BE

CHOICE BASED CREDIT SYSTEM (CBCS)

Syllabus
2017-2018

ELECTRONICS AND COMMUNICATION ENGINEERING
OBJECTIVES:

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

INTENDED OUTCOMES:

Students undergoing this course will be able to
- Use English language for communication: verbal & non-verbal.
- Enrich comprehension and acquisition of speaking & writing ability.
- Gain confidence in using English language in real life situations.
- Improve word power: lexical, grammatical and communication competence.

UNIT I  LSRW SKILLS & GRAMMAR
Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing)  (9)

Listening – Types of listening- Listening to class reading - Video tapes/ Audio tapes. Speaking – Introduction on self. Reading - Reading for comprehension – Reading different kind of passages like descriptive, narrative, objective, conversational and argumentative. Writing – Formal and Informal letters- Letters to the Editor.

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)
Tenses -Articles. Vocabulary - Word Formation – Word expansion (Root word) - Prefix and Suffix.

UNIT II  LSRW SKILLS & GRAMMAR
Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing)  (8)


Grammar & Vocabulary (Function Grammar & Technical Vocabulary)
WH questions –Yes/No Question - Subject Verb agreement. Vocabulary – Compound Nouns/Adjectives – Irregular verbs.

UNIT III  LSRW SKILLS & GRAMMAR
Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing)  (8)

Listening – Listening for specific task – fill in the gaps. Speaking – Phonemes – Syllables – Role play – Conversation Practice. Reading –Comprehension passages based on general topics or matters of current affairs. Writing - Autobiographical writing & Biographical writing.

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)
Preposition – Infinitive & Gerund. Vocabulary – Foreign words used in English – British and American usage.
UNIT IV  LSRW SKILLS & GRAMMAR, CAREER ORIENTED
Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (10)
Listening – Responding to questions – Reading in class for complete understanding and for better pronunciation. Speaking – Debate- Presentations in seminars. Reading – Making inference from the reading passage – Predicting the content of reading passages. Writing - Interpreting visual materials (tables, graphs, charts, etc) & Instruction writing.
Grammar & Vocabulary (Function Grammar & Technical Vocabulary)
Parts of Speech , Sentence pattern – Voice (active and passive voice). Vocabulary – One word substitution.

UNIT V  LSRW SKILLS & GRAMMAR, FIELD WORK
Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) (10)
Grammar & Vocabulary (Function Grammar & Technical Vocabulary)
Direct and Indirect speech – Conditional sentences - Auxiliary verbs. Vocabulary – Abbreviations & Acronyms.
Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

TEXT BOOK:

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<td>1</td>
<td>Sangeeta Sharma, Meenakshi Raman</td>
<td>Technical Communication: Principles and Practice 2nd Edition</td>
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WEBSITES:

1. www.learnerstv.com – Listening/ Speaking/ Presentation
2. www.usingenglish.com – Writing/ Grammar
3. www.englishclub.com – Vocabulary Enrichment/ Speaking
4. www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking
5. www.teachertube.com – Writing Technically
OBJECTIVES:

- To develop analytical skills for solving different engineering problems.
- To understand the concepts of Matrices, sequences and series.
- To solve problems by applying Differential Calculus and Differential equations.

INTENDED OUTCOMES:

The student will be able to

- Apply advanced matrix knowledge to Engineering problems.
- Improve their ability in solving geometrical applications of differential calculus problems.
- Improve their ability in vector differentiation.

UNIT I MATRICES (12)

UNIT II DIFFERENTIAL CALCULUS (12)
Limits, Continuity (Concepts only)- Differentiation- Differentiation Techniques: standard formulae, product rule, quotient rule, chain rule, method of substitution, implicit functions and successive differentiation.

UNIT III GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS (12)

UNIT IV DIFFERENTIAL EQUATIONS (12)
Introduction to Ordinary differential equations: Linear ordinary differential equations of second and higher order with constant coefficients.
Introduction to Partial differential equations: Linear Partial differential equations of second and higher order with constant coefficients.

UNIT V VECTOR DIFFERENTIATION (12)
Vectors-Differentiation of vectors – scalar and vector point functions – vector operator – vector operator applied to scalar point functions: Gradient; vector operator applied to vector point functions: Divergence and curl; Physical interpretation of divergence and curl, Directional derivative, solenoidal and irrotational vectors.

Total Hours: 60
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**WEBSITES:**

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.intmath.com/matrices-determinants
OBJECTIVE:

- To enhance the fundamental knowledge in Physics and its applications relevant to various branches of Engineering and Technology.

INTENDED OUTCOME:

- After completion of the course the students will have knowledge on the basics of physics related to properties of matter, fiber optics, quantum, crystal physics and that knowledge will be used by them in different engineering and technology applications.

UNIT I  PROPERTIES OF MATTER AND THERMODYNAMICS  (9)

Three types of modulus of elasticity – basic definitions, relation connecting the modulii (Derivation), Poisson’s ratio- Torsional pendulum- bending of beams - bending moment – uniform and non uniform bending.


UNIT II  LASER AND FIBER OPTICS  (9)

Introduction – emission and absorption process- Einstein’s coefficients derivation. Types of LASER - CO₂, Semiconductor LASER- Applications of LASER in industry and medicine.

Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle – derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram)

UNIT III  QUANTUM PHYSICS  (9)

Introduction to quantum theory – Black body radiation - dual nature of matter and radiation – de Broglie wavelength, uncertainty principle – Schrödinger’s wave equation – time dependent and time independent equations – particle in one dimensional box- physical significance of wave function, scanning electron microscope

UNIT IV  CRYSTAL PHYSICS  (9)

Lattice – unit cell – Bravais lattice – calculation of number of atoms per unit cell, atomic radius, coordination number, packing factor for SC, BCC, FCC and HCP structures, crystal defects – point, line and surface defects

UNIT V  ULTRASONICS AND NUCLEAR PHYSICS  (9)


Total Hours: 45
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<td>Ganesan.S and Baskar.T</td>
<td>Engineering Physics I</td>
<td>GEMS Publisher, Coimbatore-641001</td>
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<td>Physics for Scientists and Engineers with</td>
<td>Thomson Brooks/Cole, Indian reprint, New Delhi</td>
<td>2010</td>
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<td>5</td>
<td>P. Khare, A. Swarup</td>
<td>Engineering Physics: Fundamentals and</td>
<td>Jones &amp; Bartlett Learning</td>
<td>2009</td>
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## WEBSITES:

1. www.nptel.ac.in
2. www.physicsclassroom.com
3. www.oyc.yale.edu
4. www.physics.org
OBJECTIVES:
- To understand about the water technology.
- To get the information on electrochemical cells, batteries, fuels and combustion.
- To study about the corrosion and protective coatings.
- To gain knowledge on adsorption phenomena.

INTENDED OUTCOME:
- This course will create an impact on the students and make them to realize the modern utility on electrochemical cells, batteries, fuels and combustion process, corrosion and adsorption methods.

UNIT I  WATER TECHNOLOGY  

UNIT II  ELECTROCHEMISTRY AND STORAGE DEVICES  

UNIT III  FUELS AND COMBUSTION  

UNIT IV  CORROSION SCIENCE  
Chemical and Electrochemical corrosion - Galvanic corrosion - Differential aeration corrosion - Corrosion control - Sacrificial anode and Impressed current cathodic methods - Corrosion inhibitors - Protective coatings – Organic coatings-Paints - Constituents and functions –Inorganic coatings- Metallic coatings - Electroplating of Cu over Fe and Electro less plating (Ni) - Surface conversion coating - Hot dipping.- Anodizing of Al

UNIT V  SURFACE CHEMISTRY AND PHASE RULE  

Phase Rule: Definition -Phase diagrams – one component water system, two component Ag-Pb system.

Total Hours: 45
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### WEBSITES:

5. http://www.chem.qmul.ac.uk/surfaces/sec
OBJECTIVES:

- To impart the basic knowledge about the Electric circuits.
- To understand the working of various Electrical Machines.
- To understand the basic concepts of Electrical safety and wiring.

INTENDED OUTCOME:

- The students shall develop an intuitive understanding of the circuit analysis, basic concepts of electrical machines, basic concepts of Electrical safety and wiring and be able to apply them in practical situation.

UNIT I  FUNDAMENTALS OF DC CIRCUITS 9
Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor, Kirchhoff’s laws, Mesh analysis, Nodal analysis – equivalent resistor, current division, voltage division.

UNIT II  MAGNETIC CIRCUITS 9
Introduction to magnetic circuits-Simple magnetic circuits-Faraday’s laws, Lenz law-Flemings rules - induced emfs and inductances-self and mutual inductance.

UNIT III  AC CIRCUITS (Elementary treatment only) 9
Generation of AC, Average and RMS values, Form and peak factors, concept of phasor representation, J operator – representation of AC in rectangular and polar form – power and power factor - Introduction to three phase systems - types of connections, relationship between line and phase values.

UNIT VI  ELECTRICAL MACHINES (Elementary treatment only) 9
Working principle, construction, types and applications of DC machines and AC machines – single phase transformers - single phase induction motors: capacitor start and capacitor start & run motors

UNIT V  ELECTRICAL SAFETY, WIRING AND INTRODUCTION TO POWER SYSTEM 9
Safety measures in electrical system- types of wiring- wiring accessories staircase, fluorescent lamps & corridor wiring- Basic principles of earthing-Types of earthing-protection devices MCB- Fuses and its types –calculation of fuses.

Total Hours: 45
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### WEBSITES:

1. www.nptel.com
2. www.electrical4u.com
OBJECTIVES:

- To impart the basic knowledge about the basic electronic components.
- To understand the operation and characteristics of various semiconductor devices.
- To understand the basic concepts of digital electronics.

INTENDED OUTCOME:

- The students shall develop an intuitive understanding of basic electronic components, basic concepts of semiconductor devices, basic concepts of digital electronics and be able to apply them in practical situation.

UNIT I- ELECTRONIC COMPONENTS 9
 Passive components – resistors, capacitors and inductors -properties, common types, I-V relationship and uses.

UNIT II- SEMICONDUCTOR DEVICES 9
 Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET.

UNIT III – OPTOELECTRONIC DEVICES 9
 Construction and Operation: LED, LCD, 7-Segment Display, LDR, Photodiode, Phototransistor, Solar cell, Opto couplers

UNIT IV- TRANSDUCERS 9
 Transducers - Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.

UNIT V- DIGITAL ELECTRONICS 9
 Number systems – binary codes - logic gates - Boolean algebra, laws & theorems- simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

Total Hours: 45

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<td>Electronic Devices 9th Edition</td>
<td>Pearson Education</td>
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**WEBSITES:**

1. www.nptel.com  
2. www.electrical4u.com
OBJECTIVE:
- To develop basic laboratory skills and demonstrating the application of physical principles.

INTENDED OUTCOME:
- On completion of this course the students will have the knowledge on Physics practical experiments and that knowledge will be used by them in different engineering and technology applications.

LIST OF EXPERIMENTS – PHYSICS

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
3. Determination of Young’s modulus of the material – Non uniform bending (or) Uniform bending.
5. Spectrometer Dispersive power of a prism.
7. Particle size determination using Diode Laser
10. Determination of thickness of a thin wire – Air wedge method
11. Determination of Band Gap of a semiconductor material.
12. Determination of Specific resistance of a given coil of wire – Wheatstone Bridge
OBJECTIVE:

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

INTENDED OUTCOME:

- The students will be outfitted with hands-on knowledge in quantitative chemical analysis of water quality parameters and corrosion measurement.

LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of alkalinity of Water sample.
2. Estimation of hardness of Water by EDTA
3. Estimation of chloride in Water sample (Argentometric method)
4. Determination of corrosion rate by weight loss method.
5. Conductometric Titration (Simple acid base).
6. Conductometric Titration (Mixture of weak and strong acids).
7. Conductometric Titration using BaCl\textsubscript{2} vs Na\textsubscript{2}SO\textsubscript{4}.
8. pH Titration (acid & base).
9. Potentiometric Titration (Fe\textsuperscript{2+} / KMnO\textsubscript{4} or K\textsubscript{2}Cr\textsubscript{2}O\textsubscript{7}).
10. Estimation of Ferric ion by Spectrophotometry.
11. Determination of water of crystallization of a crystalline salt (Copper sulphate).
12. Determination of molecular weight and degree of polymerization using Viscometry.
OBJECTIVE:

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

INTENDED OUTCOMES:

- Ability to fabricate carpentry components and pipe connections including plumbing works.
- Ability to use welding equipment’s to join the structures.
- Ability to fabricate electrical and electronics circuits

PART – A (MECHANICAL)

1. WELDING
   i. Preparation of arc welding of butt joints, lap joints and tee joints.

2. BASIC MACHINING
   i. Simple Turning and Taper turning
   ii. Drilling and Tapping
   iii. Sheet Metal Work
   iv. Model making – Trays, funnels, etc.

3. DEMONSTRATION ON
   i. Smithy operations
   ii. Foundry operations
   iii. Plumbing Works
   iv. Carpentry Works

PART – B (ELECTRICAL & ELECTRONICS)

4. ELECTRICAL ENGINEERING
   i. Study of electrical symbols and electrical equipments.
   ii. Construct the wiring diagram for Stair case wiring.
   iii. Construct the wiring diagram for Residential house wiring using switches, fuse, indicator, lamp and energy meter.
   iv. Measurement of electrical quantities – voltage, current, power & power factor in R load.
   v. Measurement of energy using single phase energy meter.

5. ELECTRONICS ENGINEERING
   i. Study of Electronic components– Resistor (color coding), capacitors and inductors.
   ii. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
   iii. Study of logic gates AND, OR, NOT, NOR and NAND.

Total Hours: 45
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17BECE113 ELECTRICAL ENGINEERING LABORATORY L T P C 0 0 3 2

OBJECTIVES:

- To introduce the basic electrical equipments in the lab.
- To enable the students to understand the DC circuit analysis and network theorems.

INTENDED OUTCOME:

- At the end of this course Students are able to deal with some of the frequently used instruments and equipments like the digital multimeter and DC Power supply and are able to deal with some Network Theorems.

LIST OF EXPERIMENTS

1. Study of Electrical Measurements and the Oscilloscope.
2. Study of Potentiometers and Rheostats.
3. Study and verification of Series Circuits, Parallel Circuits in DC Circuits.
4. Study and verification of Series-Parallel Circuits in DC Circuits.
5. Study and verification of Ohm’s Law and Kirchoff’s law.
6. Study and verify of Mesh Analysis.
7. Study and verify of Nodal Analysis.
8. Study of V-I Characteristics of Incandescent lamp.
10. Study and verification of DC starters and DC Motors.

Total Hours: 45
OBJECTIVE:

- Yoga Education Helps To Develop The Self Discipline, Self Control, Awareness, Concentration And Higher Level Of Consciousness.

AIM: To Enable The Student To Have Physical Health And Mental Health.

UNIT- I
Introduction To Yoga- Meaning Of Yoga – Concept Of Yoga- Aim And Objectives Of Yoga – History Of Yoga - Systems Of Yoga.- Stages (Or) Limbs Of Yoga

UNIT- II

UNIT- III

UNIT- IV

UNIT- V

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<td>Sound Health Through Yoga</td>
<td>Prem Kalyan</td>
<td>2009</td>
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<td>2.</td>
<td>B.K.S.Iyangar</td>
<td>Light On Pranayama</td>
<td>Crossroad Centuary</td>
<td>2013</td>
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<td>3.</td>
<td>Thirumular</td>
<td>Thirumandhiram</td>
<td>Sriramakrishna Math</td>
<td>2016</td>
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OBJECTIVES:
- To help students comprehend the role of listening skills in effective communication.
- To familiarize students with verbal and non-verbal communication.
- To expose students to neutral accent.
- To develop emotional intelligence skills in them for enhancing their self-esteem.
- To assist them in setting goals and developing positive attitude.
- To enable students to acquire decision making skills, problem solving skills and assertive skills.

INTENDED OUTCOMES:
Students undergoing this course will be able to
- Design and deliver a persuasive presentation that convinces the audience of the topic’s relevance and overcomes resistance, using appropriate visual support and adhering to a specified time limit.
- Use a strategic communication model and critical thinking to identify objectives, analyze audiences, and choose the most effective structure and style for delivering strategically sound written and spoken messages.
- Practice principles of effective business writing and document design in all written documents.
- Build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
- Develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.

UNIT I

UNIT II

UNIT III

UNIT IV
Difference between goals and dreams - SMART goal setting - 3 Ds of goal setting- Determination, Discipline and Direction - Developing the right attitude - Motivation - Intrinsic and Extrinsic motivation - Dealing with change - Dedication - Taking responsibilities - Decision making.
UNIT V
Intrapersonal skills - Self-analysis - Thought process – Interpersonal skills - Confidence building - Resolving conflicts- Analytical skills - Team Building - Leadership skills - Planning/organizing - Ability to work independently - Professional ethics - Communicating via e-mail. Ethical perspectives and their implications for responsible communication - Proposal Presentation

Total Hours: 45

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WEBSITES:

2. www.ispeakyouspeak.blogspot.com
4. www.learning-development.hr.toolbox.com
6. http://mybcommlab.com to test your understanding of the concepts presented in each chapter and explore additional materials that will bring the ideas to life in videos, activities, and an online multimedia e-book.
OBJECTIVES:
- To motivate learners to acquire listening & speaking skills in both formal and informal context.
- To focus on question forms & to make them understand the importance of using question tags and also the functional use of transformation of sentences.
- To improve their reading habit and to train them in critical and analytical reading.
- To equip them to write for academic as well as work place context.
- To enable students to face interviews.

INTENDED OUTCOMES:
Students undergoing this course will able to
- Acquire second language: speaking convincingly, expressing their opinions clearly, negotiating and arguing using appropriate communicative strategies.
- Enhance them reading texts critically and analytically.
- Develop writing effectively, persuasively and producing different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- Enrich the ability to face interviews with confidence.

UNIT I  LSRW SKILLS & GRAMMAR
Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 9
Listening - Difference between Hearing & Listening –Listening to informal conversation.
Speaking - Spoken structures on different situations - Introduction, Greeting, Comments on topics like Films, Games etc, Excuse, Request, Agreement, Disagreement, etc., Reading – Extensive and Intensive reading. Writing – Report writing - Writing a covering letter.
Grammar & Vocabulary (Function Grammar & Technical Vocabulary)  
Regular & Irregular verbs - Kinds of sentences - Question tags. Homonyms and Homophones.

UNIT II  LSRW SKILLS & GRAMMAR
Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 9
Listening – Note Taking- Improving grasping ability. Speaking – Welcome address - Vote of thanks - Master of ceremony. Reading – Active and Passive reading - Reading for vocabulary-Reading for a purpose. Writing - Writing a review (Film review) - Summary of a story.
Grammar & Vocabulary (Function Grammar & Technical Vocabulary)  
Modal verbs – Conjunction - Expression of cause and effect. Phrasal verbs - Idioms.

UNIT III  LSRW SKILLS & GRAMMAR
Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing) 9
Grammar & Vocabulary (Function Grammar & Technical Vocabulary)  
Active and Passive voice - Purpose expression. Same words used as noun and verb - Often misspelt and confused words.
UNIT IV  LSRW SKILLS & GRAMMAR, CAREER ORIENTED
Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing)

Listening – Listening to telephone conversation - Viewing model interviews. Speaking – Group Discussion - Correlation between verbal & non - verbal communication. Reading – Reading comprehension (short & long text) - Reading job advertisements and profile of a company. Writing – Checklist preparation.

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)
Grammar - Numerical expressions – Collocations. Singular and Plural (Nouns)

UNIT V  LSRW SKILLS & GRAMMAR, FIELD WORK
Receptive Skills (Listening, Reading and Scanning) & Productive Skills (Writing, Speaking and Representing)

Listening – Types of listening- Improving listening comprehension. Speaking - Oral presentation - Vocal communication techniques - Voice, quality, volume, pitch etc., Reading - Note making - Making notes from books/ any forms of writing materials. Writing - Describing process & products - Recommendation writing – Short essays writing-

Grammar & Vocabulary (Function Grammar & Technical Vocabulary)
Transformation of sentences (Simple, Compound & Complex).Collection of Technical Vocabularies with their meanings.

Note: Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

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</thead>
</table>
WEBSITES:

1. www.learnerstv.com – Listening/ Speaking/ Presentation
2. www.usingenglish.com – Writing/ Grammar
3. www.englishclub.com – Vocabulary Enrichment/ Speaking
4. www.ispeakyouspeak.blogspot.com – Vocabulary Enrichment/ Speaking
5. www.teachertube.com – Writing Technically
OBJECTIVES:

- To have knowledge in integral calculus and Vector calculus
- To expose the concept of Analytical function and Complex integration.

INTENDED OUTCOMES:

The student will be able to

- Solve problems in Fluid Dynamics, Theory of Elasticity, heat and mass transfer etc.
- Find the areas and volumes using multiple integrals.
- Improve their ability in Vector calculus.
- Expose to the concept of Analytical function.
- Apply Complex integration in their Engineering problems.

UNIT I INTEGRAL CALCULUS

Definite and indefinite integrals – Techniques of integration – Substitution rule, Trigonometric integrals, Integration by parts , Integration of rational functions by partial fraction, Integration of irrational functions – Improper Integrals.

UNIT II MULTIPLE INTEGRALS

Double integral – Cartesian coordinates – Polar coordinates – Area as double integrals- Change the order of integration – Triple integration in Cartesian co-ordinates.

UNIT III VECTOR INTEGRATION

Integration of vectors – line integral- surface integral- volume integral- Green’s theorem - Gauss divergence theorem and Stoke’s theorems (Statement Only), hemisphere and rectangular parallelopipeds problems.

UNIT IV ANALYTIC FUNCTIONS

Analytic functions - Cauchy-Riemann equations in Cartesian and polar forms – Sufficient condition for an analytic function (Statement Only) - Properties of analytic functions – Constructions of an analytic function - Conformal mapping: w = z+a, az, 1/z and bilinear transformation.

UNIT V COMPLEX INTEGRATION

Complex Integration - Cauchy’s integral theorem and integral formula (Statement Only) – Taylor series and Laurent series - Residues – Cauchy’s residue theorem (Statement Only) - Applications of Residue theorem to evaluate real integrals around unit circle and semi-circle (excluding poles on the real axis).

Total Hours: 60
### TEXTBOOKS:

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</thead>
</table>

### WEBSITES:

1. www.efunda.com
2. www.mathcentre.ac.uk
3. www.sosmath.com/diffeq/laplace/basic/basic.html
4. www.mathworld.wolfram.com
OBJECTIVES:
- To give a comprehensive insight into natural resources, ecosystem and biodiversity.
- To educate the ways and means of the environment
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures.

INTENDED OUTCOME:
- Students will prepare themselves to go ecofriendly and help preserving the nature and environment.

UNIT I  INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES  9
Definition, Scope and Importance – Need for public awareness - Forest resources: Use and over-exploitation, deforestation - Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water - Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources- role of an individual in conservation of natural resources.

UNIT II  ECOSYSTEM  9
Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere- Concept of an ecosystem- Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem)

UNIT III  BIODIVERSITY  9
Introduction to biodiversity, Definition- Genetic diversity, Species diversity and Ecosystem diversity, Biogeographical classification of India, Importance of biodiversity- Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation of biodiversity.

UNIT IV  ENVIRONMENTAL POLLUTION  9
Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone and landslides.
UNIT V SOCIAL ISSUES AND ENVIRONMENT


TEXT BOOKS:

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<thead>
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<tbody>
<tr>
<td>1</td>
<td>Dr. Ravikrishnan, A</td>
<td>Environmental Science</td>
<td>Sri Krishna Hi tech Publishing Company Private Ltd., Chennai</td>
<td>2012</td>
</tr>
<tr>
<td>2</td>
<td>Anubha kaushik C.P. Kaushik</td>
<td>Environmental Science and Engineering</td>
<td>New Age International (P) Ltd., New Delhi.</td>
<td>2010</td>
</tr>
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<tr>
<td>3</td>
<td>Bharucha Erach</td>
<td>Environmental Science Demystified</td>
<td>Mapin Publishing (P) Ltd., Ahmedabad.</td>
<td>2005</td>
</tr>
</tbody>
</table>

WEBSITES:

2. http://nptel.ac.in/courses.php?disciplineId=120
3. www.unesco.org/ext/field/beijing/scienceb.htm
4. www.infinitepower.org/education.htm
OBJECTIVES:

- To understand the concept of circuit elements lumped circuits, circuit laws and network reduction.
- To impart concept of various theorems for circuit analysis.
- To understand the sinusoidal steady state analysis of AC Circuits.
- To understand various resonance and transient response.
- To introduce concepts of coupled circuits and its basic analysis.

INTENDED OUTCOMES:

- Ability to analyse different electrical circuits
- Ability to apply circuit theorems
- Ability to analyse and differentiate AC and DC circuits.

UNIT I  DC CIRCUIT ANALYSIS  12

UNIT II  NETWORK THEOREM AND DUALITY  12

UNIT III  SINUSOIDAL STEADY STATE ANALYSIS  12

UNIT IV  TRANSIENTS AND RESONANCE IN RLC CIRCUITS  12

UNIT V  COUPLED CIRCUITS AND TOPOLOGY  12

Total Hours: 60
**TEXT BOOKS:**

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</table>
LIST OF EXPERIMENTS

1. Verification of Kirchoff’s voltage and Current Laws
2. Verification of Superposition Theorem
3. Verification of Thevenin’s Theorem & Norton’s Theorem
4. Verification of Maximum Power Transfer Theorem
5. Verification of Tellegen’s and Reciprocity Theorem
6. Time domain response of R L Transient Circuit.
8. Series R LC Resonance Circuits (Frequency response & resonant frequency)
9. Parallel R LC Resonance Circuits (Frequency response & resonant frequency)
10. Simulation experiments using PSPICE or MultiSim.

Total Hours: 45
OBJECTIVES:

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

INTENDED OUTCOMES:

On Completion of the course the student will be able to

- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Do orthographic projection of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Prepare isometric and perspective sections of simple solids.
- Demonstrate computer aided drafting.

UNIT I INTRODUCTION
Introduction to Engineering Drawing, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning— linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

UNIT II SCALES AND PLANE CURVES
SCALES: Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conics – Construction of Ellipse, Parabola and Hyperbola by eccentricity method

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

UNIT IV PROJECTION OF POINTS, LINES AND PLANE SURFACES
Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

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

Introduction to Drafting Software/Packge (Not for Exam)
Basic operation of drafting packages, use of various commands for drawing, dimensioning, editing, modifying, saving and printing/plotting the drawings. Introduction to 3D primitives.

Total Hours: 45
**TEXTBOOKS:**

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<tr>
<td>2</td>
<td>VTU</td>
<td>A Primer on Computer Aided Engineering Drawing</td>
<td>Belgaum</td>
<td>2006</td>
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**WEB REFERENCES:**

SCOPE:

- Any business has to be developed from scratch. As entrepreneur one should learn various avenues of promoting the given business along with ethics which is other side of the coin. This course is meant to inculcate to develop a business plan connected with ethics.

OBJECTIVE:

- To explain relevance of Ethics while taking business decisions.

UNIT I

UNIT II
Business Plan Process - Sources of Information – Online Resources - Offline Resources - Sources of Market Research - Benefits of market study - Coverage of market study.

UNIT III

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<tr>
<td>2.</td>
<td>Rhonda Abrams</td>
<td>The business plan in a day</td>
<td>Planning Shop</td>
<td>2009</td>
</tr>
<tr>
<td>3.</td>
<td>V. G. Patel</td>
<td>Business plan preparation</td>
<td>Entrepreneurship Development Institute of India</td>
<td>1987</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To develop analytical skills for solving engineering problems.
- To teach the students the basic concepts of LPP, Transportation and Assignment problems.
- To make the students to study about the Integer Programming and Network Analysis.

INTENDED OUTCOMES:

- Be able to solve problems in different environments and develop critical thinking.
- Be able to build and solve Transportation Models, Assignment Models, integer programming and Non linear programming.

UNIT I LINEAR PROGRAMMING PROBLEM (12)
Formulation of LPP - Graphical Method - Simplex Method - Artificial variable technique and two phase simplex method. Duality - Dual and simplex method - Dual Simplex Method.

UNIT II TRANSPORTATION AND ASSIGNMENT PROBLEM (12)
Transportation Model- finding initial basic feasible solutions- moving towards optimality- Degeneracy. Solution of an Assignment problem - Hungarian Algorithm.

UNIT III INTEGER PROGRAMMING (11)
Integer Programming Problem – Gromory’s fractional cut Method – Branch Bound Method

UNIT IV NETWORK ANALYSIS (11)
PERT & CPM- network diagram-probability of achieving completion date- crash time- cost analysis.

UNIT V CALCULUS OF VARIATIONS (14)
Calculus of Variations - Basic definition, Simplest problem, Isoperimetric problem, Problems with Higher order derivatives, Euler Lagrange Equation, Weierstrass - Erdmann conditions; Pontryagin Maximum Principle; Transversality condition; Applications

Total Hours: 60
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<td>4</td>
<td>Kanti Swarup, Manmohan, Gupta</td>
<td>Operations Research</td>
<td>Sultan Chand &amp; Sons, New Delhi.</td>
<td>2010</td>
</tr>
</tbody>
</table>

### WEBSITES:

2. [www.mit.edu](http://www.mit.edu)
3. [www.nptel.com](http://www.nptel.com)
OBJECTIVES:

- To develop analytical skills for solving engineering problems.
- To make the students to study about linear algebra and some useful special functions.

INTENDED OUTCOMES:

- Be able to acquire basic knowledge on vector spaces and linear transformations.
- Be able to build and solve the special functions.

UNIT I VECTOR SPACES (12)
General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space.

UNIT II LINEAR TRANSFORMATIONS (12)
Linear Transformations - The Null Space and Range - Isomorphisms - Matrix Representation of Linear Transformations –Eigen values and Eigen vectors - Similarity, Diagonalization.

UNIT III INNER PRODUCT SPACES (12)
The Dot Product on $\mathbb{R}^n$ and Inner Product Spaces - Orthonormal Bases - Orthogonal Complements - Application: Least Squares Approximation - Diagonalization of Symmetric M - Application: Quadratic Forms

UNIT IV HYPERBOLIC FUNCTIONS, BETA AND GAMMA FUNCTIONS (12)
Hyperbolic Functions: Hyperbolic functions and Inverse Hyperbolic functions – Identities – Real and imaginary parts – solving problems using hyperbolic functions.

UNIT V BESSEL FUNCTIONS (12)
Bessel Functions – Preliminaries – Definitions – Bessel Differential Equation – Differential recurrence relations – the pure recurrence relation – A generating function – Bessel’s integral – Index half and odd integer.

Total Hours: 60

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<tr>
<td>3</td>
<td>Jim Defranza, Daniel Gagliardi</td>
<td>Introduction to Linear Algebra with Application</td>
<td>Tata McGraw-Hill, New Delhi.</td>
<td>2008</td>
</tr>
</tbody>
</table>

**WEBSITES:**

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com
OBJECTIVES:

- To understand the working of PN junction diodes and special purpose diodes.
- To understand the basic working physics of BJT and its applications.
- To understand the basic working of FET.
- To understand the working of Rectifiers, Filters and Voltage regulators.
- To understand the fabrication process of Monolithic ICs.

INTENDED OUTCOMES:

- Ability to choose the diodes based on applications.
- Ability to design simple circuits using diodes and transistors.
- Ability to construct DC power supply for given specification.

UNIT I  SEMICONDUCTOR DIODES AND SPECIAL PURPOSE DIODES  9

UNIT II  BIPOLAR TRANSISTORS  9

UNIT III  FIELD EFFECT TRANSISTORS  9
Field-Effect Transistors: construction, working and VI characteristics of JFET – comparison of BJT and JFET – MOSFET – enhancement MOSFET, depletion MOSFET, their working principle and VI characteristics, comparison of MOSFET with JFET, comparison of D MOSFET with E-MOSFET, CMOS, MESFET, CCD.

UNIT IV  DC POWER SUPPLIES  9
Rectifiers and Filters: Block schematic of a typical DC power supply, single phase HWR, FWR, full-wave bridge rectifier, power supply filters (ripple factor and efficiency analysis), bleeder resistor, voltage dividers.
Voltage regulators: voltage regulation, Zener diode shunt regulator, transistor series regulator, transistor shunt regulator, switching regulators, design of complete DC power supply circuit.

UNIT V  INTEGRATED CIRCUIT FABRICATION  9
Integrated circuit – advantages and drawback of ICs – scale of integration – classification of ICs – definition of linear IC and digital IC with examples – manufacturing process of monolithic ICs – fabrication of components (diode, capacitor, bipolar transistor and resistor) on monolithic IC – comparison of MOS ICs and bipolar ICs.

Total Hours: 45

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<td>1</td>
<td>Millman and Halkias</td>
<td>Electronic devices and Circuits</td>
<td>Tata McGraw Hill</td>
<td>2010</td>
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<tr>
<td>2</td>
<td>David A. Bell</td>
<td>Fundamental of electronic devices and circuits</td>
<td>Oxford press</td>
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<td>Street Man</td>
<td>Solid State Electronic Devices 6th Edition</td>
<td>Prentice Hall Of India</td>
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<td>2</td>
<td>Mathur Kulshrestha and Chadha</td>
<td>Electron devices and Applications and Integrated circuits'</td>
<td>Umesh Publications</td>
<td>2005</td>
</tr>
<tr>
<td>3</td>
<td>Thomas L. Floyd</td>
<td>Electron Devices</td>
<td>Charles and Messil Publications</td>
<td>2012</td>
</tr>
<tr>
<td>4</td>
<td>G.K. Mithal</td>
<td>Electronic Devices and Circuits</td>
<td>Khanna Publishers</td>
<td>2013</td>
</tr>
<tr>
<td>6</td>
<td>B. Somanathan Nair</td>
<td>Electronic Devices and Applications</td>
<td>PHI,</td>
<td>2006</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To introduce basic postulates of Boolean algebra and shows the correlation between boolean expressions.
- To introduce logic gates and combinational circuits.
- To outline the formal procedures for the analysis and design of sequential circuits.
- To illustrate the concept of synchronous and asynchronous sequential circuits.
- To introduce the concept of memories and programmable logic devices.

INTENDED OUTCOMES:
- Ability to reduce any given Boolean expression.
- Ability to design combinational and sequential circuits.

UNIT-I NUMBER SYSTEMS AND BOOLEAN ALGEBRA

UNIT-II LOGIC GATES AND COMBINATIONAL CIRCUITS

Implementation of combinational logic using MUX.

UNIT-III SEQUENTIAL CIRCUIT

UNIT-IV ASYNCHRONOUS SEQUENTIAL CIRCUITS
UNIT-V MEMORY DEVICES

Total Hours: 45

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<td>2</td>
<td>John M. Yarbrough</td>
<td>Digital Logic Applications and Design</td>
<td>Thomson- Vikas publishing house, New Delhi</td>
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<td>5</td>
<td>Thomas L. Floyd</td>
<td>Digital Fundamentals</td>
<td>Pearson Education, New Delhi</td>
<td>2003</td>
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</tbody>
</table>

WEBSITES:

1. http://www.ee.surrey.ac.uk/Projects/Labview/minimisation/tabular.html
3. http://nptel.ac.in/
OBJECTIVES:

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming.
- Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure.
- Study, analyze and understand logical structure of a computer program, and different construct to develop.

INTENDED OUTCOMES:

- Write small programs related to simple/ moderate mathematical and logical problems in C.
- Study, analyze and understand simple data structures and how to use it in C language.
- Identify and understand the working of different operating systems like windows and Linux etc.

UNIT I INTRODUCTION TO C LANGUAGE

Character Set, Variables And Identifiers, Keywords- Built-In Data Types- Arithmetic Operators And Expressions, Constants And Literals, Simple Assignment Statement- Basic Input/Output Statement-Simple 'C' Programs, usage of const keyword.

UNIT II CONDITIONAL STATEMENTS AND LOOPS

Logical and Relational Operators- If Statement, If-Else Statement- Loops: While Loop, Do While, For Loop- Nested Loops, Infinite Loops- Switch Statement.

UNIT III ARRAYS

One Dimensional Arrays- Array Manipulation; Searching, Insertion, Deletion Of An Element From An Array- Finding The Largest/Smallest Element In An Array- Two Dimensional Arrays, -Addition/Multiplication Of Two Matrices- Strings As Array Of Characters.

UNIT IV POINTERS AND FUNCTIONS


UNIT V USER DEFINED DATATYPES AND FILES


Total Hours: 45
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<td>3</td>
<td>H. M. Deitel and D. J. Deitel</td>
<td>C: How to Program 7th Edition</td>
<td>Prentice Hall</td>
<td>2012</td>
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<tr>
<td>4</td>
<td>E. Balagurusamy</td>
<td>Programming in ANSI C- 6th edition</td>
<td>TMH Education</td>
<td>2012</td>
</tr>
</tbody>
</table>
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 electromagnetic
- To make students have depth understanding of antennas, electronic devices, Waveguides is possible

INTENDED OUTCOMES:
Upon completion of the course, the students would be able to
- Analyze field potentials due to static changes and static magnetic fields.
- Explain how materials affect electric and magnetic fields.
- Analyze the relation between the field under time varying situations.
- Discuss the principles of propagation uniform plane waves.

UNIT I STATIC ELECTRICFIELD

UNIT II CONDUCTORS AND DIELECTRICS
Conductors and dielectrics in Static Electric Field, Current and current density, Continuity equation, Polarization, Boundary conditions, Method of Images, Resistance of a conductor, Capacitance, Parallel plate, Coaxial and Spherical capacitors, Boundary conditions for perfect dielectric materials, Poisson’s equation, Laplace’s equation, Solution of Laplace equation, Application of Poisson’s and Laplace’s equations.

UNIT III STATIC MAGNETIC FIELDS

UNIT IV MAGNETIC FORCES AND MATERIALS
UNIT V  TIME VARYING FIELDS AND MAXWELL’S EQUATIONS


Total Hours: 45

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<td>Field and Wave Electromagnetics</td>
<td>PearsonEducationInc, Delhi</td>
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<td>3</td>
<td>Karl E Longman and Savva V Savov</td>
<td>Fundamental also of Electromagnetics</td>
<td>PrenticeHallofIndiaNew Delhi</td>
<td>2006</td>
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<td>4</td>
<td>Ashutosh Pramanic</td>
<td>Electromagnetism</td>
<td>Prentice Hall of India, NewDelhi</td>
<td>2006</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To provide an awareness to Computing and C Programming.
- To know the correct and efficient ways of solving problems.
- To learn to develop algorithm for simple problem solving.

INTENDED OUTCOMES:
- Able to understand the basic terminology used in computer programming.
- Able to write, compile and debug programs in C language.
- Able to use different data types in a computer program.
- Able to design programs involving decision structures, loops and functions.
- Able to understand the dynamics of memory by the use of pointers.

List of Experiments
1. Write a C program to find Factorial of a given number using do while loop.
2. Write a C Program to print Fibonacci series using while loop.
3. Write a C Program to check a given number is Prime or Not.
4. Write a C Program to compute the sum of even numbers for a given n value.
5. Write a C Program to check the given string is Palindrome or Not.
6. Write a C Program to check the given number is Armstrong or Not using functions.
7. Write a C Program to count the number of vowels from the given string using switch case.
8. Write a C Program to read a line of text from keyboard and print the number of characters, words and spaces.
9. Write a C Program to print the student’s record using structure.
10. Write a C Program to find factorial of a number using recursion function.

Total Hours: 45
OBJECTIVES:

- To study experimentally the characteristics of diodes, BJT’s and FET’s.
- To verify practically, the response of various special purpose electron devices.

INTENDED OUTCOMES:

At the end of the course, the student should be able to:

- Learn the characteristics of basic electronic devices.
- Design Halfwave and Fullwave rectifiers with and without filters.
- Verify the Characteristics of various devices using simulation software.

LIST OF EXPERIMENTS

1. Characteristics of PN junction and Zenerdiode.
2. Input, Output and Transfer characteristics of CE Configuration.
3. Input, Output and Transfer characteristics of CC Configuration.
5. Transfer characteristics of JFET.
6. Transfer characteristics of MOSFET. (with depletion and enhancement mode)
7. Characteristics of LED with three different wavelengths.
8. Halfwave rectifier, Fullwave rectifier and Fullwave Bridge rectifier with and without Capacitive filter.
10. Simulation experiments 1, 2, 3, 5, 6 using PSPICE or Multisim.

Total Hours: 45
OBJECTIVES:

- To verify operation of logic gates and flip-flops.
- To design and construct digital circuits.

INTENDED OUTCOMES:

At the end of the course, the student should be able to:

- Differentiate between combinational and sequential circuits.
- Design simple digital circuits for various applications.
- Learn to simulate using HDL.

LIST OF EXPERIMENTS

2. Design and implementation of HalfAdder and FullAdder.
3. Design and implementation of Magnitude Comparator (2-Bit).
4. Design and implementation Encoders and Decoders.
5. Design and implementation Multiplexer and Demultiplexer.
7. Implementation of combinational logic functions using standard ICs
8. Design and implementation Synchronous Counters.
9. Design and implementation Ripple Counter.
10. Design and implementation Mod–N Counter.
11. Implementation of Shift Registers.
12. Simulation Experiments using VHDL/Verilog for experiments 2, 4,5,7,8.

Total Hours: 45

1. Introduction to OR-CAD PCB
2. Installation and Setup
3. PCB Basics(Tools)
4. PCB Design Session
5. Automatic Routing
7. Design Verification
8. Creation of Net list
OBJECTIVES:

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the concepts of waveform generation and to introduce theory and applications of analog multipliers and PLL.
- To educate the design of Filters and Voltage regulators.
- To teach the theory of ADC and DAC.

INTENDED OUTCOME:

Students gain Knowledge in

- Designing circuits using Opamp for linear and non-linear applications.

UNIT I  OPERATIONAL AMPLIFIER CHARACTERISTICS  9
Op-amp symbol, terminals, packages and specifications - Block Diagram Representation of op-amp

UNIT II  OP–AMP APPLICATIONS  9
Non-linear Applications: Precision Rectifiers – Wave Shaping Circuits (Clipper and Clampers) – Log and Antilog Amplifiers – Analog voltage multiplier circuit and its applications - Comparators and its applications.

UNIT III  WAVEFORM GENERATORS AND PLL  9
Waveform Generators: Sine-wave Generators – Square / Triangle / Sawtooth Wave generators. IC 555 Timer: Monostable operation and its applications, Astable operation and its applications
PLL: Operation of the Basic PLL–Closed loop analysis of PLL – Voltage Controlled Oscillator – PLL Applications

UNIT IV  ACTIVE FILTERS & VOLTAGE REGULATOR  9
Filters: Comparison between Passive and Active Networks-Active Network Design – Filter Approximations-Design of LPF, HPF, BPF and Band Reject Filters – State Variable Filters

UNIT V  DATA CONVERSION DEVICES  9
Digital to Analog Conversion: DAC Specifications – DAC circuits – Weighted Resistor DAC-R-2R
Ladder DAC- Inverted R-2R Ladder DAC Monolithic DAC
Analog to Digital conversion: ADC specifications-ADC circuits-Ramp Type ADC-Successive Approximation ADC-Dual Slope ADC-Flash Type ADC.

Total Hours: 45
**TEXTBOOKS:**

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Author(s) Name</th>
<th>Title of the book</th>
<th>Publisher</th>
<th>Year of publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Roy Choudhury and Shail Jain</td>
<td>Linear Integrated Circuits</td>
<td>New Age International Publishers</td>
<td>2003</td>
</tr>
<tr>
<td>2</td>
<td>Ramakant A. Gayakwad</td>
<td>Op-Amps and Linear Integrated Circuits</td>
<td>Prentice Hall of India, New Delhi</td>
<td>2000</td>
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<tbody>
<tr>
<td>1</td>
<td>Robert F. Coughlin, Frederick F. Driscoll</td>
<td>Operational-Amplifiers and Linear Integrated Circuits</td>
<td>Prentice Hall of India, New Delhi</td>
<td>2001</td>
</tr>
<tr>
<td>2</td>
<td>Sergio Franco</td>
<td>Design with operational amplifier and analog integrated circuits</td>
<td>McGraw Hill</td>
<td>2015</td>
</tr>
</tbody>
</table>
OBJECTIVES:

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

INTENDED OUTCOMES:

Students will gain
- Knowledge about the properties and representation of discrete and continuous signals.
- Knowledge about the sampling process and analysis of discrete systems using z-transforms
- Knowledge about the analysis and synthesis of discrete time systems.

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 12
Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - CT systems and DT systems Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Noncausal, Stable & Unstable.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 12
Fourier series analysis-spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in CT Signal Analysis - Properties.

UNIT III LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS 12
Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis of CT systems

UNIT IV SAMPLING THEOREM AND Z-TRANSFORMS 12

UNIT V FILTER REALIZATION STRUCTURES 12
Realization structures – Direct Form – I, Direct Form – II, Cascade, Parallel and Transpose forms.

Total Hours: 60
## TEXT BOOKS:

<table>
<thead>
<tr>
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<th>Publisher</th>
<th>Year of publication</th>
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<tbody>
<tr>
<td>1</td>
<td>Alan V. Oppenheim, Alan S. Willsky and Hamid Nawab S</td>
<td>Signals and Systems</td>
<td>Pearson Education, New Delhi</td>
<td>2003</td>
</tr>
<tr>
<td>2</td>
<td>Roberts. M. J</td>
<td>Signals and Systems Analysis using Transform method and MATLAB</td>
<td>TMH, New Delhi</td>
<td>2003</td>
</tr>
</tbody>
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<th>Year of publication</th>
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<tbody>
<tr>
<td>2</td>
<td>Simon Haykin and Barry Van Veen</td>
<td>Signals and Systems</td>
<td>John Wiley, New York</td>
<td>2002</td>
</tr>
<tr>
<td>5</td>
<td>Ashok Amhardar</td>
<td>Analog and Digital Signal Processing</td>
<td>PHI, New Delhi</td>
<td>2002</td>
</tr>
</tbody>
</table>

## WEBSITES:

1. www.relisoft.com
2. www.dspguide.com
OBJECTIVES:

- To become familiar with propagation of signals through lines.
- To know about various line parameters by conventional and graphical methods.
- To understand the need for impedance matching and different impedance matching techniques.
- To understand the design of different types of filters, equalizer and attenuators.

INTENDED OUTCOMES:

- Students have complete exposure to basics and Fundamentals of transmission lines and networks.
- Students will have ability to design filters, equalizers and attenuator.

UNIT I  TRANSMISSION LINE THEORY


UNIT II  HIGH FREQUENCY TRANSMISSION LINES

Transmission line equations at radio frequencies–Line of Zero dissipation–Voltage and current on the dissipation less line, StandingWaves, Nodes Standing Wave Ratio–Input impedance of the dissipation less line - Open and short-circuited lines – Power and impedance measurement on lines – Reflection losses– Measurement of VSWR and wavelength.

UNIT III  IMPEDANCE MATCHING IN HIGH FREQUENCY LINES


UNIT IV  PASSIVE FILTERS


UNIT V  ATTENUATORS AND EQUALIZERS

Attenuators: Lattice Attenuators, Bridged– T attenuator, L-Type Attenuator. Equalizers: Inverse network, series, fullseries, shunt, fullshunt, constant resistance T, constant resistance, constant resistance lattice and bridged T network.

Total Hours: 45
**TEXTBOOKS:**

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<tr>
<td>1</td>
<td>Ryder J. D</td>
<td>Networks, Lines and Fields</td>
<td>PHI, New Delhi</td>
<td>2009</td>
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</table>
OBJECTIVES:

- To provide various Amplitude modulation and demodulation systems.
- To provide various Angle modulation and demodulation systems.
- To provide some depth analysis in noise performance of various receiver.
- To study some basic information theory with some channel coding theorem.

INTENDED OUTCOMES:

Student will gain knowledge on
- Various Amplitude modulation and demodulation systems.
- Various Angle modulation and demodulation systems.
- Some depth analysis in noise performance of various receivers.
- Some basic information theory with some channel coding theorem.

UNIT I AMPLITUDE MODULATION
Generation and demodulation of AM, DSB-SC, SSB-SC, VSB Signals, Filtering of sidebands, Comparison of Amplitude modulation systems, Frequency translation, Frequency Division multiplexing, AM transmitters – Super heterodyne receiver, AM receiver.

UNIT II ANGLE MODULATION

UNIT III RANDOM PROCESS

UNIT IV NOISE CHARACTERIZATION

UNIT V INFORMATION THEORY
Uncertainty, Information and entropy, Source coding theorem, Data compaction, Discrete memory less channels, mutual information, channel capacity, channel coding theorem, differential entropy, and mutual information for continuous ensembles, information capacity theorem, implication of the information capacity theorem, rate distortion theory, Compression of information.

Total Hours: 45
### TEXTBOOKS:

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<tr>
<td>1</td>
<td>Simon Haykin</td>
<td>Communication Systems</td>
<td>John Wiley &amp; sons, New Jersy.</td>
<td>2005</td>
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<tbody>
<tr>
<td>1</td>
<td>Roddy and Coolen</td>
<td>Electronic communication</td>
<td>PHI, New Delhi.</td>
<td>2003</td>
</tr>
<tr>
<td>2</td>
<td>Taub and Schilling</td>
<td>Principles of communication systems</td>
<td>TMH, New Delhi</td>
<td>2008</td>
</tr>
</tbody>
</table>

### WEBSITES:

2. www.mit.edu
OBJECTIVES:

The purpose of this course is to introduce to the students:

- The basics of biasing transistor circuits.
- Concepts of feedback amplifiers, large signal amplifiers, tuned amplifiers.
- Operation of oscillators, wave shaping circuits.
- To design and analyze various electronic switching circuits and systems.

INTENDED OUTCOMES:

At the end of this course the students will learn and apply:

- Operating point calculations and working of basic amplifiers.
- Working of different types of feedback amplifiers & oscillators.
- Frequency response and design of tuned amplifiers.
- Basic working & design of wave shaping circuits.

UNIT I  BIASING CIRCUITS AND SMALL SIGNAL MODELS  9

UNIT II  SMALL SIGNAL AMPLIFIERS ANALYSIS AND FREQUENCY RESPONSE  9

UNIT III  FEEDBACK AND OSCILLATOR CIRCUITS  9

UNIT IV  POWER AMPLIFIERS AND TUNED AMPLIFIERS  9

UNIT V  SOLID STATE SWITCHING CIRCUITS  9

Total Hours: 45
### TEXTBOOKS:

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<tbody>
<tr>
<td>1</td>
<td>David A Bell,</td>
<td>Fundamentals of Electronic Devices and Circuits</td>
<td>Oxford University Press</td>
<td>2009</td>
</tr>
<tr>
<td>2</td>
<td>Jacob Millman, Christos C Halkias, Satyabrata Jit</td>
<td>Electron Devices and Circuits</td>
<td>Tata McGraw Hill</td>
<td>2010</td>
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<tbody>
<tr>
<td>4</td>
<td>David A. Bell</td>
<td>Solid State Pulse Circuits</td>
<td>Oxford University Press</td>
<td>2007</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To introduce students to control system modeling
- To introduce methods for analyzing the time response, the frequency response.
- To introduce the concept of compensators.
- To introduce control system components and its applications.

INTENDED OUTCOMES:

- Upon completion of the course, students will be able to:
  - Perform time domain and frequency domain analysis of control systems required for stability analysis.
  - Design the compensation technique that can be used to stabilize control systems.

UNIT I CONTROL SYSTEM MODELLING
System concept, differential equations and transfer functions. Modeling of electric systems, translational and rotational mechanical systems, Simple electromechanical systems. Block diagram representation of systems – Block diagram reduction methods – Closed loop transfer function, determination of signal flow graph. Mason’s gain formula – Examples.

UNIT II TIME DOMAIN ANALYSIS

UNIT III FREQUENCY DOMAIN ANALYSIS

UNIT IV COMPENSATORS
Realization of basic compensators – cascade compensation in time domain and frequency domain and feedback compensation – design of lag, lead, lag-lead compensator using Bode plot and Root locus. Introduction to P, PI and PID controllers. Analysis using MATLAB.

UNIT V CONTROL SYSTEM COMPONENTS AND ITS APPLICATION

Total Hours: 45
**TEXTBOOKS:**

<table>
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<tbody>
<tr>
<td>1</td>
<td>Ogata.K</td>
<td>Modern Control Engineering</td>
<td>Prentice Hall of India, New Delhi</td>
<td>2003</td>
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**REFERENCES:**

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</table>
OBJECTIVES:

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

INTENDED OUTCOMES:

At the end of the course, the student should be able to:

- Identify the components required to build different types of networks.
- Choose the required functionality at each layer for given application.
- Identify solution for each functionality at each layer.
- Trace the flow of information from one node to another node in the network.

UNIT I DATA COMMUNICATIONS


UNIT II DATA LINK LAYER


UNIT III NETWORK LAYER


UNIT IV TRANSPORT LAYER


UNIT V APPLICATION LAYER

Domain Name Space (DNS) – SMTP, FTP, HTTP, WWW, Email, Search engines - POP server- Security – Cryptograph y- Real time applications.

Total Hours: 45
**TEXTBOOKS:**

<table>
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<tr>
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<tr>
<td>1</td>
<td>Behrouz A. Foruzan</td>
<td>Data communication and Networking</td>
<td>Tata McGraw-Hill, New Delhi</td>
<td>2004</td>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>Larry L.Peterson &amp; Peter S.Davie</td>
<td>Computer Networks</td>
<td>Harcourt Asia Pvt. Ltd, New Delhi</td>
<td>2000</td>
</tr>
<tr>
<td>3</td>
<td>Andrew S. Tannenbaum</td>
<td>Computer Networks</td>
<td>PHI, New Delhi</td>
<td>2003</td>
</tr>
</tbody>
</table>
OBJECTIVE:

- To study experimentally the working of amplifiers, regulators and analyze their behavior by plotting graphs.

INTENDED OUTCOME:

- Ability to simulate and design any given electronic circuit and analyze their performance frequency response and characteristics.

LIST OF EXPERIMENTS

1. Series and Shunt feedback amplifiers: Frequency response, Input and output impedance calculation
2. Design of RC Phaseshift oscillator: Design Wein Bridge Oscillator
3. Design of Hartley and Colpitts Oscillator
4. Tuned Class C Amplifer
5. Integrators, Differentiators, Clippers and Clampers
6. Design of Astable, Monostable and Bistable multivibrators

SIMULATION USING PSPICE/MultiSim:

7. Differential amplifier
8. Activefilter: Butter worth I or IInd order LPF, HPF
9. Astable, Monostable and Bistable multivibrator
10. D/A and A/D converter (Successive approximation)
11. Analog multiplier
12. CMOS Inverter, NAND and NOR gates

Total Hours: 45
OBJECTIVES:

- To expose the students to linear and integrated circuits
- To understand the basics of linear integrated circuits and available ICs
- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function IC.
- To use PSPICE/MultiSim software for circuit design.

INTENDED OUTCOMES:

At the end of the course, the student should be able to:

- Design oscillators and amplifiers using operational amplifiers.
- Design filters using Opamp and perform experiment on frequency response.
- Analyse the working of PLL and use PLL as frequency multiplier.
- Design DC power supply using ICs.
- Analyse the performance of oscillators and multivibrators using PSPICE/MultiSim.

LIST OF EXPERIMENTS

1. Inverting, Noninverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier.
4. Active lowpass, highpass and Bandpass filter.
5. Astable, Monostable multivibrators and SchmittTrigger using op-amp.
6. Phase shift and Wienbridge oscillator using op-amp.
7. Astable and Monostable using NE555 Timer.
8. PLL characteristics and Frequency Multiplier using PLL.
10. Study of DC power supply using LM317 and LM723 and SMPS control ICSG 3524/SG3525.
11. Simulation of Experiments 1,2,3,4,5 using PSpice / MultiSim

Experiments 1,2,3,4,5 & 6 to be constructed using Analog kit ASLK PRO kits from Texas Instruments

Total Hours: 45
UNIT I
Overview to communication, self Introduction, Presentation on their own topic, Extempore, Group Activity

UNIT II
Group Discussion, Do's and Don’ts of Group Discussion, Body language, Grooming and Resume, Resume correction

UNIT III
Introduction to HRM – Questions - Do's and Don’t's - Interview - Mock GD - Stress Management

UNIT IV
Personality Development - Presentation skills, Interpersonal skills, Critical thinking, Confidence building and Stress management.

Total Hours: 15

REFERENCES:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Barun K Mitra</td>
<td>Personality Development and Soft Skills</td>
<td>Oxford University Press-New Delhi</td>
<td>2012</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To learn discrete Fourier transform and its properties.
- To know the characteristics of IIR and FIR filters learn the design of infinite and finite impulse response filters for filtering undesired signals.
- To understand Finite word length effects.
- To study the concept of Multirate and adaptive filters.

INTENDED OUTCOMES:
Upon completion of the course, students will be able to

- Apply DFT for the analysis of digital signals & systems
- Design IIR and FIR filters
- Characterize finite Word length effect on filters
- Design the Multirate Filters
- Apply Adaptive Filters to equalization

UNIT I  DISCRETE FOURIER TRANSFORM  12

UNIT II  IIR FILTER DESIGN  12
Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.

UNIT III  FIR FILTER DESIGN  12

UNIT IV  FINITE WORDLENGTH EFFECTS  12
Fixed point and floating point number representations – ADC – Quantization- Truncation and Rounding errors - Quantization noise – coefficient quantization error – Product quantization error - Overflow error – Roundoff noise power - limit cycle oscillations due to product round off and overflow errors – Principle of scaling

UNIT-V  DIGITAL SIGNAL PROCESSORS  12
Introduction to DSP architecture - Dedicated MAC unit - Multiple ALUs, Advanced addressing modes, Pipelining, Overview of instruction set of TMS320C5X and C54X.

Total Hours: 60
### TEXTBOOKS:

<table>
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<tr>
<td>2</td>
<td>Venkataramani B &amp; M. Bhaskar</td>
<td>Digital Signal Processor Architecture, Programming and Application</td>
<td>TMH, New Delhi</td>
<td>2002</td>
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</table>

### WEBSITES:

1. www.cnx.org
2. www.dspguide.com
OBJECTIVES:

- To learn and understand Pulse modulation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- To educate baseband pulse transmission which deals with the transmission of pulse amplitude modulated signals in their baseband form; Pass band data transmission methods.
- To learn spread spectrum techniques.

INTENDED OUTCOMES:

Upon completion of the course, students will be able to

- Design PCM systems.
- Design and implement base band transmission schemes.
- Design and implement baseband signaling schemes.
- Analyze the spectral characteristics of baseband signaling schemes and their noise performance.

UNIT I SAMPLING AND QUANTIZATION

- Sampling Process
- Aliasing
- Instantaneous sampling
- Natural Sampling
- Flat Sampling
- Quantization of signals
- Sampling and quantizing effects
- Channel effects
- SNR for quantization pulses
- Time division multiplexing.

UNIT II DIGITAL MODULATION SYSTEMS

- Pulse amplitude modulation
- Bandwidth noise trade-off
- Pulse code modulation
- Noise Considerations in PCM system
- Virtues, Limitations & Modification of PCM system
- Delta Modulation
- Noise Considerations in Delta Modulation
- SNR Calculations
- Differential PCM
- Comparison of PCM, DPCM & DM.

UNIT III BASE BAND PULSE TRANSMISSION

- Maximum likelihood receiver structure
- Matched filter receiver
- Error rate due to noise
- Probability error of the Matched filter
- Inter symbol interference
- Nyquist criterion for distortionless baseband transmission
- Correlative coding
- Eye pattern.

UNIT IV PASS BAND DATA TRANSMISSION

- Pass Band Transmission Model
- Generation, Detection, Signal Space Diagram
- Probability of Error for BFSK, BPSK, QPSK, DPSK, and Schemes
- Comparison.

UNIT V SPREAD SPECTRUM MODULATION

- Generation & Characteristics of PN Sequence
- Discrete Sequence Spread Spectrum technique
- Use of Spread Spectrum with CDMA
- Ranging Using Discrete Sequence Spread Spectrum
- Frequency Hopping Spread Spectrum.

Total Hours: 45
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<th>Publisher</th>
<th>Year of publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Simon Haykins</td>
<td>Digital Communication</td>
<td>JohnWiley PHI, NewDelhi</td>
<td>2009</td>
</tr>
</tbody>
</table>

### REFERENCES:

<table>
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</table>
OBJECTIVES:

- To give an insight to antenna fundamentals and radiations.
- To create awareness about the different types antennas arrays and synthesis.
- To give a thorough understanding of the radiation characteristics of different types of antennas.
- To understand the propagation of radio waves in the atmosphere.

INTENDED OUTCOMES:

Upon completion of the course, students will be able to:

- Explain the various types of antennas and wave propagation.
- Write about the radiation from a current element.
- Analyze the antenna arrays and special antennas with introduction nto CAD modeling.

UNIT I ANTENNA FUNDAMENTALS AND RADIATION


UNIT II ANTENNA ARRAYS AND SYNTHESIS


UNIT III SPECIAL PURPOSE ANTENNAS


UNIT IV ANTENNA MEASUREMENTS


UNIT V RADIO WAVE PROPAGATION


Total Hours: 45
### TEXT BOOKS:

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<tr>
<td>1</td>
<td>Constantine A. Balanis</td>
<td>Antenna Theory: Analysis and Design Third Edition</td>
<td>John Wileyand Sons</td>
<td>2012</td>
</tr>
<tr>
<td>2</td>
<td>G.S.N. Raju</td>
<td>Antennas and wave propagation</td>
<td>St Pearson Education</td>
<td>2012</td>
</tr>
<tr>
<td>4</td>
<td>R.L. Yadava</td>
<td>Antennas and Wave Propagation</td>
<td>PHI</td>
<td>2011</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To introduce the h/w architecture, instruction set and programming of 8086 microprocessor.
- To introduce the peripheral interfacing of microprocessors.
- To introduce the h/w architecture, instruction set, programming and interfacing of 8051 microcontroller.
- To introduce the h/w architecture of ARM processor.

INTENDED OUTCOMES:

At the end of the course, the student should be able to:

- Design and implement programs on 8086 microprocessors.
- Design and implement programs on 8051 microcontroller.
- Design Memory Interfacing circuits using 8051.
- Gain knowledge on ARMv7 processor.

UNIT I  MICROPROCESSOR- 8086

UNIT II  PROGRAMMING OF 8086
Addressing Modes- Instruction Format-Instruction set-Assembly language programs in 8086. RISC architecture – introduction to ARM Programming-register configuration and instruction set – sample program.

UNIT III  MICROCONTROLLER-8051

UNIT IV  PROGRAMMING AND INTERFACING OF 8051
Timer-Serial Communication-Interrupts Programming- Interfacing to External Memory-Interfacing to ADC, LCD, DAC, Keyboard and stepper motor.

UNIT V  OVERVIEW OF ARM PROCESSOR
Review of ARMv7 core and its architecture, Introduction to Advanced ARM CORTEX M4 architecture, Peripherals overview, Advantages of using Cortex M4, Instruction set implementation, CPU timer’s introduction.

Total Hours: 45
**TEXTBOOKS:**

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<tr>
<td>1</td>
<td>Krishna Kant</td>
<td>Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096.</td>
<td>PHI, NewDelhi.</td>
<td>2007</td>
</tr>
<tr>
<td>2</td>
<td>Kenneth J. Ayala</td>
<td>The 8051 Microcontroller</td>
<td>Thompson Delmar Learning, NewDelhi</td>
<td>2007</td>
</tr>
<tr>
<td>4</td>
<td>Barry B. Brey</td>
<td>The Intel Microprocessors Architecture, Programming and Interfacing</td>
<td>Pearson Education, New Delhi</td>
<td>2007</td>
</tr>
<tr>
<td>5</td>
<td>Ramesh S. Goankar</td>
<td>Microprocessor Architecture, Programming, and Applications with the 8085.</td>
<td>PHI, NewDelhi.</td>
<td>2002</td>
</tr>
<tr>
<td>6</td>
<td>Jonathan W Valvano</td>
<td>Introduction to Arm(r) Cortex-M Microcontrollers</td>
<td>Createspace Independent Publisher</td>
<td>2012</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To implement the processing techniques using TMS320C5X
- To implement the IIR and FIR filter using MATLAB.

INTENDED OUTCOMES:

Students will be able to:

- Carry out simulation of DSP systems.
- Demonstrate the applications of FFT to DSP.
- Implement adaptive filters for various applications of DSP.

LIST OF EXPERIMENTS USING TMS320C5X

1. Study of various addressing modes of DSP using simple programming examples
2. Sampling of input signal and display.
3. Implementation of FIR filter.
4. Calculation of FFT.

SIMULATION USING MATLAB/EQUIVALENT SOFTWARE PACKAGE

5. Generation of Signals
6. Linear and circular convolution of two sequences
7. Sampling and effect of aliasing
8. Design of FIR filters
9. Design of IIR filters
10. Calculation of FFT of asignal

Total Hours: 45
OBJECTIVES:
- To analyze radiation patterns of various antennas.
- To implement AM & FM modulation and demodulation.
- To implement PCM & DM.
- To implement FSK, PSK and DPSK schemes.

INTENDED OUTCOMES:
At the end of the course, the student should be able to:
- Distinguish between radiation patterns of various antennas.
- Demonstrate their knowledge in AM, FM transmission and reception.
- Demonstrate their knowledge in base band signaling schemes through implementation of FSK, PSK and DPSK.

LIST OF EXPERIMENTS
1. Radiation pattern of Halfwave dipole Antenna.
2. Radiation pattern of Yagi Antenna.
3. Radiation pattern of loop Antenna.
5. Characteristics of FM receiver (Selectivity & Sensitivity).
6. Signal Sampling & Time division multiplexing.
7. Pulse modulation and demodulation-PAM/PWM/PPM.
8. Pulse code modulation & demodulation.
9. Line Coding & Decoding.
10. Delta modulation & demodulation.
11. Digital modulation & demodulation--ASK, PSK, FSK.
12. Simulation of hardware mentioned above using Lsim software.

Total Hours: 45
OBJECTIVES:

The student should be made to:
- Introduce ALP concepts and features.
- Write ALP for arithmetic and logical operations in 8086.
- Interface peripherals with microprocessor and microcontroller.

INTENDED OUTCOMES:

At the end of the course, the student should be able to:
- Write ALP Programmes for fixed and Floating Point and Arithmetic.
- Interface different I/Os with processor.
- Execute Programs in 8051.

LIST OF EXPERIMENTS:
Minimum 12 Experiments to be conducted
1. Programs for 8/16 bit Arithmetic operations (Using 8085 and 8086).
2. Programs for Sorting and Searching (Using 8086).
3. Programs for String manipulation operations (Using 8086).
4. Programs for Digital clock and Stop watch (Using 8086).
5. Programs on Subroutines (Using 8086).
6. Interfacing ADC and DAC (Using MSP 430 Controller).
7. Interfacing with 8255.
8. Transfer data serially between two kits (8253/8251).
9. Interfacing with 8279.
11. Interfacing with 8259 Programmable Interrupt Controller.
12. Interfacing and Programming of DC Motor Speed control (Using MSP 430 controller).
13. Interfacing and Programming of Stepper Motor and (8051).

Total Hours: 45
OBJECTIVES:

- To learn the fundamental cellular radio concepts
- To learn radio propagation models
- To provide ideas about analog and digital modulation techniques used in mobile communication
- To learn various coders and multiple access techniques.
- To study the architectures of AMPS, GSM, WLL, Bluetooth, DECT, GPRS.

INTENDED OUTCOMES:

At the end of the course, the student should be able to:

- Gain adequate knowledge in the fundamentals of cellular radio concepts.
- Gain adequate knowledge in radio propagation models and modulation techniques.
- Provide ideas about analog and digital modulation techniques used in mobile communication.

UNIT I  CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS  9
Introduction to wireless communication: Evolution of mobile communications, mobile radio systems- Examples, trends in cellular radio and personal communications.
Cellular Concept: Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems.

UNIT II  MOBILE RADIO PROPAGATION  9
Free space propagation model, reflection, diffraction, scattering, link budget design, Outdoor Propagation models, Indoor propagation models, Small scale Multipath propagation, Impulse model, Small scale Multipath measurements, parameters of Mobile multipath channels, types of small scale fading, statistical models for multipath fading channels.

UNIT III  MODULATION TECHNIQUES AND EQUILISATION  9

UNIT IV  CODING AND MULTIPLE ACCESS  9
Coding: Vocoders, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec, RS codes for CDPD. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and SDMA.
UNIT V     WIRELESS SYSTEMS ANTENNAS AND STANDARDS
AMPS, GSM, WLL, Bluetooth, IS-95 and DECT - RFID antennas – Mobile Antennas – GPRS.

Total Hours: 45

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<tr>
<td>1</td>
<td>Rappaport. T. S</td>
<td>Wireless Communications: Principles and Practice</td>
<td>Pearson Education/Prentice Hall of India, New Delhi</td>
<td>2003</td>
</tr>
<tr>
<td>2</td>
<td>JochenSchiller</td>
<td>Mobile Communication</td>
<td>PHI, New Delhi.</td>
<td>2003</td>
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<tbody>
<tr>
<td>1</td>
<td>Roy Blake</td>
<td>Wireless Communication Technology</td>
<td>Thomson Delmar, New Delhi.</td>
<td>2003</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To learn the MOS process technology.
- To learn the basic MOS Circuits.
- To learn concept of various logic styles.
- To learn the concepts of modeling a digital system using Hardware Description Language.
- To learn the concepts of VLSI implementation strategies.

INTENDED OUTCOMES:
Upon completion of the course, students should
- Explain the basic CMOS circuits and the CMOS process technology.
- Explain working of various complex gates and logic styles.
- Model the digital system using Hardware Description Language.

UNIT I  MOS TECHNOLOGY
9
Chip Design Hierarchy – IC Layers – Photolithography and Pattern Transfers – Basic MOS Transistors – CMOS Fabrication: n-well – p-well – twin tub – Latch up and prevention- Layout design rules, physical design- basic concepts, CAD tool sets, physical design of logic gates- Inverter, NAND, NOR.

UNIT II  MOS TRANSISTOR PRINCIPLE
9

UNIT III  CMOS LOGIC GATES & OTHER COMPLEX GATES
9

UNIT IV  VERILOG HDL
9

UNIT V  VLSI IMPLEMENTATION STRATEGIES
9

Total Hours: 45
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</table>
OBJECTIVES:

- To Facilitate the knowledge about optical fiber sources and transmission techniques
- To Enrich the idea of optical fiber networks algorithm such as SONET/SDH.
- To Explore the trends of optical fiber measurement systems.

INTENDED OUTCOMES:

Upon completion of the course, students will be able to:

- Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
- Explain the various optical sources and optical detectors and their use in the optical communication system.
- Analyze the digital transmission and its associated parameters on system performance.

UNIT I INTRODUCTION TO OPTICAL FIBERS

UNIT II SIGNAL DEGRADATION OPTICAL FIBERS

UNIT III FIBER OPTICAL SOURCES AND COUPLING

UNIT IV FIBER OPTICAL RECEIVERS

UNIT V DIGITAL TRANSMISSION SYSTEM

Total Hours: 45
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<tbody>
<tr>
<td>2.</td>
<td>Ramaswami, Sivarajan and Sasaki</td>
<td>Optical Networks</td>
<td>Morgan Kaufmann Publishers</td>
<td>2009</td>
</tr>
</tbody>
</table>
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.

INTENDED OUTCOMES:

Upon completion of the course, students will be able to:

- Explain the active & passive microwave devices & components used in Microwave communication systems.
- Analyze the multi-port RF networks and RF transistor amplifiers.
- Generate Microwave signals and design microwave amplifiers.
- Measure and analyze Microwave signal and parameters.

UNIT I    TWO PORT NETWORK THEORY


UNIT II    RF AMPLIFIERS AND MATCHING NETWORKS

Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Stabilization Methods, Noise Figure, Constant VSWR, Broadband, Highpower and Multistage Amplifiers, Impedance matching using discrete components, Two component matching Networks, Frequency response and quality factor, T and Pi Matching Networks, Microstrip Line Matching Networks.

UNIT III   PASSIVE AND ACTIVE MICROWAVE DEVICES

Terminations, Attenuators, Phase shifters, Directional couplers, Hybrid Junctions, Power dividers, Circulator, Isolator, Impedance matching devices: Tuning screw, Stub and quarter wave transformers. Crystal 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

Review of conventional vacuum Triodes, Tetrodes and Pentodes, High frequency effects in vacuum Tubes, Theory and application of Two Cavity Klystron Amplifier, Reflex Klystron oscillator, traveling wave tube amplifier, Magnetron oscillator using Cylindrical, Linear, Coaxial Voltage tunable Magnetrons, Backwardwave Crossed field amplifier and oscillator.

UNIT V     MICROWAVE MEASUREMENTS


Total Hours: 45
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<tbody>
<tr>
<td>1.</td>
<td>Reinhold Ludwig and Gene Bogdano</td>
<td>RF Circuit Design: Theory &amp; Applications</td>
<td>Pearson Education Inc</td>
<td>2011</td>
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<tr>
<td>1.</td>
<td>David M. Pozar</td>
<td>Microwave Engineering</td>
<td>Wiley India(P) Ltd, New Delhi</td>
<td>2008</td>
</tr>
<tr>
<td>3.</td>
<td>Mathew M. Radmanesh</td>
<td>RF and Microwave Electronics</td>
<td>Prentice Hall</td>
<td>2000</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To develop knowledge on ARMv7 core and ARM CORTEXM4 architecture.
- To develop knowledge on Floating Point Unit.
- To develop knowledge on Motion Control.

INTENDED OUTCOMES:

- Gain adequate knowledge about devices and buses used for embedded networking.
- Gain adequate knowledge about ARMv7 core and ARM CORTEXM4 architecture.
- Gain adequate knowledge about Floating Point Unit.
- Gain adequate knowledge about Motion Control.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS
Definition and Classification–Overview of Processors and hardware units in an embedded system–Software embedded into the system–Exemplary Embedded Systems –Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits

UNIT II DEVICES AND BUSES FOR DEVICES NETWORK

UNIT III OVERVIEW OF ARCHITECTURE
Review of ARM v7 core and its architecture, Introduction to Advanced ARM CORTEX M4 architecture, Peripherals overview, Advantages of using Cortex M4, Instruction set implementation, CPU timers introduction.

UNIT IV FLOATING POINT UNIT
Introduction to Floating Point Architecture, Advantages of FPU, Need for FPU, IEEE Standards for implementing FPU, Various FPU Modules in Cortex M4 Processors, Software flow for FPU implementation.

UNIT V MOTION CONTROL
Introduction to motion control, advantages for using motion control modules, Implantation of motion control overview, introduction to PWM Modules, PWM Concepts for Motion Control, Configuration of PWM Modules, Introduction to encoders, types of encoders, QEP Module.

Total Hours: 45
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<td>2.</td>
<td>Jonathan W Valvano</td>
<td>Introduction to Arm(r) Cortex–M3 Microcontrollers</td>
<td>Createspace Independent Publisher</td>
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<tr>
<td>1.</td>
<td>Andrew Sloss, Dominic Symes, Chris Wright</td>
<td>ARM System Developer's Guide</td>
<td>Elsevier/Morgan Kaufman</td>
<td>2004</td>
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17BE.E6**  PROFESSIONAL ELECTIVE  
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3 0 0 3
OBJECTIVES:
- To learn Hardware Descriptive Language (Verilog/VHDL).
- To learn the fundamental principles of VLSI circuit design in digital and analog domain.
- To familiarise fusing of logical modules on FPGAs.

INTENDED OUTCOMES:
At the end of the course, the student should be able to
- Write HDL code for basic as well as advanced digital integrated circuits.
- Import the logic modules into FPGA Boards.

LIST OF EXPERIMENTS
All the experiments must be implemented using Cadence tool
1. Study of Simulator tools.
2. Study of Synthesis tools.
3. Place and Root and Back annotation for FPGAs.
4. Study of development tool for FPGAs for schematic entry and Verilog.
5. Design of traffic light controller using verilog and above tools.
6. Design and simulation of pipelined serial and parallel adder to add/subtract 8 number of size, 13 bits each in 2's complement method.
7. Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2's complement. Design must be pipelined and completely RTL compliant.
8. Study of FPGA board and testing on board LEDs and switches using verilog codes.
9. Testing the traffic controller design developed in SL NO.5 on the FPGA board.
10. Design a Real-time Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.) and demonstrate its working on the FPGA board. An expansion card is required for the displays.

Total Hours: 45
OBJECTIVES:

The student should be made to:

- Understand the working principle of optical sources, detector, fibers.
- Develop understanding of simple optical communication link.
- Learn about the characteristics and measurements in optical fiber.

INTENDED OUTCOMES:

At the end of the course, the student should be able to:

- Analyze the performance of simple optical link.
- Analyze the mode characteristics of fiber.

LIST OF EXPERIMENTS:

1. Numerical aperture determination for fibers & Attenuation Measurement in 3 mm cable Fibers.
2. Numerical aperture determination for fibers & Attenuation Measurement in 6 mm cable Fibers.
5. Fiber optic analog link for 3mm and 6mm cable.
6. Fiber optic digital link for 3mm and 6mm cable.
7. LED Characteristics of fiber optic transmitter using 3 mm cable.
8. LED Characteristics of fiber optic transmitter using 6 mm cable.
9. Photo Diode Characteristics of fiber optic receiver.
10. Study of fiber optic tools.

Total Hours: 45
OBJECTIVES:
The student should be made to:
- Know about the behavior of microwave components.
- Practice microwave measurement procedures

INTENDED OUTCOMES:
- Analyse the radiation of pattern of antenna.
- Test various microwave components.

LIST OF EXPERIMENTS:
1. VSWR Measurements–Determination of terminated impedance.
2. Determination of guide wavelength, frequency measurement.
3. Radiation Pattern of Horns, Paraboloids.
4. Microwave Power Measurement.
7. Study of attenuators (fixed and variable).
8. Conduct an experiment using microwave test bench.
10. Simulation using CAD tools.

Total Hours: 45

OBJECTIVES:
- To learn the working of ARM processor and PIC microcontroller.
- To understand the Building Blocks of Embedded Systems.
- To earn the concept of memory map and memory interface.

INTENDED OUTCOMES:
- Write programs in ARM and PIC microcontroller for a specific Application.
- Interface memory and Write programs related to memory operations
- Interface A/D and D/A convertors with ARM system.
- Write programmes for interfacing keyboard, display, motor and sensor.

LIST OF EXPERIMENTS
1. Study of ARM evaluation system.
2. Interfacing ADC and DAC with ARM controller.
3. Interfacing LED and keyboard with ARM controller.
4. Interfacing real time clock and serial port.
5. Interfacing EPROM and interrupt.
6. Flashing of LEDs using ARM.
7. Interfacing stepper motor and temperature sensor using ARM controller.
8. Implementing zigbee protocol with ARM.
11. Program for I2C based RTC/Memory interface using PIC microcontroller.

Total Hours: 45
17BEEC651  COMMUNICATION SKILLS AND DEVELOPMENT  L T P C  1 0 0 -

17BEEC652  ADVANCED SIMULATION LABORATORY  L T P C  1 0 0 -

1. Simulation using ORCAD PSPICE
2. Basic Bio signal pre-processing using MATLAB
3. Basic Bio signal pre-processing using LabVIEW
4. Image processing using MATLAB
OBJECTIVE:

- To enable the students to create an awareness on Engineering Ethics, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I  ENGINEERING ETHICS

UNIT II  FACTORS OF CHANGES
Forces that shape culture, social control – Meaning, Agencies, Institution, Customs, Values, Folkways, Norms and Laws. Social changes – Meaning and nature – Theories.

UNIT III  HISTORICAL DEVELOPMENT, PLANNING, ORGANISING

UNIT IV  DIRECTING AND CONTROLLING

UNIT V  ENTREPRENEURSHIP AND MOTIVATION

Total Hours: 45

TEXT BOOKS:

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<tr>
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<tbody>
<tr>
<td>1</td>
<td>Harold Kooritz and Heinz Weichrich</td>
<td>Essentials of Management</td>
<td>Tata McGraw Hill, New Delhi</td>
<td>2010</td>
</tr>
<tr>
<td>2</td>
<td>Khanka S. S</td>
<td>Entrepreneurial Development</td>
<td>S. Chand and Co. Ltd., New Delhi</td>
<td>2006</td>
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<td>2</td>
<td>Rabindra N Kanungo</td>
<td>Entrepreneurship and innovation</td>
<td>Sage Publications, New Delhi</td>
<td>1998</td>
</tr>
<tr>
<td>3</td>
<td>Charles E Harris, and Michael J Rabins</td>
<td>Engineering Ethics – Concepts and Cases</td>
<td>Wadsworth Thompson Learning, New Delhi</td>
<td>2013</td>
</tr>
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</table>

WEB REFERENCES

OBJECTIVES:

- To learn the MOS process technology.
- To learn the basic MOS Circuits.
- To learn concept of various logic styles.
- To learn the concepts of modeling a digital system using Hardware Description Language.
- To learn the concepts of VLSI implementation strategies.

INTENDED OUTCOMES:

Upon completion of the course, students should

- Explain the basic CMOS circuits and the CMOS process technology.
- Explain working of various complex gates and logic styles.
- Model the digital system using Hardware Description Language.

UNIT I MOS TECHNOLOGY

- Chip Design Hierarchy – IC Layers – Photolithography and Pattern Transfers – Basic MOS Transistors – CMOS Fabrication: n-well – p-well – twin tub – Latch up and prevention- Layout design rules, physical design- basic concepts, CAD tool sets, physical design of logic gates-Inverter, NAND, NOR.

UNIT II MOS TRANSISTOR PRINCIPLE


UNIT III CMOS LOGIC GATES & OTHER COMPLEX GATES


UNIT IV VERILOG HDL


UNIT V VLSI IMPLEMENTATION STRATEGIES


Total Hours: 45
### TEXTBOOKS:

<table>
<thead>
<tr>
<th>S.NO.</th>
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</tr>
</thead>
</table>
OBJECTIVES:

- To facilitate the knowledge about optical fiber sources and transmission techniques
- To enrich the idea of optical fiber networks algorithm such as SONET/SDH.
- To explore the trends of optical fiber measurement systems.

INTENDED OUTCOMES:

Upon completion of the course, students will be able to:

- Discuss the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
- Explain the various optical sources and optical detectors and their use in the optical communication system.
- Analyze the digital transmission and its associated parameters on system performance.

UNIT I  INTRODUCTION TO OPTICAL FIBERS  9

UNIT II  SIGNAL DEGRADATION OPTICAL FIBERS  9

UNIT III  FIBER OPTICAL SOURCES AND COUPLING  9

UNIT IV  FIBER OPTICAL RECEIVERS  9

UNIT V  DIGITAL TRANSMISSION SYSTEM  9

Total Hours: 45
### TEXTBOOK:

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<tbody>
<tr>
<td>2.</td>
<td>Ramaswami, Sivarajan and Sasaki</td>
<td>Optical Networks</td>
<td>Morgan Kaufmann Publishers</td>
<td>2009</td>
</tr>
</tbody>
</table>

17BEEC7E**               PROFESSIONAL ELECTIVE       L T P C       3 0 0 3

17BESHOE**/17BECSOE**/17BEEEOE**/  OPEN ELECTIVE       L T P C       3 0 0 3
17BTBTOE**/17BEMEOE**/17BTASOE**/
17BEAEOE**/ 17BECCEOE**

17BESHOE**/17BECSOE**/17BEEEOE**/  OPEN ELECTIVE       L T P C       3 0 0 3
17BTBTOE**/17BEMEOE**/17BTASOE**/
17BEAEOE**/ 17BECCEOE**
OBJECTIVES:

- To learn Hardware Descriptive Language (Verilog/VHDL).
- To learn the fundamental principles of VLSI circuit design in digital and analog domain.
- To familiarise fusing of logical modules on FPGAs.

INTENDED OUTCOMES:

- At the end of the course, the student should be able to
  - Write HDL code for basic as well as advanced digital integrated circuits.
  - Import the logic modules into FPGA Boards.

LIST OF EXPERIMENTS:

All the experiments must be implemented using Cadence tool
1. Study of Simulator tools.
2. Study of Synthesis tools.
3. Place and Root and Back annotation for FPGAs.
4. Study of development tool for FPGAs for schematic entry and Verilog.
5. Design of traffic light controller using verilog and above tools.
6. Design and simulation of pipelined serial and parallel adder to add/ subtract 8 number of size, 13 bits each in 2's complement method.
7. Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2's complement. Design must be pipelined and completely RTL compliant.
8. Study of FPGA board and testing on board LEDs and switches using verilog codes.
9. Testing the traffic controller design developed in S I. NO.5 on the FPGA board.
10. Design a Real-time Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.) and demonstrate its working on the FPGA board. An expansion card is required for the displays.

Total Hours: 45
OBJECTIVES:

The student should be made to:

- Understand the working principle of optical sources, detector, and fibers.
- Develop understanding of simple optical communication link.
- Learn about the characteristics and measurements in optical fiber.

INTENDED OUTCOMES:

At the end of the course, the student should be able to:

- Analyze the performance of simple optical link.
- Analyze the mode characteristics of fiber.

LIST OF EXPERIMENTS:

1. Numerical aperture determination for fibers & Attenuation Measurement in 3 mm cable Fibers.
2. Numerical aperture determination for fibers & Attenuation Measurement in 6 mm cable Fibers.
5. Fiber optic analog link for 3mm and 6mm cable.
6. Fiber optic digital link for 3mm and 6mm cable.
7. LED Characteristics of fiber optic transmitter using 3 mm cable.
8. LED Characteristics of fiber optic transmitter using 6 mm cable.
9. Photo Diode Characteristics of fiber optic receiver.
10. Study of fiber optic tools.

Total Hours: 45
INTRODUCTION
Real Time Systems, Types of Real Time systems – Hard and Soft, Real Time Event Characteristics, Challenges in Real Time System Design, Distributed and Multi-Processor Architecture, Embedded systems and its Characteristics

ARCHITECTURE OF TI C2000
Introduction to Software Development and the Process, Assembler Directives, C2000 Architecture Overview, Central Processing Unit, Program Control, Programming and System Issues, Phase Locked Loop Application
Demo Classes
- Temperature Sensor Demo
- Low Power Modes of C2000

Design using Cadence Tool
1. An Inverter
2. A Buffer
3. Transmission gates
5. T Flip-Flops
6. NCO (10 Bit number controlled oscillator)
7. Counter designs
8. Automatic generation layout followed by post layout extraction and simulation of NCO.
OBJECTIVES:

- 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.

INTENDED OUTCOMES:

Upon completion of the course, students will be able to:

- Discuss the application of electronics in diagnostic and therapeutic area.
- Measure biochemical and various physiological information.
- Describe the working of units which will help to restore normal functioning.

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING

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

UNIT II BIO-CHEMICAL AND NON-ELECTRICAL PARAMETER MEASUREMENT

PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

UNIT III ASSIST DEVICES AND BIO-TELEMETRY

Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Bio-telemetry radio-pill and tele-stimulation.

UNIT IV RADIOLOGICAL EQUIPMENTS

Ionizing radiation, Diagnostic x-ray equipments, use of Radio Isotope in diagnosis, Radiation Therapy.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION

Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Electrical safety in medical equipment.

Total Hours: 45

TEXTBOOKS:

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Leislie Cromwell</td>
<td>Biomedical instrumentation and measurement</td>
<td>Prentice Hall of India, New Delhi.</td>
<td>2007</td>
</tr>
</tbody>
</table>
**REFERENCE:**

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</thead>
</table>
OBJECTIVES:
- To understand the Fundamentals of image processing.
- To learn Various transforms used in image processing.
- To learn the Image processing techniques like image enhancement, reconstruction, compression and segmentation.

INTENDED OUTCOMES:
- Understand the Fundamentals of image processing.
- Knowledge about various transforms used in image processing.
- Knowledge about the Image processing techniques like image enhancement, reconstruction, compression and segmentation.

UNIT I  DIGITAL IMAGE FUNDAMENTALS  9

UNIT II  IMAGE TRANSFORMS  9

UNIT III  IMAGE ENHANCEMENT  9

UNIT IV  IMAGE RESTORATION  9

UNIT V  IMAGE COMPRESSION AND SEGMENTATION  9

Total Hours: 45

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<td></td>
<td>Roger Boyle, and BroosColic</td>
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</tbody>
</table>

17BEEC8E**                  PROFESSIONAL ELECTIVE                  L T P C 3 0 0 3

17BEEC891                  PROJECT WORK - PHASE II & VIVA VOCE                 L T P C 0 0 3 2 1 6
LIST OF ELECTIVES FOR V SEMESTER-ELECTIVE I
B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

17BEEC5E01  ADVANCED ELECTRONIC SYSTEM DESIGN  L T P C
             3 0 0 3

OBJECTIVES:

- To study RF component such as resonator, filter, transmission lines, etc.
- To learn design of RF amplifiers using transistors.
- To study modern Power Supplies using SCR and SMPS technology.
- To learn about signal shielding & grounding techniques and study of A/D and D/A Converters.
- To learn knowledge about fabrication of PCBs using CAD.

INTENDED OUTCOMES:

- Gain knowledge in RF component such as resonator, filter, and transmission lines, etc…
- Gain knowledge in design of RF amplifiers using transistors.
- Gain knowledge in Power Supplies using SCR and SMPS technology
- Gain knowledge about signal shielding & grounding techniques and study of A/D and D/A Converters.
- Gain knowledge about fabrication of PCBs using CAD.

UNIT I    INTRODUCTION TO RF DESIGN

UNIT II   RF TRANSISTOR AMPLIFIER DESIGN
Impedance matching using discrete components. Micro strip line matching networks. Amplifier classes of operation and biasing networks – Amplifier power gain, Unilateral design ($S_{12} =0$) – Simple input and output matching networks – Bilateral design - Stability circle and conditional stability, Simultaneous conjugate matching for unconditionally stable transistors. Broadband amplifiers, High power amplifiers and multistage amplifiers.

UNIT III  DESIGN OF POWER SUPPLIE
DC power supply design using transistors and SCRs, Design of crowbar and fold back protection circuits, switched mode power supplies, Forward, fly back, buck and boost converters, Design of transformers and control circuits for SMPS.

UNIT IV   DESIGN OF DATA ACQUISITION SYSTEMS
Amplification of Low level signals, Grounding, Shielding and Guarding techniques, Dual slope, quad slope and high-speed A/ D converters, Microprocessors Compatible A/D converters, Multiplying A/D converters and Logarithmic A/D converters, Sample and Hold, Design of two and four wire transmitters.

UNIT V    DESIGN OF PRINTED CIRCUIT BOARDS
Introduction to technology of printed circuit boards (PCB), General layout and rules and parameters, PCB design rules for Digital, High Frequency, Analog, Power Electronics and Microwave circuits, Computer Aided design of PCBs.

Total Hours: 45
TEXTBOOKS:

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<tr>
<td>2.</td>
<td>Sydney Soclof</td>
<td>Applications of Analog Integrated Circuits</td>
<td>Prentice Hall of India, New Delhi</td>
<td>2003</td>
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</thead>
</table>
OBJECTIVES:

- To introduce the concept soft Frequency and Time division multiplexing.
- To introduce digital multiplexing.
- To introduce the concepts of space switching, times switching and combination switching, example of a switch namely No.4ESS Toll switch.
- To characterize blocking probability holding service time distributions for in speech and data networks.

INTENDED OUTCOMES:

After completion of this course student will gain:

- Knowledge about the concepts of Frequency and Time division multiplexing.
- Knowledge about digital multiplexing.
- Knowledge about the enhanced local loop systems in digital environment.
- Knowledge about ISDN, DSL/ADSL, and fiber optic system in subscriber loop.
- Knowledge about statistical modeling of telephone traffic.

UNIT I  MULTIPLEXING  9

UNIT II  DIGITAL SWITCHING  9
Switching Functions, Space Division Switching, and Time Division Switching, two-dimensional is switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SSN07 signaling.

UNIT III  NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT  9

UNIT IV  DIGITAL SUBSCRIBER ACCESS  9

UNIT V  TRAFFIC ANALYSIS  9

Total Hours: 45
## TEXTBOOKS:

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<tbody>
<tr>
<td>1.</td>
<td>P. Gnanasivam</td>
<td>Telecommunication Switching System and Networks</td>
<td>New Age International</td>
<td>2007</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To gain knowledge about basic measurement concepts.
- To introduce Concepts of electronic measurements.
- To give exposure to different types of waveform generators and analyzers and their applications.
- To learn about digital instruments in measurements.
- To educate on virtual instrumentation, its applications, programming and DAQ cards and modules.

INTENDED OUTCOMES:

- Ability to understand and analyze working of various Instruments.
- Ability to choose Instruments based on application and industrial needs.

UNIT-I BASIC MEASUREMENT CONCEPTS  9

UNIT-II BASIC ELECTRONIC MEASUREMENTS  9

UNIT-III SIGNAL GENERATORS AND ANALYZERS  9

UNIT-IV DIGITAL INSTRUMENTS  9
Comparison of analog and digital techniques – digital voltmeter – Microprocessor based DMM with auto ranging and self-diagnostic features – frequency counters – measurement of frequency and time interval – extension of frequency range – measurement errors.

UNIT-V VIRTUAL INSTRUMENTATION  9
Virtual instrumentation (VI) – Definition, flexibility – Block diagram and architecture of virtual instruments – Virtual instruments versus traditional instruments – Software in virtual instrumentation - VI programming techniques – DAQ cards for VI applications – DAQ modules with serial communication

Total Hours: 45
### TEXTBOOKS:

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<tr>
<td>1</td>
<td>Albert D. Helfrick and William D. Cooper</td>
<td>Modern Electronic Instrumentation and Measurement Techniques</td>
<td>Prentice Hall of India, New Delhi</td>
<td>2003</td>
</tr>
<tr>
<td>3</td>
<td>Jerome J</td>
<td>Virtual Instrumentation using Lab VIEW</td>
<td>Prentice Hall India Private Ltd New Delhi</td>
<td>2010</td>
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<td>Alan S Morris</td>
<td>Principles of Measurements and Instrumentation</td>
<td>Prentice Hall of India, New Delhi</td>
<td>2003</td>
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<tr>
<td>3</td>
<td>Sanjay Gupta</td>
<td>Virtual Instrumentation using Lab view</td>
<td>Tata McGraw-Hill Education</td>
<td>2010</td>
</tr>
</tbody>
</table>

### WEBSITES:

1. http://mechatronics.mech.northwestern.edu/design_ref/tools/multimeter.html
OBJECTIVES:

- To make students understand the basic structure and operation of digital computer.
- To understand the hardware-software interface.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

INTENDED OUTCOMES:

After completion of this course student will gain

- Through knowledge about the basic structure and operation of a digital computer.
- Understand of operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- Detailed exposure about the different types of control and the concept of pipelining.
- Detailed exposure about the hierarchical memory system including cache memories and virtual memory.

UNIT I ARCHITECTURE OF COMPUTING SYSTEMS


UNIT II ARITHMETIC UNIT

Addition and subtraction of signed numbers– Design of fast adders – multiplication of positive Numbers-signed operand multiplication and fast multiplication– Integer division– floating point numbers and operations.

UNIT III BASIC PROCESSING UNIT


UNIT IV MEMORY SYSTEM

Basic concepts–semiconductor RAMs, ROMs–Speed, size and cost–cache Memories-Performance consideration –Virtual Memory-Memory Management requirements–Secondary storage.

UNIT V I/O ORGANIZATION


Total Hours: 45
**TEXTBOOKS:**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Carl Hamacher, Zvonko Vranesic and Safwat Zaky</td>
<td>Computer Organization</td>
<td>McGraw Hill</td>
<td>2002</td>
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<tr>
<td>1</td>
<td>David A. Patterson and John L. Hennessy</td>
<td>Computer Organization &amp; Design the hardware/ software interface</td>
<td>Morgan Kaufmann, New York.</td>
<td>2002</td>
</tr>
</tbody>
</table>

**WEBSITES:**

2.  [www.yale.edu/pclt/COMM/TCPIP.HTM](http://www.yale.edu/pclt/COMM/TCPIP.HTM)
LIST OF ELECTIVES FOR VI SEMESTER- ELECTIVE II, III, IV
B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

17BEEC6E01 ADVANCED MICROPROCESSORS  L T P C
                                           3 0 0 3

OBJECTIVES:

- To introduce the concepts in internal programming model of Intel family of microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of Pentium family of processors.
- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of RISC processor and ARM.

INTENDED OUTCOMES:

- Gain knowledge about the concepts in internal programming model of Intel family of microprocessors.
- Gain knowledge about the programming techniques using MASM, DOS and BIOS Function calls.
- Gain knowledge about the basic architecture of Pentium family of processors.
- Gain knowledge about the architecture programming and interfacing of 16 bit microcontrollers.
- Gain knowledge about the concepts and architecture of RISC processor and ARM.

UNIT I ADVANCED MICROPROCESSOR ARCHITECTURE  9
Internal Microprocessor Architecture—Real mode memory addressing– Protected Mode Memory addressing–Memory Paging—Data addressing modes–Program memory addressing modes–Stack memory addressing modes–Data movement instructions–Program control Instructions—Arithmetic and Logic Instructions.

UNIT II MODULAR PROGRAMMING AND ITS CONCEPTS  9
Modular programming–Using keyboard and video display–Data conversions–Disk files–Interrupt hooks–Using assembly languages with C/C++

UNIT III PENTIUM PROCESSORS  9

UNIT IV 16-BIT MICRO CONTROLLER  9
UNIT V  RISC PROCESSORS AND ARM


Total Hours: 45

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</thead>
</table>
OBJECTIVES:

- To study about Wireless networks, protocol stack and standards.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.

INTENDED OUTCOMES:

Upon completion of the course, the students will be able to

- Conversant with the latest 3G/4G and WiMAX networks and its architecture.
- Design and implement wireless network environment for any application using latest wireless protocols and standards.
- Implement different type of applications for smart phones and mobile devices with latest network strategies.

UNIT I    WIRELESS LAN

UNIT II   MOBILE NETWORK LAYER

UNIT III MOBILE TRANSPORT LAYER

UNIT IV WIRELESS WIDE AREA NETWORK
Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3GGSN,3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

UNIT V  4G NETWORKS

Total Hours: 45
**TEXTBOOKS:**

<table>
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<tr>
<td>1</td>
<td>Jochen Schiller</td>
<td>Mobile Communications 2nd Edition</td>
<td>Pearson Education</td>
<td>2012</td>
</tr>
<tr>
<td>2</td>
<td>Vijay Garg</td>
<td>Wireless Communications and networking</td>
<td>Elsevier</td>
<td>2007</td>
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</table>
OBJECTIVES:

- To understand the basics of satellite orbits.
- To understand the satellite segment and earth segment.
- To analyze the various methods of satellite access.
- To understand the applications of satellites.

INTENDED OUTCOMES:

Upon Completion of the course, the students will be able to:

- Analyze the satellite orbits.
- Analyze the earth segment and space segment.
- Design various satellite applications.

UNIT I  SATELLITE ORBITS

UNIT II  SPACE SEGMENT AND SATELLITE LINK DESIGN
Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation-performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

UNIT III  EARTH SEGMENT

UNIT IV  SATELLITE ACCESS

UNIT V  SATELLITE APPLICATIONS
INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet.

Total Hours: 45
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<tr>
<td>2</td>
<td>Timothy Pratt–Charles Bostian &amp; Jeremy</td>
<td>Satellite Communications</td>
<td>John Willy &amp;Sons (Asia) Pvt. Ltd</td>
<td>2004</td>
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<tr>
<td>2</td>
<td>N. Agarwal</td>
<td>Design of Geosynchronous Space Craft</td>
<td>Prentice Hall</td>
<td>1986</td>
</tr>
<tr>
<td>5</td>
<td>M.Richharia</td>
<td>Satellite Communication Systems-Design</td>
<td>Macmillan</td>
<td>2003</td>
</tr>
</tbody>
</table>
### OBJECTIVES:

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study the Euler, Lagrangian formulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications.

### INTENDED OUTCOMES:

Upon completion of the course, the student should be able to:
- Explain the basic concepts of working of robot.
- Analyze the function of sensors in the robot.
- Write a program to control a robot for a typical application.
- Use Robots indifferent applications.

### UNIT I  BASIC CONCEPTS  9

Definition and origin of robotics–different types of robotics–various generations of robots–degrees of freedom–Asimov\'s laws of robotics–dynamic stabilization of robots.

### UNIT II  POWER SOURCES AND SENSORS  9


### UNIT III  MANIPULATORS, ACTUATORS AND GRIPPERS  9


### UNIT IV  KINEMATICS AND PATH PLANNING  9


### UNIT V  CASE STUDIES  9


**Total Hours: 45**

### TEXTBOOKS:

<table>
<thead>
<tr>
<th>S.NO.</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Deb.S. R</td>
<td>Robotics Technology and flexible Automation</td>
<td>JohnWiley, USA</td>
<td>1992</td>
</tr>
<tr>
<td>3</td>
<td>McKerrow P. J</td>
<td>Introduction to Robotics</td>
<td>Addison Wesley, USA,</td>
<td>1991</td>
</tr>
<tr>
<td>4</td>
<td>BarryLeatham-Jones</td>
<td>Elements of industrial Robotics</td>
<td>PITMAN Publishing</td>
<td>1987</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To study RADAR theory.
- To study and learn different types of RADAR and their working principle.
- To study RADAR signal detection methods.
- To study an overview of RADAR Navigation.
- To learn about RADAR systems and components.

INTENDED OUTCOMES:
- Gain adequate knowledge about RADAR theory.
- Gain adequate knowledge about different types of RADAR and their working principle.
- Gain adequate knowledge about RADAR signal detection methods.
- Gain adequate knowledge about RADAR Navigation.
- Gain adequate knowledge about RADAR systems and components.

UNIT I RADAR EQUATIONS

UNIT II MTI AND PULSE DOPPLER RADAR

UNIT III RADAR SIGNAL DETECTION AND PROPAGATION ON WAVES

UNIT IV RADIO NAVIGATION

UNIT V RADAR TRANSMITTER AND RECEIVER

Total Hours: 45

TEXTBOOKS:

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<tbody>
<tr>
<td>1.</td>
<td>Nadav Levanon</td>
<td>RADAR Principles</td>
<td>John Wiley and Sons</td>
<td>1989</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1st Edition.</td>
<td>Engineering</td>
<td></td>
</tr>
</tbody>
</table>
OBJECTIVES:

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

INTENDED OUTCOMES:

- Thorough knowledge in Internet working with TCP/IP.
- Thorough knowledge about routing for high speed multimedia traffic
- Thorough knowledge in WWW, HTML and XML.
- Thorough knowledge in Java for Networking application
- Understand the basic concept sin E-com, Network operating system and Web design.

UNIT I    INTERNET WORKING WITH TCP/IP  9
Review of network technologies, Internet addressing, Address resolution protocols (ARP/ RARP), Routing IP data gram’s, Reliable stream transport service(TCP)TCP/IP over ATM networks, Internet Applications-E-mail, Telnet, FTP, NFS, Internet traffic management.

UNIT II    INTERNET ROUTING  9
Concepts of graph theory, Routing protocols, Distance vector protocols(RIP), Link state protocol (OSPP), Path vector protocols (BGP and IDRIP), Routing for high speed multimedia traffic, Multicasting, Resource reservation(RSVP), IP switching.

UNIT III   WORLD WIDE WEB  9
HTTP protocol, Web browsers net scape, Internet explorer, Website and Web page design, HTML, XML, Dynamic HTML, CGI.

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, JavaScript.

UNIT V    MISCELLANEOUS TOPICS  9
E-Commerce, Network operating systems, Web Design case studies.

Total Hours: 45
**TEXTBOOKS:**

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</table>
INTENDED OUTCOMES:

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.

UNIT I INTRODUCTION
Definition of Quality, Dimensions of Quality, Quality Planning, Quality Costs-Analysis Techniques For Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership–Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT II TQM PRINCIPLES

UNIT III STATISTICAL PROCESS CONTROL (SPC)
The seven tools of quality, Statistical Fundamentals–Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT IV TQM TOOLS

UNIT V QUALITY SYSTEMS

Total Hours: 45

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<tbody>
<tr>
<td>1</td>
<td>Dale H. Besterfiled</td>
<td>Total Quality Management</td>
<td>Pearson Education</td>
<td>2003</td>
</tr>
<tr>
<td>2</td>
<td>James R. Evans &amp; William M. Lidsay</td>
<td>The Management and Control of Quality</td>
<td>South-Western (Thomson Learning)</td>
<td>2002</td>
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<tbody>
<tr>
<td></td>
<td>Sreenivasan, N. S</td>
<td>Tasks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To understand the basics of Internet of Things.
- To get an idea of some of the application areas where Internet of Things can be applied.
- To understand the middleware for Internet of Things.
- To understand the concepts of Web of Things.
- To understand the concepts of Cloud of Things with emphasis on Mobile cloud computing.
- To understand the IOT protocols.

INTENDED OUTCOMES:

- To Identify and design the new models for market strategic interaction Design business intelligence and information security for WoB.
- Analyze various protocols for IoT Design a middleware for IoT.
- Analyze and design different models for network dynamics.

UNIT I  INTRODUCTION (10)

UNIT II  IOT PROTOCOLS (8)

UNIT III  WEB OF THINGS (10)

UNIT IV  INTEGRATED (9)
UNIT V APPLICATIONS

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging

Total Hours: 45

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<tr>
<td>1.</td>
<td>Dieter Uckelmann; Mark Harrison; Florian Michahelles</td>
<td>Architecting the Internet of Things</td>
<td>Springer</td>
<td>2011</td>
</tr>
<tr>
<td>2.</td>
<td>David Easley and Jon Kleinberg</td>
<td>Networks, Crowds, and Markets: Reasoning About a Highly Connected World</td>
<td>Cambridge University Press</td>
<td>2010</td>
</tr>
<tr>
<td>3</td>
<td>Olivier Hersent, Omar Elloumi and David Boswarthick</td>
<td>The Internet of Things: Applications to the Smart Grid and Building Automation</td>
<td>Wiley</td>
<td>2012</td>
</tr>
</tbody>
</table>
OBJECTIVES:

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

INTENDED OUTCOMES:

- Gain adequate knowledge about the systematic way of solving problems.
- Gain adequate knowledge about the different methods of organizing large amounts of data.
- Gain adequate knowledge to program in C.
- Gain adequate knowledge to implement the different data structures.
- Gain adequate knowledge about to implement solutions for specific problems.

UNIT I PROBLEM SOLVING


UNIT II LISTS, STACKS AND QUEUES

Abstract Data Type(ADT)–The List ADT–The Stack ADT–The Queue ADT.

UNIT III TREES

Preliminaries– Binary Trees– The Search Tree ADT– Binary Search Trees– AVL Trees–Tree
Probing–Priority Queues (Heaps)–Model–Simple implementations–Binary Heap.

UNIT IV SORTING


UNIT V GRAPHS


Total Hours: 45

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<tbody>
<tr>
<td>1</td>
<td>Dromey.R. G</td>
<td>How to Solve it by Computer</td>
<td>Prentice-Hall of India,</td>
<td>2002</td>
</tr>
<tr>
<td>2</td>
<td>Weiss.M. A</td>
<td>Data Structures and Algorithm</td>
<td>Pearson Education Asia, New Delhi</td>
<td>2002</td>
</tr>
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# WEBSITES:

OBJECTIVES:

- To acquire knowledge about probability and random variables.
- To gain knowledge on 2-D random variables.
- To gain knowledge about correlation functions.
- To learn about the applications of Fourier transforms like spectral density and others.
- To expose the concepts of random process.

INTENDED OUTCOMES:

- Gain knowledge about probability and random variables.
- Gain knowledge on 2-D random variables.
- Gain knowledge about correlation functions.
- Gain knowledge about the applications of Fourier transforms like spectral density and others.
- Gain knowledge about the concepts of random process.

UNIT I PROBABILITY DISTRIBUTIONS
Random Variables- Moments- Moment generating function- Binomial, Poisson, Geometric, Exponential and Normal Distributions- Functions of Random Variables.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES

UNIT III RANDOM PROCESSES

UNIT IV CORRELATION FUNCTIONS

UNIT V SPECTRAL DENSITY

Total Hours: 45

TEXTBOOK:

<table>
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<td>Siva Ramakrishna das P. and Vijayakumari.C.</td>
<td>A text book of Engineering Mathematics-III</td>
<td>Viji’s Academy</td>
<td>2010.</td>
</tr>
</tbody>
</table>

WEBSITES:

1. www.cut-theknot.org/probability.shtml
2. www.ece.uah.edu/courses/ee420-500
4. www.mhhe.com/engcs/electrical/popoulis
OBJECTIVES:

- To understand the basic concepts of Remote Sensing.
- To understand the concepts of optical and microwave remote sensing.
- To understand the concepts of geometric information systems.

INTENDED OUTCOMES:

- Understand the basic concepts of Remote Sensing.
- Understand the concepts of geometric information systems.

UNIT I REMOTE SENSING


UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS


UNIT III OPTICALANDMICROWAVE REMOTESENSING


UNIT IV GEOGRAPHICINFORMATIONSYSTEM


UNIT V MISCELLANEOUS TOPICS

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys

Total Hours: 45
### TEXTBOOKS:

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</table>
OBJECTIVES:

- To understand the basics of solid state physics.
- To understand the basics of display devices.
- To understand the optical detection devices.
- To understand the design of optoelectronic integrated circuits.

INTENDED OUTCOMES:

Upon Completion of the course, the students will be able to

- Design display devices.
- Design optoelectronic detection devices and modulators.
- Design optoelectronic integrated circuits.

UNIT I  ELEMENTS OF LIGHT AND SOLID STATE PHYSICS


UNIT II  DISPLAY DEVICES AND LASERS


UNIT III  OPTICAL DETECTION DEVICES

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT IV  OPTO ELECTRONIC MODULATOR


UNIT V  OPTO ELECTRONIC INTEGRATED CIRCUITS

Introduction, hybrid and Mono Lithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

Total Hours: 45

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LIST OF ELECTIVES FOR VII SEMESTER-ELECTIVE V
B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

17BEEC7E01 SENSORS AND TRANSDUCERS L T P C
3 0 0 3

OBJECTIVES:
- To study basic concepts of various sensors and transducers.
- To develop knowledge in selection of suitable sensor based on requirement and application.

INTENDED OUTCOMES:
After completion of this course student should be able to
- Understand basic concepts of various sensors and transducers.
- Gain thorough knowledge in selection of suitable sensor based on requirement and application.

UNIT I INTRODUCTION 9
Definition, classification, static and dynamic parameters, Characterization–Electrical, mechanical, thermal, optical, biological and chemical, Classification of errors–Error analysis, Static and dynamic characteristics of transducers, Performance measures of sensors.

UNIT II MECHANICAL AND ELECTRO MECHANICAL SENSORS 9
Resistive Potentiometer, strain gauge, Inductive sensors and transducer, capacitive sensors, ultrasonic sensors.

UNIT III THERMAL AND RADIATION SENSOR 9
Thermal Sensors: Gas thermometric sensors, acoustic temperature sensors, magnetic thermometer, resistance change-type thermometric sensors, thermost emf sensors, junction semiconductor types, Thermal radiation sensors, spectroscopic thermometry
Radiation Sensors: Photo detectors, photovoltaic and photo junction cells, photo sensitive cell, photo FET sand other devices.

UNIT IV MAGNETIC AND ELECTRO ANALYTICAL SENSOR 9
Magnetic Sensors: Force and displacement measurement, magneto resistive sensors, Hall Effect sensor, Inductance and eddy current sensors, Angular/rotary movement transducer, Electromagnetic flowmeter, squid sensor.
Electroanalytical Sensors: Electro chemical cell, cell potential, sensor electrodes, electro ceramics in gas media, chem FET.

UNIT V SENSORS AND THEIR APPLICATIONS 9
Auto mobile sensor, Home appliance sensor, Aero space sensors, sensors for manufacturing, medical diagnostic sensors, environmental monitoring.

Total Hours: 45
### TEXTBOOKS:

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<tr>
<td>1</td>
<td>Patranabis D</td>
<td>Sensor and Actuators</td>
<td>Prentice Hall of India (Pvt)Ltd</td>
<td>2006</td>
</tr>
<tr>
<td>2</td>
<td>Ian Sinclair</td>
<td>Sensor and Transducers 3rd Edition</td>
<td>Elsevier India Pvt Ltd,</td>
<td>2011</td>
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<tbody>
<tr>
<td>1</td>
<td>A.K. Sawhney, Puneethsawhney</td>
<td>A Course in Electrical and Electronic Measurements and Instrumentation</td>
<td>Dhanpat Rai Publications</td>
<td>2012</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To introduce issues related to CPU and memory.
- To understand the components on them other board.
- To understand different storage media.
- To introduce the features of different I/O peripheral devices and the interfaces.

INTENDED OUTCOMES:

- Knowledge about issues related to CPU and memory.
- Understand the components on them other board
- Understand different storage media
- Knowledge about the features of different I/O peripheral devices and their interfaces.

UNIT I  CPU AND MEMORY  9

UNIT II  MOTHER BOARDS  9

UNIT III  STORAGE DEVICES  9

UNIT IV  I/O PERIPHERALS  9

UNIT V  BUS ARCHITECTURE  9

Total Hours: 45
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</table>
OBJECTIVES:

- To introduce about ATM and Frame relay.
- Overview of an up-to-date survey of developments in High Speed Networks.
- To know techniques involved to support real-time traffic and congestion control.
- To learn different levels of quality of service (QoS) to different applications.

INTENDED OUTCOMES:

After completion of this course student will gain
- Knowledge on congestion control and traffic management.
- Knowledge in using different protocol for various applications.

UNIT I    HIGH SPEED NETWORKS

High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel–Wireless LANs: applications, requirements–Architecture of 802.11

UNIT II    CONGESTION AND TRAFFIC MANAGEMENT


UNIT III   TCP AND ATM CONGESTION CONTROL


UNIT IV    INTEGRATED AND DIFFERENTIATED SERVICES

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

UNIT V     PROTOCOLS FOR QOS SUPPORT


Total Hours: 45
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<tr>
<td>2.</td>
<td>Irvan Pepelnjak, Jim Guichard and Jeff Apear</td>
<td>MPLS and VPN architecture</td>
<td>Cisco Press, New York.</td>
<td>2003</td>
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<tr>
<td>1.</td>
<td>Warland &amp; Pravin Varaiya</td>
<td>High Performance Communication Networks</td>
<td>Jean Har court Asia Pvt. Ltd</td>
<td>2001</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To learn and understand basic concepts of Nano electronics.

INTENDED OUTCOMES:

- The students should be able to understand basic and advanced concepts of Nano electronic devices, sensors and transducers and their applications in nanotechnology.

UNIT I  BASICS OF NANO ELECTRONICS  9
Capabilities of nano electronics– physical fundamentals of nano electronics– basics of information theory – the tools for micro and nano fabrication – basics of lithographic techniques for nano electronics.

UNIT II  QUANTUM ELECTRON DEVICES  9

UNIT III  NANO ELECTRONICS WITH TUNNELING DEVICES AND SUPERCONDUCTING DEVICES  9

UNIT IV  A SURVEY ABOUT THE LIMITS  9

UNIT V  MEMORY DEVICES AND SENSORS  9

Total Hours: 45
### TEXTBOOKS:

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</table>
LIST OF ELECTIVES FOR VIII SEMESTER - ELECTIVE VI
B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

17BEEC8E01 ARTIFICIAL NEURAL NETWORKS L T P C
3 0 0 3

OBJECTIVES:
- To learn the various architectures of building an ANN and its applications.
- Advanced methods of representing information in ANN like self organizing.
- Networks, associative and competitive learning.
- To learn architecture of Neocognitron.

INTENDED OUTCOMES:
- Gain adequate knowledge about the various architectures of building an ANN and its applications.
- Gain adequate knowledge about advanced methods of representing information in ANN like self organizing networks, associative and competitive learning.
- Gain adequate knowledge applying neural networks for classification of various application.

UNIT I INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS
Neuro-Physiology-General Processing Element-ADALINE-LMS learning rule-MADALINE-MR2 training algorithm.

UNIT II BPN AND BAM
Back Propagation Network-updating of output and hidden layer weights-application of BPN-associative memory- Bi-directional Associative Memory-Hopfield memory-traveling sales man problem.

UNIT III SIMULATED ANNEALING AND CPN
Annealing, Boltzmannmachine-learning-application-CounterPropagation network-architecture-Training-Applications.

UNIT IV SOM AND ART
Self-organizing map-learning algorithm-feature map classifier-applications -architecture of Adaptive Resonance Theory-pattern matching in ART network.

UNIT V NEOCOGNITRON

Total Hours: 45

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</tbody>
</table>
OBJECTIVES:

- To understand the basic needs of VI.
- To learn LabVIEW software basics.
- To understand data acquisition techniques.
- To learn different interfacing techniques.
- To design some real-time application using LabVIEW software.

INTENDED OUTCOMES:

After completion of this course students will be
- Able to program using Virtual Instrumentation
- Familiar to use data acquisition in analog and digital design.
- Able to design filters and signal processing using LAB VIEW.

UNIT I  VIRTUAL INSTRUMENTATION  9
Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II  VI PROGRAMMING TECHNIQUES  9
VIS and sub-VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, Local and global variable, string & file input.

UNIT III  DATA ACQUISITION BASICS  9
Introduction to data acquisition on PC, Sampling fundamentals, Input / Output techniques and buses. ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation, Simple applications using NI MyDAQ and NI ELVIS.

UNIT IV  LABVIEW IN SIGNAL PROCESSING  9

UNIT V  FREQUENCY DOMAIN PROCESSING  9
Discrete Fourier Transform and Fast Fourier Transform, STFT, Wavelet Transform, Signal Processing applications.

Total Hours: 45
### TEXTBOOKS:

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>Author(s) Name</th>
<th>Title of the book</th>
<th>Publisher</th>
<th>Year of publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sumathi &amp; P. Surekha</td>
<td>LabVIEW based Advanced Instrumentation</td>
<td>Springer</td>
<td>2007</td>
</tr>
<tr>
<td>2</td>
<td>Jovitha Jerome</td>
<td>Virtual Instrumentation Using LabVIEW</td>
<td>PHI Learning Pvt. Ltd</td>
<td>2010</td>
</tr>
</tbody>
</table>

### REFERENCES:

<table>
<thead>
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</thead>
</table>
OBJECTIVES:
- To Provide an understanding of FPGA lifecycle
- To understand the concept of selecting a FPGA based on project specifications
- To enable the student to understand the floor planning, place and route optimization techniques.
- To introduce the lower power reduction techniques to analyze and design FPGA.

INTENDED OUTCOMES:
- Ability to understand FPGA lifecycle
- Understand the concept of selecting a FPGA based on project specifications
- Understand the floor planning, place and route optimization techniques.
- Knowledge on lower power reduction techniques to analyze and design FPGA.

UNIT I  INTRODUCTION TO GATE ARRAY AND CMOS LOGIC

UNIT II  FIELD PROGRAMMABLE GATE ARRAY

UNIT III  FPGA IMPLEMENTATION ISSUES

UNIT IV  FLOOR PLANNING, PLACE AND ROUTE OPTIMIZATION

UNIT V  LOW POWER FPGA IMPLEMENTATION
Sources of power Consumption–Power consumption reduction Techniques–Voltage scaling FPGA’s–Data reordering–Pipeline.

TEXTBOOKS:

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<tr>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Steve Kilts</td>
<td>Advanced FPGA Design</td>
<td>Wiley Inter-Science,</td>
<td>2003</td>
</tr>
</tbody>
</table>
REFERENCE:

<table>
<thead>
<tr>
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<th>Author(s) Name</th>
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<th>Publisher</th>
<th>Year of publication</th>
</tr>
</thead>
</table>
OBJECTIVES:

- To give basic knowledge of ASIC internals.
- To impart knowledge on ASIC types.
- To give basic understanding of tools used.

INTENDED OUTCOMES:

- Understand basic knowledge of ASIC internals.
- Gain knowledge on types of ASIC.
- Gain knowledge about the tools used in ASIC design.

UNIT I  INTRODUCTION TO ASICS  9

UNIT II  PROGRAMMABLE ASICS  9
Programmable ASICs–Anti fuse–static RAM–EPROM and technology–Actel ACT–Xilinx LCA
–Altera flex–Altera MAX Logic cells– I/O cells–Interconnects– Low level design entry:
Schematic entry.

UNIT III  SIMULATION AND SYNTHESIS  9
Logic synthesis: A comparator MUX, inside a logic synthesizer, VHDL and logic synthesis,
FSM synthesis, memory synthesis–Simulation: Types of simulation–logic systems–how logic
simulation works.

UNIT IV  ASIC TESTING  9
Boundary scan test– Faults–Fault simulation–Automatic test pattern generation algorithm: D-
algorithm, PODEM –Built in self-test.

UNIT V  ASIC CONSTRUCTION  9
System partitioning–power dissipation–partitioning methods–floor planning and placement:
Routing: Global routing, detailed routing, special routing–Introduction to SOC.

TEXTBOOKS:

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</thead>
<tbody>
<tr>
<td>2.</td>
<td>Wolf Wayne</td>
<td>FPGA based system design</td>
<td>Pearson Education</td>
<td>2005</td>
</tr>
</tbody>
</table>

Total Hours: 45
## REFERENCES:

<table>
<thead>
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</table>
LIST OF OPEN ELECTIVES OFFERED BY
SCIENCE AND HUMANITIES DEPARTMENT

17BESHOE01 PROBABILITY AND RANDOM PROCESS L T P C
3 0 0 3

OBJECTIVES:

- To gain knowledge in measures of central tendency.
- To provide necessary basic concepts in probability and random processes.

INTENDED OUTCOMES:

- Learners acquire skills in handling situations involving more than one random variable and functions of random variables.
- The students will have an exposure of various distribution functions, correlation and spectral densities.

UNIT I MEASURES OF CENTRAL TENDENCY AND PROBABILITY (9)

UNIT II STANDARD DISTRIBUTIONS (9)
Functions of a random variable - Binomial, Poisson, Uniform, Exponential, Gamma (one Parameter only) and Normal distributions - Moment generating functions, Characteristic function and their properties – Chebyshev's inequality.

UNIT III TWO DIMENSIONAL RANDOM VARIABLES (9)
Joint distributions - Marginal and conditional distributions - Probability mass function - Probability density functions – Covariance - Correlation and regression

UNIT IV CLASSIFICATION OF RANDOM PROCESS (9)
Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT V CORRELATION AND SPECTRAL DENSITIES (9)

Total Hours: 45
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<tbody>
<tr>
<td>1</td>
<td>Ross, S</td>
<td>A first Course in Probability</td>
<td>Pearson Education, New Delhi (Chap 2 to 8)</td>
<td>2012</td>
</tr>
</tbody>
</table>

### WEBSITES:

2. www.mathcentre.ac.uk
3. www.mathworld.Wolfram.com
OBJECTIVES:

- To know the fundamentals of fuzzy Algebra.
- To know the basic definitions of fuzzy theory
- To know the applications of fuzzy Technology

INTENDED OUTCOME:

- The Engineers will have an exposure on various topics such as fuzzy algebra, fuzzy theory and fuzzy technology.

UNIT I  FUZZY SETS  (9)

UNIT II  OPERATIONS ON FUZZY SETS  (9)
Operations on Fuzzy Sets Operations on [0, 1] – Fuzzy negation, triangular norms, tconorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations

UNIT III  FUZZY RELATIONS  (9)
Fuzzy Relations Fuzzy Binary and n-ary relations – composition of fuzzy relations – Fuzzy Equivalence Relations – Fuzzy Compatibility Relations – Fuzzy Relational Equations

UNIT IV  FUZZY MEASURES  (9)

UNIT V  FUZZY INFERENCE  (9)
Approximate Reasoning Fuzzy Decision Making - Fuzzy Relational Inference – Compositional rule of Inference - Efficiency of Inference - Hierarchical

Total Hours: 45

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<tr>
<td>2</td>
<td>Michal Baczynski and Bala subramaniam Jayaram</td>
<td>Fuzzy Implications</td>
<td>Springer-Verlag publishers, Heidelberg</td>
<td>2008</td>
</tr>
<tr>
<td>3</td>
<td>Kevin M Passino and Stephen Yurkovich</td>
<td>Fuzzy Control</td>
<td>Addison Wesley Longman publishers, USA</td>
<td>1998</td>
</tr>
</tbody>
</table>

WEBSITES:

1. www.mathcentre.ac.uk
2. www.mathworld. Wolfram.com
3. www.calvin.edu/~pribeiro/othrlinks/Fuzzy/fuzzysets.htm
OBJECTIVES:
- To know the fundamentals of linear Algebra.
- To study about the linear transformations.
- To introduce the concepts of inner product spaces.

INTENDED OUTCOMES:
The student will be able to:
- Recognize the underlying theory of vector spaces over a field and inner product spaces over real or complex numbers.
- Visualize linear transformations as matrix form.
- Articulate the importance of Linear Algebra and its applications in branches of Mathematics.

UNIT I VECTOR SPACES (9)
General vector spaces, real vector spaces, Euclidean n-space, subspaces, linear independence, basis and dimension, row space, column space and null space.

UNIT II EIGEN VALUES AND EIGEN VECTORS (9)
Eigen values and Eigen vectors - Diagonalization - Power method - QR decomposition.

UNIT III SYSTEM OF LINEAR EQUATIONS (9)

UNIT IV LINEAR TRANSFORMATIONS (9)

UNIT V INNER PRODUCT SPACES (9)

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<tr>
<td>2</td>
<td>Anton and Rorres</td>
<td>Elementary Linear Algebra, Applications version</td>
<td>Wiley India, New Delhi.</td>
<td>2012</td>
</tr>
<tr>
<td>3</td>
<td>Jim Defranza, Daniel Gagliardi</td>
<td>Introduction to Linear Algebra with Application</td>
<td>Tata McGraw-Hill, New Delhi.</td>
<td>2008</td>
</tr>
</tbody>
</table>

WEBSITES:

1. www.sosmath.com
2. www.nptel.ac.in
3. www.mathworld.wolfram.com
OBJECTIVES:

- To provide mathematical basis for acoustics waves and the characteristic behaviour of sound in pipes, resonators and filters.
- To introduce the properties of hearing and speech.

INTENDED OUTCOME:

- The students will have the knowledge on acoustics waves, the characteristic behaviour of sound in pipes, resonators and filters and that knowledge will be used by them in different engineering and technology applications.

UNIT I  INTRODUCTION  9

UNIT II  RADIATION AND RECEPTION OF ACOUSTIC WAVES  9
Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source radiation impedance - Fundamental properties of transducers. Absorption and attenuation of sound. Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

UNIT III  PIPES RESONATORS AND FILTERS  9

UNIT IV  ARCHITECTURAL ACOUSTICS  9

UNIT V  TRANSDUCTION  9
Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker– horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers

Total Hours: 45
**TEXTBOOK:**

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</table>

**WEBSITES:**

1. www.acousticalsociety.org
2. www.acoustics-engineering.com
3. www.nptel.ac.in
4. www.ocw.mit.edu
OBJECTIVES:

- To understand about the solid waste.
- To study about the waste treatment.
- To gain knowledge on the disposal of waste and waste management.
- To get the information on energy conservation.

INTENDED OUTCOME:

- The students will know solid waste and energy conservation. They will understand the methodologies to disposal of solid waste and its management.

UNIT I  SOLID WASTE


UNIT II  WASTE TREATMENT

Size Reduction – Aerobic Composting – Incineration – batch type and continuous flow type, Medical/ Pharmaceutical Waste Incineration – Environmental Impacts – Measures of Mitigate Environmental Effects due to Incineration

UNIT III  WASTE DISPOSAL


UNIT IV  HAZARDOUS WASTE MANAGEMENT


UNIT V  ENERGY GENERATION FROM WASTE


Total Hours: 45

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</thead>
</table>

# WEBSITES:

2. http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/
4. nzic.org.nz/Chem Processes/environment/
OBJECTIVES:

- To understand about the green chemistry.
- To study the atom efficient process and synthesis elaborately.
- To gain knowledge on the green technology and renewable energy resources.
- To get the information on catalysis.

INTENDED OUTCOME:

- Students will know the chemistry and application of green technology for energy sources. They will understand the role of green catalyst in industries.

UNIT I  INTRODUCTION TO GREEN CHEMICAL PRINCIPLES  
Definition, tools, and twelve principles of green chemistry, solvent-less reactions and reactions in water, microwaves and fluorous solvents, green resolution of racemic mixtures, materials for a sustainable economy, chemistry of longer wear, agrochemicals: problems and green alternate solutions.

UNIT II  ATOM EFFICIENT PROCESSES  
Atom efficient processes, evaluating chemical reagents according to their yield and atom efficiency, examples of efficient stoichiometric and catalytic processes, atom economy and homogeneous catalysis, halide-free synthesis and alternatives to Strecker synthesis.

UNIT III  BIOTECHNOLOGY AND GREEN CHEMISTRY  
Bio technology and its applications in environmental protection-Bio informatics-Bio remediation, biological purification of contaminated air. Green chemistry for clean technology-Significance of green chemistry-Basic components of green chemistry, Industrial applications of green chemistry, green fuels-e-green propellants and bio catalysts.

UNIT IV  RENEWABLE RESOURCES  
Use of renewable materials, evaluating feedstock and starting materials and their origins, toxicity, sustainability and the downstream implications of the choice of feedstock, commodity chemicals from glucose and biomass conversion.

UNIT V  CATALYSIS IN GREEN CHEMISTRY  
Catalysis, energy requirements and usage, optimization of the reaction by minimizing the energy requirements, examples of efficient catalytic reactions including the use of heterogeneous catalysis, zeolites, oxidation using molecular oxygen.

Total Hours: 45
### TEXTBOOKS:

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<tbody>
<tr>
<td>1</td>
<td>Sanjay K. Sharma, Ackmez Mudhoo</td>
<td>Green Chemistry for Environmental Sustainability</td>
<td>CRC Press, London</td>
<td>2010</td>
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### WEBSITES:

OBJECTIVES:

- To get the information on electrochemical material.
- To study about the conducting polymers.
- To understand about the fuel.
- To gain knowledge on the batteries and power sources.

INTENDED OUTCOME:

- Students will understand about the fuel. They will get knowledge on the batteries and power sources.

UNIT I METAL FINISHING

UNIT II CONDUCTING POLYMERS AND ELECTROCHEMICALS
Electropolymerization- anodic and cathodic polymerization-effect of reaction parameters on the course of the reaction- Electrochemical preparation of conducting polymers- poly acetylene- Electrolytic production of perchlorates and manganese dioxide- Electro organic chemicals- constant current electrolysis.

UNIT III BATTERIES AND POWER SOURCES-I
Principles of energy conservation- electrochemical energy conservation- thermodynamic reversibility, Gibbs equation. EMF- battery terminology, energy and power density- Properties of anodes, cathodes, electrolytes and separators- Types of electrolytes.

UNIT IV BATTERIES AND POWER SOURCES-II
Primary batteries- Dry Leclanche cells, alkaline primary batteries, Lithium batteries, Lithium ion batteries- construction, characteristics, problems associated with system- Secondary batteries- Lead acid, nickel cadmium- Fuel cells- Introduction, types of fuel cells, advantages.

UNIT V ELECTROCHEMICAL MATERIAL SCIENCE
Solar cells- Preparation of CdS/Cu2S solar cells by screen printing techniques and their characteristics - Amorphous silicon solar cells - Photo electrochemical cells(PEC) for conversion of light energy to electrical energy - PEC cells based on Cd/Se and Ga/As characteristics.

Total Hours: 45
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<tbody>
<tr>
<td>1</td>
<td>M. Barak</td>
<td>Electrochemical Power Sources</td>
<td>IEEE series, Peter Peregrinius Ltd, Steverage, U.K.</td>
<td>1997</td>
</tr>
<tr>
<td>2</td>
<td>Bruno Scrosati</td>
<td>Applications of Electroactive Polymers</td>
<td>Chapman &amp; Hall, London</td>
<td>1993</td>
</tr>
<tr>
<td>4</td>
<td>M.M.Baizer</td>
<td>Organic Electrochemistry</td>
<td>Dekker Inc. New York</td>
<td>1983</td>
</tr>
</tbody>
</table>

### WEBSITES:

2. http://hyperphysics.phy-astr.gsu.edu/hbase/electric/battery.html
OBJECTIVES:

- To understand about the fuel.
- To study about the abrasives and lubricants.
- To gain knowledge on inorganic chemicals and explosive materials.
- To get the information on agriculture chemicals.

INTENDED OUTCOME:

- The student will acquire basic knowledge on cement. The student will understand the interaction of engineering materials and their utilization in industries.

UNIT I CEMENT AND LIME


UNIT II ABRASIVES AND REFRACTORIES


UNIT III INORGANIC CHEMICALS


UNIT IV EXPLOSIVES


UNIT V AGRICULTURE CHEMICALS


Total Hours: 45
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<tr>
<td>1</td>
<td>Hari krishan</td>
<td>Industrial Chemistry</td>
<td>Goel Publishing House, Meerut.</td>
<td>2014</td>
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</table>

## WEBSITES:

PURPOSE:
It provides techniques of writing and also trains the students to write without their influence of mother tongue. In addition to honing their skills as professional writers, students will develop technical vocabularies that will aid writing research articles and discussing articles produces by their peers.

OBJECTIVE:
- Develop abilities to write technically and expressively.
- Recognize writing as a constructive, meaningful process.
- Practise using reading strategies for effective writing.

INTENDED OUTCOMES:
Students undergoing this course are able to
- Construct simple sentences, correct common grammatical errors in written English.
- Build confidence in English language by imbibing lexical and syntax rules.
- Enrich their reading ability for effective writing.

UNIT I  BASICS OF WRITING  9
Introduction to Technical Writing – Importance of Writing – Characteristics of Writing – Audience Recognition/ Analysis – Appropriateness of language — Conciseness and Flow – Bias free and plain writing – Impersonal and Formal Language -Techniques of Technical Writing – Overcoming writer’s block – Prioritizing for effective writing – Avoiding plagiarism.

UNIT II  PARAGRAPHS AND ESSAYS  9

UNIT III  LETTERS, MEMOS AND EMAIL  9

UNIT IV  THE ART OF CONDENSATION AND TECHNICAL PROPOSALS  9

UNIT V  REPORTS AND RESEARCH ARTICLES  9

Total Hours: 45
**TEXTBOOK:**

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<tbody>
<tr>
<td>1</td>
<td>V.N. Arora &amp; Lakshmi Chandra</td>
<td>Improve Your Writing: Revised First Edition</td>
<td>OUP</td>
<td>2014</td>
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<tr>
<td>1</td>
<td>Crème, P. and M. Lea.</td>
<td>Writing at University: A guide for students.</td>
<td>OUP</td>
<td>2003</td>
</tr>
<tr>
<td>2</td>
<td>Graham King</td>
<td>Collins Improve Your Writing First edition</td>
<td>Collins</td>
<td>2009</td>
</tr>
<tr>
<td>3</td>
<td>David Morley</td>
<td>The Cambridge Intro. To Creative Writing</td>
<td>Cambridge</td>
<td>2008</td>
</tr>
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</table>

**WEBSITES:**

2. [http://www.nyu.edu/classes/keefer/brain/net2.html](http://www.nyu.edu/classes/keefer/brain/net2.html)
LIST OF OPEN ELECTIVES OFFERED BY
COMPUTER SCIENCE ENGINEERING DEPARTMENT

17BECSEO01  INTERNET PROGRAMMING  L T P C

3 0 0 3

OBJECTIVE:

- To introduce the Java programming language and explore its current strengths and Weaknesses
- To study the way that object-oriented concepts are implemented in the Java programming language
- To write working Java code to demonstrate the use of applets for client side programming
- To study the way that exceptions are detected and handled in the Java programming language
- To write working Java code that demonstrates multiple threads of execution

UNIT I  INTRODUCTION

UNIT II  HTML

UNIT III  PERL

UNIT IV  CLIENT-SERVER PROGRAMMING
UNIT V       INTERNET TELEPHONY


Total Hours: 45

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<tbody>
<tr>
<td>1.</td>
<td>Rahul Banerjee</td>
<td>Internetworking Technologies, An Engineering Perspective</td>
<td>PHI Learning, Delhi</td>
<td>2011</td>
</tr>
</tbody>
</table>
OBJECTIVE:

- To study the graphics techniques and algorithms
- To study the multimedia concepts and various I/O technologies.
- To enable the students to develop their creativity
- To impart the fundamental concepts of Computer Animation and Multimedia.

UNIT I INTRODUCTION


UNIT II CREATING ANIMATION IN FLASH


UNIT III 3D ANIMATION & ITS CONCEPTS


UNIT IV MOTION CAPTION


UNIT V CONCEPT DEVELOPMENT

Story Developing – Audio & Video – Color Model – Device Independent Color Model – Gamma and Gamma Correction - Production Budgets- 3D Animated Movies.

Total Hours: 45

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<th>Title of The Book</th>
<th>Publisher</th>
<th>Year of Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ranjan Parekh</td>
<td>Principles of Multimedia</td>
<td>TMH</td>
<td>2007</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- Assemble/setup and upgrade personal computer systems
- Perform installation, configuration, and upgrading of microcomputer hardware and software.
- Install/connect associated peripherals.
- Diagnose and troubleshoot microcomputer systems hardware and software, peripheral equipment.

UNIT I INTRODUCTION

UNIT II PERIPHERAL DEVICES

UNIT III PC HARDWARE OVERVIEW

UNIT IV INSTALLATION AND PREVENTIVE MAINTENANCE

UNIT V TROUBLESHOOTING

Total Hours: 45

TEXTBOOK:

<table>
<thead>
<tr>
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</tr>
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<tbody>
<tr>
<td>1.</td>
<td>B. Govindarajalu</td>
<td>IBM PC Clones Hardware, Troubleshooting and Maintenance</td>
<td>TMH</td>
<td>2002</td>
</tr>
</tbody>
</table>
# REFERENCES:

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Peter Abel, Niyaz Nizamuddin</td>
<td>IMB PC Assembly Language and Programming</td>
<td>Pearson Education</td>
<td>2007</td>
</tr>
<tr>
<td>2.</td>
<td>Scott Mueller</td>
<td>Repairing PC's</td>
<td>PHI</td>
<td>1992</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the Java SDK environment to create, debug and run simple Java programs.

UNIT I  INTRODUCTION TO JAVA

UNIT II  PACKAGES

UNIT III  I/O STREAMS

UNIT IV  EXCEPTION HANDLING
Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions – Using exceptions for debugging

UNIT V  THREADS
Introduction, Creating Threads, The Life Cycle of a Thread, Thread Methods, Using Threads, Synchronization of Threads, Summary

Total Hour: 45

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</thead>
<tbody>
<tr>
<td>2</td>
<td>Timothy Budd</td>
<td>Understanding Object-oriented programming with Java Updated Edition</td>
<td>Pearson Education</td>
<td>2002</td>
</tr>
</tbody>
</table>

WEBSITES:

LIST OF OPEN ELECTIVES OFFERED BY ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT

17BEEEOE01 ELECTRIC HYBRID VEHICLES L T P C 3 0 0 3

OBJECTIVES:

- To understand the basic concepts of electric hybrid vehicle.
- To gain the knowledge about electric propulsion unit.
- To understand and gain the knowledge about various energy storage devices.

INTENDED OUTCOMES:

- At the end of the course the student will be understand the concept of electric hybrid vehicle and its energy storage schemes.

UNIT I INTRODUCTION 9
History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II HYBRID ELECTRIC DRIVE-TRAINS 9
Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT III ELECTRIC PROPULSION UNIT 9
Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV ENERGY STORAGE 9
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT V ENERGY MANAGEMENT STRATEGIES 9
Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Total Hours: 45

TEXTBOOK:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Iqbal Hussein</td>
<td>Electric and Hybrid Vehicles: Design Fundamentals – 2nd edition.</td>
<td>CRC Press</td>
<td>2010</td>
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<th>Year of Publication</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>James Larminie, John Lowry</td>
<td>Electric Vehicle Technology Explained – 2\textsuperscript{nd} editions.</td>
<td>Wiley</td>
<td>2012</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To gain the knowledge about energy management.
- To understand the basic concepts in economic analysis in energy management.
- To understand the basic principles of energy audit.

INTENDED OUTCOME:

- At the end of the course the student will be able to understand the concept of energy efficient motors, economic crisis and energy management.

UNIT I ENERGY MANAGEMENT
Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting – Energy Auditor and Energy Manager – Eligibility, Qualification and functions - Questionnaire and check list for top management.

UNIT II ECONOMIC ASPECTS AND ANALYSIS
Economics analysis – Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Calculation of simple payback method, net present worth method.

UNIT III BASIC PRINCIPLES OF ENERGY AUDIT
Energy audit – definition, concept, type of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes – Energy audit of industries – energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT IV ENERGY EFFICIENT MOTORS
Electric Motors: Factors affecting efficiency - Energy efficient motors - constructional details, characteristics - voltage variation -over motoring – motor energy audit-


UNIT V POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS

Total Hours: 45
**TEXTBOOK:**

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<tbody>
<tr>
<td>1</td>
<td>John.C. Andreas</td>
<td>Energy Efficient Electric Motors – 3rd edition</td>
<td>Marcel Dekker Inc Ltd.</td>
<td>2005</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To understand the basic principles of PLC systems.
- To gain the knowledge about data handling functions.
- To understand the principles of PID.

INTENDED OUTCOME:

- At the end of the course the student will be able to understand the registers and functions in PLC and they are able to do the program.

UNIT I INTRODUCTION

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment Programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT II PLC PROGRAMMING

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT III REGISTERS AND PLC FUNCTIONS

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT IV DATA HANDLING FUNCTIONS

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT V PID PRINCIPLES

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

Total Hours: 45

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<th>Publisher</th>
<th>Year of Publication</th>
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<tr>
<td>1</td>
<td>JR Hackworth and F.D. Hackworth Jr</td>
<td>Programmable Logic Controllers – Programming Method and Applications</td>
<td>Pearson</td>
<td>2006</td>
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<tbody>
<tr>
<td>1</td>
<td>John Webb and Ronald A Reiss</td>
<td>Programmable Logic Controllers – Principle and Applications Fifth edition.</td>
<td>PHI</td>
<td>2004</td>
</tr>
</tbody>
</table>

WEBSITE:

1. http://www.mikroe.com/old/books/plcbook/chapter1/chapter1.htm,-
   Introduction to programmable Logic controller.
OBJECTIVES:

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of wind energy conversion, solar cells, photovoltaic conversion.
- To understand the basic principles fuel cell, Geothermal power plants.
- To gain the knowledge about hydro energy.

INTENDED OUTCOME:

- At the end of the course student understands about all types of energy sources and utilization.

UNIT I  INTRODUCTION

UNIT II  SOLAR ENERGY

UNIT III  WIND ENERGY

UNIT IV  HYDRO ENERGY
Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy routes. Principles of océan thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V  OTHER SOURCES
Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic (MHD) energy conversion.

Total Hours: 45

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<th>Publisher</th>
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<tbody>
<tr>
<td>1</td>
<td>Rai.G.D</td>
<td>Non-conventional sources of energy</td>
<td>Khanna publishers</td>
<td>2011</td>
</tr>
</tbody>
</table>
REFERENCES:

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<th>Year of Publication</th>
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</table>

WEBSITES:

1. www.energycentral.com
2. www.catelectricpowerinfo.com
LIST OF OPEN ELECTIVES OFFERED BY BIO TECHNOLOGY DEPARTMENT

17BTBTOE01 BIOREACTOR DESIGN L T P C 3 0 0 3

OBJECTIVES:

- To understand the basic design of bioreactors
- To understand the principle of heat transfer inside a bioreactor

INTENDED OUTCOMES:

After completion of this course students will be able to

- Design bioreactors for various operations.
- Select the appropriate separation equipment based on the nature of the product.

UNIT I ENGINEERING PROPERTIES AND STORAGE TANK 9
Introduction to various mechanical properties of material to be used material of construction, design of cylindrical storage tank.

UNIT II REACTOR DESIGN 9
Design of Airlift fermentor, Bubble column reactor and Continuous stirred tank reactor.

UNIT III HEAT TRANSFER EQUIPMENTS 9
Design of Shell and tube Heat exchanger, Double pipe heat exchanger, long tube vertical evaporator and forced circulation evaporator.

UNIT IV MASS TRANSFER EQUIPMENTS 9
Design of Bollmann extractor, fractionating column, packed tower and spray tray absorber

UNIT V SEPARATION EQUIPMENTS 9
Design of plate and frame filter press, leaf filter, rotary drum filter, disc bowl centrifuge, rotary drum drier and Swenson –walker crystallizer.

Total Hours: 45
**TEXTBOOKS:**

<table>
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<tr>
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<th>Title of the book</th>
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<tbody>
<tr>
<td></td>
<td>David F. Ollis</td>
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<td></td>
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</tr>
<tr>
<td>2</td>
<td>Don W. Green,</td>
<td>Chemical Engineer Hand book</td>
<td>The McGraw- Hill Companies, Inc.</td>
<td>2008</td>
</tr>
<tr>
<td></td>
<td>Robert H.Perry</td>
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</thead>
</table>
OBJECTIVES:
- To understand the importance of food processing
- To make the students learn the various processing and preservation techniques.

INTENDED OUTCOMES:
The students are exposed to
- Properties of food material.
- Various methods used for preserving fruits and vegetables.

UNIT I  SCOPE AND IMPORTANCE OF FOOD PROCESSING  9
Properties of food- Physical, thermal, mechanical, sensory. Raw material Preparation - Cleaning, sorting, grading, peeling.

UNIT II  PROCESSING METHODS  9

UNIT III  FOOD CONVERSION OPERATIONS  9
Size reduction- Fibrous foods, dry foods and liquid foods- Theory and equipments- membrane separation- filtration- equipment and application.

UNIT IV  FOOD PRESERVATION BY COOLING  9
Refrigeration, Freezing-Theory, freezing time calculation, methods of freezing, freezing equipments, freeze drying, freeze concentration, thawing, effect of low temperature on food. Water activity, methods to control water activity.

UNIT V  PRESERVATION METHODS FOR FRUITS AND VEGETABLES  9
Pre processing operations - preservation by reduction of water content: drying / dehydration and concentration – chemical preservation – preservation of vegetables by acidification, preservation with sugar - Heat preservation– Food irradiation- Combined preservation techniques.

Total Hours: 45
### TEXTBOOKS:

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</thead>
<tbody>
<tr>
<td>3</td>
<td>Mircea Enachescu Dauhy</td>
<td>Fruit and Vegetable Processing</td>
<td>FAO agricultural services bulletin no.119</td>
<td>1995</td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td>1</td>
<td>M.A. Rao, Syed S.H. Rizvi, Ashim K. Datta</td>
<td>Engineering properties of foods</td>
<td>CRC Press</td>
<td>2005</td>
</tr>
<tr>
<td>2</td>
<td>B. Sivasankar</td>
<td>Food processing and preservation</td>
<td>PHI Learning Pvt. Ltd</td>
<td>2002</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To enable the students to get aware of available tools and databases for performing research in bioinformatics.
- To provide the thorough understanding of protein structure in detail.

INTENDED OUTCOMES:

At the end of the course,

- The students will understand the importance of Bioinformatics in various sectors.
- The students will be exposed to biological database management and microarray technology.

UNIT I OVERVIEW OF BIOINFORMATICS

The scope of bioinformatics; bioinformatics & the internet; useful bioinformatics sites. Data acquisition: sequencing DNA, RNA & proteins; determination of protein structure; gene & protein expression data; protein interaction data. Databases – contents, structure & annotation: file formats; annotated sequence databases; miscellaneous databases.

UNIT II RETRIEVAL OF BIOLOGICAL DATA

Data retrieval with Entrez & DBGET/ LinkDB; data retrieval with SRS (sequence retrieval system). Searching sequence databases by sequence similarity criteria: sequence similarity searches; amino acid substitution matrices; database searches, FASTA & BLAST; sequence filters; iterative database searches & PSI-BLAST. Multiple-sequence alignment, gene & protein families: multiple-sequence alignment & family relationships; protein families & pattern databases; protein domain families.

UNIT III PHYLOGENETICS

Phylogenetics, cladistics & ontology; building phylogenetic trees; evolution of macromolecular sequences. Sequence annotation: principles of genome annotation; annotation tools & resources.

UNIT IV STRUCTURAL BIOINFORMATICS

Conceptual models of protein structure; the relationship of protein three-dimensional structure to protein function; the evolution of protein structure & function; obtaining, viewing & analyzing structural data; structural alignment; classification of proteins of known three-dimensional structure: CATH & SCOP; introduction to protein structure prediction; structure prediction by comparative modeling; secondary structure prediction; advanced protein structure prediction & prediction strategies.
UNIT V  MICROARRAY DATA ANALYSIS

Microarray data, analysis methods; microarray data, tools & resources; sequence sampling & SAGE. Bioinformatics in pharmaceutical industry: informatics & drug discovery; pharmainformatics resources. Basic principles of computing in bioinformatics: running computer software; computer operating systems; software downloading & installation; database management.

**Total Hours: 45**

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<tbody>
<tr>
<td>1</td>
<td>Dan E. Krane, Michael L. Rayme</td>
<td>Fundamental Concepts of Bioinformatics</td>
<td>Pearson education</td>
<td>2004</td>
</tr>
<tr>
<td>3</td>
<td>David W. Mount</td>
<td>Sequence and Genome Analysis</td>
<td>Cold Spring Harbor Laboratory</td>
<td>2004</td>
</tr>
<tr>
<td>4</td>
<td>Jonathan Pevsner</td>
<td>Bioinformatics and Functional Genomics</td>
<td>Wiley-Liss</td>
<td>2003</td>
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<tr>
<td>1</td>
<td>Michael J. Korenberg</td>
<td>Microarray Data Analysis: Methods and Applications</td>
<td>Springer Science &amp; Business Media</td>
<td>2007</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To develop skills of the students in the field of nano biotechnology and its applications in various fields.
- The course will serve as an effective course to understand Socio-economic issues of Nanobiotechnology.

INTENDED OUTCOMES:

At the end of the course,

- The students will be able to identify the potential areas where nanoparticles can be utilized.
- The students will be exposed to the ethical issues regarding the use of nanoparticles.

UNIT I INTRODUCTION

(9)

UNIT II NANO PARTICLES

(9)

UNIT III APPLICATIONS

(9)

UNIT IV NANOBIO TECHNOLOGY

(9)

UNIT V ETHICAL ISSUES IN NANOTECHNOLOGY

(9)

Total Hours: 45
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<tr>
<td>1</td>
<td>Niemeyer, C.M. and Mirkin, C.A</td>
<td>Nanobiotechnology: Concepts, Applications and</td>
<td>Wiley-VCH</td>
<td>2004</td>
</tr>
<tr>
<td>2</td>
<td>Goodsell, D.S.</td>
<td>Bionanotechnology</td>
<td>John Wiley and Sons, Inc</td>
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<tr>
<td>2</td>
<td>Bhushan, B.</td>
<td>Springer Handbook of Nanotechnology</td>
<td>Springer-Verlag Berlin Heidelberg</td>
<td>2004</td>
</tr>
<tr>
<td>3</td>
<td>FreitasJr R.A</td>
<td>Nanomedicine</td>
<td>Landes Biosciences</td>
<td>2004</td>
</tr>
<tr>
<td>4</td>
<td>Kohler, M. and Fritzsche, W.</td>
<td>Nanotechnology – An Introduction to Nanostructuring Techniques</td>
<td>Wiley-VCH</td>
<td>2004</td>
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</table>
LIST OF OPEN ELECTIVES OFFERED BY MECHANICAL ENGINEERING DEPARTMENT

17BEMEOE01 COMPUTER AIDED DESIGN

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</table>

OBJECTIVE:
- To provide an overview of how computers are being used in mechanical component design

UNIT I      OVERVIEW OF CAD SYSTEMS
Conventional and computer aided design processes-advantages and disadvantages. Subsystems of CAD-CAD hardware and software, analytical and graphics packages, CAD workstations. Networking of CAD systems.

UNIT II INTERACTIVE COMPUTER GRAPHICS AND GRAPHICS TRANSFORMATIONS

UNIT III GEOMETRIC MODELING

UNIT IV PARAMETRIC DESIGN AND OBJECT REPRESENTATION

UNIT V PRODUCT DESIGN AND DEVELOPMENT

Total Hours: 45
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<tr>
<td>2</td>
<td>Radhakrishnan P and Subramanyan S</td>
<td>CAD/CAM/CIM</td>
<td>New Age International Pvt. Ltd</td>
<td>2004</td>
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</table>
OBJECTIVE

- Upon completion of this course, the students can able to understand the role of logistics and understand the phases of supply chain.

UNIT I INTRODUCTION TO LOGISTICS
Logistics - concepts, definitions and approaches, factors influencing logistics - Supply chain: basic tasks, definitions and approaches, influencing supply chain - a new corporate model.

UNIT II PHASES OF SUPPLY CHAIN
The new paradigm shift - The modular company - The network relations - Supply processes - Procurement processes - Distribution management.

UNIT III EVOLUTION OF SUPPLY CHAIN MODELS

UNIT IV SUPPLY CHAIN ACTIVITIES
Structuring the SC, SC and new products, functional roles in SC - SC design frame- work - Collaborative product commerce (CPC).

UNIT V SCM ORGANISATION AND INFORMATION SYSTEM
The management task - Logistics organization - The logistics information systems - Topology of SC application - Product Data Management - Warehouse management system MRP- I, MRP - II, ERP, - Case study, ERP Software's

Total Hours: 45

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<tr>
<td>2</td>
<td>Steudel H.J and Desruelle P</td>
<td>Manufacturing in the nineteen - How to become a mean, lean and world class competitor</td>
<td>Van Nostrand Reinhold, New York</td>
<td>1992</td>
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</table>
OBJECTIVE:

- Upon completion of this course, the students can able to understand the relationship between free energy, entropy, internal energy, and enthalpy.

UNIT I  INTRODUCTION AND BASIC CONCEPTS  9
General overview of transport phenomena including various applications, Transport of momentum, heat and mass, Transport mechanism, Level of transport, Driving forces, Molecular transport (diffusion), convective transport (microscopic)

UNIT II  PROPERTIES, UNITS AND OTHER PHYSICAL PARAMETERS  9
Unit systems, temperature, mole, concentration, pressure, Gas laws, laws of conservation, energy and heat units

UNIT III  MOMENTUM TRANSPORT  9
Basic concepts in fluid mechanics, Force, unit and dimensions, pressure in fluid, head of fluid, Molecular transport for momentum, heat and mass transfer, Viscosity of fluids, Newton's law, Momentum transfer, Newtonian and non-Newtonian fluids, Fluid flow and Reynolds number, Overall mass balance, Control volume and Continuity equation, Overall energy balance, Bernoulli's equation, Overall momentum balance, Drag coefficient, Stokes law, Flow in packed beds, Flow in fluidized bed

UNIT IV  ENERGY TRANSPORT  9
Basic concepts in heat transfer, Heat transfer mechanisms, Fourier's law of heat conduction, thermal conductivity, convective heat transfer coefficient, Conduction heat transfer - through flat slab/wall and through hollow cylinder, Conduction through solids in series, Forced convection heat transfer inside pipes, Heat transfer outside various geometrics in forced convection, General discussion on natural convection heat transfer, Heat exchangers, General discussion on radiation heat transfer

UNIT V  MASS TRANSPORT  9
Basic concepts in mass transport, Some application examples, Modes of mass transfer, Molecular diffusion- Fick's law, Analogy between mass, heat and momentum transfer, Dispersion, Hydraulic or Darcy's flow in porous media, Chemical kinetics and activation energy, Film theory, Convective mass transfer, Liquid-solid mass transfer, Liquid-liquid mass transport, Gas-liquid mass transfer, Aeration and oxygen transport, Air stripping

Total Hours: 45

REFERENCE:

<table>
<thead>
<tr>
<th>S. NO</th>
<th>Author(s) Name</th>
<th>Title of the book</th>
<th>Publisher</th>
<th>Year of Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Geankoplis, C. J</td>
<td>Transport Processes and Separation Processes Principles</td>
<td>Prentice Hall</td>
<td>2003</td>
</tr>
</tbody>
</table>

WEB REFERENCE:
1. https://laulima.hawaii.edu/portal
OBJECTIVE:

- Biomechanics provides key information on the most effective and safest movement patterns, equipment, and relevant exercises to improve human movement.

UNIT I  INTRODUCTION
Biomechanics - Improving Performance – Applications - Preventing And Treating Injury - Qualitative And Quantitative Analysis - Scholarly Societies - Computer Searches – Biomechanical Knowledge versus Information - Kinds of Sources - Evaluating Sources

UNIT II  KEY MECHANICAL CONCEPTS
Mechanics - Basic Units - Nine Fundamentals of Biomechanics - Principles and Laws - Nine Principles for Application of Biomechanics

UNIT III  HUMAN ANATOMY AND SOME BASIC TERMINOLOGY

UNIT IV  ANATOMICAL DESCRIPTION
Key Anatomical Concepts - Directional Terms - Joint Motions - Muscle Actions - Active and Passive Tension of Muscle - Limitations of Functional Anatomical Analysis - Mechanical Method of Muscle Action Analysis - The Need for Biomechanics to Understand Muscle Actions - Sports Medicine and Rehabilitation Applications

UNIT V  MECHANICS OF THE MUSCULOSKELETAL SYSTEM

References:

<table>
<thead>
<tr>
<th>S. NO</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Duane Knudson</td>
<td>Fundamentals of Biomechanics</td>
<td>Springer Science+ Business Media, LLC</td>
<td>2007</td>
</tr>
<tr>
<td>2</td>
<td>C. Ross Ethier</td>
<td>Introductory Biomechanics</td>
<td>Cambridge University Press</td>
<td>2007</td>
</tr>
</tbody>
</table>
LIST OF OPEN ELECTIVES OFFERED BY
AEROSPACE ENGINEERING DEPARTMENT

17BTAROE01 NON-DESTRUCTIVE TESTING L T P C
                      3 0 0 3

OBJECTIVES:

- To provide in-depth knowledge on various techniques of non-destructive testing.

UNIT I INTRODUCTION
Properties of Materials – Characteristics of Ferrous, Non-ferrous and Alloys. Destructive testing and Non-destructive testing – Classification – Uses and applications. Codes, Standards and Specifications (ASME, ASTM, AWS etc.).

UNIT II PENETRANT TESTING AND MAGNETIC PARTICLE INSPECTION
Introduction to Penetrant Testing – Liquid Penetrants and Dye Penetrants - An Illustration of Penetrant Testing, Advantages of Penetrant Testing, Disadvantages of Penetrant Testing. Introduction to Magnetic Particle Inspection - An Illustration of Magnetic Particle Inspection, Advantages of Magnetic Particle Crack Detection, Disadvantages of Magnetic Particle Crack Detection

UNIT III ULTRASONIC FLAW DETECTION AND RADIOGRAPHY INSPECTION

UNIT IV EDDY CURRENT AND ELECTRO-MAGNETIC METHODS

UNIT V NON-DESTRUCTIVE INSPECTION (NDI) AND ITS APPLICATIONS
Inspection of Raw Products, Inspection For In-Service Damage, Power Plant Inspection, Storage Tank Inspection, Aircraft Inspection, Jet Engine Inspection, Pressure Vessel Inspection, Bridge Inspection, Pipeline Inspection.

Total Hours: 45

TEXTBOOKS:

<table>
<thead>
<tr>
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</tr>
</thead>
</table>

WEB REFERENCE:

1. https://www.asnt.org/MinorSiteSections/AboutASNT/Intro-to-NDT
2. https://www.asnt.org/
3. www.bindt.org/
4. www.ndt.net/
OBJECTIVES:
- Ability to design UAV system
- Ability to identify different hardware for UAV

UNIT I  INTRODUCTION TO UAV  9

UNIT II  THE DESIGN OF UAV SYSTEMS  9

UNIT III  AVIONICS HARDWARE  9

UNIT IV  COMMUNICATION PAYLOADS AND CONTROLS  9

UNIT V  THE DEVELOPMENT OF UAV SYSTEMS  9

Total Hours: 45

TEXTBOOKS:

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Rel Austin</td>
<td>Unmanned Aircraft Systems UAV design, development and deployment</td>
<td>John Wiley &amp; Sons New York</td>
<td>2011</td>
</tr>
<tr>
<td>2.</td>
<td>Jay Gundlach</td>
<td>Designing Unmanned Aircraft Systems</td>
<td>American Institute of Aeronautics and Astronautics, Reston</td>
<td>2014</td>
</tr>
</tbody>
</table>
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</table>

## WEB REFERENCE:

1. www.draganfly.com/.../introduction-to-unmanned-aerial-vehicles-uavs/  
   rahauav.com/Library/.../Unmanned-Air-Systems
   spaceflight.nasa.gov/shuttle/reference/shutref/orbiter/.../plcomm.html  
3. www.theuav.com/
OBJECTIVES:
- To study the procedure of the formation of aerodrome, its design and the concepts of air transportation.

UNIT I  INTRODUCTION  9
Development of air transportation, comparison with other modes of transport – Role of IATA, ICAO – The general aviation industry airline – Factors affecting general aviation, use of aircraft, airport: airline management and organization – levels of management, functions of management, Principles of organization planning the organization – chart, staff departments & line departments.

UNIT II  AIRLINE ECONOMICS  9
Forecasting – Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity, load factor etc. – Passenger fare and tariffs – Influence of geographical, economic & political factors on routes and route selection.

UNIT III  PRINCIPLES OF AIRLINES SCHEDULING  9
Equipment maintenance, Flight operations and crew scheduling, Ground operations and facility limitations, equipments and types of schedule – hub & spoke scheduling, advantages / disadvantages & preparing flight plans – Aircraft scheduling in line with aircraft maintenance practices.

UNIT IV  AERODROME DATA, PHYSICAL CHARACTERISTICS AND OBSTACLE RESTRICTION  9

UNIT V  VISUAL AIDS FOR NAVIGATION, VISUAL AIDS FOR DENOTING OBSTACLES EMERGENCY AND OTHER SERVICES  9
Visual aids for navigation Wind direction indicator – Landing direction indicator – Location and characteristics of signal area – Markings, general requirements – Various markings – Lights, general requirements – Aerodrome beacon, identification beacon – Simple approach lighting system and various lighting systems – VASI & PAPI - Visual aids for denoting obstacles; object to be marked and lighter – Emergency and other services.

Total hours: 45
### TEXTBOOKS:

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### WEB REFERENCE:

1. www.grc.nasa.gov/WWW/k-12/airplane/
4. www.britannica.com/EBchecked/topic/.../Aircraft-configurations
5. www.brown.edu/Departments/EEB/EML/.../principles-flight.html
OBJECTIVES:

- To introduce the basic concepts of various avionics systems of aircraft.

UNIT I  INTRODUCTION TO AVIONICS  9
Need for avionics in civil and military aircraft and space systems – integrated avionics and weapon systems – typical avionics subsystems, design, technologies – Introduction to digital computer and memories.

UNIT II  DIGITAL AVIONICS ARCHITECTURE  9

UNIT III  FLIGHT DECKS AND COCKPITS  9
Control and display technologies: CRT, LED, LCD, EL and plasma panel – Touch screen – Direct voice input (DVI) – Civil and Military Cockpits: MFDS, HUD, MFK, HOTAS.

UNIT IV  INTRODUCTION TO NAVIGATION SYSTEMS  9

UNIT V  AIR DATA SYSTEMS AND AUTO PILOT  9
Air data quantities – Altitude, Air speed, Vertical speed, Mach Number, Total air temperature, Mach warning, Altitude warning – Auto pilot – Basic principles, Longitudinal and lateral auto pilot.

Total Hours: 45

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<tbody>
<tr>
<td>1.</td>
<td>Ian Moir, Allan Seabridge, Malcolm Jukes</td>
<td>Civil Avionics Systems</td>
<td>John Wiley &amp; Sons, New Jersey, USA.</td>
<td>2013</td>
</tr>
</tbody>
</table>
LIST OF OPEN ELECTIVES OFFERED BY AUTOMOBILE ENGINEERING DEPARTMENT

17BEAE01 AUTOMOBILE ENGINEERING L T P C
3 0 0 3

INTENDED OBJECTIVES:

• This course enables the students to know about all the main and auxiliary systems of automobile with its base construction and working.

UNIT I ENGINE AND FUEL FEED SYSTEMS
9 Classification of Engine, construction and working of four stroke petrol and diesel engine, firing order and its significance. Caruretor working principle, requirements of an automotive caruretor, Petrol injection Systems (MPFI, TBI), Diesel fuel injection systems (CRDI)

UNIT II TRANSMISSION SYSTEMS

UNIT III SUSPENSION SYSTEM

UNIT IV BRAKES

UNIT V ELECTRICAL SYSTEM
9 Principle and construction of lead acid battery. Lighting system: details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator. Starting System and charging system.

Total Hours: 45
**TEXTBOOKS:**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>3.</td>
<td>Dr. Kirpal Singh</td>
<td>Automobile Engineering</td>
<td>Standard Publishes</td>
<td>2011</td>
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</thead>
</table>
OBJECTIVES:

- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.

UNIT I INTRODUCTION

Classifications- design considerations –weight and dimension limitations – requirements stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS

2 stoke and 4 stoke SI engines and CI engines design criteria– design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburetor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical system.

UNIT III CLUTCHES AND TRANSMISSION

Types of clutches for 2 and 3 wheelers. Design of clutch system. Gears for two and three wheelers. Design of gear box and gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV FRAMES, SUSPENSION, WHEELS AND TYRES

Types of frames used for two wheelers and three wheelers. Wheel frames- construction design of frames for fatigue strength torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V THREE WHEELERS

Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission for 3 wheelers wheel types, wheel attachment tyre types. Brakes and their operating mechanism.

Total Hours: 45

TEXTBOOKS:

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<tr>
<td></td>
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<td>Engineering.</td>
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</thead>
</table>
OBJECTIVES:

- The objective of this course is to make the students to know and understand the maintenance and fault diagnosis of basic systems in Automobile.

UNIT I MAINTENANCE OF RECORDS AND SCHEDULES
Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT II ENGINE MAINTENANCE
Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT III CHASSIS MAINTENANCE
Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system, Maintenance servicing of suspension systems. Brake systems, types and servicing techniques, Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing.

UNIT IV ELECTRICAL SYSTEM MAINTENANCE
Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems, Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT V MAINTENANCE OF FUEL SYSTEM, COOLING SYSTEMS, LUBRICATION SYSTEM AND VEHICLE BODY
Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply, Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives, Lubrication maintenance, lubricating oil changing, greasing of parts, Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

Total hours: 45

TEXTBOOKS:

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<tr>
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<th>Year of publication</th>
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<tbody>
<tr>
<td>3.</td>
<td>Service Manuals from Different Vehicle Manufacturers</td>
<td></td>
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</tbody>
</table>
INTRODUCTION TO MODERN VEHICLE TECHNOLOGY

OBJECTIVES:

- This course enables the students to have a knowledge about the recent technologies that is in use in automobile.

UNIT I  TRENDS IN POWER PLANTS

UNIT II  DRIVER ASSISTANCE SYSTEMS
Collision Avoidance Systems, Adaptive cruise control, adaptive noise control, anti-spin regulation, traction control systems, cylinder cut- off technology, ABS, Driver Drowsiness Detection system

UNIT III  SUSPENSION BRAKES AND SAFETY
Air suspension - Closed loop suspension - antiskid braking system, Retarders, Regenerative braking safety cage - air bags - crash resistance - passenger comfort.

UNIT IV  NOISE & POLLUTION
Reduction of noise - Internal & external pollution control through alternate fuels/power plants – Catalytic converters and filters for particulate emission.

UNIT V  TELEMATICS
Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition

Total hours: 45

TEXTBOOKS

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</table>
LIST OF OPEN ELECTIVES OFFERED BY
CIVIL ENGINEERING DEPARTMENT

17BECEOE01 HOUSING, PLAN AND MANAGEMENT 3003

OBJECTIVE:

- At the end of this course the students should have learnt the basic terms of housing programmes, planning and designing of housing projects, construction techniques and cost effective materials and housing finance and project appraisal techniques.

UNIT I INTRODUCTION TO HOUSING 9
Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

UNIT II HOUSING PROGRAMMES 9
Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9
Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems)

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9
New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9

Total Hours: 45

TEXTBOOKS:

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<tr>
<th>S.NO.</th>
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</thead>
<tbody>
<tr>
<td>2.</td>
<td>Francis Cherunilam and Odeyar D Heggade</td>
<td>Housing in India</td>
<td>Himalaya Publishing House, Bombay</td>
<td>2001</td>
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<tbody>
<tr>
<td>1.</td>
<td>Development Control Rules for Chennai Metropolitan Area, CMAM Chennai</td>
<td>2002</td>
</tr>
<tr>
<td>2.</td>
<td>UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi</td>
<td>2000</td>
</tr>
</tbody>
</table>
OBJECTIVE:
- At the end of this course the students should have learnt various machineries of construction, electrical systems in building, design and principle of illumination, refrigeration principle and application and various fire safety installations.

UNIT I MACHINERIES
Hot Water Boilers – Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS

UNIT V FIRE SAFETY INSTALLATION

Total Hours: 45
### TEXTBOOKS:

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<tr>
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<tr>
<td>2.</td>
<td></td>
<td>Handbook for Building Engineers in Metric systems</td>
<td>NBC, New Delhi</td>
<td>2005</td>
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</thead>
</table>
OBJECTIVE:

- At the end of this course the students should have learnt the irrigation system requirements, irrigation scheduling, strategies in water use management, canal operation places and involvement of stake holder.

UNIT I  IRRIGATION SYSTEM REQUIREMENTS  9

UNIT II  IRRIGATION SCHEDULING  9

UNIT III  MANAGEMENT  9
Structural and non-structural strategies in water use and management – Conjunctive use of surface and ground waters – Quality of irrigation water.

UNIT IV  OPERATION  9
Operational plans – Main canals, laterals and field channels – Water control and regulating structures – Performance indicators – Case study.

UNIT V  INVOLVEMENT OF STAKE HOLDERS  9
Farmer’s participation in System operation – Water user’s associations – Farmer councils – Changing paradigms on irrigation management – Participatory irrigation management

Total Hours: 45

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</thead>
</table>
OBJECTIVE:
- At the end of this course, the students should have learnt the modern construction methods, methods for special structures, modern equipments used for excavation, conveyance etc and principles and practices of temporary structures.

UNIT - I MODERN CONSTRUCTION METHODS
Open Excavation, Shafts and Tunnels- Preparation of foundation, Cofferdams, Caisson, Piled Foundation, Prestressed Concrete Construction, Pre-cast Concrete Construction.

UNIT - II CONSTRUCTION METHODS FOR SPECIAL STRUCTURES

UNIT - III MODERN CONSTRUCTION EQUIPMENTS -I
Construction Equipment used for Earth Moving, Excavating, Drilling, Blasting, Tunneling and hoisting.

UNIT - IV MODERN CONSTRUCTION EQUIPMENTS -II
Construction Equipment used for Conveying, Hoisting, Dredging, Dewatering Systems, Paving and concreting Plant.

UNIT - V PRINCIPLES AND PRACTICES OF TEMPORARY STRUCTURES
Principles and Practices of Temporary structures, Shoring, and Strutting, Underpinning, Principles and Design of Formwork, Scaffolding, Operation and maintenance of construction equipments

TEXTBOOKS:

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<tbody>
<tr>
<td>1.</td>
<td>Varma, M</td>
<td>Construction Equipment and its Planning &amp; Applications</td>
<td>Metropolitan Book Co</td>
<td>2000</td>
</tr>
<tr>
<td>3.</td>
<td>Ataev, S.S</td>
<td>Construction Technology</td>
<td>MIR , Pub</td>
<td>2000</td>
</tr>
</tbody>
</table>
LIST OF OPEN ELECTIVES OFFERED BY ELECTRONICS AND COMMUNICATION ENGINEERING TO OTHER DEPARTMENTS

17BEECOE01 REAL TIME EMBEDDED SYSTEMS L T P C
3 0 0 3

OBJECTIVES:
- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To study about task management
- To learn about semaphore management and message passing
- To study about memory management

INTENDED OUTCOMES:
- Ability to understand embedded systems, its hardware and software.
- Gain knowledge about devices and buses used for embedded networking.
- Gain knowledge about task management.
- Gain knowledge about semaphore management and message passing.
- Gain knowledge about memory management.

UNIT-I INTRODUCTION TO EMBEDDED SYSTEM 9

UNIT-II OPERATING SYSTEM OVERVIEW 9

UNIT-III TASK MANAGEMENT 9

UNIT-IV SEMAPHORE MANAGEMENT AND MESSAGE PASSING 9
UNIT-V MEMORY MANAGEMENT


Total hours: 45

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<td>1</td>
<td>JeanJ. Labrosse</td>
<td>Micro C/OS–II The Real Time Kernel</td>
<td>CMPBOOKS</td>
<td>2009</td>
</tr>
<tr>
<td>3</td>
<td>Steve Furbe,</td>
<td>ARM System-on-Chip Architecture,</td>
<td>Addison-Wesley Professional, California</td>
<td>2000</td>
</tr>
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REFERENCES:

<table>
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<tr>
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<td></td>
<td>Pankaj Gupta</td>
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</table>
OBJECTIVES:

- To study about various speakers and microphone
- To learn the fund a mental of television systems and standards
- To learn the process of audio recording and reproduction
- To study the various telephone networks

INTENDED OUTCOMES:

- Gain knowledge about various speakers and microphone
- Gain knowledge about the fundamental of television systems and standards
- Gain knowledge about the process of audio recording and reproduction
- Gain knowledge about the various telephone networks

UNIT I    LOUDSPEAKERS AND MICROPHONES    9

UNIT II   TELEVISION STANDARDS AND SYSTEMS    9

UNIT III  OPTICAL RECORDING AND REPRODUCTION    9

UNIT IV   TELECOMMUNICATION SYSTEMS    9

UNIT V    HOME APPLIANCES    9
Basic principle and block diagram of microwave oven; washing machine hardware and software; Components of air conditioning and refrigeration systems.

Total Hours: 45
**TEXTBOOKS:**

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<td>1</td>
<td>S.P. Bali</td>
<td>Consumer Electronics</td>
<td>PearsonEducation</td>
<td>2007</td>
</tr>
<tr>
<td>2</td>
<td>J.S.Chitode</td>
<td>Consumer Electronics</td>
<td>Technical Publications</td>
<td>2007</td>
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<td>Philip Hoff, Philip Herbert Hoff.</td>
<td>Consumer Electronics for Engineers.</td>
<td>Cambridge University Press</td>
<td>1998</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To introduce the basic concepts of neural networks and its applications in various domain
- To educate how to use Soft Computing to solve real-world problems
- To have a solid understanding of Basic Neural Network.

INTENDED OUTCOMES:

- Understand the basic concepts of neural networks and its applications in various domain
- Ability to develop the use of Soft Computing to solve real-world problems
- Understand the Basic Neural Network.

UNIT I  INTRODUCTION TO NEURAL NETWORKS  9
Introduction-biological neurons and their artificial models-learning, adaptation and neural network's learning rules-types of neural networks-single layer, multiple layer-feed forward, feedback networks

UNIT II  LEARNING PROCESS  9

UNIT III  PERCEPTION  9

UNIT IV  ATTRACT OR NEURAL NETWORK AND ART  9

UNIT V  SELF ORGANIZATION  9

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<tr>
<td>1</td>
<td>Simon Haykin</td>
<td>Neural Networks and Learning Machines 3rd Edition</td>
<td>Pearson/Prentice Hall</td>
<td>2009</td>
</tr>
<tr>
<td>2</td>
<td>Satish Kumar</td>
<td>Neural Networks: A Classroom Approach</td>
<td>TMH</td>
<td>2008</td>
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<td>3</td>
<td>Wasserman P.D</td>
<td>Neural Computing Theory &amp; Practice</td>
<td>Van Nortrand Reinhold</td>
<td>1989</td>
</tr>
<tr>
<td>4</td>
<td>Freeman J.A., S kapura D.M</td>
<td>Neural networks, algorithms, applications, and programming techniques.</td>
<td>AdditionWesley</td>
<td>2005</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To introduce the basic concepts of Fuzzy logic and its applications in various domain
- To educate how to use Fuzzy computation to solve real-world problems
- To have a solid understanding of Basic fuzzy models.

INTENDED OUTCOMES:

- Understand the basic concepts of Fuzzy logic and its applications in various domain
- Ability to develop how to use Fuzzy computation to solve real-world problems
- Understand basic fuzzy models.

UNIT I
Basics of Fuzzy Logic: Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, fuzzy relations, the extension principle

UNIT II
Theory of Approximate Reasoning: Linguistic variables, Fuzzy proportions, Fuzzy if-then statements, inference rules, compositional rule of inference-fuzzy models

UNIT III
Fuzzy Knowledge Based Controllers (Fkbc): Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzy fiction and de fuzzy fiction procedures—Design of Fuzzy Logic Controller

UNIT IV

UNIT V
Fuzzy based systems: Simple applications of FKBC-washing machines-traffic regulations-lift control-fuzzy in medical Applications-Introduction to ANFIS.

Total Hours: 45

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<tr>
<td>1</td>
<td>D. Diankar, H. Hellendoorn and M. Rein frank</td>
<td>An Introduction to Fuzzy Control</td>
<td>Narosa Publishers India</td>
<td>1996</td>
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<tr>
<td>2</td>
<td>G.J. Klir and T.A. Folger</td>
<td>Fuzzy Sets Uncertainty and Information</td>
<td>PHI IEEE</td>
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<td>2</td>
<td>George J Klir and Bo Yuan</td>
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