisher, 2006.

**REFERENCES:**

1. David E-Simon, "An Embedded Software Primer", Pearson Education, 2007.
2. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", dreamtech press, 2005.
3. Tim Wilmshurst, "An Introduction to the Design of Small Scale Embedded Systems", Palgrave Publisher, 2004.
4. Sriram V Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", Tata Mc-Graw Hill, 2004.
5. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.

**EC2043****WIRELESS NETWORKS****L T P C  
3 0 0 3****AIM**

To study some fundamental concepts in wireless networks.

**OBJECTIVES**

- To understand physical as wireless MAC layer alternatives techniques.
- To learn planning and operation of wireless networks.
- To study various wireless LAN and WAN concepts.
- To understand WPAN and geo-location systems.

**UNIT I      MULTIPLE RADIO ACCESS      9**

Medium Access Alternatives: Fixed-Assignment for Voice Oriented Networks Random Access for Data Oriented Networks , Handoff and Roaming Support, Security and Privacy.

**UNIT II      WIRELESS WANS      9**

First Generation Analog, Second Generation TDMA – GSM, Short Messaging Service in GSM, Second Generation CDMA – IS-95, GPRS - Third Generation Systems (WCDMA/CDMA 2000)

**UNIT III      WIRELESS LANS      9**

Introduction to wireless LANs - IEEE 802.11 WLAN – Architecture and Services, Physical Layer- MAC sublayer- MAC Management Sublayer, Other IEEE 802.11 standards, HIPERLAN, WiMax standard.

**UNIT IV      ADHOC AND SENSOR NETWORKS      9**

Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

**UNIT V WIRELESS MANS AND PANS****9**

Wireless MANs – Physical and MAC layer details, Wireless PANs – Architecture of Bluetooth Systems, Physical and MAC layer details, Standards.

**TOTAL : 45 PERIODS****TEXT BOOKS**

1. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India, 2<sup>nd</sup> Ed., 2007.
2. Dharma Prakash Agrawal & Qing-An Zeng, "Introduction to Wireless and Mobile Systems", Thomson India Edition, 2<sup>nd</sup> Ed., 2007.

**REFERENCES**

1. Vijay. K. Garg, "Wireless Communication and Networking", Morgan Kaufmann Publishers, 2007.
2. Kaveth Pahlavan, Prashant Krishnamurthy, "Principles of Wireless Networks", Pearson Education Asia, 2002.
3. Gary. S. Rogers & John Edwards, "An Introduction to Wireless Technology", Pearson Education, 2007.
4. Clint Smith, P.E. & Daniel Collins, "3G Wireless Networks", Tata McGraw Hill, 2<sup>nd</sup> Ed., 2007.

**EC2044 TELECOMMUNICATION SWITCHING AND NETWORKS****L T P C****3 0 0 3****AIMS**

- To introduce fundamentals functions of a telecom switching office, namely, digital multiplexing, digital switching and digital subscriber access.
- To introduce a mathematical model for the analysis of telecommunication traffic.

**OBJECTIVES**

- To introduce the concepts of Frequency and Time division multiplexing.
- To introduce digital multiplexing and digital hierarchy namely SONET / SDH
- To introduce the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
- To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.
- To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL / ADSL, and fiber optic systems in subscriber loop.
- To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.
- To characterize blocking probability holding service time distributions for in speech and data networks.

**UNIT I MULTIPLEXING****9**

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings, SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats, SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Optical Standards, SONET Networks. SONET Rings: Unidirectional Path-Switched Ring, Bidirectional Line-Switched Ring.



**AIM**

To enable the student to become familiar with satellites and satellite services.

**OBJECTIVES**

- Overview of satellite systems in relation to other terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.

**UNIT I SATELLITE ORBITS 8**

Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

**UNIT II SPACE SEGMENT AND SATELLITE LINK DESIGN 12**

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

**UNIT III SATELLITE ACCESS: 10**

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption

**UNIT IV EARTH SEGMENT 5**

Earth Station Technology-- Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain.

**UNIT V SATELLITE APPLICATIONS 10**

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet

**TOTAL = 45 PERIODS**

**TEXT BOOKS:**

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4<sup>th</sup> Edition, 2006.
2. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Prentice Hall/Pearson, 2007.

## REFERENCES:

1. N.Agarwal, 'Design of Geosynchronous Space Craft, Prentice Hall, 1986.
2. Bruce R. Elbert, 'The Satellite Communication Applications' Hand Book, Artech House Boston London, 1997.
3. Tri T. Ha, 'Digital Satellite Communication', II edition, 1990.
4. Emanuel Fthenakis, 'Manual of Satellite Communications', McGraw Hill Book Co., 1984.
5. Robert G. Winch, 'Telecommunication Trans Mission Systems', McGraw-Hill Book Co., 1983.
6. Brian Ackroyd, 'World Satellite Communication and earth station Design', BSP professional Books, 1990.
7. G.B.Bleazard, 'Introducing Satellite communications NCC Publication, 1985.
8. M.Richharia, 'Satellite Communication Systems-Design Principles', Macmillan 2003

**EC2046**

**ADVANCED ELECTRONIC SYSTEM DESIGN**

**L T P C  
3 0 0 3**

## AIM

To get knowledge about usage of electronic devices in Communication Engineering and Power supplies.

## OBJECTIVES

- To study RF component such as resonator, filter, transmission lines, etc...
- To learn design of RF amplifiers using transistors.
- To study modern Power Supplies using SCR and SMPS technology
- To learn about signal shielding & grounding techniques and study of A/D and D/A Converters.
- To learn knowledge about fabrication of PCBs using CAD.

## UNIT I INTRODUCTION TO RF DESIGN

**9**

RF behaviour of passive components, Chip components and circuit board considerations, Review of transmission lines, Impedance and admittance transformation, Parallel and series connection of networks, ABCD and scattering parameters, Analysis of amplifier using scattering parameter. RF filter – Basic resonator and filter configurations – Butterworth and Chebyshev filters. Implementation of microstrip filter design. Band pass filter and cascading of band pass filter elements.

## UNIT II RF TRANSISTOR AMPLIFIER DESIGN

**9**

Impedance matching using discrete components. Microstrip line matching networks. Amplifier classes of operation and biasing networks – Amplifier power gain, Unilateral design ( $S_{12} = 0$ ) – Simple input and output matching networks – Bilateral design - Stability circle and conditional stability, Simultaneous conjugate matching for unconditionally stable transistors. Broadband amplifiers, High power amplifiers and multistage amplifiers.

**UNIT III DESIGN OF POWER SUPPLIES 9**  
DC power supply design using transistors and SCRs, Design of crowbar and foldback protection circuits, Switched mode power supplies, Forward, flyback, buck and boost converters, Design of transformers and control circuits for SMPS.

**UNIT IV DESIGN OF DATA ACQUISITION SYSTEMS 9**  
Amplification of Low level signals, Grounding, Shielding and Guarding techniques, Dual slope, quad slope and high speed A/D converters, Microprocessors Compatible A/D converters, Multiplying A/D converters and Logarithmic A/D converters, Sample and Hold, Design of two and four wire transmitters.

**UNIT V DESIGN OF PRINTED CIRCUIT BOARDS 9**  
Introduction to technology of printed circuit boards (PCB), General lay out and rules and parameters, PCB design rules for Digital, High Frequency, Analog, Power Electronics and Microwave circuits, Computer Aided design of PCBs.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Reinhold Luduig and Pavel Bretchko, RF Circuit Design – Theory and Applications, Pearson Education, 2000.
2. Sydney Soclof, Applications of Analog Integrated Circuits, Prentice Hall of India, 1990.
3. Walter C. Bosshart, Printed Circuit Boards – Design and Technology, TMH, 1983.

**REFERENCES:**

1. Keith H. Billings, Handbook of Switched Mode Supplies, McGraw-Hill Publishing Co., 1989.
2. Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1991.
3. Otmar Kigenstein, Switched Mode Power Supplies in Practice, John Wiley and Sons, 1989.
4. Muhammad H. Rashid, Power Electronics – Circuits, Devices and Applications, Prentice Hall of India, 2004.

**EC2047**

**OPTO ELECTRONIC DEVICES**

**L T P C  
3 0 0 3**

**AIM**

To learn different types of optical emission, detection, modulation and opto electronic integrated circuits and their applications.

**OBJECTIVES**

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of optical switching.
- To study the integration process and application of opto electronic integrated circuits in transmitters and receivers.

<b>UNIT I</b>	<b>ELEMENTS OF LIGHT AND SOLID STATE PHYSICS</b>	<b>9</b>
Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.		
<b>UNIT II</b>	<b>DISPLAY DEVICES AND LASERS</b>	<b>9</b>
Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.		
<b>UNIT III</b>	<b>OPTICAL DETECTION DEVICES</b>	<b>9</b>
Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.		
<b>UNIT IV</b>	<b>OPTOELECTRONIC MODULATOR</b>	<b>9</b>
Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustoptic devices, Optical, Switching and Logic Devices.		
<b>UNIT V</b>	<b>OPTOELECTRONIC INTEGRATED CIRCUITS</b>	<b>9</b>
Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.		
		<b>TOTAL : 45 PERIODS</b>

**TEXT BOOKS**

1. Pallab Bhattacharya "Semiconductor Opto Electronic Devices", Prentice Hall of India Pvt., Ltd., New Delhi, 2006.
2. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", McGraw-Hill International Edition, 1998

**REFERENCES**

1. S C Gupta, Opto Electronic Devices and Systems, Prentice Hal of India,2005.
2. J. Wilson and J.Haukes, "Opto Electronics – An Introduction", Prentice Hall, 1995.

<b>EC2048</b>	<b>TELECOMMUNICATION SYSTEM MODELING AND SIMULATION</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**AIM**

To model the random variables and random process applied to telecommunication system and to learn the methods of system simulation and performance evaluation.

**OBJECTIVES**

- To learn simulation of random variables and random process
- To learn modeling of radio communication channels
- To understand various simulation techniques
- To understand simulation methodologies and performance evaluation
- To analyse some digital communication optical communication and satellite communication techniques as case studies through simulation.

<b>UNIT I</b>	<b>SIMULATION METHODOLOGY</b>	<b>9</b>
Introduction, Aspects of methodology, Performance Estimation, Sampling frequency, Low pass equivalent models for bandpass signals, multicarrier signals, Non-linear and time varying systems, Post processing, Basic Graphical techniques and estimations		
<b>UNIT II</b>	<b>SIMULATION OF RANDOM VARIABLES RANDOM PROCESS</b>	<b>9</b>
Generation of random numbers and sequence, Guassian and uniform random numbers Correlated random sequences, Testing of random numbers generators, Stationary and uncorrelated noise, Goodness of fit test.		
<b>UNIT III</b>	<b>MODELING OF COMMUNICATION SYSTEMS</b>	<b>9</b>
Radio frequency and optical sources, Analog and Digital signals, Communication channel and models, Free space channels, Multipath channel and discrete channel noise and interference.		
<b>UNIT IV</b>	<b>ESTIMATION OF PERFORMANCE MEASURE FOR SIMULATION</b>	<b>9</b>
Quality of estimator, Estimation of SNR, Probability density function and bit error rate, Monte Carlo method, Importance sampling method, Extreme value theory.		
<b>UNIT V</b>	<b>SIMULATION AND MODELING METHODOLOGY</b>	<b>9</b>
Simulation environment, Modeling considerations, Performance evaluation techniques, error source simulation, Validation.		

**TOTAL : 45 PERIODS**

**TEXTBOOK:**

1. MC.Jeruchim, P.Balaban and Sam K Shanmugam, Simulation of communication Systems: Modeling, Methodology and Techniques, Plenum Press, New York, 2001.

**REFERENCES:**

1. Averill.M.Law and W.David Kelton,Simulation Modeling and Analysis, McGraw-Hill Inc., 2000.
2. Geoffrey Gorden, System Simulation, 2<sup>nd</sup> Edition, Prentice Hall of India, 1992.
3. W.Turin, Performance Analysis of Digital Communication Systems, Computer Science Press, New York, 1990.
4. Jerry banks and John S.Carson, Discrete Event System Simulation, Prentice Hall of India, 1984.
5. William H. Tranter, K. Sam shanmugam, Theodore s. Rappaport, K.Kurt L.Kosbar, Principles of Communication Systems Simulation, Pearson Education (Singapore) Pvt Ltd, 2004.

**EC2049**

**RADAR AND NAVIGATIONAL AIDS**

**L T P C  
3 0 0 3**

**AIM**

To make the student understand the principles of Radar and its use in military and civilian environment

Also to make the student familiar with navigational aids available for navigation of aircrafts and ships.

## **OBJECTIVES:**

- To derive and discuss the Range equation and the nature of detection.
- To apply Doppler principle to radars and hence detect moving targets, cluster, also to understand tracking radars
- To refresh principles of antennas and propagation as related to radars, also study of transmitters and receivers.
- To understand principles of navigation, in addition to approach and landing aids as related to navigation
- To understand navigation of ships from shore to shore.

## **UNIT I INTRODUCTION TO RADAR 9**

Basic Radar –The simple form of the Radar Equation- Radar Block Diagram- Radar Frequencies –Applications of Radar – The Origins of Radar

### **THE RADAR EQUATION**

Introduction- Detection of Signals in Noise- Receiver Noise and the Signal-to-Noise Ratio-Probability Density Functions- Probabilities of Detection and False Alarm-Integration of Radar Pulses- Radar Cross Section of Targets- Radar cross Section Fluctuations- Transmitter Power-Pulse Repetition Frequency- Antenna Parameters- System losses – Other Radar Equation Considerations

## **UNIT II MTI AND PULSE DOPPLER RADAR 9**

Introduction to Doppler and MTI Radar- Delay –Line Cancelers- Staggered Pulse Repetition Frequencies –Doppler Filter Banks - Digital MTI Processing - Moving Target Detector - Limitations to MTI Performance - MTI from a Moving Platform (AMIT) - Pulse Doppler Radar – Other Doppler Radar Topics- Tracking with Radar –Monopulse Tracking –Conical Scan and Sequential Lobing - Limitations to Tracking Accuracy - Low-Angle Tracking - Tracking in Range - Other Tracking Radar Topics -Comparison of Trackers - Automatic Tracking with Surveillance Radars (ADT).

## **UNIT III DETECTION OF SIGNALS IN NOISE 9**

Introduction – Matched –Filter Receiver –Detection Criteria – Detectors –Automatic Detector - Integrators - Constant-False-Alarm Rate Receivers - The Radar operator - Signal Management - Propagation Radar Waves - Atmospheric Refraction -Standard propagation - Nonstandard Propagation - The Radar Antenna - Reflector Antennas - Electronically Steered Phased Array Antennas - Phase Shifters - Frequency-Scan Arrays

**Radar Transmitters-** Introduction –Linear Beam Power Tubes - Solid State RF Power Sources - Magnetron - Crossed Field Amplifiers - Other RF Power Sources - Other aspects of Radar Transmitter.

**Radar Receivers** - The Radar Receiver - Receiver noise Figure - Superheterodyne Receiver - Duplexers and Receiver Protectors- Radar Displays.

## **UNIT IV 9**

**Introduction** Introduction - Four methods of Navigation .

**Radio Direction Finding** - The Loop Antenna - Loop Input Circuits - An Aural Null Direction Finder - The Goniometer - Errors in Direction Finding - Adcock Direction Finders - Direction Finding at Very High Frequencies - Automatic Direction Finders - The Commutated Aerial Direction Finder - Range and Accuracy of Direction Finders

**Radio Ranges** - The LF/MF Four course Radio Range - VHF Omni Directional Range(VOR) - VOR Receiving Equipment - Range and Accuracy of VOR - Recent Developments.

**Hyperbolic Systems of Navigation (Loran and Decca)** - Loran-A - Loran-A Equipment - Range and precision of Standard Loran - Loran-C - The Decca Navigation System - Decca Receivers - Range and Accuracy of Decca - The Omega System

**UNIT V DME AND TACAN 9**

Distance Measuring Equipment - Operation of DME - TACAN - TACAN Equipment  
**Aids to Approach and Landing** - Instrument Landing System - Ground Controlled Approach System - Microwave Landing System (MLS)

**Doppler Navigation** - The Doppler Effect - Beam Configurations - Doppler Frequency Equations - Track Stabilization - Doppler Spectrum - Components of the Doppler Navigation System - Doppler range Equation - Accuracy of Doppler Navigation Systems.

**Inertial Navigation** - Principles of Operation - Navigation Over the Earth - Components of an Inertial Navigation System - Earth Coordinate Mechanization - Strapped-Down Systems - Accuracy of Inertial Navigation Systems.

**Satellite Navigation System** - The Transit System - Navstar Global Positioning System (GPS)

**TOTAL : 45 PERIODS**

**TEXTBOOKS**

1. Merrill I. Skolnik, "Introduction to Radar Systems", Tata McGraw-Hill (3<sup>rd</sup> Edition) 2003.
2. N.S.Nagaraja, Elements of Electronic Navigation Systems, 2<sup>nd</sup> Edition, TMH, 2000.

**REFERENCES**

1. Peyton Z. Peebles, "Radar Principles", John Wiley, 2004
2. J.C Toomay, "Principles of Radar", 2<sup>nd</sup> Edition - PHI, 2004

**EC2050 MOBILE ADHOC NETWORKS L T P C  
3 0 0 3**

**UNIT I INTRODUCTION 9**

Introduction to adhoc networks – definition, characteristics features, applications. Characteristics of Wireless channel, Adhoc Mobility Models:- Indoor and out door models.

**UNIT II MEDIUM ACCESS PROTOCOLS 9**

MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

**UNIT III NETWORK PROTOCOLS 9**

Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

**UNIT IV END-END DELIVERY AND SECURITY 9**

Transport layer : Issues in designing- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

**UNIT V            CROSS LAYER DESIGN AND INTEGRATION  
                         OF ADHOC FOR 4G**

**9**

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary prespective. Intergration of adhoc with Mobile IP networks.

**TEXT BOOKS**

1. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2<sup>nd</sup> edition, Pearson Education. 2007
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000

**REFERENCES**

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobilead hoc networking, Wiley-IEEE press, 2004.
2. Mohammad Ilyas, The handbook of adhoc wireless networks, CRC press, 2002.
3. T. Camp, J. Boleng, and V. Davies “A Survey of Mobility Models for Ad Hoc Network
4. Research,” Wireless Commun. and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.
5. A survey of integrating IP mobility protocols and Mobile Ad hoc networks, Fekri M. Abduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, v no.1 2007
6. V.T. Raisinhani and S.Iyer “Cross layer design optimization in wireless protocol stacks”Comp. communication, vol 27 no. 8, 2004.
7. V.T.Raisinhani and S.Iyer,”ÉCLAIR; An Efficient Cross-Layer Architecture for wireless protocol stacks”,World Wireless cong., San francisco,CA,May 2004.
8. V.Kawadia and P.P.Kumar,”A cautionary perspective on Cross-Layer design,”IEEE Wireless commn., vol 12, no 1,2005.

**EC2051**

**WIRELESS SENSOR NETWORKS**

**L T P C  
3 0 0 3**

**UNIT I            OVERVIEW OF WIRELESS SENSOR NETWORKS**

**8**

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

**UNIT II           ARCHITECTURES**

**9**

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

**UNIT III           NETWORKING SENSORS**

**10**

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

**UNIT IV INFRASTRUCTURE ESTABLISHMENT 9**  
Topology Control , Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

**UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9**  
Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

**REFERENCES:**

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, And Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

**EC2052 REMOTE SENSING L T P C**  
**3 0 0 3**

**UNIT I REMOTE SENSING 9**  
Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR, Thermal IR and Microwave – Black Body Radiation - Planck’s law – Stefan-Boltzman law.

**UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS 9**  
Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces- Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface:Imaging spectrometry and spectral characteristics.

**UNIT III OPTICAL AND MICROWAVE REMOTE SENSING 9**  
Satellites - Classification – Based on Orbits and Purpose – Satellite Sensors - Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Landsat, SPOT, IRS series – Current Satellites - Radar – Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics ; Sonar remote sensing systems.



**UNIT I      ACOUSTICS WAVES      9**

Acoustics waves - Linear wave equation – sound in fluids – Harmonic plane waves – Energy density – Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales.

**Reflection and Transmission:** Transmission from one fluid to another normal and oblique incidence – method of images.

**UNIT II      RADIATION AND RECEPTION OF ACOUSTIC WAVES      9**

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source - radiation impedance - Fundamental properties of transducers.

**Absorption and attenuation of sound**

Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

**UNIT III      PIPES RESONATORS AND FILTERS      9**

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmholtz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass.

**Noise, Signal detection, Hearing and speech**

Noise, spectrum level and band level – combining band levels and tones – detecting signals in noise – detection threshold – the ear – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

**UNIT IV      ARCHITECTURAL ACOUSTICS:      9**

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design.

**Environmental Acoustics:**

Weighted sound levels speech interference – highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

**UNIT V      TRANSDUCTION      9**

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker – loudspeaker cabinets – horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers.

**TOTAL : 45 PERIODS**

**TEXT BOOK**

1. Lawrence E.Kinsler, Austin, R.Frey, Alan B.Coppens, James V.Sanders, Fundamentals of Acoustics, 4th edition, Wiley, 2000.

**REFERENCE**

1. L.Beranek , “Acoustics” - Tata McGraw-Hill

- UNIT I OPTICAL SYSTEM COMPONENTS 9**  
Light propagation in optical fibers – Loss & bandwidth, System limitations, Non-Linear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.
- UNIT II OPTICAL NETWORK ARCHITECTURES 9**  
Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Testbeds for Broadcast & Select WDM; Wavelength Routing Architecture.
- UNIT III WAVELENGTH ROUTING NETWORKS 9**  
The optical layer, Node Designs, Optical layer cost tradeoff, Routing and wavelength assignment, Virtual topology design, Wavelength Routing Testbeds, Architectural variations.
- UNIT IV PACKET SWITCHING AND ACCESS NETWORKS 9**  
Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronisation, Broadcast OTDM networks, Switch-based networks; Access Networks – Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.
- UNIT V NETWORK DESIGN AND MANAGEMENT 9**  
Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations; Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

**TOTAL : 45 PERIODS**

**TEXT BOOK**

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks : A Practical Perspective”, Harcourt Asia Pte Ltd., Second Edition 2004.

**REFERENCES**

1. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks : Concept, Design and Algorithms”, Prentice Hall of India, 1st Edition, 2002.
2. P.E. Green, Jr., “Fiber Optic Networks”, Prentice Hall, NJ, 1993.