



**ANNA UNIVERSITY  
CHENNAI - 600 025**

**UNIVERSITY DEPARTMENTS**

**REGULATIONS 2012  
CURRICULA AND SYLLABI FOR  
I TO VIII SEMESTERS**

**B.E. ELECTRONICS AND  
COMMUNICATION ENGINEERING  
(FULL TIME)**



# ANNA UNIVERSITY, CHENNAI-600 025

## UNIVERSITY DEPARTMENTS

R – 2012

### B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

#### I – VIII SEMESTERS CURRICULA AND SYLLABI

##### I SEMESTER

Course Code	Course Title	L	T	P	C
<b>Theory</b>					
HS8151	Technical English I	3	1	0	4
MA8151	Mathematics I	3	1	0	4
PH8151	Engineering Physics	3	0	0	3
CY8151	Engineering Chemistry	3	0	0	3
GE8151	Computing Techniques	3	0	0	3
GE8152	Engineering Graphics	2	0	3	4
<b>Practical</b>					
PH8161	Physics Laboratory	0	0	2	1
CY8161	Chemistry Laboratory	0	0	2	1
GE8161	Computer Practice Laboratory	0	0	3	2
GE8162	Engineering Practices Laboratory	0	0	3	2
	<b>Total</b>	<b>17</b>	<b>2</b>	<b>13</b>	<b>27</b>

##### SEMESTER II

Course Code	Course Title	L	T	P	C
<b>Theory</b>					
HS8251	Technical English II	3	1	0	4
MA8251	Mathematics - II	3	1	0	4
PH8252	Physics for Electronics Engineering	3	0	0	3

CS8251	Data Structures and Object Oriented Programming in C++	3	0	0	3
EC8201	Electronic Devices	3	0	0	3
EC8251	Circuit Theory	3	1	0	4
<b>Practical</b>					
CS8213	Data Structures and Object Oriented Programming Laboratory.	0	0	3	2
EC8214	Electronic Devices and Circuits Laboratory.	0	0	3	2
<b>Total</b>		<b>18</b>	<b>1</b>	<b>6</b>	<b>25</b>

### SEMESTER III

Course Code	Course Title	L	T	P	C
<b>Theory</b>					
MA8357	Transform Techniques and Partial Differential Equation	3	1	0	4
GE8351	Environmental Science and Engineering	3	0	0	3
EC8301	Electronic Circuits – I	3	1	0	4
EC8351	Digital Electronics and System Design	3	0	0	3
EC8353	Signals and Systems	3	0	0	3
EE8351	Basics of Electrical Engineering	3	0	0	3
<b>Practical</b>					
EC8311	Digital Systems Laboratory	0	0	3	2
EC8312	Electronic Circuits – I Laboratory	0	0	3	2
<b>Total</b>		<b>18</b>	<b>2</b>	<b>6</b>	<b>24</b>

### SEMESTER IV

Course Code	COURSE TITLE	L	T	P	C
<b>Theory</b>					
MA8401	Linear Algebra and Numerical Methods	3	1	0	4
EC8401	Communication Theory	3	0	0	3
EC8402	Electromagnetic Fields and Waves	3	0	0	3

EC8403	Electronic Circuits – II	3	1	0	4
EC8451	Computer Architecture and Organization	3	0	0	3
EC8452	Operational Amplifiers and Analog Integrated Circuits	3	0	0	3
<b>Practical</b>					
EC8411	Electronic Circuits – II Laboratory	0	0	3	2
EE8262	Electrical Engineering Laboratory	0	0	3	2
<b>Total</b>		<b>18</b>	<b>2</b>	<b>6</b>	<b>24</b>

### SEMESTER V

Course Code	Course Title	L	T	P	C
<b>Theory</b>					
EC8501	Control System Engineering	3	0	0	3
EC8502	Digital Communication Techniques	3	0	0	3
EC8503	Microprocessor and Microcontrollers	3	0	0	3
EC8504	Transmission Lines and Wave Guides	3	0	0	3
EC8551	Discrete Time Signal Processing	3	1	0	4
<b>Practical</b>					
HS8561	Employability Skills	0	0	2	1
EC8511	Microcontroller and Interfacing Laboratory	0	0	3	2
EC8512	Communication Systems Laboratory	0	0	3	2
EC8561	Digital Signal Processing Laboratory	0	0	3	2
<b>Total</b>		<b>15</b>	<b>1</b>	<b>11</b>	<b>23</b>

### SEMESTER VI

Course Code	Course Title	L	T	P	C
<b>Theory</b>					
MG8653	Principles of Management	3	0	0	3
EC8601	Antennas and Wave Propagation	3	0	0	3
EC8602	Communication Networks	3	0	0	3

EC8651	Digital VLSI	3	0	0	3
E1	Elective I	3	0	0	3
E2	Elective II	3	0	0	3
<b>Practical</b>					
EC8611	Networking Laboratory	0	0	3	2
EC8612	VLSI Design Laboratory	0	0	3	2
<b>Total</b>		<b>18</b>	<b>0</b>	<b>6</b>	<b>22</b>

### SEMESTER VII

Course Code	COURSE TITLE	L	T	P	C
<b>Theory</b>					
EC8701	Optical Communication	3	0	0	3
EC8702	Wireless Communication	3	0	0	3
E3	Elective III	3	0	0	3
E4	Elective IV	3	0	0	3
E5	Elective V	3	0	0	3
E6	Elective VI	3	0	0	3
<b>Practical</b>					
EC8711	High frequency Communication Laboratory	0	0	3	2
EC8712	Innovative System Design Laboratory	0	0	3	2
<b>Total</b>		<b>18</b>	<b>0</b>	<b>6</b>	<b>22</b>

### SEMESTER VIII

Course Code	COURSE TITLE	L	T	P	C
<b>Theory</b>					
E7	Elective – VII	3	0	0	3
E8	Elective – VIII	3	0	0	3
<b>Practical</b>					
EC8811	Project Work	0	0	12	6
<b>Total</b>		<b>6</b>	<b>0</b>	<b>12</b>	<b>12</b>

**TOTAL NO OF CREDITS: 179**

**E LECTIVES**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
EC8001	Advanced Digital Signal Processing	3	0	0	3
EC8002	Advanced Microcontrollers	3	0	0	3
EC8003	Advanced Wireless Communication	3	0	0	3
EC8004	Avionics	3	0	0	3
EC8005	CAD for VLSI	3	0	0	3
EC8006	CMOS Analog IC Design I	3	0	0	3
EC8007	CMOS Analog IC Design II	3	0	0	3
EC8008	Cognitive Radio Communication	3	0	0	3
EC8009	Digital Control Engineering	3	0	0	3
EC8010	Digital Switching and Transmission	3	0	0	3
EC8011	Embedded and Real-Time Systems	3	0	0	3
EC8012	Information Theory	3	0	0	3
EC8013	Internet and Java	3	0	0	3
EC8014	Measurements and Instrumentation	3	0	0	3
EC8015	Medical Electronics	3	0	0	3
EC8016	Microwave Engineering	3	0	0	3
EC8017	Parallel and Distributed processing	3	0	0	3
EC8018	RF Microelectronics	3	0	0	3
EC8019	Satellite Communication	3	0	0	3
EC8020	Speech Processing	3	0	0	3
EC8021	VLSI Signal Processing	3	0	0	3
EC8022	Wireless Networks	3	0	0	3
EC8071	Cryptography and Network Security	3	0	0	3
EC8072	Electro Magnetic Interference and Compatibility	3	0	0	3
EC8073	Foundations for Nano-Electronics	3	0	0	3
EC8074	Multimedia Compression and Communication	3	0	0	3
EC8075	Robotics	3	0	0	3

EC8076	Soft Computing and Applications	3	0	0	3
GE8751	Engineering Ethics and Human Values	3	0	0	3
MG8654	Total Quality Management	3	0	0	3
BM8751	Principles of Digital Image Processing	3	0	0	3
CS8451	Operating Systems	3	0	0	3
IT8451	Web technology	3	0	0	3

**OBJECTIVES**

- To enable all students of engineering and technology develop their basic communication Skills in English.
- To give special emphasis to the development of speaking skills amongst the students of Engineering and Technology students.
- To ensure that students use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading for pleasure.

**UNIT I**

**Listening** - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); **Speaking** - Speaking about one's place, important festivals etc. – Introducing oneself, one's family / friend; **Reading** - Skimming a reading passage – Scanning for specific information - Note-making; **Writing** - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one's leisure time activities, hometown, etc.); **Grammar** - Prepositions - Reference words - Wh-questions - Tenses (Simple); **Vocabulary** - Word formation - Word expansion (root words / etymology); **E-materials** - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

**UNIT II**

**Listening** - Listening and responding to video lectures / talks; **Speaking** - Describing a simple process (filling a form, etc.) - Asking & answering questions - Telephone skills – Telephone etiquette; **Reading** – Critical reading - Finding key information in a given text - Sifting facts from opinions; **Writing** - Biographical writing (place, people) - Lab descriptions (general/specific description of laboratory experiments) - Definitions - Recommendations; **Grammar** - Use of imperatives - Subject-verb agreement; **Vocabulary** - Compound words - Word Association; **E-materials** - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

**UNIT III**

**Listening** - Listening to specific task - focused audio tracks; **Speaking** - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); **Reading** - Reading and interpreting visual material; **Writing** - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause

& effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; **Grammar** - Tenses (Past) - Use of sequence words - Adjectives; **Vocabulary** - Different forms and uses of words, Cause and effect words; **E-materials** - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

#### **UNIT IV**

**Listening** - Watching videos / documentaries and responding to questions based on them; **Speaking** - Responding to questions - Different forms of interviews - Speaking at different types of interviews; **Reading** - Making inference from the reading passage - Predicting the content of a reading passage; **Writing** - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; **Grammar** - Adverbs – Tenses – future time reference; **Vocabulary** - Single word substitutes - Use of abbreviations & acronyms; **E-materials** - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.

#### **UNIT V**

**Listening** - Listening to different accents, Listening to Speeches / Presentations, Listening to broadcast & telecast from Radio & TV; **Speaking** - Giving impromptu talks, Making presentations on given topics; **Reading** - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email **Writing** - Creative writing, Poster making; **Grammar** - Direct and indirect speech; **Vocabulary** - Lexical items (fixed / semi fixed expressions); **E-materials** - Interactive exercises for Grammar & Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters

**TOTAL :60 PERIODS**

#### **TEXT BOOKS:**

1. Mindscapes: English for Technologists and Engineers, Orient Black Swan, 2012 .
2. S.P. Dhanavel, English and Communication Skills for students of Science and Engineering. Oriented Black Swan, Chennai, 2011

#### **REFERENCES:**

1. Pickett, Nell Ann, Ann A.Laster and Katherine E.Staples. **Technical English: Writing, Reading and Speaking**. New York: Longman, 2001.
2. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge, 2011.

3. Morgan, David and Nicholas Regan. **Take-Off: Technical English for Engineering.** Reading: Garnet Publishing Limited, 2008.
4. Thorn, Michael and Alan Badrick. **An Introduction to Technical English.** Harlow: Prentice Hall Europe, 1993.
5. Rizvi, M.Ashraf. **Effective Technical Communication.** New Delhi: Tata McGraw-Hill Publishing Company, 2007.

#### **EXTENSIVE READERS:**

1. Murthy, Sudha. **Wise & Otherwise.** New Delhi: Penguin Books India, 2006.
2. Gates, Bill and Collins Hemingway. **Business @ the Speed of Thought: Succeeding in the Digital Economy.** New York: Warner Business Books, 2000.

#### **WEBSITE RESOURCES:**

1. [www.uefap.com](http://www.uefap.com)
2. [www.eslcafe.com](http://www.eslcafe.com)
3. [www.listen-to-english.com](http://www.listen-to-english.com)
4. [www.owl.english.purdue.edu](http://www.owl.english.purdue.edu)
5. [www.chompchomp.com](http://www.chompchomp.com)

**MA8151**

**MATHEMATICS – I**

**L T P C**

**(Common to all branches of B.E. / B.Tech. Programmes in I Semester) 3 1 0 4**

#### **OBJECTIVES:**

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

**UNIT I MATRICES****9+3**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

**UNIT II INFINITE SERIES****9+3**

Sequences – Convergence of series – General properties – Series of positive terms – Tests of convergence (Comparison test, Integral test, Comparison of ratios and D’Alembert’s ratio test) – Alternating series – Series of positive and negative terms – Absolute and conditional convergence – Power Series – Convergence of exponential, logarithmic and Binomial Series.

**UNIT III FUNCTIONS OF SEVERAL VARIABLES****9+3**

Limits and Continuity – Partial derivatives – Homogeneous functions and Euler’s theorem – Total derivative – Differentiation of implicit functions – Change of variables –Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange’s method of undetermined multipliers.

**UNIT IV IMPROPER INTEGRALS****9+3**

Improper integrals of the first and second kind and their convergence – Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions – Properties – Evaluation of integrals using Beta and Gamma functions – Error functions.

**UNIT V MULTIPLE INTEGRALS****9+3**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals – Area of a curved surface.

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

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 40<sup>th</sup> Edition, 2007.

2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11<sup>th</sup> Reprint, 2010.

#### **REFERENCES:**

1. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3<sup>rd</sup> Edition, 2007.
2. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7<sup>th</sup> Edition, 2009.
3. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2<sup>nd</sup> Edition, 5<sup>th</sup> Reprint, 2009.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

**PH8151**

**ENGINEERING PHYSICS**  
**(Common to ALL Branches of B.E./B.Tech. Programmes)**

**L T P C**

**3 0 0 3**

#### **OBJECTIVE:**

To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

#### **UNIT I PROPERTIES OF MATTER**

**9**

Elasticity - Poisson's ratio and relationship between moduli (qualitative) - Stress-strain diagram - factors affecting elasticity - bending of beams - cantilever - bending moment - theory and experiment of Young's modulus determination - Uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus- moment of inertia of a body (regular and irregular).

#### **UNIT II ACOUSTICS AND ULTRASONICS**

**9**

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - rate of growth and decay of sound intensity - derivation of Sabine's formula - absorption coefficient and its determination - factors affecting acoustics of buildings : focussing, interference, echo, Echelon effect, resonance - noise and their remedies. Ultrasonics - production - magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating - industrial applications - NDT - Ultrasonic method: scan modes and practice.

### **UNIT III THERMAL PHYSICS**

**9**

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity - conduction in solids - Forbe's and Lees' disc methods - Rectilinear flow of heat through a rod - flow of heat through a compound materials - radial flow of heat through a spherical shell - thermal insulation of buildings – Laws of blackbody radiation: Kirchoffs law, Stephens law, Wiens law, Raleigh-Jean law and Planks law (derivation). Laws of thermodynamics - Otto and diesel engines and their efficiency - entropy - entropy of Carnot's cycle - reverse Carnot's cycle - refrigerator.

### **UNIT IV APPLIED OPTICS**

**9**

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its application - Lasers - Einstein's coefficients - CO<sub>2</sub>, Nd:YAG and semiconductor lasers - homo junction and hetro junction - construction and working - applications - Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

### **UNIT V SOLID STATE PHYSICS**

**9**

Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

**TOTAL: 45 PERIODS**

#### **TEXT BOOKS:**

1. Gaur R.K., and Gupta, S.L., Engineering Physics, Dhanpat Raj Publications, 2003
2. Palanisamy, P.K., Engineering Physics, Scitech Publications (P) Ltd, 2006.
3. Arumugam, M., Engineering Physics, Anuradha Publications, 2000.

#### **REFERENCES:**

1. Sankar, B.N., Pillai.S.O., Engineering Physics, New Age International (P) Ltd., 2007.
2. Rajendran.V Engineering Physics, Tata McGraw-Hill, 2009.

**UNIT I CHEMICAL THERMODYNAMICS****9**

Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

**UNIT II POLYMER CHEMISTRY****9**

Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: T<sub>g</sub>, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

**UNIT III KINETICS AND CATALYSIS****9**

Introduction – reaction velocity, factors affecting reaction velocity, rate constant, order of reaction, molecularity, pseudo molecular reactions, zero, first, second and third order reactions, reactions of fractional orders, determination of order of reactions. Catalysis: Auto catalysis - Enzyme Catalysis: Michaelis - Menton equation; factors affecting enzyme catalysis. Heterogeneous Catalysis: Types of adsorption isotherms: Langmuir–Hinselwood and Rideal–Eley Mechanism.

**UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY****9**

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Photoprocesses - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitisation. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram) and applications.

## UNIT V NANOCHEMISTRY

9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: Nanocluster, nanorod, nanotube and nanowire. Synthesis: Precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and Applications. Risk discussion and Future perspectives.

### TEXT BOOKS:

1. P. Kannan and A. Ravikrishnan, "Engineering Chemistry", Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009.
2. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India, 2011

### REFERENCE BOOKS:

1. P.W. Atkins and de Paula Julio, "Physical Chemistry", Oxford University Press, 8<sup>th</sup> Ed., (Indian Student Edition) (2009).
2. K. K. Rohatgi-Mukherjee, "Fundamental of Photochemistry" New Age International (P) Ltd., New Delhi, 1986.
3. G.A. Ozin and A.C. Arsenault, "Nanotechnology: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
4. V.R.Gowariker, N.V.Viswanathan and Jayadev Sreedhar, "Polymer Science", New Age International P (Ltd.), Chennai, 2006

GE8151

COMPUTING TECHNIQUES

L T P C  
3 0 0 3

## UNIT I INTRODUCTION

8

Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

## UNIT II C PROGRAMMING BASICS

10

Problem formulation – Problem Solving - Introduction to 'C' programming –fundamentals – structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

**UNIT III ARRAYS AND STRINGS****9**

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String-String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

**UNIT IV FUNCTIONS AND POINTERS****9**

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

**UNIT V STRUCTURES AND UNIONS****9**

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

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

1. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009
2. Ashok N. Kamthane, “Computer programming”, Pearson Education, 2007.
3. Yashavant P. Kanetkar. “ Let Us C”, BPB Publications, 2011.

**REFERENCES:**

1. Kernighan,B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
2. Byron S Gottfried, “ Programming with C”, Schaum’s Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, “How to Solve it by Computer”, Pearson Education, Fourth Reprint, 2007

**GE8152****ENGINEERING GRAPHICS L T P C****2 0 3 4****OBJECTIVES :**

To develop in students, graphic skills 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 14**

**Basic Geometrical Constructions, 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, **Scales:** Construction of Diagonal and Vernier scales.

**VISUALIZATION CONCEPTS AND FREE HAND SKETCHING:** Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

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

Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces

Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT III PROJECTION OF SOLIDS 14**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

**UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in

simple vertical positions and miscellaneous problems. Perspective projection of simple solids- Prisms, pyramids and cylinders by visual ray method and vanishing point method.

### **COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)**

**3**

Introduction to drafting packages and demonstration of their use.

**TOTAL: 75 PERIODS**

#### **TEXT BOOK:**

1. N.D.Bhatt and V.M.Panchal, "Engineering Drawing", Charotar Publishing House, 50<sup>th</sup> Edition, 2010

#### **REFERENCES:**

1. K.R.Gopalakrishna., "Engineering Drawing" (Vol I&II combined) Subhas Stores, Bangalore, 2007
2. Luzzader, Warren.J., and Duff,John M.,," Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005
3. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson, 2<sup>nd</sup> Edition, 2009
4. K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International (P) Limited ,2008.
5. K. V.Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
6. 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. The examination will be conducted in appropriate sessions on the same day

**PH8161** **PHYSICS LABORATORY** **L T P C**  
**(common to all branches of B.E./B.Tech. Programmes)** **0 0 2 1**

- |     |                       |   |
|-----|-----------------------|---|
| 1.  | Torsional pendulum    | Determination of rigidity modulus of wire and moment of inertia of disc     |
| 2.  | Non – uniform bending | Determination of Young’s modulus  |
| 3.  | Lee’s disc            | Determination of thermal conductivity of a bad conductor                    |
| 4.  | Potentiometer         | Determination of thermo e.m.f. of thermocouple                              |
| 5.  | Air wedge             | Determination of thickness of a thin sheet of paper                         |
| 6.  | i. Optical fibre      | Determination of Numerical Aperture and acceptance angle                    |
|     | ii. Compact disc      | Determination of width of the groove using laser                            |
| 7.  | Acoustic grating      | Determination of velocity of ultrasonic waves in liquids                    |
| 8.  | Post office box       | Determination of Band gap of a semiconductor                                |
| 9.  | Spectrometer          | Determination of wavelength using grating                                   |
| 10. | Viscosity of liquids  | Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow |

**TOTAL: 30 PERIODS**

**CY8161** **CHEMISTRY LABORATORY** **L T P C**  
**(Common to all branches of Engineering and Technology)** **0 0 2 1**

1. Estimation of HCl using  $\text{Na}_2\text{CO}_3$  as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.

8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics – ester hydrolysis.
13. Corrosion experiment – weight loss method.
14. Determination of CMC.
15. Phase change in a solid.

**TOTAL: 30 PERIODS**

**REFERENCE BOOKS:**

1. A text of quantitative inorganic analysis, A. L. Vogel , ELBS London. 1995.
2. Experiments in physical chemistry, D.P. Shoemaker and C.W. Gardad, McGraw Hill, London, 2001.
3. American Public Health Association.

**GE8161**

**COMPUTER PRACTICES LABORATORY**

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

**LIST OF EXPERIMENTS:**

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

**TOTAL : 45 PERIODS**

**OBJECTIVE:**

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 & ELECTRICAL)****1. CIVIL ENGINEERING PRACTICE****12****PLUMBING**

- Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
- Laying pipe connection to the suction side of a pump – inlet.
- Laying pipe connection to the delivery side of a pump – out let.
- Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

**WOOD WORK:**

- Sawing, planing and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

**STUDY:**

- Study of joints in door panels, wooden furniture
- Study of common industrial trusses using models.

**2. ELECTRICAL ENGINEERING PRACTICE****9**

- Basic household wiring using switches, fuse, indicator – lamp etc.,
- Preparation of wiring diagrams
- Stair case light wiring
- Tube – light wiring
- Study of iron-box, fan with regulator, emergency lamp

**3. MECHANICAL ENGINEERING PRACTICE****WELDING**

- Arc welding of butt joints, lap joints, tee joints
- Gas welding Practice.
- Basic Machining
- Simple turning, drilling and tapping operations.
- Machine assembly Practice.
- Study and assembling the following:
- Centrifugal pump, mixies and air conditioners.
- Demonstration on
  - (a) Smithy operations like the production of hexagonal bolt.
  - (b) Foundry operation like mould preparation for grooved pulley.

**4. ELECTRONIC ENGINEERING PRACTICE****9**

- Soldering simple electronic circuits and checking continuity.
- Assembling electronic components on a small PCB and testing.
- Study of Telephone, FM radio, low-voltage power supplies.

**TOTAL: 45 PERIODS****HS8251**

**TECHNICAL ENGLISH II**  
**(For all branches of B.E / B.Tech programmes)**

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

- To make the students acquire listening and speaking skills meant for both formal and informal contexts
- To help them develop their reading skills by exposing them to different types of reading strategies
- To equip them with writing skills needed for academic as well as workplace situations
- To make them acquire language skills at their own pace by using e-materials and language lab component

## UNIT I

**Listening** - Listening to informal conversations and participating; **Speaking** - Opening a conversation (greetings, comments on something, weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); **Reading** - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; **Writing** - Effective use of SMS for sending short notes and messages - Using 'emoticons' as symbols in email messages; **Grammar** - Regular & irregular verbs - Active and passive voice; **Vocabulary** - Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); **E-materials** - Interactive exercise on Grammar and vocabulary – blogging; **Language Lab** - Listening to different types of conversation and answering questions.

## UNIT II

**Listening** - Listening to situation based dialogues; **Speaking** - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); **Reading** - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; **Writing** - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his success, thanking one's friend / relatives); **Grammar** - modal verbs, Purpose expressions; **Vocabulary** - Phrasal verbs and their meanings, Using phrasal verbs in sentences; **E-materials** - Interactive exercise on Grammar and vocabulary, Extensive reading activity (reading stories / novels from links), Posting reviews in blogs - **Language Lab** - Dialogues (Fill up exercises), Recording students' dialogues.

## UNIT III

**Listening** - Listening to the conversation - Understanding the structure of conversations; **Speaking** - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret etc.); **Reading** - Speed reading – reading passages with the time limit - Skimming; **Writing** - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading the articles from the journals - Format for the journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; **Grammar** - Conditional clauses - Cause and effect expressions; **Vocabulary** - Words used as nouns and verbs without any change in the spelling (e.g. 'rock', 'train', 'ring'); **E-materials** - Interactive exercise on Grammar & vocabulary - Speed Reading practice exercises; **Language Lab** - Intonation practice using EFLU materials – Attending a meeting and writing minutes.

## UNIT IV

**Listening** - Listening to a telephone conversation, Viewing a model interview (face-to-face, telephonic and video conferencing) and observing the practices; **Speaking** - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping the interview skills; **Reading** - Reading the job advertisements and the profile of the company concerned – scanning; **Writing** - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; **Grammar** - Numerical expressions - Connectives (discourse markers); **Vocabulary** - Idioms and their meanings – using idioms in sentences; **E-materials** - Interactive exercises on Grammar & Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; **Language Lab** - Telephonic interview – recording the responses - e-résumé writing.

## UNIT V

**Listening** - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; **Speaking** - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/ agreement – assertiveness in expressing opinions – mind mapping technique; **Reading** - Note making skills – making notes from books, or any form of written materials - Intensive reading **Writing** - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); **Grammar** - Use of clauses; **Vocabulary** – Collocation; **E-materials** - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises - Pictures for discussion; **Language Lab** - Different models of group discussion

**TOTAL : 60 PERIODS**

## TEXT BOOKS:

1. Mindscapes: English for Technologists and Engineers, Orient Black Swan, 2012 .
2. S.P. Dhanavel, English Language Teaching in India, the shifting paradigms, Tata McGraw-Hill Publishing, 2012.

## REFERENCE BOOKS

1. Laws, Anne. **Presentations**. Hyderabad: Orient BlackSwan, 2000.
2. Lewis, Hedwig. **Body Language: A Guide for Professionals**. New Delhi: Sage Publications, 1998.
3. Naterop, Jean B. and Rod Revell. **Telephoning in English**. Cambridge: Cambridge University Press, 1987.

4. Rutherford, Andrea J. **Basic Communication Skills for Technology**. New Delhi: Pearson Education, 2001.
5. Ur, Penny. **Teaching Listening Comprehension**. Cambridge: Cambridge University Press, 1984.

### **EXTENSIVE READERS**

1. Abdul Kalam, A P J. **Ignited Minds: Unleashing the Power within India**. New Delhi: Penguin Books India, 2002.
2. Parameswaran, Uma. **C.V.Raman: A Biography**. New Delhi: Penguin Books India, 2011.

### **WEB RESOURCES**

1. [www.esl-lab.com](http://www.esl-lab.com)
2. [www.englishgrammar.org](http://www.englishgrammar.org)
3. [www.englishclub.com](http://www.englishclub.com)
4. [www.mindtools.com](http://www.mindtools.com)
5. [www.esl.about.com](http://www.esl.about.com)

**MA8251**

**MATHEMATICS II**

**L T P C**

**(Common to all branches of B.E. / B.Tech. Programmes in II Semester) 3 1 0 4**

### **OBJECTIVES:**

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated

### **UNIT I DIFFERENTIAL EQUATIONS**

**9+3**

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

## **UNIT II VECTOR CALCULUS**

**9+3**

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

## **UNIT III ANALYTIC FUNCTION**

**9+3**

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions  $w = z + c$ ,  $az$ ,  $1/Z$ ,  $Z^2$  - Bilinear transformation.

## **UNIT IV COMPLEX INTEGRATION**

**9+3**

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

## **UNIT V LAPLACE TRANSFORMS**

**9+3**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

**TOTAL : 60 PERIODS**

### **TEXT BOOKS:**

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 2010.

### **REFERENCES:**

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, Delhi, 3rd Edition, 2007.

3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
4. Peter V.O'Neil, Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

**PH8252**

**PHYSICS FOR ELECTRONICS ENGINEERING**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

- To illustrate, with suitable examples, the concepts of conductors, semiconductors, dielectric, magnetic and superconducting materials.
- To make the students familiarize with the optical properties of materials.
- To introduce the essential principles of physics for electronics and communication engineering applications.

**UNIT I ELECTRICAL PROPERTIES OF METALS**

**9**

Classical theory: Drude model - thermal conductivity, thermal resistance - electrical conductivity of nonmetals: semiconductors, ionic crystals and glasses - thin metal films: conductivity and resistivity - Schrödinger wave equation - particle in a box - Tunneling (qualitative) degenerate states - Fermi-Dirac statistics - density of states: electron concentration and Fermi level - band theory of solids: energy band formation (qualitative) - electron effective mass.

**UNIT II SEMICONDUCTORS**

**9**

Intrinsic semiconductors: energy band-diagram - direct and indirect band gap semiconductors - carrier concentrations and conductivity - extrinsic semiconductors: compensation doping - temperature dependence of conductivity - degenerate and nondegenerate semiconductors - recombination and minority carrier injection: direct and indirect recombination - minority carrier lifetime - diffusion and conduction equations and random motion - optical absorption - Hall effect and devices - Ohmic contacts - Schottky diode and solar cell.

**UNIT III DIELECTRIC MATERIALS AND INSULATION**

**9**

Matter polarization and relative permittivity: definition - dipole moment and polarization vector P-polarization mechanisms: electronic, ionic, orientational, interfacial and total polarization - frequency dependence - local field and Clausius-Mossetti equation - dielectric constant

and dielectric loss - Gauss's law and boundary conditions - dielectric strength and insulation break-down in gases, liquids and solids - capacitor materials - typical capacitor constructions - piezoelectricity, ferroelectricity and pyroelectricity - quartz oscillators and filters - piezo and pyroelectric crystals.

#### **UNIT IV MAGNETIC PROPERTIES AND SUPERCONDUCTIVITY**

**9**

Magnetic dipole moment - origin: atomic magnetic moments - magnetic materials: diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, ferrimagnetism, ferromagnetism - origin and the exchange interaction - saturation magnetization and Curie temperature - ferromagnetic materials: magnetic domains magnetocrystalline anisotropy, domain walls and motion - M versus H behaviour, demagnetization - soft and hard magnetic materials - examples and uses - Giant Magneto Resistance and materials - superconductivity: properties and classifications - High T<sub>c</sub> superconductors - applications.

#### **UNIT V OPTICAL PROPERTIES OF MATERIALS**

**9**

Light waves in a homogeneous medium - refractive index - dispersion: refractive index-wave-length behaviour - group velocity and group index - Fresnel's equations: amplitude, reflection and transmission coefficients, intensity, reflectance and transmittance - complex refractive index and light absorption - Luminescence, phosphors and white LEDs - polarization - optical anisotropy: uniaxial crystals, birefringence, dichroism - electro-optic effect and amplitude modulators.

**TOTAL : 45 PERIODS**

#### **TEXT BOOKS:**

1. Palanisamy, P.K., Materials Science, Scitech, 2003
2. Arumugam, M., Materials Science, Anirudha Publ., 2002.

#### **REFERENCES:**

1. Kasap, S.O., Principles of Electronic Materials and Devices, Tata McGraw-Hill, 2007.
2. Ali Omar, M., Elementary Solid State Physics, Adition Wiley, 1974.
3. Kittel, C., Introduction to Solid State Physics, John Wiley, 1996.
4. Millman J and Halkias C, Electronic Devices and Circuits, Tata-McGraw Hall, 2004.

**OBJECTIVES:**

This course comprehends the fundamentals of object oriented programming, particularly in C++, which are then used to implement data structures. This also gives an idea of linear and non-linear data structures and their applications.

**UNIT I DATA ABSTRACTION & OVERLOADING 9**

Overview of C++ – Structures – Class Scope and Accessing Class Members – Reference Variables – Initialization – Constructors – Destructors – Member Functions and Classes – Friend Function – Dynamic Memory Allocation – Static Class Members – Container Classes and Integrators – Proxy Classes – Overloading: Function overloading and Operator Overloading.

**UNIT II INHERITANCE & POLYMORPHISM 9**

Base Classes and Derived Classes – Protected Members – Casting Class pointers and Member Functions – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes – Implicit Derived – Class Object To Base – Class Object Conversion – Composition Vs. Inheritance – Virtual functions – This Pointer – Abstract Base Classes and Concrete Classes – Virtual Destructors – Dynamic Binding.

**UNIT III LINEAR DATA STRUCTURES 11**

Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Definition and an example – Arrays and its representations – Stacks and Queues – Linked lists – Linked list based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.

**UNIT IV NON-LINEAR DATA STRUCTURES 9**

Trees – Binary Trees – Binary tree representation and traversals – Threaded binary trees – Binary tree representation of trees – Application of trees: Set representation and Union-Find operations – Graph and its representations – Graph Traversals – Connected components.

**UNIT V SORTING & SEARCHING 7**

Insertion sort – Merge sort – Quick sort – Heap sort – Linear Search – Binary Search.

**TOTAL: 45 PERIODS**

## TEXT BOOKS

1. Deitel and Deitel, "C++, How To Program", Fifth Edition, Pearson Education, 2005.
2. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, Fundamentals of Data Structures in C++, Galgotia, New Delhi, 1995.

## REFERENCES:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Third Edition, Addison-Wesley, 2007.
2. Bhushan Trivedi, "Programming with ANSI C++, A Step-By-Step approach", Oxford University Press, 2010.
3. Goodrich, Michael T., Roberto Tamassia, "David Mount. Data Structures and Algorithms in C++", 7th ed, Wiley. 2004.

**EC8201**

**ELECTRONIC DEVICES**

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

## OBJECTIVES:

- To acquaint the students with the construction, theory and operation of the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LED, LCD and other Opto-electronic devices

### **UNIT I SEMICONDUCTOR DIODE**

**9**

PN junction diode, Current equations, Diffusion and drift current densities, forward and reverse bias characteristics, Switching Characteristics.

### **UNIT II BIPOLAR JUNCTION TRANSISTOR**

**9**

NPN -PNP -Junctions-Early effect-Current equations – Input and Output characteristics of CE, CB CC-Hybrid - $\pi$  model - h-parameter model, Ebers Moll Model- Gummel Poon-model, Multi Emitter Transistor.

### **UNIT III FIELD EFFECT TRANSISTORS**

**9**

JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation,

D-MOSFET, E-MOSFET, Current equation - Equivalent circuit model and its parameters, FINFET, DUAL GATE MOSFET.

**UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9**

Metal-Semiconductor Junction- MESFET, Schottky barrier diode-Zener diode-Varactor diode –Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

**UNIT V POWER DEVICES AND DISPLAY DEVICES 9**

UJT, SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS. LED, LCD, Photo transistor, Opto Coupler, Solar cell, CCD.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. Donald A Neaman, "Semiconductor Physics and Devices", Third Edition, Tata Mc GrawHill Inc. 2007.

**REFERENCES:**

1. Yang, "Fundamentals of Semiconductor devices", McGraw Hill International Edition, 1978.
2. Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory" Pearson Prentice Hall, 10<sup>th</sup> edition, July 2008.

**EC8251**

**CIRCUIT THEORY**

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

**OBJECTIVES**

- To introduce the basic concepts of DC and AC circuits behavior
- To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
- To introduce different methods of circuit analysis using Network theorems, duality and topology.

**UNIT I DC CIRCUIT ANALYSIS 9**

Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff's Current Law, Kirchoff's voltage law, The single Node

– Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis.

**UNIT II NETWORK THEOREM AND DUALITY 8**

Useful Circuit Analysis techniques - Linearity and superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Delta-Wye Conversion. Duals, Dual circuits.

**UNIT III SINUSOIDAL STEADY STATE ANALYSIS 10**

Sinusoidal Steady – State analysis , Characteristics of Sinusoids, The Complex Forcing Function, The Phasor, Phasor relationship for R, L, and C, impedance and Admittance, Nodal and Mesh Analysis, Phasor Diagrams, AC Circuit Power Analysis, Instantaneous Power, Average Power, apparent Power and Power Factor, Complex Power.

**UNIT IV TRANSIENTS AND RESONANCE IN RLC CIRCUITS 9**

Basic RL and RC Circuits, The Source- Free RL Circuit, The Source-Free RC Circuit, The Unit-Step Function, Driven RL Circuits, Driven RC Circuits, RLC Circuits, Frequency Response, Parallel Resonance, Series Resonance, Quality Factor.

**UNIT V COUPLED CIRCUITS AND TOPOLOGY 9**

Magnetically Coupled Circuits, mutual Inductance, the Linear Transformer, the Ideal Transformer, An introduction to Network Topology, Trees and General Nodal analysis, Links and Loop analysis.

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

**TEXT BOOKS**

1. William H.Kayt, Jr.Jack E. Kemmerly, Steven M.Durbin, “Engineering Circuit Analysis”, Sixth Edition, Tata McGraw-Hill Edition, 2006.
2. David A Bell, “Electric Circuits”, PHI,2006

**REFERENCES**

1. Charles K. Alexander & Mathew N.O.Sadiku, Fundamentals of Electric Circuits”, Second Edition, McGraw- Hill 2003.
2. Sudhakar. A and Shyammohan S. Palli, Tata Mc Graw –Hill, Third Edition, 2007.
3. D.R.Cunningham, J.A.Stuller, “Basic Circuit Analysis”, Jaico Publishing House, 1996.

4. David E. Johnson, Johny R. Johnson, John L. Hilburn, "Electric Circuit Analysis", Second Edition, Prentice-Hall international Editions, 1997
5. K.V.V. Murthy, M.S. Kamath, "Basic Circuit Analysis", Jaico Publishing House, 1999.
6. Norman Balabanian, "Electric Circuits", International Edition, 1994.

**CS8213      DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING  
LABORATORY**

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

Constructors and destructors – Function overloading – Operator overloading.

Inheritance – Polymorphism – Constructors and Destructors in derived Classes.

Stacks – Queues – linked list.

Binary tree traversal – graph traversal.

Merge sort – Linear Search – Binary Search.

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
6. The next two exercises are to be done by implementing the following source files
  - i. Program source files for Stack Application 1
  - ii. Array implementation of Stack ADT
  - iii. Linked list implementation of Stack ADT
  - iv. Program source files for Stack Application 2
  - v. An appropriate header file for the Stack ADT should be included in (i) and (iv)
7. Implement any Stack Application using array implementation of Stack ADT (by implementing files (i) and (ii) given above) and then using linked list
8. Implementation of Stack ADT (by using files (i) and implementing file (iii))
9. Implement another Stack Application using array and linked list implementations of Stack ADT (by implementing files (iv) and using file (ii), and then by using files (iv) and (iii))
10. Queue ADT – Array and linked list implementations

11. Search Tree ADT - Binary Search Tree
12. Hash Table – separate chaining
13. Implement an interesting application as separate source files and using any of the searchable ADT files developed earlier. Replace the ADT file alone with other appropriate ADT files. Compare the performance.
14. Heap Sort
15. Quick Sort

**TOTAL: 45 PERIODS**

### **LABORATORY REQUIREMENTS**

Pentium IV PCs with C++	30 Nos
(or)	
Unix server with C++	30 terminals

### **EC8214 ELECTRONIC DEVICES AND CIRCUITS LABORATORY**

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

1. Characteristics of PN Junction Diode
2. Zener diode Characteristics & Regulator using Zener diode
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. FET Characteristics
6. SCR Characteristics
7. Clipper and Clamper & FWR
8. Verifications Of Thevinin & Norton theorem
9. Verifications Of KVL & KCL
10. Verifications Of Super Position Theorem
11. verifications of maximum power transfer & reciprocity theorem
12. Determination Of Resonance Frequency of Series & Parallel RLC Circuits
13. Transient analysis of RL and RC circuits

**TOTAL: 45 PERIODS**

## LABORATORY REQUIREMENTS

BC 107, BC 148, 2N2646, BFW10	-	25 each
1N4007, Zener diodes	-	25 each
Resistors, Capacitors, Inductors	-	sufficient quantities
Bread Boards	-	15 Nos
CRO (30MHz)	-	10 Nos.
Function Generators (3MHz)	-	10 Nos.
Dual Regulated Power Supplies ( 0 – 30V)	-	10 Nos.

<b>MA8357</b>	<b>TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATION (BRANCH SPECIFIC COURSE)</b>	<b>L T P C</b>
		<b>3 1 0 4</b>

### OBJECTIVES:

- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
- To develop Z- transform techniques which will perform the same task for discrete timesystems as Laplace Transform, a valuable aid in analysis of continuous time systems

<b>UNIT I</b>	<b>PARTIAL DIFFERENTIAL EQUATIONS</b>	<b>9+3</b>
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Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange’s Linear equation – Integral surface passing through a given curve – Classification of Partial Differential Equations – Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous PDE.

<b>UNIT II</b>	<b>FOURIER SERIES</b>	<b>9+3</b>
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Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.

**UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION****9+3**

Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in cartesian coordinates.

**UNIT IV FOURIER TRANSFORM****9+3**

Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

**UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS****9+3**

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform.

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

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.

**REFERENCES:**

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
2. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 11th Reprint, 2010.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
4. Peter V.O'Neil, Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

**GE8351 ENVIRONMENTAL SCIENCE AND ENGINEERING****L T P C  
3 0 0 3****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 – soil 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 production 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).

### **REFERENCE 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)



**TEXT BOOKS**

1. Donald .A. Neamen, Electronic Circuit Analysis and Design –2<sup>nd</sup> edition, Tata McGraw Hill, 2009.
2. Adel .S. Sedra, Kenneth C. Smith, Micro Electronic circuits, 6th Edition, Oxford University Press, 2010.

**REFERENCES:**

1. David A. “Bell Electronic Devices and Circuits”, Oxford Higher Education press, 5<sup>th</sup> Edition, 2010
2. Behzad Razavi, “ Design of Analog CMOS Integrated Circuits”, Tata McGraw Hill, 2007.
3. Paul Gray, Hurst, Lewis, Meyer “Analysis and Design of Analog Integrated Circuits”, 4<sup>th</sup> Edition , John Willey & Sons 2005
4. Millman .J. and Halkias C.C, “Integrated Electronics”, McGraw Hill, 2001.
5. D.Schilling and C.Belove, “Electronic Circuits”, 3<sup>rd</sup> edition, McGraw Hill, 1989.

**EC8351**

**DIGITAL ELECTRONICS AND SYSTEM DESIGN**

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

**OBJECTIVES:**

- To introduce Boolean algebra and its applications in digital systems
- To introduce design of various combinational digital circuits using logic gates
- To bring out the analysis and design procedures for synchronous and asynchronous sequential circuits
- To introduce the electronic circuits involved in the making of logic gates
- To introduce semiconductor memories and related technology

**UNIT I BASIC CONCEPTS AND COMBINATIONAL CIRCUITS**

**9**

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1s and 2s complements, Codes – Binary, BCD, 84-2-1, 2421, Excess 3, Biquinary, Gray, Alphanumeric codes, Boolean theorems, Logic gates , Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and Tabulation methods, Problem formulation and design of combinational circuits, Code-Converters

**UNIT II MSI CIRCUITS****9**

Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder, Carry Look Ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Implementation of combinational logic using standard ICs, ROM, EPROM and EEPROM, PLA and PAL

**UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS****9**

Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FFS, Analysis and design of clocked sequential circuits – Moore / Mealy models, state minimization, state assignment, circuit implementation, Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

**UNIT III ASYNCHRONOUS SEQUENTIAL CIRCUITS****9**

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits

**UNIT V LOGIC FAMILIES AND SEMICONDUCTOR MEMORIES****9**

Logic families- TTL, MOS, CMOS, Comparison of Logic families, Basic memory cell, RAM, Memory decoding, Static and Dynamic memories.

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

1. Morris Mano, "Digital logic", Pearson, 2009
2. Charles H. Roth, Jr, "Fundamentals of Logic Design", Fourth edition, Jaico Books, 2002

**REFERENCES:**

1. William I. Fletcher, "An Engineering Approach to Digital Design", Prentice- Hall of India, 1980
2. Floyd T.L., "Digital Fundamentals", Charles E. Merrill publishing company, 1982
3. John. F. Wakerly, "Digital design principles and practices", Pearson Education, Fourth Edition, 2007 .

**OBJECTIVES:**

- To introduce visualization and mathematical representation of continuous-time and discrete-time signals
- To teach the applications of Laplace and Fourier transforms in the analysis of continuous-time signals
- To teach the applications of Z- and Fourier transforms in the analysis of discrete – time signals

**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 signals, random signals, Energy & Power signals - CT systems and DT systems, Classification of systems.

**UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 9**

Fourier series analysis- Spectrum of Continuous Time (CT) signals- Fourier and Laplace transforms in Signal Analysis.

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

Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis.

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

Baseband Sampling of CT signals- Aliasing, Reconstruction of CT signal from DT signal DTFT and properties, Z-transform & properties.

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

Difference Equations-Block diagram representation-Impulse response-Convolution sum-DTFT and Z Transform analysis of Recursive & Non-Recursive systems.

**TOTAL: 45 PERIODS**

## TEXTBOOK

1. Allan V. Oppenheim, S. Willsky and S. H. Nawab, "Signals and Systems", Pearson, Indian Reprint, 2007.
2. P. Ramakrishna Rao, "Signals and Systems", Tata Mc Graw Hill Publications, 2008.
3. B. P. Lathi, "Principles of Linear Systems and Signals", Oxford, Second Edition, 2009.

## REFERENCES

1. H P Hsu, "Signals and Systems", Schaum's Outlines, Tata McGraw Hill, 2006
2. Edward W. Kamen, Bonnie S. Heck, "Fundamentals of Signals and Systems Using the Web and MATLAB", Pearson, Indian Reprint, 2007
3. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007
4. M. J. Roberts, "Signals & Systems, Analysis using Transform methods & MATLAB", Tata McGraw Hill (India), 2007.

EE8351

**BASICS OF ELECTRICAL ENGINEERING**

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

## OBJECTIVES:

- To introduce three phase supply and power measurement
- To teach concepts in electrical generators, motors and transformers
- To introduce power generation, transmission and distribution concepts.

## UNIT I THREE PHASE CIRCUITS

9

Three phase supply – Star connection – Delta connection – Balanced and Unbalanced Loads – Power in three-phase systems – Measurement of power and power factor in three-phase systems – Comparison of star and delta - Advantages

## UNIT II DC MACHINES

9

Construction of DC machines – Theory of operation of DC generators – Characteristics of DC generators – Operating principle of DC motors – Types of DC motors and their characteristics – Speed control of DC motors – Applications.

## UNIT III TRANSFORMER

9

Introduction – Single phase transformer construction and principle of operation – EMF equation of transformer – Transformer no-load phasor diagram — Transformer on-load phasor diagram

— Equivalent circuit of transformer – Regulation of transformer –Transformer losses and efficiency-All day efficiency –auto transformers.

#### **UNIT IV INDUCTION MACHINES AND SYNCHRONOUS MACHINES**

**9**

Principle of operation of three-phase induction motors – Construction –Types – Equivalent circuit –Construction of single-phase induction motors – Types of single phase induction motors – Double revolving field theory – starting methods - Principles of alternator – Construction details – Types – Equation of induced EMF – Voltage regulation. Methods of starting of synchronous motors – Torque equation – V curves – Synchronous motors.

#### **UNIT V MEASUREMENT AND INSTRUMENTATION**

**9**

Static and Dynamic Characteristics of Measurement – Errors in Measurement - Classification of Transducers – Variable resistive – Strain gauge, thermistor RTD – transducer - Variable Capacitive Transducer – Capacitor Microphone - Piezo Electric Transducer – Variable Inductive transducer – LVDT, RVDT – DVM, DMM – Storage Oscilloscope.

Types of Electrical Instruments-Essentials of Indicating Instruments-Principles of Electrical Instruments –Measurement of Electrical quantities using Moving Iron ,Moving Coil meters and Dynamometer type meters-Digital meters.

Transmission & Distribution of electrical energy –Over head Vs Underground system – Protection of power system -types of tariff –power factor improvement.

**TOTAL: 45 PERIODS**

#### **TEXT BOOKS**

1. I.J Nagarath and Kothari DP 'Electrical Machines ' Tata McGraw Hill ,1997
2. Del Toro 'Electrical Engineering Fundamentals' Pearson Education, New Delhi, 2007.
3. John Bird 'Electrical Circuit theory and technology' Elsevier, First Indian Edition, 2006.
4. David A. Bell, "Electronic Instrumentation and Measurement", Second edition, Prentice Hall of India, (2007)
5. Albert D.Helfrick and William D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2007.

#### **REFERENCES:**

1. Rajendra Prasad 'Fundamentals of Electrical engineering' Prentice Hall of India, 2006.
2. Thereja .B.L 'Fundamentals of Electrical Engineering and Electronics' S chand & Co Ltd, 2008

3. A. K. Sawhney, "Course in Electrical and Electronic measurement and Instrumentation", Dhanpat Rai Publisher, 2000.
4. V.K Mehta and Rohit Mehta ' Principle of Electrical Engineering' S Chand & Company, 2008

**EC8311**

**DIGITAL SYSTEMS LABORATORY**

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

1. Implementation of Boolean expression using universal gates
2. Priority encoder
3. Half adder, Full adder and BCD adder
4. 2-bit Magnitude Comparator
5. Implementation of Boolean expressions using MUX
6. RS, JK, T and D FFs – truth Table verification
7. BCD counter, Mod 5,6,9 counters
8. Counters with 7 segment display
9. Ring counter, Johnson counter
10. Data transfer using shift register
11. Realization of Digital circuits using HDL

**TOTAL: 45 PERIODS**

**LAB REQUIREMENTS**

1. Digital Trainer Kit - 15 Nos.  
(with 5 V, Variable and fixed frequency Clock,  
Bread Board, Four Seven Segment displays,  
LEDs for output display, Logic 1 and 0 Input switches)
2. Logic ICs - 50 Nos each  
(7400, 7402, 7404, 7408, 7410, 7420, 7432, 7447,  
7448, 7474, 7476, 7483, , 7485, 7486, 7490, 7495, 74151  
Common Anode and cathode 7-segment displays, LEDs)
3. Resistors (220 ohms, 1/4 Watt) – 50 Nos
4. IC Power supply (5 V fixed) - 15 Nos
5. Bread Boards - 15 Nos

1. Frequency Response of CE amplifier
2. Frequency response of CB amplifier
3. CC Amplifier - buffer
4. Frequency response of CS Amplifiers
5. Differential Amplifiers- Transfer characteristic.
6. CMRR Measurement
7. Cascode amplifier
8. Cascade amplifier
9. Spice Simulation of Common Emitter and Common Source amplifiers

**TOTAL: 45 PERIODS**

### LAB REQUIREMENTS

CRO (30MHz)	– 10 Nos.
Function Generators (3MHz)	– 10 Nos.
Dual Regulated Power Supplies ( 0 – 30V)	– 10 Nos.
Pentium IV PC	– 10 Nos.
Transistor (BJJ-NPN)	– 50 Nos

### OBJECTIVES:

The basic concepts and tools of the subject covered are:

- Solving systems of linear equations, Matrix operations.
- Vector spaces and subspaces; linear independence and span of a set of vectors, basis and dimension; the standard bases for common vector spaces.
- Inner product spaces: Cauchy-Schwarz inequality, orthonormal bases, the Gram-Schmidt procedure, orthogonal complement of a subspace, orthogonal projection.
- Linear Transformations: kernel and range of a linear transformation, the Rank- Nullity Theorem, linear transformations and matrices, change of basis, similarity of matrices.

- Eigenvalues and eigenvectors, diagonalizability of a real symmetric matrix, canonical forms.
- Mathematical foundations of numerical techniques for solving linear system, eigen value problems and generalized inverses.

## **UNIT I VECTOR SPACES**

**9+3**

Vector spaces – Subspaces – Linear equations – Linear independence and Linear dependence – Basis and Dimension – Four Fundamental spaces - Linear Transformation – Matrix and representation of Linear Transformation - Null space, Range dimension theorem.

## **UNIT II ORTHOGONALITY**

**9+3**

Perpendicular vectors and Orthogonal subspaces – Inner Product Spaces – Projection onto lines – Projection – Least square Approximations – Orthogonal bases, Orthogonal matrices and Gram Schmidt orthonormalization process – Fast Fourier Transforms.

## **UNIT III EIGENVALUES, EIGENVECTORS AND POSITIVE DEFINITE MATRICES**

**10**

Diagonal form of a Matrix – Difference equations and the powers  $A^k$  – Differential equations and the exponential  $e^{At}$  – similarity transformations - Minima, Maxima and Saddle points, Test for Positive, Negative and Semidefinite and Indefinite Matrices.

## **UNIT IV NUMERICAL SOLUTION OF LINEAR SYSTEM OF EQUATIONS**

**10+3**

Solution of linear system of equations – Direct method: Gauss elimination method – Pivoting – Gauss-Jordan method -LU decomposition method – Cholesky decomposition method - Iterative methods: Gauss-Jacobi and Gauss-Seidel – SOR Method.

## **UNIT V NUMERICAL SOLUTION OF EIGENVALUE PROBLEMS AND GENERALISED INVERSES**

**10+3**

Eigenvalue Problems: Power method – Inverse Power method -Jacobi's rotation method – conjugate gradient method – QR algorithm - Singular Value Decomposition method.

**TOTAL: 60 PERIODS**

### **TEXT BOOKS:**

1. Strang, G., "Linear Algebra and its applications", Thomson (Brooks/Cole), New Delhi, 2005.

- Faires, J.D. and Burden, R., "Numerical Methods", Brooks/Cole (Thomson Publications), New Delhi, 2002.

## REFERENCES:

- Kumaresan, S., "Linear Algebra – A geometric approach", Prentice – Hall of India, New Delhi, Reprint, 2010.
- Friedberg, A.H., Insel, A.J. and Spence, L., "Linear Algebra", Prentice - Hall of India, New Delhi, 2004.
- Gerald, C.F. and Wheatley, P.O., "Applied Numerical Analysis", Pearson Education, New Delhi, 2002.
- Sundarapandian. V, "Numerical Linear Algebra", Prentice – Hall of India, New Delhi, 2008.
- Bernard Kolman, David R. Hill, "Introductory Linear Algebra", Pearson Education, New Delhi, First Reprint 2009.

**EC8401**

**COMMUNICATION THEORY**

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

## OBJECTIVES:

- To introduce the concepts of various modulations and their spectral analysis
- To introduce random processes and their characteristics
- To understand noise impact on modulations and
- To introduce some of the essential baseband signal processing techniques.

### **UNIT I    AMPLITUDE MODULATION**

**9**

Review of Fourier and Hilbert Transforms-Amplitude Modulation – AM, DSBSC, SSBSC, VSB–Spectral analysis of modulated signals–Demodulation – Square law, envelope detectors Superheterodyne receivers

### **UNIT II    ANGLEMODULATION**

**9**

Angle modulation – PM and FM – Narrow band, Wideband FM - Spectral analysis of modulated signal- FM Modulators and FM Demodulators- Discriminator, PLL, Stereo FM

### **UNIT III    RANDOM PROCESS**

**9**

Random variables, Central limit Theorem, Random Process, Stationary Processes, Mean,

Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian Process, Transmission of a Random signal Through a LTI filter.

**UNIT IV NOISE PERFORMANCE**

**9**

Noise sources and types – Noise figure and noise temperature – Noise in cascaded systems. Narrow band noise – PSD of in-phase and quadrature noise – Noise performance in AM systems – Noise performance in FM systems – Pre-emphasis and de-emphasis – Capture effect, threshold effect.

**UNIT V BASEBAND TECHNIQUES**

**9**

Quantization – Uniform and non-uniform quantization – Quantization noise – Companding laws of speech signals – PCM, DPCM, ADPCM, DM, ADM, and Subband Coding. Multiplexing – TDM (E and T lines), FDM.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. S.Haykin, "Communication Systems" 4/e, John Wiley 2007
2. D.Roody, J.Coolen, "Electronic Communications", 4/e PHI 2006

**REFERENCES:**

1. J.G.Proakis, M.Salehi, "Fundamentals of Communication Systems" – Pearson Education 2006.
2. H P Hsu, Schaum Outline Series - "Analog and Digital Communications" TMH 2006
3. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3/e, Oxford University Press,2007.
4. B.Sklar, "Digital Communications Fundamentals and Applications" 2/e Pearson Education 2007

**EC8402**

**ELECTROMAGNETIC FIELDS AND WAVES**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

- To impart knowledge on the basics of static electric and magnetic field and the associated laws.
- To give insight into the propagation of EM waves and also to introduce the methods in computational electromagnetics.

**UNIT I     STATIC ELECTRIC FIELD****9**

Introduction to co-ordinate systems , Gradient , Divergence , Curl , Divergence theorem, Stokes theorem , Coulombs law , Electric field intensity , Principle of superposition , Electric scalar potential, Electric flux density. Gauss's law and its application, Permittivity, Polarization, Boundary relation, Capacitance, Dielectric strength ,Energy and Energy density, Poisson and Laplace equation and their application, Numerical examples

**UNIT II     STATIC MAGNETIC FIELD****9**

Magnetic field of a current carrying element ,Amperes law , The Biot – Savart law , Magnetic flux Density and Field intensity , Gauss law for magnetic fields , Torque, Magnetic moment ,Magneto motive force , Permeability , Vector potential , Field computation. Inductance, Energy in an Inductor and Energy density, Boundary relation, Hysterisis, Reluctance and Permeance. Numerical examples

**UNIT III    TIME VARYING ELECTRIC AND MAGNETIC FIELDS****9**

Faradays law , Transformer and Mutual induction , Maxwell's equation , Self and Mutual inductance ,Displacement current , Amperes law and its inconsistency for time varying fields , Boundary relation , Poynting vector , Numerical examples.

**UNIT IV    PLANE EM WAVES IN ISOTROPIC MEDIA****9**

Wave equation from Maxwell's Equation, Uniform plane waves in perfect dielectric, conductors, free space. Polarization, Reflection and Refraction of plane waves at different boundaries, Surface impedance, Numerical examples

**UNIT V     APPLICATION OF STATIC FIELDS AND COMPUTATIONAL METHODS****9**

Deflection of a charged particle, CRO, Ink Jet Printer, Electro static generator, Magnetic Separator, Cyclotron, Velocity selector and Mass Spectrometer, Electromagnetic pump, Introduction to field computation methods-FDM, FEM, MOM, Numerical examples

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

1. W.H.Hayt and A.Buck,"Engineering ElectroMagnetics" , 7th Edition, McgrawHill, 2010
2. David .K.Cheng, "Field and wave Electromagnetics" , 2nd edition, Pearson education, 2004.

3. Mathew.N.O.Sadiku,"Elements of Electromagnetics", Fourth edition ,Oxford University Press, 2009

#### REFERENCES:

1. Karl E.Longman and Sava V.Savov, "Fundamentals of Electro-Magnetics" , Prentice Hall of India, 2006
2. Kraus, Fleisch, "Electromagnetics with Applications", McGraw-Hill, 2005
3. Guru & Hiziroglu, "Electromagnetic Field Theory Fundamentals`` Second edition Cambridge University press,2005
4. Ashutosh Pramanik," ElectroMagnetism" ,Prentice Hall of India, 2006
5. Nannapaneni Narayana Rao," Elements of Engineering ElectroMagnetics", 6<sup>th</sup> edition, Prentice Hall of India, 2006

**EC8403**

**ELECTRONIC CIRCUITS II**

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

#### OBJECTIVES:

- To study about feedback amplifiers and oscillator principles
- To design oscillators
- To study about tuned amplifiers
- To study about active filters
- To know the principles of DC-DC convertors

#### **UNIT I FEEDBACK AMPLIFIERS AND STABILITY**

**9**

Basic feedback concepts – Properties of Negative feedback – Four feedback topologies– Analysis of series–shunt, series-series, shunt-shunt and shunt-series feedback amplifiers – stability problem – Gain and Phase-margins- Frequency compensation.

#### **UNIT II OSCILLATORS**

**9**

Barkhausen criteria for oscillator – Analysis of RC oscillators – Phase shift and Wein bridge oscillators – LC oscillators – Colpitts, Hartley, Clapp, Crystal, Armstrong, Franklin and Ring Oscillators

### **UNIT III TUNED AMPLIFIERS**

**9**

Basic principles – Inductor losses – Use of transformers – Single tuned amplifier frequency analysis - Amplifier with multiple tuned circuits – Cascade – Synchronous tuning – Stagger tuning – Stability of tuned amplifiers using Neutralization techniques

### **UNIT IV ACTIVE FILTERS**

**9**

Filter transmission –Types - specification, transfer function - Butterworth and Chebyshev filters - First and second order filter functions - circuit implementation – single-amplifier bi quadratic active filters - Switched-capacitor filters

### **UNIT V POWER AMPLIFIERS AND DC CONVERTERS**

**9**

Power amplifiers- class A-Class B-Class AB-Class C-Power MOSFET-Temperature Effect-Class AB Power amplifier using MOSFET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design

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

#### **TEXTBOOKS:**

1. Adel .S. Sedra, Kenneth C. Smith, Micro Electronic circuits, 6th Edition, Oxford University Press, 2010.
2. F. Bogart Jr. Electronic Devices and Circuits 6<sup>th</sup> Edition, Pearson Education, 2007.

#### **REFERENCES**

1. Donald .A. Neamen, Electronic Circuit Analysis and Design –2<sup>nd</sup> edition, Tata McGraw Hill, 2007.
2. Muhammed H.Rashid power electronics Pearson Education / PHI , 2004
3. Jacob Millman, Taub Pulse, Digital and Switching Waveforms 2<sup>nd</sup> Edition 2007

**EC8451**

**COMPUTER ARCHITECTURE AND ORGANIZATION**

**L T P C**

**3 0 0 3**

#### **OBJECTIVES:**

- To study the general purpose architecture for computer system .
- To study the design of data path unit and control unit for ALU operation.
- Understanding the concept of various memories.
- To introduce the concept of interfacing and organization of multiple processors.

**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. Behrooz Paraami, "Computer Architecture, From Microprocessor to Supercomputers", , Oxford University Press, Sixth impression 2010.
3. P.Pal Chaudhuri, , "Computer organization and design", 2<sup>nd</sup> Ed., Prentice Hall of India, 2007.
4. Miles J. Murdocca and Vincent P. Heuring, Principles of Computer Architecture, Printice Hall, 2000
5. William Stallings, "Computer Organisatin and Architecture, Designing for Performance, Pearson Education, Eighth Edition 2010.

**EC8452**

**OPERATIONAL AMPLIFIERS AND  
ANALOG INTEGRATED CIRCUITS**

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

## OBJECTIVES:

- To study the circuit configuration of linear integrated circuits
- To introduce practical applications of linear integrated circuits
- To introduce the concept of analog multiplier and Phase Locked Loop with applications
- To study ADC and DAC
- To introduce special function ICs and its construction

## **UNIT I      CIRCUIT CONFIGURATION FOR LINEAR ICS**

**9**

Current sources, Analysis of difference amplifiers with active loads, supply and temperature independent biasing, Band gap references, Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate.

## **UNIT II      APPLICATION OF OPERATIONAL AMPLIFIERS**

**9**

Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting and Non inverting Amplifiers, Differentiator, Integrator Voltage to Current converter, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear function generator.

**UNIT III ANALOG MULTIPLIER AND PLL****9**

Analysis of four quadrant and variable Transconductance multipliers, Voltage controlled Oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators. Frequency synthesizers, Compaander ICs

**UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTORS****9**

Analog switches, High speed sample and hold circuits and sample and hold IC's, Types of D/A converter Current driven DAC, Switches for DAC, A/D converter, Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to frequency converters.

**UNIT V SPECIAL FUNCTION ICs****9**

Timers, Voltage regulators - linear and switched mode types, Switched capacitor filter, Frequency to Voltage converters, Tuned amplifiers, Power amplifiers and Isolation Amplifiers, Video amplifiers, Fiber optics ICs and Opto couplers, Sources for Noises, Op Amp noise analysis and Low noise OP-Amps.

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

1. Sergio Franco, " Design with operational amplifiers and analog integrated circuits", McGraw Hill, 1997.

**REFERENCES:**

1. Gray and Meyer, " Analysis and Design of Analog Integrated Circuits ", Wiley International, 1995.
2. Michael Jacob J., " Applications and Design with Analog Integrated Circuits ", Prentice Hall of India, 1996.
3. Ramakant A. Gayakwad, " OP - AMP and Linear IC's ", Prentice Hall, 1994.
4. Botkar K.R., " Integrated Circuits ", Khanna Publishers, 1996.
5. Taub and Schilling, " Digital Integrated Electronics ", McGraw Hill, 1977.
6. Caughlier and Driscoll, " Operational amplifiers and Linear Integrated circuits ", Prentice Hall, 1989.
7. Millman J. and Halkias C.C., " Integrated Electronics ", McGraw Hill, 2001.

1. Design and Analysis of Feedback amplifiers
2. Design of RC Oscillators
3. Design of LC Oscillators
4. LPF and HPF
5. Single Tuned amplifier
6. Spice simulation of feedback amplifiers
7. Spice simulation of oscillators and Multivibrators
8. Class A and Class B Power Amplifiers.

**TOTAL: 45 PERIODS**

**LAB REQUIREMENTS :**

CRO (30MHz)	–	10 Nos.
Function Generators (3MHz)	–	10 Nos.
Dual Regulated Power Supplies ( 0 – 30V)	–	10 Nos.
Pentium IV PC (LTSPICE or equivalent s/w)	–	10 user license
BC 107, BC 147	–	50 Nos
Resistors, Capacitors & Inductors	–	As required
Breadboards	–	15 Nos

1. Study of DC & AC motor starters
2. Open Circuit and Short Circuit test on single phase transformer to draw its equivalent circuit
3. Regulation of three phase alternator
4. Study of three phase circuits
5. Speed Control of DC shunt motor
6. Load Test on DC shunt motor
7. OCC & Load Characteristics of DC shunt generator
8. Load test on single-phase transformer

9. Load test on three-phase Induction motor
10. Load test on single-Phase Induction motor

**TOTAL: 45 PERIODS**

**LAB REQUIREMENTS :**

S.No	Equipment	Quantity
1.	DC Shunt Motor with Loading Arrangement 3HP,220V,14A,750RPM,0.6A(Shunt field)	2
2.	DC Shunt Motor Coupled With Three phase Alternator	1
	<table border="1"> <tr> <td>DC Shunt Motor kW: 5.2 volts: 220 Amps: 27.5 Speed: 1500 RPM Field current: 0.9A</td> <td>Three phase Alternator kVA: 7.5 volts: 415 Amps: 10.4 Speed: 1500 RPM Field current: 2A</td> </tr> </table>	
DC Shunt Motor kW: 5.2 volts: 220 Amps: 27.5 Speed: 1500 RPM Field current: 0.9A	Three phase Alternator kVA: 7.5 volts: 415 Amps: 10.4 Speed: 1500 RPM Field current: 2A	
3.	Single Phase Transformer;2 KVA,230/110-166 V	1
4.	Three Phase Induction Motor with Loading Arrangement 3.7KW,415v,7.5A,1430 RPM	1
5.	Single Phase Induction Motor with Loading Arrangement 230V,5HP,17A	1
6.	DC Shunt Motor Coupled With DC Compound Generator	1
	<table border="1"> <tr> <td>DC Shunt Motor kW: 7.4 volts: 220 Amps: 38.5 Speed: 960 RPM Field current1.2A</td> <td>DC Compound Generator kW: 7.5 volts: 220 Amps: 38.5 Speed: 960 RPM Field current1.2A</td> </tr> </table>	
DC Shunt Motor kW: 7.4 volts: 220 Amps: 38.5 Speed: 960 RPM Field current1.2A	DC Compound Generator kW: 7.5 volts: 220 Amps: 38.5 Speed: 960 RPM Field current1.2A	
7.	Tachometer -Digital/Analog	8

8.	Single Phase Auto Transformer;(0-270)V	2
9.	Three Phase Auto Transformer;(0-270)V	1
10.	MC Voltmeter-(0-300/600)V	5
11.	MC Ammeter (0-10/20)A	5
12.	MC Ammeter (0-2/1)A	4
13.	MI Voltmeter (0-300/600)V	5
14.	MI Ammeter (0-10/20)A	6
15.	MI Ammeter (0-1/2)A	4
16.	UPF Wattmeter (300/600V,10/20A)	4
17.	LPF Wattmeter (300/600V,10/20A)	4
18.	Single Phase Resistive Loading Bank(10KW)	2
19.	Three Phase Resistive Loading Bank(10KW)	2
20.	SPST switch	2
21.	Fuse various ranges	As per the requirement
22.	Wires	As per the requirement
23.	Rheostats(100 $\Omega$ ,1A;250 $\Omega$ ,1.5A;75 $\Omega$ ,16A,1000 $\Omega$ ,1A)	Each 2

**EC8501**

**CONTROL SYSTEM ENGINEERING**

**L T P C**

**3 1 0 3**

**OBJECTIVES:**

- To introduce the elements of control system and their modeling using various Techniques.
- To introduce methods for analyzing the time response, the frequency response and the stability of systems
- To introduce the state variable analysis method

**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**

**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 – Sampler & Hold – Open loop & Closed loop sampled data systems.

**TOTAL : 45 PERIODS**

### **TEXTBOOK:**

1. J.Nagrath and M.Gopal," Control System Engineering", New Age International Publishers, 5<sup>th</sup> Edition, 2007.

### **REFERENCES:**

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7<sup>th</sup> Edition, 1995.
2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2<sup>nd</sup> Edition, 2002.
3. Schaum's Outline Series, 'Feedback and Control Systems' Tata McGraw-Hill, 2007.
4. John J.D'Azzo & Constantine H.Houpis, 'Linear control system analysis and design', Tata McGraw-Hill, Inc., 1995.
5. Richard C. Dorf & Robert H. Bishop, " Modern Control Systems", Addison – Wesley, 1999.

**OBJECTIVES:**

- To understand the concept of information, types of channels
- To understand the capabilities of various source coding theorems and the fundamental limit of transmission over the channel.
- To understand the capabilities of various channel coding theorems
- To develop the knowledge on pass band communication and spread spectrum.

**UNIT I INFORMATION THEORY****9**

Measure of information – Entropy – Source coding theorem – Discrete memoryless channels – lossless, deterministic, noiseless, BEC, BSC – Mutual information – Channel capacity – Shannon-Hartley law - Transform coding – LPC – Shannon-Fano coding, Huffman Coding, Run length coding, LZW algorithm.

**UNIT II ERROR CONTROL CODING TECHNIQUES****9**

Channel coding theorem – Linear block codes – Hamming codes – Cyclic codes – Convolutional codes – Viterbi decoding.

**UNIT III BASEBAND TECHNIQUES****9**

Pulse Modulation-PAM,PPM and PDM, Line codes – RZ,NRZ, Manchester, Binary N-zero substitution codes - PSDs – ISI – Nyquist criterion for distortionless transmission – Pulse shaping – Correlative coding - M-ary schemes – Eye pattern

**UNIT IV BANDPASS SIGNALING****9**

Geometric representation of signals – ML detection -Correlator and matched filter detection - generation and detection of BPSK, BFSK, QPSK - BER and Power spectral Density Comparison - Structure of non-coherent receivers - generation and detection of BFSK, DPSK – Principles of QAM. Band Pass Sampling.

**UNIT V SYNCHRONISATION AND SPREAD SPECTRUM TECHNIQUES****9**

Synchronisation – Carrier, symbol, Chip and frame synchronisation techniques, Spread Spectrum - PN Sequences, Direct Sequence and Frequency Hopping Spread Spectrum

Systems, BER Analysis, Processing gain and Jamming Margin, Application in Cellular Systems.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. S. Haykin, "Digital Communications", John Wiley, 2005
2. B. Sklar, "Digital Communication Fundamentals and Applications", 2/e, Pearson Education, 2009

**REFERENCES:**

1. H P Hsu, Schaum Outline Series - "Analog and Digital Communications", TMH 2006
2. B.P.Lathi, "Modern digital and Analog Communication Systems" 3/e, Oxford University Press 2007
3. J.G Proakis, "Digital Communication", 4/e, Tata Mcgraw Hill Company, 2001.

**EC8503**

**MICROPROCESSOR AND MICROCONTROLLERS**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

- To study the architecture of 8085 and 8086, 8051
- To study the addressing modes and instruction set of 8085 and 8086, 8051
- To introduce the need and use of interrupt structure in 8085 and 8051.
- To develop skill in simple program writing for 8085 and 8051 applications.
- To introduce commonly used peripheral / interfacing ICs.

**UNIT I ARCHITECTURE OF 8085 /8086**

**9**

8085- Functional Block Diagram- Description - Addressing Modes, Timing diagrams. Introduction to 8086 – Architecture, Instruction set, Addressing Modes.

**UNIT II ASSEMBLY LANGUAGE PROGRAMMING**

**9**

8085: Assembly Language Programming, programming techniques, Subroutines, serial I/O and data communication, Interrupts, Interrupt programming, 8086:Simple Assembly Language Programming, Assembler Directives- Interrupts and Interrupt Applications.

**UNIT III PERIPHERAL INTERFACING & APPLICATION****9**

Programmable Peripheral Interface (8255), keyboard display controller (8279), ADC, DAC Interface, Programmable Timer Controller (8254), Programmable interrupt controller (8259), Serial Communication Interface (8251).

**UNIT IV MICROCONTROLLER****9**

8051 – Architecture, Special Function Registers(SFRs), I/o Pins Ports and Circuits, Instruction set, Addressing modes, Assembly language programming.

**UNIT V INTERFACING 8051: MEMORY, I/O, INTERRUPTS****9**

Programming 8051 Timers- Serial Port Programming- Interrupts Programming–LCD & Keyboard Interfacing- ADC, DAC & Sensor Interfacing, External Memory Interface- RTC Interfacing using I2C Standard- Motor Control- Relay, PWM, DC & Stepper Motor.

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

1. Ramesh S. Gaonkar, Microprocessor Architecture Programming and Applications with 8085. Fifth edition, Penram International Publishing 2010.
2. Douglas V.Hall, Microprocessor and Interfacing, Programming and Hardware. Revised second Edition 2006, Eleventh Reprint 2010. Tata McGraw Hill
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay The 8051 Microcontroller and Embedded Systems, Second Edition 2008, Fifth Impression 2010, Pearson Education 2008.

**REFERENCES:**

1. Krishna Kant, “ Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096, PHI, 2007, Seventh Reprint 2011
2. Kenneth J.Ayala., “The 8051 Microcontroller, 3<sup>rd</sup> Edition, Thompson Delmar Learning, 2007, New Delhi.
3. A.K. Ray , K.M .Bhurchandi “Advanced Microprocessor and Peripherals” ,Second edition, Tata McGraw-Hill, 2007.
4. Barry B.Brey, “The Intel Microprocessors Architecture, Programming and Interfacing” Pearson Education, 2007. New Delhi.
5. Nilesh B Bahadure, “ Microprocessors The 8086 to Pentium Family, PHI, 2010

**OBJECTIVES:**

- To introduce the various types of transmission lines and to discuss the losses associated.
- To give thorough understanding about impedance transformation and matching.
- Usage of smith chart in problem solving is dealt with.
- Knowledge on filter theories and waveguide theories are imparted.

**UNIT I TRANSMISSION LINE THEORY & PARAMETERS 8**

Introduction to different types of transmission lines , Transmission line Equation – Solution – Characteristic impedance-Infinite line concept - Distortion less line – loading – input impedance, Losses in Transmission lines– Reflection loss, Insertion loss, return loss, Introduction to planar transmission lines. Numerical examples

**UNIT II IMPEDENCE MATCHING AND TRANSFORMATION 9**

Reflection Phenomena – Standing waves –  $\lambda/8$ ,  $\lambda/4$  &  $\lambda/2$  lines –  $\lambda/4$  Impedance transformers, Stub Matching – Single and Double Stub – Smith Chart and Applications. Numerical examples

**UNIT III NETWORKCOMPONENTS 8**

Filter fundamentals, Filter design- lumped element and distributed element approach to filter design –Design of Attenuators and Equalizers – Lattice type , Concept of inverse networks –Transients in transmission lines, Lattice diagram. Numerical examples

**UNIT IV RECTANGULAR WAVE GUIDES 10**

Waves between Parallel Planes – characteristic of TE , TM and TEM waves , Velocities of propagation ,Solution of wave Equation in Rectangular guides ,TE and TM modes , Dominant Mode, Attenuation, Mode Excitation, Dielectric slab wave guides, Numerical examples .

**UNIT V CYLINDRICAL WAVE GUIDES 10**

Solution of wave equation in circular guides, TE and TM wave in circular guides, Wave impedance, attenuation, mode excitation, formation of cylindrical cavity, Application , cavity resonator and Q for dominant mode, Numerical examples

**TOTAL=45 PERIODS**

**TEXTBOOK:**

1. John D Ryder "Networks lines and fields" Prentice Hall of India, 2005

**REFERENCES**

1. E.C.Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems" Prentice Hall of India, 2006
2. Guru & Hiziroglu,"Electromagnetic Field Theory Fundamentals" Second edition Cambridge University press, 2005
3. R.K.Shevgaonkar, "ELECTROMAGNETIC FIELDS" Tata McGraw Hill Publications,2006
4. G.S.N Raju" Electromagnetic Field Theory and Transmission Lines" Pearson Education, First edition 2005

**EC8551****DISCRETE TIME SIGNAL PROCESSING****L T P C  
3 1 0 4****OBJECTIVES:**

- To introduce discrete fourier transform and its applications
- To teach the design of infinite and finite impulse response filters for filtering undesired signals
- To introduce signal processing concepts in systems having more than one sampling frequency

**UNIT I DISCRETE FOURIER TRANSFORM****12**

Review of discrete-time signals & systems - DFT and its properties, FFT algorithms & its applications, Overlap-add & overlap-save methods.

**UNIT II DESIGN OF INFINITE IMPULSE RESPONSE FILTERS****12**

Analog filters – Butterworth filters, Chebyshev Type I filters (upto 3<sup>rd</sup> order), Analog Transformation of prototype LPF to BPF /BSF/ HPF. Transformation of analog filters into equivalent digital filters using Impulse invariant method and Bilinear Z transform method- Realization structures for IIR filters – direct, cascade, parallel forms.

**UNIT III DESIGN OF FINITE IMPULSE RESPONSE FILTERS****12**

Design of linear phase FIR filters windowing and Frequency sampling methods - Realization structures for FIR filters – Transversal and Linear phase structures- Comparison of FIR & IIR.

**UNIT IV FINITE WORDLENGTH EFFECTS****12**

Representation of numbers-ADC Quantization noise-Coefficient Quantization error-Product Quantization error-truncation & rounding errors -Limit cycle due to product round-off error-Round-off noise power-limit cycle oscillation due to overflow in digital filters- Principle of scaling.

**UNIT V MULTIRATE SIGNAL PROCESSING****12**

Introduction to Multirate signal processing-Decimation-Interpolation-Polyphase Decomposition of FIR filter-Multistage implementation of sampling rate conversion- Design of narrow band filters - Applications of Multirate signal processing.

**TOTAL: 60 PERIODS****TEXTBOOKS:**

1. A.V.Oppenheim, R.W. Schafer and J.R. Buck, Discrete-Time Signal Processing, 8<sup>th</sup> Indian Reprint, Pearson, 2004.
2. John G Proakis and Manolakis, “ Digital Signal Processing Principles, Algorithms and Applications”, Pearson, Fourth Edition, 2007

**REFERENCES:**

1. I.C.Ifeachor and B.W. Jervis, Digital Signal Processing- A practical approach, Pearson, 2002.
2. M.H.Hayes, Digital Signal Processing, Schaum’s outlines, Tata McGraw Hill, 2007.
3. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata McGraw-Hill, 1998.
4. D.J. De Fatta, J.G.Lucas and W.S. Hodgkiss, Digital Signal Processing- A system Design Approach, John Wiley & sons, Singapore, 1988.
5. P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993.

**(Common to all branches of Fifth or Sixth Semester  
B.E / B.Tech programmes)**

**OBJECTIVES:**

- To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
- To help them improve their soft skills, including report writing, necessary for the workplace situations
  1. Making presentations – introducing oneself – introducing a topic – answering questions – individual presentation practice
  2. Creating effective PPTs – presenting the visuals effectively
  3. Using appropriate body language in professional contexts – gestures, facial expressions, etc.
  4. Preparing job applications - writing covering letter and résumé
  5. Applying for jobs online - email etiquette
  6. Participating in group discussions – understanding group dynamics - brainstorming the topic
  7. Training in soft skills - persuasive skills – People skills - questioning and clarifying skills – mock GD
  8. Writing Project proposals – collecting, analyzing and interpreting data / drafting the final report
  9. Attending job interviews – answering questions confidently
  10. Interview etiquette – dress code – body language – mock interview

**TOTAL: 30 PERIODS****REQUIREMENTS FOR A CLASS OF 30 STUDENTS**

1. A PC or a lap top with one or two speakers
2. A Collar mike and a speaker
3. An LCD projector and a screen
4. CD's and DVD's on relevant topics

**REFERENCE BOOKS**

1. Dhanavel, S.P. 2010. *English and Soft Skills*. Hyderabad: Orient BlackSwan Ltd.
2. Corneilssen, Joep. *How to Prepare for Group Discussion and Interview*. New Delhi: Tata-McGraw-Hill, 2009.

3. D'Abreo, Desmond A. *Group Discussion and Team Building*. Mumbai: Better Yourself Books, 2004.
4. Ramesh, Gopalswamy, and Mahadevan Ramesh. *The ACE of Soft Skills*. New Delhi: Pearson, 2010.
5. Gulati, Sarvesh. *Corporate Soft Skills*. New Delhi: Rupa and Co. 2006.
6. Van Emden, Joan, and Lucinda Becker. *Presentation Skills for Students*. New York: Palgrave Macmillan, 2004.

### **EXTENSIVE READERS**

1. Covey, Stephen R. *The 7 Habits of Highly Effective People*. New York: Free Press, 1989.
2. Bagchi, Subroto. *The Professional*. New Delhi: Penguin Books India, 2009.

### **WEB RESOURCES**

1. [www.humanresources.about.com](http://www.humanresources.about.com)
2. [www.careerride.com](http://www.careerride.com)

**EC8511**

**MICROCONTROLLER AND  
INTERFACING LABORATORY**

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

### **8085 BASED EXPERIMENTS**

1. Assembly Language Programming of 8085

### **8086 BASED EXPERIMENTS**

2. Programs for 16 bit Arithmetic, Sorting, Searching and String operations,
3. Programs for Digital clock, Interfacing ADC and DAC
4. Interfacing and Programming 8279, 8259, and 8253.
5. Serial Communication between two Microprocessor Kits using 8251.
6. Interfacing and Programming of Stepper Motor and DC Motor Speed control and Parallel Communication between two Microprocessor Kits using Mode 1 and Mode 2 of 8255.
7. Macroassembler Programming for 8086

### **8051 BASED EXPERIMENTS**

8. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.

9. Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
10. Interfacing – DAC and ADC and 8051 based temperature measurement
11. Interfacing – LED and LCD
12. Interfacing – stepper motor traffic light control
13. Communication between 8051 Microcontroller kit and PC.
14. R8C based applications

**TOTAL: 45 PERIODS**

**LAB REQUIREMENTS:**

1. 8085 trainer kit 15 Nos.
2. 8051 trainer kit 15 Nos.
3. 8086 trainer kit 10 Nos.
4. Macro assembler MASM (Simulator) - 10 Users.
5. 8279 Interfacing card compatible with 8085, 8051 and 8086 trainers. – 2Nos.
6. 8251 Interfacing card compatible with 8085, 8051 and 8086 trainers. – 2Nos.
7. ADC and DAC Interfacing card compatible with 8085, 8051 and 8086 trainers. – 2Nos.
8. Traffic Light - Interfacing card compatible with 8085, 8051 and 8086 trainers. – 2Nos.
9. Stepper motor Interfacing - Interfacing card compatible with 8085, 8051 and 8086 trainers. – 2Nos.
10. (16X2) LCD Display - Interfacing card compatible with 8085, 8051 and 8086 trainers. – 2Nos
11. Temperature measurement card - Interfacing card compatible with 8085, 8051 and 8086 trainers. – 2Nos
12. DC motor speed control card- Interfacing card compatible with 8085, 8051 and 8086 trainers. – 2Nos

**EC8512**

**COMMUNICATION SYSTEMS LABORATORY**

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

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM / FM Modulator and Demodulator
4. Pulse Code Modulation and Demodulation
5. Delta Modulation and Demodulation
6. Line coding schemes

7. FSK, PSK and DPSK schemes (Simulation)
8. Error control coding schemes (Simulation)
9. Spread spectrum communication (Simulation)
10. Communication link simulation
11. Symbol Timing Synchronization
12. Equalization – Zero Forcing & LMS algorithms

**TOTAL: 45 PERIODS**

**LAB REQUIREMENTS:**

- i) Kits for Signal Sampling, TDM, AM, FM, PCM, DM and Line Coding Schemes
- ii) Software Defined Radio platform for link simulation studies
- iii) MATLAB / SCILAB for simulation experiments
- iv) PCs - 6 No.s

**EC8561**

**DIGITAL SIGNAL PROCESSING LABORATORY**

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

**DSP PROCESSOR IMPLEMENTATION**

1. Study of architecture of Digital Signal Processor
2. MAC operation using various addressing modes
3. Implementation of difference equations
4. Linear Convolution
5. Circular Convolution
6. Waveform generation

**MATLAB / EQUIVALENT SOFTWARE PACKAGE**

7. Generation of sequences
8. Linear and Circular Convolutions
9. DFT
10. FIR filter design
11. IIR filter design

12. Finite wordlength effects
13. Decimation and Interpolation

**TOTAL: 45 PERIODS**

**LAB REQUIREMENTS:**

- TMS 320C5x / TMS 320C6x Kits – 15 Nos.  
 MATLAB or Equivalent S/w – 15 User License

**MG8653**

**PRINCIPLES OF MANAGEMENT**

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

**AIM**

To learn the different principles and techniques of management in planning, organizing, directing and controlling.

**OBJECTIVES**

- To study the Evolution of Management
- To study the functions and principles of management
- To learn the application of the principles in an organization

**UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS**

**9**

Definition of Management –Science or Art – Manager Vs Entrepreneur- types of managers- managerial roles and skills–Evolution of Management–Scientific, human relations , system and contingency approaches– Types of Business organization- Sole proprietorship, partnership, company-public and private sector enterprises- Organization culture and Environment – Current trends and issues in Management.

**UNIT II PLANNING**

**9**

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

### **UNIT III ORGANISING**

**9**

Nature and purpose – Formal and informal organization – organization chart–organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization –Job Design - Human Resource Management –HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

### **UNIT IV DIRECTING**

**9**

Foundations of individual and group behaviour– motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership –communication – process of communication – barrier in communication – effective communication –communication and IT.

### **UNIT V CONTROLLING**

**9**

System and process of controlling –budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

**TOTAL: 45 PERIODS**

#### **TEXT BOOKS:**

1. Stephen P. Robbins & Mary Coulter, “ Management”, Prentice Hall (India)Pvt. Ltd., 10<sup>th</sup> Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, Pearson Education, 6th Edition, 2004.

#### **REFERENCES:**

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management” Pearson Education, 7th Edition, 2011.
2. Robert Kreitner & Mamata Mohapatra, “ Management”, Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich “Essentials of management” Tata McGraw Hill, 1998.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata Mcgraw Hill, 1999

**OBJECTIVES:**

- To give insight into the radiation phenomena.
- To give a thorough understanding of the radiation characteristics of different types of antennas .
- To create awareness about the the different types of propagation of radio waves at different frequencies

**UNIT I FUNDAMENTALS OF RADIATION****9**

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi array.

**UNIT II APERTURE AND SLOT ANTENNAS****9**

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

**UNIT III ANTENNA ARRAYS****9**

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array

**UNIT IV SPECIAL ANTENNAS****9**

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

**UNIT V PROPAGATION OF RADIO WAVES****9**

Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept

, Sky wave propagation – Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation

**TOTAL : 45 PERIODS**

**TEXT BOOKS :**

1. John D Kraus, "Antennas for all applications", 3 Ed, McGraw Hill, 2005
2. Edward C. Jordan and Keith G. Balmain "Electromagnetic Waves and Radiating Systems" Prentice Hall of India, 2006
3. R.E. Collin, "Antennas and radiowave propagation" McGraw hill 1985

**REFERENCES:**

1. Constantine.A. Balanis "Antenna Theory Analysis and Design" Wiley student edition, 2006
2. Rajeswari Chatterjee, "Antenna Theory and Practice " Revised Second edition " New Age international Publishers, 2006
3. S. Drabowitch, "Modern Antennas" Second edition, Springer Publications, 2007
4. Robert S. Elliott "Antenna theory and Design " Wiley student edition, 2006
5. H. Sizon " Radio Wave Propagation for Telecommunication Applications " First Indian Reprint, Springer Publications, 2007

**EC8602**

**COMMUNICATION NETWORKS**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

- To introduce the layered communication architectures
- To understand various physical, data link and routing layer protocols
- To understand application layer protocols and security issues .
- To understand various digital switching techniques.

**UNIT I NETWORK FUNDAMENTALS AND PHYSICAL LAYER**

**9**

Introduction to Networks, definition of layers, services, interface and protocols. OSI reference model- layers and duties. TCP/IP reference model – layers and duties. Physical layer- general description, characteristics, signaling media types, topologies, examples physical layer (RS232C, ISDN, ATM, SONET)

## **UNIT II DATA LINK LAYER AND NETWORK INTERCONNECTION**

**9**

Logical link control Functions:- Framming, Flow control , Error control: CRC, LLC protocols:- HDLC, P to P. Medium access layer:- Random access, Controlled access, Channelization, IEEE standards:- 802.3, 802.4 and 802.5. Internetworking, Interconnection issues, Interconnection devices:- Repeaters, Hubs, Routers/switches and Gateways.

## **UNIT III MESSAGE ROUTING TECHNOLOGIES**

**9**

Circuit switching, packet switching, message switching. Internet protocols; IPV4, IPV6, ARP, RARP, ICMP, IGMP, VPN. Network Routing Algorithms: - Distance vector routing, OSPF, Dijkstra's , Bellman Ford, Congestion control algorithms.

## **UNIT IV END-END PROTOCOLS AND SECURITY**

**9**

Process-process delivery:- TCP, UDP and SCTP. Application protocols: WWW, HTTP, FTP and TELNET, Network management protocol: SNMP, Network security.

## **UNIT V DIGITAL SWITCHING**

**9**

Switching functions, Space Division Switch, Time Division Switch, STS switching, TST switching, No 4 ESS Toll switch, digital cross connect systems.

**TOTAL: 45 PERIODS**

### **TEXT BOOKS**

1. Behrouz.A. Forouzan, Data Communication And Networking, 4<sup>th</sup> Edition, Tata McGraw Hill, 2007.
2. John C. Bellamy, Digital Telephony, 3<sup>rd</sup> Edition, John Wiley 2006.

### **REFERENCES**

1. Stallings.W., Data And Computer Communication, 4<sup>th</sup> Edition, Prentice Hall of India, 1996
2. Tanenboum, A.S, Computer Networks, 3<sup>rd</sup> Edition , Prentice Hall Of India, 1996
3. Keshav.S. An Engineering Approach To Computer Networking, Addison – Wesley,1999.
4. J.E.Flood, Telecommunication Switching, Traffic and networks, 1st edition, Pearson Education, 2006.



**TOTAL: 45 PERIODS**

**TEXTBOOKS:**

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated circuits: A design perspective". Second Edition, Prentice Hall of India, 2003.
2. M.J. Smith, "Application specific integrated circuits", Addison Wesley, 1997

**REFERENCES:**

1. N.Weste, K.Eshraghian, "Principles of CMOS VLSI DESIGN", second edition, Addison Wesley 1993
2. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", 2005 Prentice Hall of India
3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI DESIGN", Third edition, Prentice Hall of India, 2007.

**EC8611**

**NETWORKING LABORATORY**

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

1. Analysis of logical link control layer protocols – Stop & wait, Sliding Window, Go-back N
2. Analysis of MAC protocols 6 – ALOHA, SLOTTED ALOHA, CSMA, CSMA/CD, TOKEN BUS, TOKEN RING.
3. Analysis of Routing protocols – OSPF, LINK STATE ROUTING, BELLMAN FORD
4. Client / Server communication using TCP / UDP Socket programming
5. Data Packet Scheduling, Congestion Control
6. Switches / Routers
7. Wi – Fi Physical Layer
8. Wi – Fi MAC Layer
9. Cryptography ( Network Security )
10. LAN / MAN / WAN simulation and performance evaluation

**TOTAL: 45 PERIODS**

**LAB REQUIREMENTS:**

- LAN TRAINER KITS FOR LLC PROTOCOL STUDIES – 2 No.s
- LAN TRAINER KITS FOR MAC PROTOCOL STUDIES – 4 No.s

NETWORK SIMULATION SOFTWARE

- NETSIM / QUALNET /  
Ns2 / GLOMOSIM

PCs

- 8 No.s

**EC8612**

**VLSI DESIGN LABORATORY**

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

**FPGA Based experiments.**

1. HDL based design entry and simulation of simple counters, state machines, adders (min 8 bit) and multipliers (4 bit min).
2. Synthesis, P&R and post P&R simulation of the components simulated in (1) above. Critical paths and static timing analysis results to be identified. Identify and verify possible conditions under which the blocks will fail to work correctly.
3. Hardware fusing and testing of each of the blocks simulated in (1). Use of either chipscope feature (Xilinx) or the signal tap feature (Altera) is a must. Invoke the PLL and demonstrate the use of the PLL module for clock generation in FPGAs.

**IC Design Experiments: (Based on Cadence/MAGMA/Tanner )**

4. Design and simulation of a simple 5 transistor differential amplifier. Measure gain, ICMR, and CMRR
5. Layout generation, parasitic extraction and resimulation of the circuit designed in (1)
6. Synthesis and Standard cell based design of an circuits simulated in 1(1) above. Identification of critical paths, power consumption.
7. For expt (c) above, P&R, power and clock routing, and post P&R simulation.
8. Analysis of results of static timing analysis.

**TOTAL: 45 PERIODS**

**LAB REQUIREMENTS:**

Xilinx or Altera FPGA

12 nos

Xilinx software

Cadence/MAGMA/Tanner or equivalent software package

10 User License

PCs

10 No.s

**OBJECTIVES:**

- To introduce the principle of light propagation through optical fibers
- To understand signal distortion mechanisms in the fiber
- To introduce optical transmitters and receivers for fiber /free space links
- To introduce optical network concepts and components involved.

**UNIT I OPTICAL FIBERS****9**

Introduction, light propagation in optical fibers, ray and mode theory of light, optical fiber structure and parameters, fiber materials, fiber fabrication techniques, optical signal attenuation mechanisms, merits and demerits of guided and unguided optical signal transmissions.

**UNIT II TRANSMISSION CHARACTERISTICS****9**

Optical signal distortion – Group delay, material dispersion, waveguide dispersion, polarization mode dispersion, intermodal dispersion, profile dispersion, fiber types, Standard Singlemode Fibers, Dispersion Shifted Fibers, Dispersion Flattened Fibers, Polarization Maintaining Fibers, Dispersion compensation, Principles of fiber nonlinearities.

**UNIT III OPTICAL TRANSMITTERS****9**

Materials for optical sources, light-emitting diodes, semiconductor laser diodes, longitudinal modes, gain and index-guiding, power-current characteristics, spectral behaviour, longitudinal mode control and tunability, noise, direct and external modulation, Laser sources and transmitters for free space communication.

**UNIT IV OPTICAL RECEIVERS****9**

Principles of optical detection, spectral responsivity, PIN, APD, preamplifier types, receiver noises, Signal to Noise Ratio (SNR) and Bit Error Rate (BER), Principles of coherent detection, link power and risetime budget.

**UNIT V OPTICAL NETWORKING PRINCIPLES AND COMPONENTS****9**

Network Components: Optical couplers, filters, isolators, switches, optical amplifiers: erbium doped fiber amplifiers, semiconductor optical amplifiers, Networking Concepts:

SONET/SDH/FDDI optical networks, WDM optical networks, layered optical network architecture.

**TOTAL: 45 PERIODS**

**TEXTBOOKS:**

1. Gerd Kaiser , “Optical Fiber Communications”, 4 th edition,Sixth reprint,Tata Mc Graw Hill, New Delhi,2009.
2. John M. Senior, ”Optical Fiber Communications- Principles And Practice”, Third Edition, Pearson Education, 2010.

**REFERENCES:**

1. Gerd Keiser, “Optical communications Essentials”, Special Indian Edition, Tata Mc Graw Hill, New Delhi,2008.
2. Govind P. Agrawal, “ Fiber-Optic Communication Systems”, Third Edition, John Wiley & Sons, 2004.
3. Rajiv Ramasamy & Kumar N. Sivarajan, “Optical Networks – A Practical Perspective”,2 Ed, Morgan Kauffman 2002.

**EC8702**

**WIRELESS COMMUNICATION**

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

**OBJECTIVES:**

- To study the characteristic of wireless channel
- To understand the design of a cellular system
- To study the various digital signaling techniques and multipath mitigation techniques
- To understand the concepts of multiple antenna techniques

**UNIT I WIRELESS CHANNELS**

**9**

Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters-Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.

## **UNIT II CELLULAR ARCHITECTURE**

**9**

Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept- Frequency reuse - channel assignment- hand off- interference & system capacity- trunking & grade of service – Coverage and capacity improvement.

## **UNIT III DIGITAL SIGNALING FOR FADING CHANNELS**

**9**

Structure of a wireless communication link, Principles of Offset-QPSK,  $\pi/4$ -DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

## **UNIT IV MULTIPATH MITIGATION TECHNIQUES**

**9**

Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms.

Diversity – Micro and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver,

## **UNIT V MULTIPLE ANTENNA TECHNIQUES**

**9**

MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.

**TOTAL : 45 PERIODS**

### **TEXTBOOKS:**

1. Rappaport, T.S., “Wireless communications”, Pearson Education, Second Edition, 2010.
2. Andreas.F. Molisch, “Wireless Communications”, John Wiley – India, 2006.

### **REFERENCES:**

1. David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Cambridge University Press, 2005.
2. Upena Dalal, “Wireless Communication”, Oxford University Press, 2009.
3. Van Nee, R. and Ramji Prasad, “OFDM for wireless multimedia communications”, Artech House, 2000.

4. Simon Haykins & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.
5. Vijay. K. Garg, "Wireless Communication and Networking", Morgan Kaufmann Publishers, 2007.

**EC8711**

**HIGH FREQUENCY COMMUNICATION LABORATORY**

**L T P C**

**0 0 3 2**

1. Characterisation of Glass and Plastic Optical Fibers – Measurement of Numerical Aperture and Attenuation, Coefficient OTDR Principle
2. DC Characteristics of LEDs and PIN Photodiodes – Determination of external power Efficiency and dark current of detector Responsivity
3. P-I of LED Characteristics of Laser Diode Sources – Threshold Current Determination and Study of Temperature Effects
4. Gain Characteristics of APDs – Determination of Threshold Voltage and Average gain estimation
5. Analog Transmission Characteristics of a Fiber Optic Link – Determination of Operating Range of LED and System Bandwidth for Glass and Plastic fiber links and determination of device capacity of photo detection
6. Determination of Capacity of a Digital Fiber Optic Link – Maximum Bit Rate estimation for Glass and Plastic fiber links
7. Spectral Characterisation of Optical Sources – Determination of Peak Emission Wavelength and Spectral Width
8. Study of WDM Link Components – WDM Mux / Demux, Isolator, Circulator, Fiber Bragg Grating, EDFA.
9. Gain and Radiation Pattern Measurement of an Antenna - Horn Antenna, Dipole Antenna, Array Antenna,
10. Log-Periodic Antenna, Loop Antenna
11. Determination of Mode Characteristics of a Reflex Klystron Oscillator
12. VSWR and Impedance Measurement and Impedance Matching
13. Dielectric Constant Measurement
14. Characterisation of Directional Couplers and Multiport junctions
15. Gunn Diode Characteristics
16. Microwave IC – Filter Characteristics

**LAB REQUIREMENTS:**

MM/SM Glass and plastic fiber patch chords with ST/SC/E2000 connectors  
 LEDs and LDs with ST / SC / E2000 receptacles – 650 / 850 nm  
 PiN PDs and APDs with ST / SC / E2000 receptacles – 650 / 850 nm  
 Stabilized current sources,  
 Signal generators, Pulse generators, Oscilloscopes  
 Optical power meters and Spectrum Analyzers  
 WDM modules

**MICROWAVE COMPONENTS ?**

Microwave source X-band Reflex klystron oscillator / Gunn oscillator	5 nos
Klystron / gunn power supply	5 nos
Isolator	5 nos
Variable attenuator	5 nos
Freq meter direct reading type	5 nos
Detector with mount	5 nos
VSWR meter	2 nos
Waveguide slotted-section with probe and carriage	2 nos
Directional coupler 3 dB and 10 dB	1 each
Waveguide TEE E-plane, H-plane and hybrid	1 each
PIN modulator	1no
Horn antenna	2 nos
Turn table for receiver antenna	1 no
Waveguide 90 deg twist	1 no
Plane short	1 no
CRO ( 100 MHz)	5 nos
Waveguide stands	15 nos
Matched Terminations	5 nos
Variable short circuit	2 nos
Nuts and bolts	100 nos

**EC8712**

**INNOVATIVE SYSTEM DESIGN LABORATORY**

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

The objective of this laboratory is

- to encourage the students to identify socially relevant problems,
- to make them think of creative solutions for the same,
- to develop low cost proof of concept system prototype.

**METHODOLOGY:**

- Students could form teams not exceeding 4 members,
- Students should submit / present their ideas to the Lab-in-Charge and get it approved,
- Student should submit proposal with system/ technical details and cost implications,
- Students should periodically demonstrate the progress they have made,
- Students should be evaluated on the basis of the social relevance and utility of the system developed, level of proof of concept, industry support if obtained, etc.

**TOTAL: 45 PERIODS**

**EC8001**

**ADVANCED DIGITAL SIGNAL PROCESSING**

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

**OBJECTIVES:**

- To bring out the concepts related to stationary and non-stationary random signals
- To emphasize the importance of true estimation of power spectral density
- To introduce the design of linear and adaptive systems for filtering and linear prediction
- To introduce the concept of wavelet transforms in the context of image processing

**UNIT – I DISCRETE-TIME RANDOM SIGNALS**

**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 SPECTRUM ESTIMATION**

**9**

Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion.

### **UNIT - III LINEAR ESTIMATION AND PREDICTION**

**9**

Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters, Discrete Kalman filter.

### **UNIT - IV ADAPTIVE FILTERS**

**9**

Principles of adaptive filter – FIR adaptive filter – Newton’s Steepest descent algorithm – LMS algorithm – Adaptive noise cancellation, Adaptive equalizer, Adaptive echo cancellers.

### **UNIT – V WAVELET TRANSFORM**

**9**

Short Time Fourier Transform, Continuous and discrete wavelet transform, Multiresolution analysis, Application of wavelet transform, Cepstrum and Homomorphic filtering.

**TOTAL : 45 PERIODS**

#### **TEXTBOOKS:**

1. Monson H, Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons Inc., New York, Indian Reprint, 2007.
2. John G.Proakis, Dimitris G. Manolakis, Digital Signal Processing, Pearson, Fourth 2007.
3. Dwight F. Mix, Random Signal Processing, Prentice Hall, 1995.

#### **REFERENCE:**

1. Sophocles J. Orfanidis, Optimum Signal Processing, An Introduction, McGraw Hill, 1990.

**EC8002**

**ADVANCED MICROCONTROLLERS**

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

#### **OBJECTIVES:**

- To study the properties and evolution of RISC and CISC processors.
- To study the architecture addressing modes and instruction set of R8C microcontroller.
- To impart knowledge on embedded software development.
- To introduce the concept of microcontroller based system development.

**UNIT I RISC PROCESSORS 9**

RISC Vs CISC, RISC properties and evolution, Advanced RISC microcontrollers, PIC 8-bit microcontrollers.

**UNIT II R8C 16-BIT MICROCONTROLLER 9**

The R8C Architecture, CPU Registers, Instruction Set, On-Chip Peripherals, R8C Tiny Development Tools, ADC, PWM, UART, Timer Interrupts, System design using R8C Microcontroller.

**UNIT III MSP430 16 - BIT MICROCONTROLLER 9**

The MSP430 Architecture, CPU Registers, Instruction Set, On-Chip Peripherals, MSP430 Development Tools, ADC, PWM, UART, Timer Interrupts, System design using MSP430 Microcontroller.

**UNIT IV EMBEDDED SOFTWARE DEVELOPMENT 9**

Cross development tools, Debugging techniques, Real-time Operating System, Memory Management, Scheduling techniques.

**UNIT V SYSTEM DEVELOPMENT 9**

Microcontroller based System Design, Peripheral Interfacing, Inter-Integrated Circuit Protocol for RTC, EEPROM, ADC/DAC, CAN BUS interfacing, Application in Automobiles, Robotics and consumer Electronics.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. Julio Sanchez Maria P.Canton, "Microcontroller Programming: The microchip PIC", CRC Press, Taylor & Francis Group,2007.

**REFERENCES**

1. D. E. Simon, "An Embedded Software Primer", Addison-Wesley, 1999.
2. Wayne Wolf, "Computers as Components: Principles of Embedded Computing System Design", Morgan Kaufman Publishers, 2006.
3. John H.Davis , "MSP 430 Micro controller basics" Elsevier, 2008.

**OBJECTIVES:**

- To teach the importance of improving capacity of wireless channel using MIMO
- To teach the characteristic of wireless channel
- To teach techniques for channel improvements using space-time block and Trellis codes
- To teach advanced MIMO system like layered space time codes, MU-MIMO System and MIMO-OFDM systems

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

The crowded spectrum, need for high data rate, MIMO systems – Array Gain, Diversity Gain, Data Pipes, Spatial MUX, MIMO System Model. MIMO System Capacity – channel known to the TX, Ch unknown to the TX – capacity of deterministic channels, Random channels and frequency selective channels.

**UNIT II RADIO WAVE PROPAGATION****9**

Radio wave propagation – Macroscopic fading - free space and out door, small scale fading – Fading measurements – Direct pulse measurements, spread spectrum correlation channel sounding frequency domain channel sounding, Antenna Diversity – Diversity combining methods.

**UNIT III STBC****9**

Delay Diversity scheme, Alamoti space time code – Maximum likelihood decoding maximum ratio combining. Transmit diversity space time block codes for real signal constellation and complex signal constellation- decoding of STBC.

**UNIT IV STTC****9**

Space time coded systems, space time code word design criteria, design of space time T C on slow fading channels, design of STTC on Fast Fading channels, performance analysis in slow and fast fading channels, effect of imperfect channel estimation and Antenna correlation on performance, comparison of STBC & STTC.

## UNIT V LAYERED SPACE TIME CODES

9

LST transmitter – Horizontal and Vertical LST receiver – ML Rx, Zero forcing Rx; MMSE Rx, SIC Rx, ZF V-blast Rx -MMSE V-blast Rx, Iterative Rx- capacity of MIMO – OFDM systems – capacity of MIMO multi user systems.

**TOTAL : 45 PERIODS**

### TEXT BOOKS:

1. Mohinder Jankiraman, Space-time codes and MIMO systems, Artech House, Boston, London . www.artech house.com, ISBN 1-58053-865-7-2004
2. Paulraj Rohit Nabar, Dhananjay Gore, Introduction of space time wireless communication systems, Cambridge University Press, 2003.

### REFERENCES:

1. David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Cambridge University Press, 2005.
2. Sergio Verdu “ Multi User Detection” Cambridge University Press, 1998
3. Andre Viterbi “ Principles of Spread Spectrum Techniques” Addison Wesley 1995
4. Volker Kuhn, “ Wireless communication over MIMO channels” John Wiley and Sons Ltd.2006.

**EC8004**

**AVIONICS**

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

### OBJECTIVES:

- To introduce the hardware required for aircraft
- To introduce communication and navigation techniques used in aircrafts
- To introduce autopilot and cockpit display related concepts

## 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 BOOK:**

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

**EC8005**

**CAD FOR VLSI**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

- To understand the suite of tools available for support and design of VLSI circuits
- To introduce rules and planning methodologies for synthesizing VLSI circuits
- To introduce different modeling schemes for aynthesizing VLSI circuits



**OBJECTIVES:**

- To study the DC biasing conditions of various MOS amplifier configurations
- To understand the small signal model of various MOS circuits
- To study OPAMP circuits and its stability conditions
- To study in general negative feedback concept in MOS circuits

**UNIT I BASIC BUILDING BLOCKS: 9**

NMOS and PMOS device operation in saturation and sub-threshold regions, device transconductance, output impedance and equivalent circuit. Introduction to Device models for simulation. CG, CG, and source follower circuits.

**UNIT II MULTIPLE TRANSISTOR STAGES: 9**

Cascode circuits. folded cascode circuits, , Differential amplifier circuits, quantitative analysis of differential pair, CMRR, Differential pair with MOS loads, Gilbert Cell, Current Mirrors.

**UNIT III FREQUENCY RESPONSE, NOISE. 9**

Frequency response of CS and CG stages. Miller effect and association of poles with nodes. Characteristics of noise – thermal and flicker noise. Noise in CS, CG, Cascode and source follower stages.

**UNIT IV OPERATIONAL AMPLIFIERS: 9**

Two stage op-amps, gain boosting, common mode feedback, input range limitation, slew rate, power supply rejection, noise in op-amps.

**UNIT V FEEDBACK AND STABILITY: 9**

Properties of feedback circuits, topologies, effect of loading and noise in feedback circuits. Stability in multipole systems, phase margin, frequency compensation in two stage op-amps, other compensation techniques.

**TOTAL: 45 PERIODS**

**TEXT BOOK:**

1. B.Razavi, "Design of CMOS Analog Integrated Circuits", Tata McGraw Hill 2002.

**REFERENCE:**

1. Willy Sansen , " Analog Design Essentials:" Springer 2006

**EC8007****CMOS ANALOG IC DESIGN II****L T P C  
3 0 0 3****OBJECTIVES:**

- To design MOS circuits applied for various data conversion stages namely, sample and hold, ADC and DAC
- To study designs with better precision in data conversion
- To study various ADC and DAC circuit architectures

**UNIT I SAMPLE AND HOLD:****9**

Properties of MOS Switches, multiplexed input architectures, recycling architecture, open and closed loop sampling architectures, switched capacitor and current mode architectures.

**UNIT II BUILDING BLOCK OF DATA CONVERSION CIRCUITS:****9**

Amplifiers, open loop and closed loop amplifiers, gain boosting, common mode feedback, bipolar, CMOS and BiCMOS comparators.

**UNIT III PRECISION TECHNIQUES:****9**

Comparator cancellation, input and output offset storage principles, comparators using offset cancelled latches, opamp offset cancellation, ADC and DAC calibration techniques.

**UNIT IV ADC/DAC ARCHITECTURES:****9**

DAC Performance metrics, reference multiplication and division, switching and logical functions of DACs, Current steering architectures, DAC Performance metrics, Flash ADC architecture, Gray encoding, thermometer encoding and metastability.

## **UNIT V OVER SAMPLING CONVERTERS.**

**9**

Delta sigma modulators, alternative modulator architectures, quantization and noise shaping, decimation filtering, implementation of Delta sigma modulators, delta sigma DACs,

**TOTAL: 45 PERIODS**

### **TEXT BOOKS:**

1. B.Razavi "Data Conversion System Design" IEEE Press and John Wiley, 1995.
2. Phillip Allen and Douglas Holmberg "CMOS Analog Circuit Design" Second Edition, Oxford University Press, 2004.

**EC8008**

## **COGNITIVE RADIO COMMUNICATION**

**L T P C**

**3 0 0 3**

### **OBJECTIVE:**

- To introduce the concept of software defined radios and their architectures
- To introduce the concept of cognitive radio communication and the components involved
- To introduce the cognitive radio architecture and the functions and issues involved in communication system design.

## **UNIT I INTRODUCTION TO SOFTWARE DEFINED RADIO**

**9**

Definitions and potential benefits, software radio architecture evolution – foundations, technology tradeoffs and architecture implications.

## **UNIT II SDR ARCHITECTURE**

**9**

Essential functions of the software radio, architecture goals, quantifying degrees of programmability, top level component topology, computational properties of functional components, interface topologies among plug and play modules, architecture partitions.

## **UNIT III INTRODUCTION TO COGNITIVE RADIOS**

**9**

Marking radio self-aware, the cognition cycle, organization of cognition tasks, structuring knowledge for cognition tasks, Enabling location and environment awareness in cognitive radios – concepts, architecture, design considerations.

## **UNIT IV COGNITIVE RADIO ARCHITECTURE**

**9**

Primary Cognitive Radio functions, Behaviors, Components, A–Priori Knowledge taxonomy, observe – phase data structures, Radio procedure knowledge encapsulation, components of orient, plan, decide phases, act phase knowledge representation, design rules.

## **UNIT V NEXT GENERATION WIRELESS NETWORKS**

**9**

The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design.

**TOTAL: 45 PERIODS**

### **TEXT BOOKS:**

1. Qusay. H. Mahmoud, “Cognitive Networks : Towards Self Aware Network”, John Wiley & Sons Ltd. 2007.
2. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, “Software Defined Radio”, John Wiley, 2003.
3. Huseyin Arslan, “Cognitive Radio, SDR and Adaptive System”, Springer, 2007.
4. Joseph Mitola, “Cognitive Radio Architecture”, John Wiley & Sons, 2006.
5. Alexander M. Wyglinski, Maziarnekov, Y. Thomas Hu, “Cognitive Radio Communication and Networks”, Elsevier, 2010.

### **REFERENCES:**

1. J. Mitola, “ The Software Radio Architecture”, IEEE Communications Magazine, May 1995.
2. Joseph Mitola III and Gerald Q. Maquire, “Cognitive radio: making software radios more personal”, IEEE Personal Communications, August 1999.
3. J. Mitola, “ Cognitive Radio: An Integrated Agent Architecture for software defined radio”, Doctor of Technology thesis, Royal Inst. Technology, Sweden 2000.
4. Simon Haykin, “Cognitive Radio: Brain –empowered wireless communications”, IEEE Journal on selected areas in communications, Feb 2005.
5. Hasari Celebi, Huseyin Arslan , “ Enabling location and environment awareness in cognitive radios”, Elsevier Computer Communications , Jan 2008.
6. Ian F. Akyildiz, Won – Yeol Lee, Mehmet C. Vuran, Shantidev Mohanty, “ Next generation / dynamic spectrum access / cognitive radio wireless networks: A Survey” Elsevier Computer Networks, May 2006.

**OBJECTIVES:**

The OBJECTIVES: of this course is to extend the concepts of continuous-time control systems to digital domain where the design and stability aspects are introduced.

**UNIT I CONTINUOUS TIME SYSTEMS 6**

Review of frequency and time response analysis and specifications of control systems, need for controllers, continuous time compensations, continuous time PI, PD, PID controllers.

**UNIT II SIGNAL PROCESSING IN DIGITAL CONTROL 12**

Sampling, time and frequency domain descriptions, aliasing, hold operations, mathematical model of sample and hold, zero and first order hold, factors limiting the choice of sample rate, reconstruction, Difference equation description, Z-transform method of description, pulse transfer function, time and frequency response of discrete time control systems.

**UNIT III DESIGN OF DIGITAL CONTROL ALGORITHMS 9**

Review of principle of compensator design, Z-plane specifications, digital compensator design using frequency response plots, discrete integrator, discrete differentiator, development of digital PID controller, transfer function, design in Z-plane.

**UNIT IV STATE VARIABLE TECHNIQUES 9**

Discrete State Variable concepts, Characteristic equation, Eigenvalues and Eigenvectors, Jordan canonical models, Phase Variable companion forms.

**UNIT V CONTROLLABILITY, OBSERVABILITY AND STABILITY 9**

Definitions and Theorems of Controllability and Observability, Relationships between Controllability, Observability and Transfer Functions, Jury, Routh, Lyapunov stability analysis, Principles of state and output feedback.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Benjamin C.Kuo, Digital Control Systems, OXFORD University Press, II Edition, 2007
2. M.Gopal, Digital Control and State Variable Methods, Tata McGraw Hill, II Edition, 2007.

**REFERENCES**

1. K.Ogata, Discrete-Time Control Systems, PHI, II Edition,2007.
2. Gene. F.Franklin, J.D.Powell, M.Workman, Digital Control of Dynamic Systems, Addison-Wesley, III Edition, 2000.

**EC8010****DIGITAL SWITCHING AND TRANSMISSION****L T P C  
3 0 0 3****OBJECTIVES:**

- To introduce different types of signaling in digital telephony
- To introduce various transmission schemes for telephony and broadband
- To introduce modeling and analysis techniques for data transmission

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

Overview of existing Voice, Data and Multimedia Networks and Services; Review of Basic Communication principles; Synchronous and Asynchronous transmission, Line Codes

**UNIT II TRUNK TRANSMISSION****9**

Multiplexing & Framing- types and standards; Trunk signaling; Optical Transmission-line codes and Muxing: SONET/SDH; ATM; Microwave and Satellite Systems.

**UNIT III LOCAL LOOP TRANSMISSION****9**

The Analog Local Loop; ISDN local loop; DSL and ADSL; Wireless Local Loop; Fiber in the loop; Mobile and Satellite Phone local loop.

**UNIT IV SWITCHING****9**

Evolution; Space switching, Time switching and Combination Switching; Blocking and Delay characteristics; Message ,Packet and ATM switching; Advances in switching techniques – shared memory fast packet switches, shared medium fast packet switches and space division fast packet switches, Photonic switching- Optical TDM, WDM.

## **UNIT V TELETRAFFIC ENGINEERING**

**9**

Telecom Network Modeling; Arrival Process; Network Blocking performance; Delay Networks-Queuing system analysis and delay performance.

**TOTAL : 45 PERIODS**

### **TEXTBOOKS:**

1. J. Bellamy, "Digital Telephony", John Wiley, 2003, 3<sup>rd</sup> Edition.
2. JE Flood, "Telecommunications Switching, Traffic and Networks", Pearson, 2005.

### **REFERENCES:**

1. R.A.Thompson, "Telephone switching Systems", Artech House Publishers, 2000.
2. W. Stalling, " Data and Computer Communications", Prentice Hall, 1993.
3. T.N.Saadawi, M.H.Ammar, A.E.Hakeem, "Fundamentals of Telecommunication Networks", Wiley Interscience, 1994.
4. W.D. Reeve, "Subscriber Loop Signalling and Transmission Hand book",IEEE Press(Telecomm Handbook Series), 1995.
5. Tarmo Anttalaian, " Introduction to Telecommunication Network Engineering", 2<sup>nd</sup> edition, Artech House, 2003.
6. T. Viswanathan, "Telecommunication Switching Systems", Prentice-Hall, 1992.

**EC8011**

**EMBEDDED AND REAL -TIME SYSTEMS**

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

### **OBJECTIVES:**

- To study the architecture and programming of ARM processor.
- To introduce the basic concepts of hard real time multiprocessing.
- To introduce the analysis concepts for effective programming .
- To study about the basics of the buses used for embedded system networking.

## **UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS**

**9**

Complex systems and microprocessors – Embedded system design process – Formalism for system design– Design example: Model train controller- ARM Processor Fundamentals- Instruction Set and Programming using ARM Processor.

## **UNIT II COMPUTING PLATFORM**

**9**

CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption- CPU buses – Memory devices – I/O devices – Component interfacing- System Level Performance Analysis- Parallelism. Design Example : Data Compressor.

## **UNIT III PROGRAM DESIGN AND ANALYSIS**

**9**

Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Program Optimization- Analysis and optimization of execution time, power, energy, program size – Program validation and testing- Example : Software Modem.

## **UNIT IV PROCESS AND OPERATING SYSTEMS**

**9**

Multiple tasks and Multi processes – Processes – Context Switching – Operating Systems –Priority based Scheduling- RMS and EDF - Inter Process Communication mechanisms – Evaluating operating system performance – Power optimization strategies for processes.

## **UNIT V HARDWARE ACCELERATORS & NETWORKS**

**9**

Multiprocessors- CPUs and Accelerators – Performance Analysis- Distributed Embedded Architecture – Networks for Embedded Systems: - I<sup>2</sup>C, CAN Bus, SHARC link supports, Ethernet, Myrinet – Network based design – Internet enabled systems. Design Example: Digital Still Camera – Video Accelerator.

**TOTAL : 45 PERIODS**

### **TEXT BOOKS:**

1. Wayne Wolf, “Computers as Components - Principles of Embedded Computing System Design”, Morgan Kaufmann Publisher (An imprint from Elsevier), Second Edition ,2008.
2. Andrew N Sloss, Dominic Symes, Chris Wright, “ARM System Developer’s Guide- Designing and Optimizing System Software”, Elsevier/Morgan Kaufmann Publisher, 2008.

### **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. Jane.W.S. Liu, “Real-Time systems”, Pearson Education Asia.



**TEXT BOOK:**

1. Thomas Cover, Joy Thomas ,”Elements of Information theory “, Wiley, 2005.

**REFERENCE:**

1. David Mackay , “Information theory, interference & learning algorithms”, Cambridge University Press, I edition, 2002.

**EC8013**

**INTERNET AND JAVA**

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

**OBJECTIVES:**

- To introduce various concepts of internetworking with TCP/IP
- To introduce the principles of world wide web
- To introduce Java programming and Java script programming
- To teach students to develop simple web pages with data bases

**UNIT I. INTERNET WORKING WITH TCP/IP**

**9**

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

**UNIT II WORLD WIDE WEB**

**9**

HTTP protocol, Web browsers Netscape, Internet explorer, Web site and web page design, HTML,XHTML, XML, CSS, Dynamic HTML, CGI.

**UNIT III JAVASCRIPT PROGRAMMING**

**9**

Introduction, Control statements, Functions, Arrays and Objects - Programming

**UNIT IV JAVA PROGRAMMING: 9**

Language features, Classes, Object and methods. Sub-classing and dynamic binding, Multithreading, Overview of class library, Object method serialization, Remote method invocation, Java Servelets and Javasever pages.

## UNIT V WEB DESIGN AND DATABASES

9

Macromedia Dream Weaver, Web Servers, Databases – SQL, MYSQL, DBI and ADO.NET, Web design

**TOTAL : 45 PERIODS**

### TEXT BOOKS:

1. Deitel, Internet and World Wide Web, Pearson Education / PHI, 2007
2. Deitel, “Java How to Program”, Pearson Education / PHI, 2006.
3. Herbert Schildt, The complete Reference JAVA 2, Fifth Edition, Tata McGraw Hill Publishing Com.Ltd, New Delhi.
4. A S Godbole A Kahate, “Web Technologies, TCP/IP to Internet Application Architectures”, TMH 2007

### REFERENCES:

1. Margaret Levine Young, “Internet The Complete Reference”, Tata McGraw Hill, 1999
2. Balagurusamy.E. `Programming with Java, A premier` Second Edition, Tata McGraw Hill,2006
3. Douglas E.Comer, ”Internetworking with TCP/IP”, Vol 1: 3<sup>rd</sup> edition, Prentice Hall of India, 1999..
4. Cay S. Horstmann & Gary Cornell, Core Java™ Volume – I & II, Pearson Education, 2006

**EC8014**

**MEASUREMENTS AND INSTRUMENTATION**

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

### OBJECTIVES:

- To introduce principles of various measurement techniques using analog and digital equipments
- To teach Importance of signal generators and analyzers in measurements
- To emphasize the need for data acquisition systems and optical domain measurement techniques

## UNIT I SCIENCE OF MEASUREMENT

9

Measurement System – Instrumentation – Characteristics of measurement systems – Static and Dynamic – Errors in Measurements – Calibration and Standards.

## **UNIT II    TRANSDUCERS**

**9**

Classification of Transducers – Variable Resistive transducers – Strain gauges , Thermistor, RTD- Variable Inductive transducers- LVDT, RVDT,- Variable Capacitive Transducers – Capacitor microphone- Photo electric transducers – Piezo electric transducers – Thermocouple – IC sensors - Fibre optic sensors – Smart/intelligent sensors.

## **UNIT III    SIGNAL CONDITIONING AND SIGNAL ANALYZERS**

**9**

DC and AC bridges – Wheatstone, Kelvin, Maxwell, Hay and Schering. Pre- amplifier – Isolation amplifier – Filters – Data acquisition systems. Spectrum Analyzers – Wave analyzers – Logic analyzers.

## **UNIT IV    DIGITAL INSTRUMENTS**

**9**

Digital Voltmeters – Millimeters – automation in Voltmeter – Accuracy and Resolution in DVM - Guarding techniques – Frequency counter- Data Loggers – Introduction to IEEE 488/GPIB Buses.

## **UNIT V    DATA DISPLAY AND RECORDING SYSTEMS**

**9**

Dual trace CRO – Digital storage and Analog storage oscilloscope. Analog and Digital Recorders and printers. Virtual Instrumentation - Block diagram and architecture – Applications in various fields. Measurement systems applied to Micro and Nanotechnology.

**TOTAL : 45 PERIODS**

### **TEXT BOOKS:**

1. Albert D.Helfrick and William D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, 2007.
2. Ernest o Doebelin and dhanesh N manik, “Measurement systems” ,5<sup>th</sup> edition ,McGraw-Hill, 2007.

### **REFERENCES:**

1. John P. Bentley, “Principles of Measurement Systems”, Fourth edition, pearson Education Limited, 2005.
2. A. K. Sawhney, “Course In Electrical And Electronic Measurement And Instrumentation”, Dhanpat Rai Publisher, 2000.
3. Bouwens,A.J, “Digital Instrumentation”, Tata Mc-Graw Hill, 1986.
4. David A.Bell, “Electronic Instrumentation and Measurements”, Second edition, Prentice Hall of India, 2007.

**OBJECTIVE:**

- To gain knowledge about the various physiological parameters both electrical and non electrical and the methods of recording and also the method of transmitting these parameters.
- To study about the various assist devices used in the hospitals.
- To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.

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

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

**UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9**

pH, PO<sub>2</sub>, PCO<sub>2</sub>, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

**UNIT III ASSIST DEVICES 9**

Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine

**UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9**

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radiopill, electrical safety

**UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9**

Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine

**TOTAL : 45 PERIODS**

**TEXTBOOKS:**

1. Leslie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2007.
2. John G.Webster," Medical Instrumentation Application and Design", 3<sup>rd</sup> Edition, Wiley India Edition, 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.

**EC8016****MICROWAVE ENGINEERING****L T P C****3 0 0 3****OBJECTIVES:**

- To inculcate understanding of the basics required for circuit representation of RF networks
- To deal with the issues in the design of microwave amplifier
- To instill knowledge on the properties of various microwave components
- to deal with the microwave generation and microwave measurement techniques

**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,

**UNIT II MICROWAVE TRANSISTOR 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 PASSIVE AND ACTIVE MICROWAVE DEVICES AND CIRCUITS****9**

Open, short and matched terminations; coupling probes and loops; power divider; directional coupler; attenuators; phase shifter; circulator; isolator; Impedance matching Devices– Tuning screw, stub and quarter-wave transformers. Crystal diodes and Schottkey diode detector and mixers; PIN diode switch, Gunn diode oscillator; IMPATT diode oscillator and amplifier; varactor diode; Introduction to MIC.

**UNIT IV MICROWAVE GENERATION****9**

High frequency effects in Tubes, Two cavity klystron amplifier; Reflex klystron oscillator; TWT amplifier, Backwards wave oscillator; Magnetron oscillator – Theory and applications.

**UNIT V MICROWAVE MEASUREMENTS****9**

Measuring Instruments – VSWR meter, Power meter, Spectrum Analyser, Network Analyser – principles; Measurement of Impedance, frequency, power, VSWR, Q factor, dielectric constant, S-Parameter.

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

1. Robert E.Colin, “Foundations for Microwave Engineering”, 2 edition, McGraw Hill, 2001.
2. Reinhold.Ludwig and Pavel Bretshko ‘RF Circuit Design”, Pearson Education, Inc., 2006.
3. Guillermo Gonzalez, ”Microwave transistor amplifier design “Second edition.Prentice hall,1997.
4. Annapurna Das and Sisir K Das, “Microwave Engineering”, Tata Mc Graw Hill Inc., 2004.

**REFERENCES:**

1. Thomas H.Lee, “Planar Microwave Engineering”, Cambridge University Press, 2004
2. M.M.Radmanesh,“RF and Microwave Electronics”, Pearson Education, Inc., first edition 2005
3. S.Y.Liao, “Microwave Devices and Circuits”, Pearson Education Limited, third edition 2006.
4. D.M.Pozar, “Microwave Engineering.”, John Wiley & sons, Inc., 2006

**OBJECTIVES:**

- To study the principles of parallel processing
- To understand the concept of shared memory architecture in multiprocessing
- To study the parallel programming models.

**UNIT I PARALLEL ARCHITECTURE 9**

Parallel Computer Models, Program and Network properties, Principles of scalable performance

**UNIT II PROCESSORS AND MEMORY HIERARCHY, BUS 9**

Advanced processor Technology, Super scalar and vector processor, Memory hierarchy technology, Virtual Memory Technology, Backplane Bus systems.

**UNIT III PIPELINING AND SUPER SCALAR TECHNIQUES 9**

Linear Pipeline, Nonlinear pipeline, Instruction pipeline, Arithmetic pipeline, Superscalar and super pipeline design, Parallel and scalable architectures- Multiprocessor and Multicomputers.

**UNIT IV SOFTWARE FOR PARALLEL PROGRAMMING 9**

Parallel programming models, languages, compilers- Parallel Program Development and Environments.

**UNIT V DISTRIBUTED SYSTEMS 9**

Models, Hardware concepts, communication, synchronization mechanism, case study: MPI and PVM, Distributed file systems.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Hwang. K, "Advanced computer Architecture", Parallelism, scalability, Programmability, Tata McGraw Hill, 1993.
2. Tanenbaum A.S, "Distributed Operating Systems", Peason Education Asia, 2002.
3. Dezso Sima, Terence Fountain, Peter Kacsuk, "Advanced Computer Architectures", Pearson Education, 2007.

## REFERENCES:

1. V.Rajaraman and C.Siva Ram Murthy, "Parallel Computers Architecture and Programming", PHI, 2000.
2. Quinn, M.J., "Designing Efficient Algorithms for Parallel Computers", McGraw - Hill, 2003.
3. Culler, D.E., "Parallel Computer Architecture", A Hardware – Software approach, Harcourt Asia Pte. Ltd., 1999.

**EC8018**

**RF MICROELECTRONICS**

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

## OBJECTIVES:

- To introduce radio transceiver architectures
- To understand the design issues in CMOS LNAs , Mixers, Oscillators, PLLs, Synthesizers and Power Amplifiers.

### **UNIT I TRANSCEIVER ARCHITECTURES**

**9**

Heterodyne and Homodyne architectures, Discrete and CMOS realization passive components for RF, Impedance Matching, Distortion, IIP3 and Blocking Effects, Noise Figure, Noise matching conditions. Friis Formula for cascaded blocks. .

### **UNIT II CMOS LNAs AND MIXERS**

**9**

Noise Figure of and impedance matching issues CS, CG and differential LNAs, Passive mixers and conversion loss, Active mixers, Gilbert cells, linearity and Noise Figure of mixers.

### **UNIT III OSCILLATORS**

**9**

Negative transconductance, nonlinearity and Differential LC tuned oscillators, Ring oscillators and Colpitts oscillator, Quadrature oscillators–Phase noise.

### **UNIT IV PLLS AND SYNTHESIZERS**

**9**

Phase Detectors, charge pumps and their transfer functions, Synthesizers based on first, second and third order PLLs and stability issues, Introduction to integer and fractional N synthesizers.

**UNIT V POWER AMPLIFIERS****9**

Class A, B, C, D, E, F and AB power amplifiers, Linearization and impedance matching issues of power amplifiers.

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

1. Thomas Lee, "The Design of Radio Frequency Integrated Circuits", Cambridge University Press, Second Edition, 2004

**REFERENCE:**

1. B. Razavi, "RF Microelectronics", Pearson Education, 1997.

**EC8019****SATELLITE COMMUNICATION****L T P C****3 0 0 3****OBJECTIVES:**

- To introduce orbital mechanics and related parameters
- To introduce the different satellite subsystems
- To introduce different aspects of communication link design, multiple access methods
- To expose some of the important applications of satellites

**UNIT I SATELLITE ORBITS AND TRAJECTORIES****8**

Orbital Mechanics—Orbit Equations, Kepler's Laws, Orbital Period, Orbits and their types, look angle calculation; Satellite Launch.

**UNIT II SATELLITE SUBSYSTEM****10**

Satellite Subsystems—AOCS, TTC&M, Power, Transponders, Antennas; earth control-Effects of earth-Perturbation, suntransit, moontransit, satellite power design, MTBF. Basic Equations; System Noise and G/T ratio; Uplink, Downlink and Design for a specified C/N ratio, with GEO and LEO examples; Atmospheric and Rain effects on link performance.

**UNIT III LINK DESIGN, MODULATION AND ERROR CONTROL****10**

Single link design-double link design aspects, PAM, baseband processing, Digital Modulation for satellite links- BPSK,QPSK and QAM; TDM standards for satellite systems; Error control requirements for satellite link—ARQ, Concatenated Codes, Interleaving, Turbo codes.

**UNIT IV MULTIPLE ACCESS FOR SATELLITE COMMUNICATIONS****9**

FDM-FM-FDMA - TDMA-structure and system design; Onboard Processing systems; DAMA and PAMA; CDMA-system design and capacity.

**UNIT V SOME APPLICATIONS****8**

Remote sensing, navigation, scientific and military application, VSAT—Network architecture, Access Control protocols and techniques, VSAT Earth stations; Satellite Mobile Telephony—Global star, DBS/DTH Television, GPS, Weather satellites.

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

1. T.Pratt, C. Bostian and J.Allnutt; “Satellite Communications”, John Wiley and Sons, Second Edition., 2003.
2. D.Rody, “Satellite Communications”, Regents/Prentice Hall; Englewoods (NJ), 1989.
3. M. Richharia, “Satellite communication systems”, McGraw-Hill Professional , 1999.

**REFERENCES:**

1. W.L.Pritchard,H G Suyderhoud and R A Nelson, “Satellite Communication System Engineering”, Second edition, Prentice Hall, 1993.
2. Tri. T. Ha, “Digital Satellite Communications”, McGraw Hill, Second Edition, 1990.
3. B.N.Agarwal, “Design of Geosynchronous Space craft”, Prentice Hall, 1986.

**EC8020****SPEECH PROCESSING****L T P C****3 0 0 3****OBJECTIVES:**

- To introduce speech production and related parameters of speech
- To show the computation and use of techniques such as short time Fourier transform, linear predictive coefficients and other coefficients in the analysis of speech

- To understand different speech modeling procedures such as Markov and their implementation issues
- To introduce speech recognition and synthesis techniques

**UNIT I BASIC CONCEPTS 10**

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – Acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

**UNIT II SPEECH ANALYSIS 10**

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

**UNIT III SPEECH MODELING 8**

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

**UNIT IV SPEECH RECOGNITION 8**

Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status.

**UNIT V SPEECH SYNTHESIS 9**

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

**TOTAL: 45 PERIODS**

**TEXTBOOKS:**

1. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.

2. Daniel Jurafsky and James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education, 2002.
3. Frederick Jelinek, "Statistical Methods of Speech Recognition", MIT Press, 1997.

**REFERENCES:**

1. Steven W. Smith, "The Scientist and Engineer's Guide to Digital Signal Processing", California Technical Publishing, 1997.
2. Thomas F Quatieri, "Discrete-Time Speech Signal Processing – Principles and Practice", Pearson Education, 2004.
3. Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition", John Wiley and Sons, 1999.
4. Ben Gold and Nelson Morgan, "Speech and audio signal processing, Processing and Perception of Speech and Music", Wiley- India Edition, 2006 Edition.

**EC8021**

**VLSI SIGNAL PROCESSING**

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

**OBJECTIVES:**

- To design DSP architectures that are suitable for VLSI implementation for a given algorithm
- To learn high-level algorithms that reduce the number of multipliers, area of implementation and power consumption.
- To address issues related to high performance VLSI architectures such as pipelining styles.

**UNIT I PIPELINING AND PARALLEL PROCESSING**

**9**

Introduction to DSP Systems, Typical DSP algorithms, Data flow graph representations, Loop bound and Iteration bound, Longest Path Matrix algorithm; Pipelining and Parallel processing of FIR digital filters, Pipelining and Parallel processing for low power.

**UNIT II RETIMING AND ALGORITHMIC STRENGTH REDUCTION**

**9**

Retiming - definitions and properties; Unfolding – an algorithm for Unfolding, properties of unfolding, sample period reduction and parallel processing application; Algorithmic strength

reduction in filters and transforms – 2-parallel FIR filter, 2-parallel fast FIR filter, DCT algorithm architecture transformation, Odd-Even Merge-Sort architecture, Parallel Rank-Order filters.

**UNIT III FAST CONVOLUTION AND COMBINED PIPELINING AND PARALLEL PROCESSING OF IIR FILTERS 9**

Fast convolution – Cook-Toom algorithm, Modified Cook-Toom algorithm; Pipelined and parallel recursive adaptive filters, Look-Ahead pipelining in first-order IIR filters, Look-Ahead pipelining with power-of-two decomposition, Clustered Look-Ahead pipelining, parallel processing of IIR filters, combined pipelining and parallel processing of IIR filters, pipelined adaptive digital filters, relaxed look-ahead, pipelined LMS adaptive filter.

**UNIT IV BIT-LEVEL ARITHMETIC ARCHITECTURES 9**

Bit-Level Arithmetic Architectures- parallel multipliers with sign extension, parallel carry-ripple array multipliers, parallel carry-save multiplier, 4x 4 bit Baugh-Wooley carry-save multiplication tabular form and implementation, Bit-serial FIR filter, CSD representation, CSD multiplication using Horner's rule for precision improvement, Distributed Arithmetic

**UNIT V NUMERICAL STRENGTH REDUCTION AND WAVE PIPELINING 9**

Numerical Strength Reduction – subexpression elimination, Multiple Constant Multiplications, Synchronous pipelining and Clocking styles, Clock skew in edge-triggered single-phase clocking, Wave pipelining.

**TOTAL : 45 PERIODS**

**TEXT BOOK**

1. Keshab K.Parhi, " VLSI Digital Signal Processing systems, Design and implementation ", Wiley, Inter Science, 1999.

**REFERENCES:**

1. Mohammed Ismail and Terri Fiez, " Analog VLSI Signal and Information Processing ", Mc Graw-Hill, 1994.
2. S.Y. Kung, H.J. White House, T. Kailath, " VLSI and Modern Signal Processing ", Prentice Hall, 1985.
3. Jose E. France, Yannis Tsividis, " Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing ", Prentice Hall, 1994.

**OBJECTIVES:**

- To teach advanced Mobile technology of 2.5G and 4G techniques
- To introduce 4G technologies such as Adhoc and Sensor networks
- To teach the importance of internetworking between LAN and 3GWWANS

**UNIT I 2G & 2.5G EVOLUTION 9**

Evolution of cellular communication, GSM – Architecture, Frame format, channels, call progress. CDMA –IS95 Forward and reverse channel, GPRS and EDGE

**UNIT II 3G SYSTEMS 9**

Migration path to UMTS, UMTS Basics, Air Interface, 3GPP Network Architecture, CDMA2000 overview- Radio and Network components, Network structure, Radio network, TD-CDMA, TD-SCDMA.

**UNIT III WIRELESS LOCAL AREA NETWORKS 9**

Introduction to wireless LANs - IEEE 802.11 WLANs - Physical Layer- MAC sublayer- MAC Management Sublayer- Overview of WIMAX systems.

**UNIT IV ADHOC & 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 4G & INTERWORKING 9**

4G features and challenges, Technology path, Overview of LTE, Interworking Objectives and requirements, Schemes to connect WLANs and 3G Networks, Session Mobility, Interworking Architectures for WLAN and GPRS, System Description, LMDS and MMDS

**TOTAL : 45 PERIODS**

**TEXT BOOKS**

1. Clint Smith. P.E., and Daniel Collins, “3G Wireless Networks”, 2<sup>nd</sup> Edition, Tata McGraw Hill, 2007.

2. Vijay. K. Garg, “Wireless Communication and Networking”, Morgan Kaufmann Publishers, 2007.
3. Rappaport, T.S., “Wireless communications”, Pearson Education, Second Edition, 2010.
4. Schiller, “ Mobile Communications” , Pearson Education, 2<sup>nd</sup> edition, 2005

**REFERENCES:**

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.
3. Gary. S. Rogers & John Edwards, “An Introduction to Wireless Technology”, Pearson Education, 2007.
4. Sumit Kasera and Nishit Narang, “ 3G Networks – Architecture, Protocols and Procedures”, Tata McGraw Hill, 2007.
5. Jeffrey. G. Andrews ,” Fundamentals of WIMAX – Understanding Broadband Wireless Networking”, Prentice Hall Publication, 2007.
6. C.Sivaramoorthy and C.S.Manoj, “Adhoc Wireless Networks Architecture& Protocols”, Pearson Education, 2008.

**EC8071**

**CRYPTOGRAPHY AND NETWORK SECURITY**

**L T P C**

**3 0 0 3**

**OBJECTIVES:**

- To teach the importance of security for networks
- To teach the basics of number theory and galois field concepts
- To teach symmetric and asymmetric key in crypto systems
- To teach authentication and key management techniques
- To teach security specific to network layer

**UNIT I**

**NUMBER THEORETIC AND ALGEBRAIC ALGORITHMS**

**9**

Introduction – Integer Arithmetic Modular Arithmetic – matrices – Linear congruence - Substitution ciphers – Transposition ciphers – Stream cipher - Block ciphers – Algebraic structures – GF(2<sup>n</sup>) fields.



**OBJECTIVES:**

- To tutor the basics of EMI,EMC
- To instill knowledge on the EMI coupling mechanism and its mitigation techniques
- To impart comprehensive insight about the current EMC standards and about various measurement techniques

**UNIT I BASIC CONCEPTS****7**

Definition of EMI and EMC; Intra and Inter system EMI; Sources and victims of EMI, Conducted and Radiated EMI emission and susceptibility; Transient & ESD; Case Histories; Radiation Hazards to humans.

**UNIT II COUPLING MECHANISM****9**

Common mode coupling; Differential mode coupling; Common impedance coupling; Ground loop coupling; Field to cable coupling; Cable to cable coupling; Power mains and Power supply coupling.

**UNIT III EMI MITIGATION TECHNIQUES****10**

Shielding – principle, choice of materials for H, E and free space fields, and thickness; EMI gaskets; Bonding; Grounding – circuits, system and cable grounding; Filtering; Transient EMI control devices and applications; PCB Zoning, Component selection, mounting, trace routing.

**UNIT IV STANDARDS AND REGULATION****7**

Units of EMI; National and International EMI Standardizing Organizations – IEC, ANSI, FCC, CISPR, BIS, CENELEC; FCC standards; EN Emission and Susceptibility standards and specifications; MIL461E Standards.

**UNIT V TEST METHODS AND INSTRUMENTATION****12**

EMI test sites - Open area site; TEM cell; Shielded chamber; Shielded Anechoic chamber; EMI test receivers; Spectrum Analyzer; Transient EMI Test wave Simulators; EMI coupling Networks - Line impedance Stabilization Networks; Feed through capacitors; Antennas and factors; Current probes and calibration factor; MIL-STD test methods; Civilian STD Test methods.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. V.P. Kodali, "Engineering EMC Principles, Measurements and Technologies", IEEE Press, Newyork, 2010 (2nd Edition)
2. Henry W.Ott., "Noise Reduction Techniques in Electronic Systems", A Wiley Inter Science Publications, John Wiley and Sons, Newyork, 2009
3. C.R. Paul, "Introduction to Electromagnetic Compatibility", John wiley & sons Inc. 2006

**REFERENCES:**

1. Don R.J.White Consultant Incorporate, "Handbook of EMI/EMC", Vol I-V, 1988
2. Bemhard Keiser, "Principles of Electromagnetic Compatibility", 3<sup>rd</sup> Ed, Artech house, Norwood, 1987

**EC8073****FOUNDATIONS FOR NANO-ELECTRONICS****L T P C  
3 0 0 3****OBJECTIVES:**

The objectives of the course is to introduce quantum mechanics concepts, approximations and statistical mechanics for understanding nano systems

**UNIT I INTRODUCTION TO QUANTUM MECHANICS 9**

Particles, waves, probability amplitudes, schrodinger equation, wavepackets solutions, operators, expectation values, eigenfunctons, piecewise constant potentials.

**UNIT II SIMPLE HARMONIC OSCILLATORS AND APPROXIMATIONS 9**

SHM Operators, SHM wavepacket solutions, Quantum LC circuit, WKB approximations, variational methods.

**UNIT III SYSTEMS WITH TWO AND MANY DEGREES OF FREEDOM 9**

Two level systems with static and dynamic coupling, problems in more than one dimensions, electromagnetic field quantization, density of states.

**UNIT IV STATISTICAL MECHANICS 9**

Basic concepts, microscopic, quantum systems in equilibrium, statistical models applied to metals and semiconductors

## UNIT V APPLICATIONS

9

Hydrogen and Helium atoms, electronic states, Atomic force microscope, Nuclear Magnetic Resonance, carbon nanotube properties and applications

**TOTAL : 45 PERIODS**

### TEXT BOOKS:

1. Hagelstein, Peter L., Stephen D. Senturia, and Terry P. Orlando, "*Introduction to Applied Quantum and Statistical Physics*.", New York, NY: Wiley, 2004.
2. Rainer Waser, "Nanoelectronics and Information Technology", Wiley 2005
3. Michael A. Nielsen and Isaac L. Chuang, "Quantum Computation and Quantum Information", Cambridge University Press, 2000.

### REFERENCES:

1. Neil Gershenfeld "The Physics of Information Technology", Cambridge University Press, 2000.
2. Adrian Ionesu and Kaustav Banerjee eds. "Emerging Nanoelectronics: Life with and after CMOS" , Vol I, II, and III, Kluwer Academic, 2005.

## EC8074 MULTIMEDIA COMPRESSION AND COMMUNICATION

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

### OBJECTIVES:

- To introduce probability related study of the characteristics of text, voice, image and video data
- To introduce various compression schemes for text, voice, image and video
- To analyse the compression schemes
- To introduce communication protocols for voice over internet and multimedia networking

## 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 DPCM –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 Huffman 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 – best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

**TOTAL : 45 PERIODS**

### **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, 3rd ed, 2005.

### **REFERENCES:**

1. Marcus Goncalves “Voice over IP Networks”, McGraw 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, First ed, 1995.
4. Ranjan Parekh, “Principles of Multimedia”, TMH, 2006

**OBJECTIVES:**

- To introduce the electronics and software aspects in robots
- To bring out the different languages for programming robot
- To specify robot requirements in the industry
- To introduce latest state of the art robots

**UNIT I SCOPE OF ROBOTS 4**

The scope of industrial Robots - Definition of an industrial robot - Need for industrial robots -Economic and Social Issues- applications.

**UNIT II ROBOT COMPONENTS 9**

Fundamentals of Robot Technology - Automation and Robotics - Robot anatomy - Work volume - Precision of movement - End effectors - Sensors.

**UNIT III ROBOT PROGRAMMING 9**

Robot Programming - Methods - interlocks textual languages. Characteristics of Robot level languages, characteristic of task level languages.

**UNIT IV ROBOT WORK CELL 9**

Robot Cell Design and Control - Remote Center compliance - Safety in Robotics.

**UNIT V FUTURE TRENDS 14**

Advanced robotics, Advanced robotics in Space - Specific features of space robotics systems - long-term technical developments, Advanced robotics in under - water operations. Robotics Technology of the Future - Future Applications.

**TOTAL : 45 PERIODS**

**TEXTBOOK:**

1. Barry Leatham - Jones, "Elements of industrial Robotics" PITMAN Publishing , 1987.

## REFERENCES:

1. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, "Industrial Robotics Technology, Programming and Applications ", McGraw Hill Book Company 1986.
2. Fu K.S. Gonzaleaz R.C. and Lee C.S.G., "Robotics Control Sensing, Vision and Intelligence " McGraw Hill International Editions, 1987.
3. Bernard Hodges and Paul Hallam, " Industrial Robotics", British Library Cataloging in Publication 1990.
4. Deb, S.R. Robotics Technology and flexible automation, Tata Mc GrawHill, 1994.

**EC8076**

**SOFT COMPUTING AND APPLICATIONS**

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

## OBJECTIVES:

- This course gives an idea and principles of various soft computing techniques, which are applicable to core areas such as networks , pattern recognition, image processing
- To introduce fuzzy set theory
- To teach different optimization techniques
- To introduce neural networks and neuro-fuzzy modeling
- To teach various applications of computational intelligence

## 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 NEURAL NETWORKS

**10**

Supervised Learning Neural Networks – Perceptrons - Adaline – Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks

– Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian 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. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill, 1997.
2. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
4. R.Eberhart, P.Simpson and R.Dobbins, “Computational Intelligence - PC Tools”, AP Professional, Boston, 1996.
5. Dr.S.N.Sivanandam and S.N.Deepa, “Principles of Soft Computing”, Wiley India, 2007.
6. Amit Konar, “Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain”, CRC Press, 2008.

**UNIT I HUMAN VALUES****10**

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality.

**UNIT II 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 – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

**UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION****9**

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study

**UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS****9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl Case Studies

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****8**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Conduct

**TOTAL: 45 PERIODS****TEXTBOOK**

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

## REFERENCES:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Thompson Wadsworth, A Division of Thomson Learning Inc., United States, 2000
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

## WEB SOURCES:

1. [www.onlineethics.org](http://www.onlineethics.org)
2. [www.nspe.org](http://www.nspe.org)
3. [www.globalethics.org](http://www.globalethics.org)
4. [www.ethics.org](http://www.ethics.org)

**MG8654**

**TOTAL QUALITY MANAGEMENT**

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

## AIM

To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

## OBJECTIVES

- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

## UNIT I INTRODUCTION

**9**

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.

**UNIT II TQM PRINCIPLES****9**

Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA 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 – Performance measures - BPR.

**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 –Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.

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

1. Dale H.Besterfield, et al., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint , 2006.

**REFERENCE BOOKS:**

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third 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.

**OBJECTIVES:**

- To study the formation of an image and its acquisition
- To introduce the use and application of transforms in image processing
- To study techniques for improving quality of information in spoilt images
- To introduce schemes for compressing images to save storage space

**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**

Point processing, Histograms, 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 and Constrained restoration, Inverse filtering, 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 – Hybrid methods

**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**

## **TEXT BOOKS:**

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Education, Inc., Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson Education, Inc., 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
6. Alan C. Bovik, "Handbook of image and video processing" Elsevier Academic press, 2005
7. S.Sridhar, " Digital Image processing" Oxford University press, Edition 2011

**CS8451**

**OPERATING SYSTEMS**

**L T P C**

**3 0 0 3**

## **OBJECTIVE**

Gives an idea about process synchronization, inter-process communication, scheduling, deadlock handling, and memory management.

## **UNIT I OPERATING SYSTEMS OVERVIEW**

**9**

Introduction to operating systems – Computer system organization, architecture – Operating system structure, operations – Process, memory, storage management – Protection and security – Distributed systems – Computing Environments – Open-source operating systems – OS services – User operating-system interface – System calls – Types – System programs – OS structure – OS generation – System Boot – Process concept, scheduling – Operations on processes – Cooperating processes – Inter-process communication – Examples – Multithreading models – Thread Libraries – Threading issues – OS examples

## **UNIT II PROCESS MANAGEMENT**

**9**

Basic concepts – Scheduling criteria – Scheduling algorithms – Thread scheduling – Multiple-processor scheduling – Operating system examples – Algorithm Evaluation – The critical-section problem – Peterson’s solution – Synchronization hardware – Semaphores – Classic problems of synchronization – Critical regions – Monitors – Synchronization examples – Deadlocks – System model – Deadlock characterization – Methods for handling deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock detection – Recovery from deadlock

## **UNIT III STORAGE MANAGEMENT**

**9**

Memory Management – Swapping – Contiguous memory allocation – Paging – Segmentation – Example: The Intel Pentium - Virtual Memory: Background – Demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing.

## **UNIT IV I/O SYSTEMS**

**9**

File concept – Access methods – Directory structure – File-system mounting – Protection – Directory implementation – Allocation methods – Free-space management – Disk scheduling – Disk management – Swap-space management – Protection

## **UNIT V CASE STUDY**

**9**

The Linux System – History – Design Principles – Kernel Modules – Process Management – Scheduling – Memory management – File systems – Input and Output – Inter-process Communication – Network Structure – Security – Windows 7 – History – Design Principles – System Components – Terminal Services and Fast User – File system – Networking.

**TOTAL: 45 PERIODS**

### **TEXT BOOKS:**

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “Operating System Concepts Essentials”, John Wiley & Sons Inc., 2010.

### **REFERENCES:**

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Addison Wesley, 2001.
2. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”, 1996.

3. D M Dhamdhere, “ Operating Systems: A Concept-based Approach”, Second Edition, Tata McGraw-Hill Education, 2007.
4. William Stallings, “Operating Systems: Internals and Design Principles”, Seventh Edition, Prentice Hall, 2011.

**IT8451**

**WEB TECHNOLOGY**

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

**AIM:**

To provide an introduction to Java and basic Web concepts and enable the student to create simple Web based applications.

**OBJECTIVES:**

- To introduce the features of object oriented programming languages using Java
- To design and create user interfaces using Java frames and applets
- To have a basic idea about network programming using Java
- To create simple Web pages and provide client side validation
- To create dynamic web pages using server side scripting

**UNIT I JAVA FUNDAMENTALS**

**9**

Java Data types – Class – Object – I / O Streams – File Handling concepts – Threads – Applets – Swing Framework – Reflection

**UNIT II JAVA NETWORKING FUNDAMENTALS**

**9**

Overview of Java Networking - TCP - UDP - InetAddress and Ports - Socket Programming - Working with URLs - Internet Protocols simulation - HTTP - SMTP - POP - FTP - Remote Method Invocation - Multithreading Concepts

**UNIT III CLIENT SIDE TECHNOLOGIES**

**9**

XML - Document Type Definition - XML Schema - Document Object Model - Presenting XML - Using XML Parsers: DOM and SAX – JavaScript Fundamentals - Evolution of AJAX - AJAX Framework - Web applications with AJAX - AJAX with PHP - AJAX with Databases

## UNIT IV SERVER SIDE TECHNOLOGIES

9

Servlet Overview - Life cycle of a Servlet - Handling HTTP request and response - Using Cookies - Session tracking - Java Server Pages - Anatomy of JSP - Implicit JSP Objects – JDBC - Java Beans - Advantages - Enterprise Java Beans - EJB Architecture - Types of Beans - EJB Transactions

## UNIT V APPLICATION DEVELOPMENT ENVIRONMENT

9

Overview of MVC architecture - Java Server Faces: Features - Components - Tags - **Struts**: Working principle of Struts - Building model components - View components - Controller components - Forms with Struts - Presentation tags - Developing Web applications - **Hibernate**: Configuration Settings - Mapping persistent classes - Working with persistent objects - Concurrency - Transactions - Caching - Queries for retrieval of objects - **Spring**: Framework - Controllers - Developing simple applications

**TOTAL: 45 PERIODS**

### TEXT BOOK:

1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.

### REFERENCE BOOKS:

1. Marty Hall and Larry Brown, "Core Servlets And Javasever Pages", Second Edition
2. Bryan Basham, Kathy Siegra, Bert Bates, "Head First Servlets and JSP", Second Edition
3. Uttam K Roy, "Web Technologies", Oxford University Press, 2011.