REGULATIONS – 2013

DEPARTMENT OF
ELECTRONICS AND INSTRUMENTATION ENGINEERING

CURRICULUM AND SYLLABI OF
B.E. – ELECTRONICS AND INSTRUMENTATION ENGINEERING
NATIONAL ENGINEERING COLLEGE, K.R.NAGAR, KOVILPATTI
(An Autonomous Institution, Affiliated to Anna University, Chennai)

COLLEGE VISION

- Transforming lives through quality Education and research with human values

COLLEGE MISSION

- To maintain excellent infrastructure and highly qualified and dedicated faculty
- To provide a conducive learning environment with an ambience of humanity, wisdom, creativity and team spirit
- To promote the values of ethical behavior and commitment to the society
- To partner with academic, industrial and government entities to attain collaborative research
DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

VISION

• Achieving excellence in Teaching–Learning, Research and Consultancy among nationwide peer groups.

MISSION

The EIE department will achieve its vision by:

• Offering well–balanced curriculum to acquire professional competencies and transferable skills.
• Bringing innovations in Teaching-Learning process through effective content delivery and appropriate assessment methods.
• Catalyzing the research activities of both faculty members and students through more and more sponsored research projects.
• Rendering its consultancy services by providing instrumentation solutions to the nearby Industries.

Program Educational Objectives (PEO)

Within a few years (3 to 5 years) of graduation, our graduates are expected to

1. be an engineer in Design, Manufacturing, Marketing, Operation and Maintenance with the technical and managerial skills in the fields of Measurement, Control, Robotics, and Automation Engineering Technology.

2. utilize modern and effective management skills for Performing Investigation, Analysis and Synthesis in the implementation of instrumentation and automatic control systems.

3. pursue higher studies at the institutes of repute in India and abroad and work in Educational Institutions, Research Organizations and Engineering Consultancy Companies and be successful entrepreneurs.

4. collaborate in multi disciplinary teams and be the leaders in their organization, their profession and in society.
Program Outcomes (PO)


2. Identify, formulate, research literature and analyse complex Engineering problems in, Measurement & Instrumentation Systems, Control & Automation Systems and Computer Systems reaching substantiated conclusions using first principles of mathematics, Physics, Mechanics, Chemistry, Thermal Sciences, Earth Sciences, Biological Sciences and Engineering Sciences.


4. Conduct investigations of complex Electronics and Instrumentation Engineering problems in the areas of Instrumentation Devices and automatic control systems using research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

5. Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex Electronics and Instrumentation engineering problems pertaining to Electronics systems, Measurements, Control, Robotics and Automation with an understanding of the limitations.

6. Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice in the fields of Electronics system, Measurements, Control, Robotics and Automation and solutions to complex Electronics and Instrumentation Engineering problems.

7. Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex Electronics and Instrumentation Engineering Problems engineering problems in societal and environmental contexts.

8. Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

9. Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Demonstrate knowledge and understanding of engineering management principles and economic decision making and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.
REGULATIONS 2013 – CURRICULUM AND SYLLABI

B.E. – ELECTRONICS AND INSTRUMENTATION ENGINEERING

SEMESTER I (Common to all B.E. / B.Tech., Degree Programmes)

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
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## SEMESTER II

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**PRACTICAL**

| 7.     | 13E26       | Computer Programming Laboratory (Common to all)                             | 0 | 1 | 2 | 2 |
| 8.     | 13E27       | Physics and Chemistry Laboratory – II (Common to all)                        | 0 | 0 | 3 | 2 |
|         |             | Part A – Physics Laboratory – II                                            |   |   |   |   |
|         |             | Part B – Chemistry Laboratory – II                                          |   |   |   |   |
| 9.     | 13E28       | Electric Circuits Laboratory (Common to EEE and EIE)                        | 0 | 0 | 3 | 2 |
| 10.    | 13E29       | English Language Skill Laboratory (Common to all)                           | 0 | 0 | 3 | 2 |

**Total Number of Credits**: 29
### SEMESTER III

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#### PRACTICAL

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#### PRACTICAL

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**TOTAL** 18 4 9 28
# Curriculum & Syllabus for B.E. (EIE) Regulations-2013

## SEMESTER V

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**TOTAL** 18 03 06 25

## SEMESTER VI

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**TOTAL** 18 3 6 25

* Industry oriented courses (Invited lectures by Industrial Persons / Alumni, Field Visit)
LIST OF ELECTIVES FOR ELECTRONICS AND INSTRUMENTATION ENGINEERING

Electronics and Instrumentation Stream (Minimum 2 Course Maximum of 5 Course)

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<th>S. No.</th>
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* Industry oriented courses (Invited lectures by Industrial Persons / Alumni, Field Visit)
SH100 TECHNICAL ENGLISH – I
(Common to all B.E. / B.Tech., Degree Programmes) L T P C
3 1 0 4

COURSE OUTCOMES
The Student will
• apply basic grammar in Writing and Speaking.
• prepare formal Letter Writings.
• come out with proper pronunciation.
• speak confidently in interactions.
• develop interest to read any article.

UNIT I Language Focus: Technical Vocabulary, Word Formation, Concord, Tense (Present).
Writing: Leave Application Letter, Paragraph writing.
Listening: Listening to correct pronunciation of words.

UNIT II Language Focus: Words often misspelled, Articles, Tense (Past)
Writing: Permission letters (In-plant training/Seminar/Workshop), Chart description.
Listening: Listening to the Sentences with correct stress and Intonation.
Speaking: Situational Conversations.

UNIT III Language Focus: Compound nouns, Tense (Future), Preposition, Comparative Adjectives.
Listening: Listening to the conversations.
Speaking: One minute speech.

UNIT IV Language Focus: Modal verbs, Gerund, Infinitives, Voice.
Writing: Writing Instructions, Letters to Editor.
Listening: Listening to the different Tonal Expressions.
Speaking: Giving Opinions.

UNIT V Language Focus: ‘If’ Conditionals, ‘Wh’ questions, Question Tags.
Writing: Reading and Note - taking
Speaking: Group Discussion.
Reading: ERC, one word questions from the suggested book.

SUGGESTED ACTIVITIES
2. Exercises on gap filling and correction of errors on Concord (Subject – Verb Agreement).
3. Gap filling exercises using the appropriate Tense forms.
4. Exercises on transferring information from Graph to Text – Bar charts, Flow charts.
5. Making sentences using Modal verbs to express probability, compulsion, etc.
6. Exercises on Writing Instructions.
7. Exercises on framing Questions.
8. Other relevant classroom activities.

L: 45 T: 15 TOTAL: 60 PERIODS
BOOK SUGGESTED FOR READING

REFERENCES
SH101 MATRICES AND DIFFERENTIAL CALCULUS  
(Common to all B.E. / B.Tech., Degree Programmes)  

L T P C  
3 1 0 4  

COURSE OUTCOMES  
- Ability to find inverse and integral powers of matrices and to perform transformations of matrices.  
- Ability to find the evolutes of various curves.  
- Ability to solve ordinary and partial differential equations.  
- Ability to obtain constrained maxima and minima.  

UNIT I  MATRICES  
12  
Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties (excluding proofs); Cayley – Hamilton theorem (excluding proof) – Inverse and integral powers of a matrix using Cayley – Hamilton theorem; Diagonalisation of a matrix by orthogonal transformation; Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.  

UNIT II  DIFFERENTIAL CALCULUS  
12  
Curvature in cartesian, parametric and polar forms; Centre, radius and circle of curvature; Evolutes.  

UNIT III  FUNCTIONS OF SEVERAL VARIABLES  
12  
Partial derivatives; Total derivatives; Differentiation of implicit functions; Jacobians; Maxima and Minima - Method of Lagrangian multipliers.  

UNIT IV  ORDINARY DIFFERENTIAL EQUATIONS  
12  
Higher order linear differential equations with constant coefficients; Method of variation of parameters; Cauchy’s and Legendre’s linear equations; Simultaneous first order linear equations with constant coefficients.  

UNIT V  PARTIAL DIFFERENTIAL EQUATIONS  
12  
Formation of partial differential equations; Lagrange’s linear equations; Solutions of standard types of first order partial differential equations; Linear partial differential equations of second and higher order with constant coefficients.  

L: 45 T: 15 TOTAL: 60 PERIODS  

TEXT BOOKS  

REFERENCES  
SH102 APPLIED PHYSICS
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES
The students will be able to

- gain knowledge on the properties of matter and hydrodynamics.
- study and apply the ultrasonic methods for industrial and medical field.
- understand Lasers and to identify the appropriate Laser technique for industrial and medical field.
- understand the different types, fabrication, losses of optical fibers and the applications of fiber optics in communication and instrumentation.
- understand the physical properties of photons and electrons and to study the different Electron Microscopes.

UNIT I PROPERTIES OF MATTER AND HYDRODYNAMICS 9

Properties of Matter
Stress, Strain, Hooke’s law; Types of moduli of elasticity; Torsional pendulum – Determination of Rigidity modulus of a wire; Bending of beams – Expression for bending moment – Measurement of Young’s modulus by uniform and Non-uniform bending – I Shaped girders.

Hydrodynamics
Stream line flow, Turbulent flow, Poiseuille’s formula for flow of liquid through a capillary tube, Determination of coefficient of viscosity of a liquid.

UNIT II ULTRASONICS 9


UNIT III LASERS 9

Principle of spontaneous emission and stimulated emission, Population inversion, Pumping, Einstein’s A and B coefficients – derivation; Types of Lasers - CO₂ Laser, Nd-YAG Laser, Semiconductor Laser (Homojunction); Determination of wavelength of Laser using grating and Particle size; Applications of Lasers: Industrial applications – Welding, Cutting and Heat treatment; Medical applications; Holography (construction and reconstruction).

UNIT IV FIBER OPTICS AND ITS APPLICATIONS 9

Principle and propagation of light in optical fibers; Numerical aperture and Acceptance angle; Types of optical fibers – material, refractive index and mode; Double crucible technique of fiber drawing; Splicing – fusion splicing; Loss in optical fiber – attenuation, dispersion and bending; Fiber optical communication system (Block diagram); Advantages and Applications of optical fiber; Fiber optic sensors – temperature and displacement; Endoscope.

UNIT V QUANTUM PHYSICS AND MICROSCOPY 9

Black body radiation – Planck’s theory (derivation) – Deduction of Wien’s displacement law and Rayleigh Jean’s Law from Planck’s theory; Photoelectric effect – Law of Photoelectric effect – Photoelectric equation; Matter Waves – De Broglie wavelength - Schrodinger’s wave equation – time independent and time dependent equations – Particle in one dimensional box; Heisenberg’s Uncertainty principle; Linear Harmonic oscillator; Electron microscope – scanning electron microscope – transmission electron microscope.

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
SH103 ENGINEERING CHEMISTRY
(Common to all B.E. / B.Tech., Degree Programmes)

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COURSE OUTCOMES
The students will be able to
• select suitable water treatment techniques for industrial and domestic purpose.
• acquire knowledge of electrochemistry.
• apply the contextual knowledge of adsorption techniques for industrial applications.
• synthesize polymers for domestic and industrial applications.
• understand the knowledge of nano materials for their applications in Science and Engineering.

UNIT I WATER TREATMENT

UNIT II ELECTRO ANALYTICAL TECHNIQUES
Electrode potential: definition, measurement of electrode potential, Nernst equation – problems; EMF: definition, measurement of EMF – Poggendorff’s method; reference electrode: standard hydrogen electrode, calomel electrode, glass electrode – measurement of pH using glass electrode; CO₂ sensing electrode; conductometric titrations: acid-base titration (HCl vs NaOH); potentiometric titrations: redox titration (Fe²⁺ vs K₂Cr₂O₇), precipitation titration (Ag⁺ vs NaCl).

UNIT III CATALYSIS AND SURFACE PHENOMENA
Types of catalysis – homogeneous catalysis – heterogeneous catalysis, mechanism of catalytic action - contact theory, catalytic promoters, catalytic poison; enzyme catalysis: Michaelis-Menton equation; adsorption: definition, types – physical adsorption – chemical adsorption – differences between physical and chemical adsorption; adsorption isotherms: definition, Freundlich and Langmuir adsorption isotherms, applications of adsorption.

UNIT IV ENGINEERING POLYMERS

UNIT V NANO MATERIALS
Nanoparticles: definition, carbon nanotubes (CNT), types of carbon nano tubes – single walled and multi walled carbon nanotubes – fullerene; synthesis of carbon nanotubes: chemical vapour deposition – laser ablation – arc-discharge method; properties of CNT: mechanical, electrical, thermal and optical properties; applications of carbon nanotubes in chemical field, medicinal field, mechanical field and current applications.

TOTAL: 45 PERIODS

TEXT BOOKS
REFERENCES
SH104   FUNDAMENTALS OF COMPUTING AND PROGRAMMING IN C
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES

• Learn the major components of a computer system.
• Formulate the algorithms and analyze their complexity.
• Identify the correct and efficient ways of solving problems.
• Acquire knowledge about dynamic memory allocation, modular programming and data organization.
• Develop real time applications using the power of C language features.

UNIT I  COMPUTER FUNDAMENTALS        10

UNIT II  BASIC C PROGRAMMING              9
Structure of C Program – Keywords, Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making – Branching and Looping.

UNIT III  FUNCTIONS, ARRAYS AND POINTERS            9

UNIT IV  STRUCTURES AND UNIONS          9

UNIT V  FILE HANDLING            8

TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

SH105  ENGINEERING GRAPHICS
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES

- Students will be able to use the drawing instruments effectively.
- An ability to draw the basic engineering curves and problems related to projections of points, straight lines, planes and solids.
- Able to apply the knowledge acquired on practical applications of sectioning and development of solids.
- Able to draw simple solids and its sections in isometric view and projections and also to draw its perspective views.

Drawing Instruments – IS specifications on lines – drawing sheets – Printing letters and dimensioning – scales (not for examination) – First angle projection should be followed.

UNIT I  PLANE CURVES  12
Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloids – Epi and Hypo cycloids - construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACES  12
Projection of points and straight lines located in the first quadrant – Traces – Determination of true lengths and true inclinations.
Projection of regular polygonal surfaces and circular lamina inclined to any one reference plane.

UNIT III  PROJECTION OF SOLIDS  12
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV  SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES  12
Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – obtaining true shape of section.
Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinder and cone – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V  ISOMETRIC AND PERSPECTIVE PROJECTIONS  12
Perspective projection of prisms, pyramids and cylinders by visual ray method and vanishing point method.

TOTAL: 60 PERIODS

Note: In end semester examination from each unit one question with either or pattern may be asked.
No short questions.

TEXT BOOK
REFERENCES
C PROGRAMMING LABORATORY
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES
- Acquire logical thinking and problem solving skills.
- Implement the algorithms and analyze their complexity.
- Identify the correct and efficient ways of solving problems.
- Acquire hands on practice in dynamic memory allocation, modular programming and data organization.
- Implement real time applications using the power of C language features.

LIST OF EXPERIMENTS
1. Solve problems such as temperature conversion, student grading, interest calculation.
2. Finding the 2’s complement of a binary number.
3. Generation of the first ‘n’ terms of the Fibonacci sequence and prime sequence.
5. Given distance traveled by a vehicle as \( d = ut + \frac{1}{2}at^2 \), where ‘u’ and ‘a’ are the initial velocity and acceleration. Calculate the distance traveled for different time intervals.
6. Solving the roots of a quadratic equation.
7. Designing a simple arithmetic calculator. (Use switch statement)
8. Performing the following operations: (Use loop statement)
   i. Generate Pascal’s triangle.
   ii. Construct a Pyramid of numbers.
9. Performing the following operations to a string:
   i. To insert a sub-string into main string at a given position.
   ii. To delete ‘n’ characters from a given position in a string.
   iii. To replace a character of string either from beginning or ending or at a specified location.
10. Performing the following operations: (Use arrays)
    i. Matrix addition.
    ii. Transpose of a matrix.
    iii. Matrix multiplication by checking compatibility.
11. Performing the following operations: (Use recursive functions)
    i. To find the factorial of a given integer.
    ii. To find the GCD (Greatest Common Divisor) of two given integers.
    iii. To solve Towers of Hanoi problem.
12. Performing the Student Information Processing using File Handling concepts.

TOTAL: 45 PERIODS

SOFTWARE REQUIREMENTS
- Turbo C/ ANSI C Compiler
- Gcc compiler
SH107  PHYSICS AND CHEMISTRY LABORATORY – I  
(Common to all B.E. / B.Tech., Degree Programmes)

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**PART A – PHYSICS LABORATORY – I**

**COURSE OUTCOMES**

At the end of the Laboratory classes, the students are able to

- develop collaborative learning skills and to add some of their own ideas to the experiments and their explanations.
- understand the optical properties, mechanical properties and electrical properties.

**LIST OF EXPERIMENTS**

1. (a) Particle size determination using Diode Laser.
   (b) Determination of Laser parameters – Wavelength, and angle of divergence.
   (c) Determination of Numerical aperture and acceptance angle of an optical fiber.
2. Determination of thickness of a thin wire – Air wedge method.
3. Determination of velocity of sound and compressibility of the liquid – Ultrasonic Interferometer.
5. Determination of Young’s modulus – Non-uniform bending method.
7. Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge.
   - *A minimum of FIVE experiments shall be offered.*

**PART B - CHEMISTRY LABORATORY – I**

**COURSE OUTCOMES**

The student

- can estimate the amount of hardness and acidity present in the water sample.
- gain knowledge about the estimation of nickel in an alloy.
- quantify the electrolyte by measuring the conductance and pH.

**LIST OF EXPERIMENTS**

1. Estimation of hardness of Water sample by EDTA method.
2. Estimation of acidity of Water sample.
3. Estimation of Nickel by EDTA method.
4. Conductometric titration (HCl Vs NaOH).
5. Conductometric titration (BaCl₂ Vs Na₂SO₄).
6. pH metric titration (HCl Vs NaOH).
7. Determination of molecular weight and degree of polymerization using Viscometry.
   - *A minimum of FIVE experiments shall be offered.*
   - *Laboratory classes on alternate weeks for Physics and Chemistry.*

**TOTAL: 45 PERIODS**
SH108 ENGINEERING PRACTICES LABORATORY
(Common to all B.E. / B.Tech., Degree Programmes)

COURSE OUTCOMES
- Students will be able to prepare the pipe connections and identify the various components used in plumbing.
- An ability to prepare simple wooden joints using wood working tools.
- An ability to prepare simple lap, butt and tee joints using arc welding equipments.
- An ability to prepare simple components using lathe and drilling machine.

PART A – MECHANICAL AND CIVIL ENGINEERING PRACTICES

I PLUMBING WORKS: 5
Study of components related to plumbing.
Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

II CARPENTRY PRACTICES: 6
Study of the joints in roofs, doors, windows and furniture.
Hands-on-exercise:
Wood work, joints by sawing, planning and cutting.

III WELDING: 5
Study of the tools used in welding Gas welding practice.
Preparation of butt joints, lap joints and tee joints using arc welding.

IV BASIC MACHINING: 7
(a) Simple Turning and Taper turning.
(b) Drilling Practice.

REFERENCES
PART B – ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICES

COURSE OUTCOMES

• An ability to develop familiarity with rudimentary measurement equipment – signal generators, oscilloscopes, multimeters and power supplies.
• Ability to demonstrate and evaluate the parameters of basic electronic components (wires, resistors, capacitors, diodes etc.) based on their physical parameters and dimensions.
• Define, describe, and analyze fundamentals of Boolean algebra and digital logic gates.
• An ability to predict qualitatively and quantitatively compute the steady state AC responses of basic circuits using the phasor method.
• Gain experience in the documentation of measurements and procedures as well as the preparation of formal reports.

I ELECTRICAL ENGINEERING PRACTICE

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
5. Measurement of energy using single phase energy meter.

II ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO
2. Study of logic gates AND, OR, XOR and NOT.
4. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

REFERENCES

13E20 TECHNICAL ENGLISH – II (Common to all B.E. / B.Tech., Degree Programmes)  

COURSE OUTCOMES
The student will be able to
• apply correct form of language while Speaking and Writing.
• prepare his own Professional letter writings.
• interpret any passage after listening.
• interact at different situations fluently.

UNIT I
Language Focus: Homonyms, Different grammatical forms of the same word, correct usage of words / phrases.
Writing: Recommendation writing.
Listening: Interpreting Poetic lines.
Speaking: Telephone English.

UNIT II
Language Focus: Cause and Effect, Phrasal Verbs.
Listening: Conversations.
Speaking: Asking questions.

UNIT III
Language Focus: Idioms and Phrases with animal names.
Writing: Checklist, Process Description.
Speaking: Presentations.

UNIT IV
Language Focus: Technical Definitions, Transformation of Sentences.
Writing: Job Application Letter, Curriculum Vitae, Bio-data, Resume.
Speaking: Mock Interview.

UNIT V
Language Focus: British and American Vocabulary, Numerical Expressions.
Writing: E-mail Writing, Report Writing.
Speaking: Group Discussion.

SUGGESTED ACTIVITIES
1. Making sentences using different grammatical forms of the same word.
2. Exercises on combining sentences using Cause and Effect expressions.
4. Writing exercises on Recommendations.
5. Exercises on Idioms and Phrases.
7. Exercises on British and American English words with meanings.

TOTAL: 45 PERIODS

BOOK SUGGESTED FOR READING
REFERENCES
13E21 INTEGRAL CALCULUS AND TRANSFORMS  
(Common to all B.E. / B.Tech., Degree Programmes) 


COURSE OUTCOMES

• Ability to find area and volume of objects using double and triple integrals.
• Ability to analyze the concepts related to vector calculus and to apply them in engineering field.
• Ability to perform the ideas of Laplace transform and Z-transform in their respective engineering subjects.

UNIT I MULTIPLE INTEGRALS
Double integration – Cartesian and polar coordinates; Change of order of integration; Change of variables between cartesian and polar coordinates; Triple integration in cartesian coordinates; Area as double integral; Volume as triple integral.

UNIT II VECTOR CALCULUS
Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields; Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stoke’s theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

UNIT III LAPLACE TRANSFORM

UNIT IV INVERSE LAPLACE TRANSFORM
Definition of Inverse Laplace transform – Convolution theorem – Solution of linear ordinary differential equations of second order with constant coefficients using Laplace transformation techniques and solution of simultaneous differential equations of first order with constant coefficients using Laplace transformation techniques.

UNIT V Z – TRANSFORM

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13E22 SOLID STATE PHYSICS  
(Common to ECE, CSE, EEE, EIE and IT)  

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COURSE OUTCOMES
The Student will be able to
- identify the crystal lattices, their structures and how the structure influences its major properties at different levels.
- choose the major functional and structural properties required for specific applications of conducting materials
- check the parameter that satisfies superconducting behaviour.
- relate technology to the physics of semiconductor devices.
- classify the magnetic materials and their storage applications.
- design optical materials that are able to be manufactured and measured using the state of art optical fabrication technologies.

UNIT I CRYSTAL PHYSICS  
Lattice, Unit cell, Bravais lattice, Lattice planes; Miller indices – d-spacing in cubic lattice; Calculation of number of atoms per unit cell, Atomic radius, Coordination number and Packing factor for SC, BCC, FCC and HCP structures; Crystal defects – point, line and surface defects; Burger vector.

UNIT II CONDUCTING MATERIALS AND SUPERCONDUCTORS  
Conductors
Superconductors
Superconductivity: Properties – Meissner effect – Isotopic effect; Types of superconductors – Type I and Type II superconductors; Applications of superconductors – Magnetic levitation.

UNIT III SEMICONDUCTORS  
Intrinsic semiconductor – carrier concentration derivation – Fermi level – variation of Fermi level with temperature – electrical conductivity – bandgap determination; Extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration; Hall effect – Determination of Hall coefficient – Applications.

UNIT IV MAGNETIC MATERIALS AND STORAGE DEVICES  
Origin of magnetic moment, Bohr magneton, Dia and Para magnetism, Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials; Anti-ferromagnetic materials; Ferrites – structure and applications; magnetic recording and readout – storage of magnetic data – tapes, floppy, Hard disk and CD ROM.

UNIT V OPTICAL MATERIALS  
Optical properties of metals, insulators and semiconductors; Phosphorescence and fluorescence; Excitons traps and colour centre and their importance; Different phosphors used in CRO screens, liquid crystal display, LED – working of LED; Thermography and its applications; Solar cell – PN junction solar cell – Conversion efficiency and solar concentration – Hetero junction solar cell.

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
13E23  CHEMISTRY OF ELECTRICAL AND ELECTRONIC MATERIALS  
(Common to ECE, CSE, EEE, EIE and IT)  

COURSE OUTCOMES  
The students can  
• apply the knowledge in designing new energy storing devices.  
• identify the types of corrosion and to design a method to control the corrosion.  
• apply the knowledge of photochemistry in designing the various electronic materials.  
• choose proper analytical technique for analyzing the synthesized electronic materials.  

UNIT I  ENERGY SOURCES AND STORAGE DEVICES  
9  

UNIT II  CORROSION AND ITS CONTROL  
9  

UNIT III  PHOTOCHEMICAL PROCESSES  
9  

UNIT IV  ELECTRONIC MATERIALS  
9  

UNIT V  ANALYTICAL INSTRUMENTATION  
9  

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
COURSE OUTCOMES
Students will be able to
• define basic electrical concepts, including electrical potential, electrical current, electrical power and electrical network topology including nodes, branches, and loops.
• define the relationship of voltage and current in resistors, capacitors, inductors, and mutual inductors.
• simplify and analyze the electric circuits using electric circuit theory.
• analyze the dynamic behavior of the first and second order AC and DC circuits.

UNIT I ELECTRIC CIRCUIT ELEMENTS AND ANALYSIS 12

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 12
Network reduction: voltage and current division, source transformation – star-delta conversion. Thevenin’s and Norton’s Theorem – Superposition Theorem – Maximum Power Transfer Theorem – Reciprocity Theorem and its applications.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and AC with sinusoidal input.

UNIT V ANALYSING OF THREE PHASE CIRCUITS 12
Three phase balanced / unbalanced voltage sources – analysis of three phase 3–wire and 4–wire circuits with star and delta connected loads, balanced and unbalanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

L: 45 T:15 TOTAL :60 PERIODS

TEXT BOOKS

REFERENCES
13E25 BASIC CIVIL AND MECHANICAL ENGINEERING
(Common to ECE, CSE, EEE, EIE and IT)

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COURSE OUTCOMES
- An ability to identify the various systems and its components of various power plants.
- An ability to state and differentiate the working principles of IC engines.
- Students will be able to identify the various systems and components of refrigeration and air conditioning systems.

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15
leveling – determination of areas – illustrative examples.

UNIT II BUILDING COMPONENTS AND STRUCTURES 15
Foundations: Types, Bearing capacity – Requirement of good foundations.
plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges
and Dams – Basics of Interior Design and Landscaping.

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 10
Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-
electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of
Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV IC ENGINES 10
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel
Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines –
Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10
Terminology of refrigeration and air conditioning – Principle of vapour compression and absorption
system – Layout of typical domestic refrigerator – Window and Split type room air conditioner.

TOTAL: 60 PERIODS

REFERENCES
1. Shanmugam G. and Palanichamy M.S., “Basic Civil and Mechanical Engineering”, Tata
5. Shantha Kumar S.R.J., “Basic Mechanical Engineering”, Hi-tech Publications,
13E26 COMPUTER PROGRAMMING LABORATORY  
(Common to all B.E. / B.Tech., Degree Programmes)  

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COURSE OUTCOMES  
Upon successful completion of this course, the students will be able to:  

- Demonstrate how to use the UNIX Shell commands.  
- Use the Shell programming constructs.  
- Learn tracing mechanisms (for debugging), user variables, Shell variables, read-only variables, positional parameters, reading input to a Shell script.  
- Test on numeric values, test on file type, and test on character strings using shell scripts.  
- Write moderately complex Shell scripts and make them executable.  

Execute programs written in C under UNIX environment.  

LIST OF EXPERIMENTS  
1. Study of UNIX OS, vi Editor.  
2. Use of Basic UNIX Shell Commands:  
   ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd,  
   dfspace, du, ulimit.  
3. Shell Programming:  
   i. Interactive shell scripts  
   ii. Positional parameters  
   iii. Arithmetic Operators  
   iv. if-then-fi, if-then-else-fi, nested if-else  
   v. Logical operators  
   vi. if - elif, case structure  
   vii. while, until, for loops, use of break  
   viii. Metacharacters  
4. Shell scripts for the following:  
   i. Showing the count of users logged in  
   ii. Printing column wise list of files in your home directory  
   iii. To count lines, words and characters in its input (do not use wc)  
5. C Programming on UNIX:  
   i. Dynamic Storage Allocation  
   ii. Pointers  
   iii. Functions  
   iv. File Handling  

SOFTWARE REQUIREMENTS  
- UNIX/LINUX OS  
- Gcc compiler  

TOTAL: 45 PERIODS
PART A - PHYSICS LABORATORY – II

COURSE OUTCOMES
At the end of the Laboratory classes, the students
- demonstrate and report the elastic behaviour of materials
- demonstrate the interference property of light waves
- demonstrate the diffraction property of light waves
- measure the thermal properties of conducting materials
- identify the substance that deforms continuously when subjected to shearing stress.

LIST OF EXPERIMENTS
1. Determination of Young’s modulus – Uniform bending method.
2. Determination of Band Gap of a semiconductor material.
3. Determination of Hall Co-efficient.
5. Determination of wavelength of mercury spectrum using spectrometer and grating
7. Torsional pendulum – Determination of Moment of Inertia of the disc and Rigidity modulus of the material of the wire.

* A minimum of FIVE experiments shall be offered.

PART B - CHEMISTRY LABORATORY – II

COURSE OUTCOMES
The student
- can estimate the amount of alkalinity and Dissolved Oxygen (DO) present in the water sample.
- gain knowledge in the estimation of copper in an alloy and iron in rust.
- quantify electrolyte and ion by measuring the conductance and emf.

LIST OF EXPERIMENTS
1. Estimation of copper in brass by EDTA method.
2. Determination of Dissolved Oxygen (DO) in water (Winkler’s method)
3. Estimation of alkalinity of Water sample
4. Estimation of Fe^{3+} ion in rust by Dichrometry
5. Conductometric titration (Mixture of acids vs NaOH)
6. Potentiometric Titration (Fe^{2+} vs K_{2}Cr_{2}O_{7})
7. Estimation of Fe^{2+} ion by spectrophotometry.

TOTAL: 45 PERIODS

* A minimum of FIVE experiments shall be offered.
* Laboratory classes on alternate weeks for Physics and Chemistry.
13E28 ELECTRIC CIRCUITS LABORATORY  
(Common to EEE and EIE)  

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COURSE OUTCOMES  
• Illustrate the basic concepts of electric circuits.  
• Relate the physical observations in network theorems of electrical circuits to theoretical principles.  
• Examine the electric circuits using mesh and nodal analysis.  
• Analyze the dynamic behavior of electric circuits using PSIM.  
• Compute the frequency response of resonant and tuned circuits.  

LIST OF EXPERIMENTS  
1. Verification of Ohm’s laws and Kirchoff’s laws  
2. Verification of Thevenin’s and Norton’s theorem  
3. Verification of Superposition theorem  
4. Verification of Maximum Power Transfer theorem  
5. Verification of Reciprocity theorem  
6. Measurement of self inductance of a coil  
7. Verification of mesh and nodal analysis  
8. Transient response of RL and RC circuits for DC input  
9. Frequency response of series and parallel resonance circuits  
10. Frequency response of single tuned coupled circuits  

TOTAL: 45 PERIODS
13E29  ENGLISH LANGUAGE SKILL LABORATORY  
(Common to all B.E. / B.Tech., Degree Programmes)  

COURSE OUTCOMES  
The Student will  
• improve their pronunciation skill.  
• gather information from any speech.  
• imibe the stress and intonation of the native speakers’ accent.  

1. Micro Skills  
• Spotting the Homonyms / Silent letter words / mispronounced words  
• Identifying the missing words in native speech  
• Finding the cluster words  
• Marking correct punctuation  
• Marking word chunks  
• Identification of sentences  

2. Content Comprehension and making inferences  
• Listening to audio files of Speech, Poetry, Recent Issues, News clippings, etc  
  a. True / False  
  b. Multiple Choice Questions  
  c. Filling the blanks  
  d. Filling the charts  

3. Listen and Act  
• Drawing the map using audio  
• Picture completing task  
• Transferring data to Graph  

4. Interpreting the video clippings  

5. Listening to Conversations  

TOTAL: 30 PERIODS
13E131 TRANSFORMS AND COMPLEX ANALYSIS

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COURSE OUTCOMES

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

• Perform Fourier series analysis of the functions
• Solve the problems using Fourier transform techniques in engineering
• Understand the concept of wavelet transform
• Acquire the knowledge of conformal mappings
• Perform integration of complex functions

UNIT I FOURIER SERIES


UNIT II FOURIER TRANSFORMS


UNIT III WAVELETS AND WAVELET TRANSFORMS

Introduction – Continuous Wavelet Transforms – Discrete Wavelet Transforms – Orthonormal Wavelets

UNIT IV ANALYTIC FUNCTIONS

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

UNIT V COMPLEX INTEGRATION

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

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS


REFERENCES

13EI32 ENVIRONMENTAL SCIENCE AND ENGINEERING
(Common to all B.E/B.Tech. Degree Programmes)

COURSE OUTCOMES
Upon successful completion of course the student will be able to

- Understand the various ecosystem and biodiversity
- Classify the different types of natural resources and identify the role of individual in conservation of resources
- Identify and analyse the causes, effects and control measures of environmental pollution
- Identify the different types of environmental hazards and their management
- Analyse the social issues related to the environment and how human population affect the environment

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers– energy flow in the ecosystem – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) aquatic (pond) ecosystems. Field study of simple ecosystems –pond and forest. Introduction to biodiversity: definition - genetic, species and ecosystem diversity – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values –India as a mega-diversity nation – hot spots of biodiversity –threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation. Field study of common plants, insects, birds.

UNIT II NATURAL RESOURCES
Forest resources: Use and over-exploitation, deforestation, case studies- dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide Problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, case studies – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT III ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Noise pollution (e) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – e-Waste: Definition-dimension of the problem - source-toxic Substances in e-waste - risks related to toxic substances–environmental problems-role of an individual in prevention of pollution.

UNIT IV ENVIRONMENTAL HAZARDS
Environmental hazards: Definition – Hazard- Types-Natural and man-made hazards – Natural hazards: Causes, effect and management of Earthquake, Flood, Landslide, Cyclones and Tsunami; Man-made Hazards: Hazards due to dams and reservoirs, hazards due to nuclear power plant, Industrial hazards. Case study: Chernobyl disaster, Bhopal gas tragedy.

UNIT V SOCIAL ISSUES, HUMAN POPULATION AND THE ENVIRONMENT

TOTAL: 45 PERIODS
TEXT BOOKS

REFERENCES
13EI33 DIGITAL CIRCUITS L T P C 3 1 0 4

COURSE OUTCOMES
Upon completion of the course, students will be able to
• Explain various number systems and to simplify the mathematical expressions using Boolean functions
• Design and implement combinational circuits and sequential circuits
• Comprehend the various memory devices.

UNIT I NUMBER SYSTEMS AND BOOLEAN ALGEBRA 12
Review of number systems; types and conversion, codes. Boolean algebra: De-Morgan’s theorem, switching functions and simplification using K-maps and Quine McCluskey method.

UNIT II COMBINATIONAL CIRCUITS 12

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 12

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 12
Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

UNIT V MEMORY DEVICES, PROGRAMMABLE LOGIC DEVICES AND LOGIC FAMILIES 12
Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, Digital logic families: TTL, ECL, CMOS.

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EI34 SENSORS AND TRANSDUCERS  L T P C  3 1 0 4

COURSE OUTCOMES
Upon completion of the course, students will be able to
• Define the basic need of measurement systems.
• Analyze the operation and construction of various transducers.
• Construct the various types of Resistive transducers.
• Demonstrate the features of Capacitive and Inductive Transducers
• Apply an appropriate transducer for various applications.

UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS  12

UNIT II CHARACTERISTICS OF TRANSDUCERS  12
Static characteristics – Accuracy, precision, resolution, sensitivity, linearity, repeatability, reproducibility, loading effect, drift, static error, span and range, hysteresis, dead time and dead zone - Dynamic characteristics – Mathematical model of transducer – Zero, I and II order transducers - Response to impulse, step, ramp and sinusoidal inputs.

UNIT III VARIABLE RESISTANCE TRANSDUCERS  12
Principle of operation, construction details, characteristics and applications of potentiometer-loading effect - strain gauge – types - Resistance temperature detector (RTD) – Thermistor - hot-wire anemometer - constant current and constant temperature operation - piezoresistive sensor - resistive humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS  12
Induction potentiometer – Variable reluctance transducers – Eddy current transducer – Principle of operation, construction details, characteristics and applications of LVDT –Capacitive transducer and types- differential capacitance arrangement – variation of dielectric constant for the measurement of liquid level - Capacitor microphone – Frequency response.

UNIT V MODERN TRANSDUCERS  12
Piezoelectric transducer –Hall Effect transducer – Magnetostrictive sensor- Digital displacement transducer– Smart sensors – IC sensor for temperature - AD 590, LM 335 - Fiber optic sensors-Introduction to SQUID sensors, Film sensors, Touch screen sensor, Photovoltaic and electromagnetic sensor, MEMS and Nano sensors.

L : 45 T : 15, TOTAL : 60 PERIODS

TEXT BOOKS

REFERENCES
13EI35  ELECTRONIC DEVICES AND CIRCUITS

COURSE OUTCOMES
Upon completion of the course, students will be able to
• Acquire basic knowledge about semiconductor devices and their implementation
• Design and analyze amplifiers, oscillators and wave generators using BJT and FET
• Design power amplifiers and how to implement them in circuits
• Design fixed and variable regulated power supply with various current range

UNIT I   DIODES
Diode applications: HWR –FWR– power supply filters –diode clipping and clamping circuits.
Special purpose diodes: Zener diodes – zener diode applications– Varactor diode– LED–photodiode – Schottky diode – Tunnel diode

UNIT II  BJTs
BJT amplifiers: CE, CC and CB amplifiers– Small signal low frequency transistor amplifier circuit -h parameter representation of a transistor – Analysis of single stage transistor amplifier using parameters voltage gain, current gain, input impedance and output impedance –Multistage RC coupled Amplifiers –Transformer coupled amplifier- frequency response of amplifiers

UNIT III  FETs
Field-EffectTransistors: JFET characteristics and parameters – JFET biasing, self bias, voltage divider bias – Q point stability over temperature – MOSFET D-MOSFET, E-MOSFET-MOSFET characteristics and parameters – MOSFET biasing – Introduction to FinFET.
FET amplifiers: JFET/Depletion MOSFET small signal model – small signal analysis of CS, CD and CG amplifiers – Frequency response of amplifiers

UNIT IV  POWER AMPLIFIERS AND FEEDBACK AMPLIFIERS
Feedback amplifiers: Positive feedback– Advantages of Negative feedback –Voltage / current, series / shunt feedback amplifiers

UNIT V  REAL TIME APPLICATIONS AND SPECIAL DEVICES
Sinusoidal signal generators: Oscillator – Condition for oscillation – Phase shift - Wein Bridge – Hartley - Colpitts and crystal oscillators.
Square wave generators: Multivibrators –Schmitt triggers
Power supply unit: linear regulator power supply – switched mode power supply – low drop out regulator
Special devices: Characteristics and applications of UJT, SCR, DIAC, TRIAC.

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS
REFERENCES

13EI36            C++ AND DATA STRUCTURES          L T P C
                                    3  0  0  3

COURSE OUTCOMES
Upon successful completion of this course, the students will be able to

- Recognize and use object oriented programming constructs to write object oriented programs
- Describe encapsulation, polymorphism and inheritance.
- Identify the suitable data organization structure and its implementation methods.
- Analyze the importance of self-balancing trees for effective organizing the data.
- Enumerate the systematic way of solving problems.

UNIT I  PRINCIPLES OF OBJECT ORIENTED PROGRAMMING                      9
Introduction – Tokens – Expressions - C++ classes and objects - constructors and destructors - operators overloading and type conversions.

UNIT II  ADVANCED OBJECT ORIENTED PROGRAMMING                             9
Inheritance, Extending classes, Pointers, Virtual functions and polymorphism, File handling, Templates, Exception handling, Manipulating strings.

UNIT III  LINEAR DATA STRUCTURES                                           9
Lists, Stacks and queues: Array and linked list implementation of List, Stack, Queue – Applications of List – Polynomial addition – sparse matrix – Applications of stack – Infix to Postfix – Evaluation of expression – Function calls.

UNIT IV  NONLINEAR DATA STRUCTURES                                         9

UNIT V  SORTING AND SEARCHING                                              9

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
13E137 ELECTRONIC DEVICES AND CIRCUITS LABORATORY

COURSE OUTCOMES
Upon completion of the course, students will be able to
- Analyze the characteristics of two terminal and three terminal semiconductor devices.
- Use the modern virtual instrumentation kits to study the characteristics of devices and its applications.
- Design, test and implement the amplifiers and oscillators using BJT and FET.

EXPERIMENTS
1. Characteristics of Semiconductor diode and Zener diode
2. Characteristics of Transistor in Common Emitter, Common Collector, and Common Base Configuration
3. Characteristics of FET
4. Characteristics of SCR and UJT
5. Photodiode, photo transistor Characteristics and study of light activated relay circuit
6. Single phase half wave and full wave rectifiers with inductive and capacitive filters using Educational laboratory virtual instrumentation suite
7. Amplifier design using BJT
8. Differential amplifier using FET
9. Realization of Passive filters
10. Design of sinusoidal wave generator using BJT
11. Study of simulation experiments

TOTAL: 45 PERIODS
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
• Implement common data structures, such as trees, lists.
• Design and apply appropriate data structures for solving computing problems.
• Develop the appropriate objects required to solve a programming problem.
• Practice exception handling mechanisms to handle runtime errors.
• Solve problems using advanced object-oriented concepts like inheritance, polymorphism, and
  generic programming.

LIST OF EXPERIMENTS
1. Design C++ classes with static members, methods with default arguments, friend functions.
   (For example, design matrix and vector classes with static allocation, and a friend function to
do matrix-vector multiplication).
2. Develop C++ class hierarchy for various types of inheritances.
3. Implement Matrix class with dynamic memory allocation and necessary methods. Give proper
   constructor, destructor, copy constructor and overloading of assignment operator.
4. Design a simple application to demonstrate dynamic polymorphism and RTTI.
5. Design stack and queue classes with necessary exception handling
6. Implement singly and doubly linked lists.
7. Represent a polynomial as a linked list and write functions for polynomial addition.
8. Implement stack and use it to convert infix to postfix expression.
9. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
10. Implement binary search tree and AVL Tree.

TOTAL: 45 PERIODS

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

HARDWARE:
• 30 Personal Computers with Pentium III or Pentium IV
• RAM – 256 MB or higher
• Hard disk – 40 GB or higher

SOFTWARE:
• Turbo C ++(freeware) – to be installed in all PCs
• OS – Linux (or) Windows 2000/ Windows XP/ NT.
13EI41    NUMERICAL METHODS AND PROBABILITY    L  T  P  C
3   1   0   4

COURSE OUTCOMES
On the successful completion of the course, the students should be able to

- Solve the linear and non-linear algebraic equations using Numerical methods
- Find the solution of differential equations using Numerical methods
- Interpolate and approximate polynomials
- Apply the sampling Distributions to Engineering problem
- Understand the concept of Correlations and regressions

UNIT I  SOLUTION OF ALGEBRAIC EQUATIONS    12

UNIT II  INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION    12
Lagrange’s and Newton’s divided difference interpolation – Newton’s forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials- Numerical integration using Trapezoidal and Simpson’s 1/3 rules.

UNIT III  NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS    12

UNIT IV  PROBABILITY    12
Mean – Median – Mode - Standard Deviation – Probability - Conditional probability (Definitions only). One dimensional Random variable - Moments – Moment generating function and its properties - Discrete and Continuous distributions- Binomial, Poisson and Normal distributions.

UNIT V  TWO DIMENSIONAL RANDOM VARIABLES    12
Two dimensional Random variables – Covariance - Correlations and Regressions.

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EI42  INDUSTRIAL INSTRUMENTATION – I  L T P C  3 0 0 3

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

- Explain the working of pressure measurements.
- Define the need of temperature transducer in industries.
- Apply thermocouple for different temperature applications.
- Define the basic principle of speed and torque measurements.
- Describe the features of density measurements.

UNIT I  MEASUREMENT OF FORCE, TORQUE AND SPEED  9
Electric balance - Different types of load cells - Hydraulic, Pneumatic, strain gauge- Magnetoelastic and Piezoelectric load cells, Different methods of torque measurement; Strain gauge, Relative angular twist, Speed measurement-Capacitive tacho, Drag cup type tacho-D.C and A.C tacho generators, Stroboscope.

UNIT II  MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY  9
Accelerometers - LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers - Mechanical type vibration instruments, Seismic instruments as accelerometer, Vibration sensor, Calibration of vibration pickups, Units of density and specific gravity, Baume scale and API scale, Pressure type densitometers - Float type densitometers, Ultrasonic densitometer, gas densitometer

UNIT III  PRESSURE MEASUREMENT  9
Units of pressure, Manometers, different types, Elastic type pressure gauges, Bourdon tube, bellows and diaphragms, Electrical methods - Elastic elements with LVDT and strain gauges, Capacitive type pressure gauge, Piezo resistive pressure sensor, Resonator pressure sensor, Measurement of vacuum-McLeod gauge, Thermal conductivity gauge, Ionization gauges, Cold cathode type and hot cathode type, calibration of pressure gauges, Dead weight tester.

UNIT IV  TEMPERATURE MEASUREMENT  9
Definitions and standards - Primary and secondary fixed points - Calibration of thermometers, Different types of filled in system thermometers - Sources of errors in, filled in systems and their compensation, Bimetallic thermometers, RTD - characteristics and signal conditioning-3 lead and 4 lead RTDs - Thermistors.

UNIT V  THERMOCOUPLE AND RADIATION PYROMETER  9
Thermocouples - Laws of thermocouple, Fabrication of industrial thermocouples, Signal conditioning for thermocouple, isothermal block reference junctions, Commercial circuits for cold junction compensation, Response of thermocouple, Special techniques for measuring high temperature using thermocouple, Radiation fundamentals, Radiation methods of temperature measurement, Total radiation pyrometers, Optical pyrometers, Two colour radiation pyrometers - Fiber optic sensor for temperature measurement.

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

13E143 ELECTRICAL AND ELECTRONIC MEASUREMENTS

L T P C
3 1 0 4

COURSE OUTCOMES

Upon completion of the course, students will be able to

• Understand the operation of electrical instruments, various measurement techniques and the concept of identification and minimization of errors in particular measurement situations.
• Describe the measurement techniques of Power, Energy and Flux density.
• Explain the prospective ideas about Potentiometer & Instrument transformers and to extend the views in resistance measuring methods, inductance and capacitance measurement.
• Know the electronic measurement techniques of voltage, frequency etc.

UNIT I MEASUREMENT OF VOLTAGE AND CURRENT


UNIT II MEASUREMENT OF POWER, ENERGY AND FLUX DENSITY


UNIT III POTENTIOMETERS AND INSTRUMENT TRANSFORMERS

DC potentiometer: Basic circuit, standardization, Laboratory type (Crompton’s) – AC potentiometers: Drysdale (polar) type, Gall-Tinsley (coordinate) type – Applications of DC and AC potentiometers – Leeds Northrup self balancing potentiometer – Instrument Transformers: C.T and P.T – construction, theory, operation and characteristics.

UNIT IV MEASUREMENT OF R,L,C


UNIT V ELECTRONIC MEASUREMENTS


L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS


REFERENCES

13EI44  CONTROL SYSTEMS  L  T  P  C
3  1  0  4

COURSE OUTCOMES
Upon completion of the course, students will be able to
• Analyze the performance of linear feedback control systems.
• Describe the transient and steady state response of linear systems
• Investigate the stability Analysis of linear control systems
• Describe the concepts of frequency domain analysis in control engineering
• Analyze the various types of compensator design in control Systems

UNIT I  MODELING OF PHYSICAL AND ELECTRICAL SYSTEM  12
Concepts of typical Control system – Open loop and closed loop control system - Applications –
Transfer function- Mathematical modeling of electrical systems, mechanical systems- Electrical
analogy of mechanical translational and mechanical rotational system – Transfer function model of
D.C Servo motor and A.C servomotor – Block diagram reduction technique - Signal flow graph
representation using Mason’s gain formula.

UNIT II  TIME RESPONSE ANALYSIS  12
Time response and its classification- Standard test signals – Time response of First order and Second
order system , Time domain specifications – delay time, rise time, peak time, settling time, peak
overshoot. Steady state error and error constants- position, velocity and acceleration error constants –
Generalized error series- P, PI, PID modes of feed back control.

UNIT III  STABILITY OF CONTROL SYSTEM  12
Characteristics equation – Routh Hurwitz criterion of stability- Absolute and Relative stability -
Concepts of Root Locus – Design procedure and construction of root locus technique .

UNIT IV  FREQUENCY DOMAIN ANALYSIS  12
Frequency domain specifications - Bode plot - Polar plot – Determination of gain margin and phase
margin from Magnitude and phase angle plot - Nyquist stability criterion – Correlation between
frequency domain and time domain specifications.

UNIT V  COMPENSATOR DESIGN  12
Performance criteria - Lag, Lead, Lag Lead networks – compensation design using Bode Plot and root
locus - Introduction to state variable representation of continuous time system.

L: 45  T: 15, TOTAL: 60 PERIODS

TEXT BOOKS
2007.

REFERENCES
13EI45 ELECTRICAL MACHINES

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Explain the principle of operation of a DC Machine
- Compare the different types of transformer and derive its EMF equation
- Explain the principle of operation of synchronous machine with its starting methods
- Derive the transformer equivalent circuit of an Induction motor
- Analyze the different types of single phase machines

UNIT I D.C. MACHINES

Construction of D.C. Machines - Principle and theory of operation of D.C generator - EMF equation - Armature reaction - Principle of operation of D.C Motor - Torque equation - Types of D.C. Motors - Starters - Speed control of D.C Motors.

UNIT II TRANSFORMERS


UNIT III SYNCHRONOUS MACHINES


UNIT IV INDUCTION MACHINES

Induction motor - Construction and principle of operation, Classification of induction motor, Torque equation - Equivalent Circuit- Starting methods and Speed control of induction motors.

UNIT V SPECIAL MACHINES


TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

13EI46 DIGITAL SYSTEM DESIGN AND APPLICATIONS L T P C
3 1 0 4

COURSE OUTCOMES
Upon completion of the course, students will be able to
- Build the basics of digital systems design with a focus on FPGA design.
- Design the combinational and sequential hardware system.
- Describe the Testing in digital circuits and testability

UNIT I DIGITAL LOGIC FAMILIES
TTL, CMOS, NMOS, Dynamic MOS, ECL, 1L, Operating conditions, Parameters, Interpreting data sheets. Power supply grounding considerations for digital ICs, TTL – to – CMOS Interface, CMOS – to – TTL interface.

UNIT II DIGITAL MEMORIES
The role of Memory in a system – memory types and terminology – ROM – types of ROM – RAM – SRAM – DRAM – Expanding word size and capacity – Applications.

UNIT III SYSTEM DESIGN USING PLDs AND CPLDs
Structure of Standard PLDs and Complex PLDs (CPLDs) – Design of combinational and sequential circuits using PLDs and CPLDs – Design of state machines using Algorithmic State Machines (ASM) chart as a design tool.

UNIT IV INTRODUCTION TO FIELD PROGRAMMABLE DEVICES
Field programmable combination devices, Field programmable logic sequences, Types of FPGA – Xilinx XC2000 & XC3000 series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) – Input/Output Blocks (IOB) – Programmable Interconnection Points (PIP).

UNIT V TESTING IN DIGITAL CIRCUITS AND DESIGN FOR TESTABILITY

L: 45 T: 15, TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13E147    TRANSUCERS AND MEASUREMENTS LABORATORY    L T P C
          0 0 3 2

COURSE OUTCOMES

Upon completion of the course, students will be able to

- Observe the principles of operation of sensors and transducers.
- Demonstrate and analyze the practical concepts about different sensors and transducers which are useful for measuring process parameters through experimentation.
- Design the measurement system and criticize the output for the measurement of resistance, capacitance and inductance.

LIST OF EXPERIMENTS

2. Characteristics of Strain gauge and Load cell.
3. Characteristics of LVDT, Hall effect transducer and Photoelectric tachometer.
4. Characteristic of LDR
5. Characteristics of RTD, thermistor and thermocouple
6. Step response characteristics of RTD, thermocouple and thermistor.
13. Study of smart transducers.

TOTAL: 45 PERIODS
13E148  ELECTRICAL MACHINES AND CONTROL SYSTEMS  L T P C
LABORATORY  0 0 3 2

COURSE OUTCOMES
Upon completion of the course, students will be able to
- Describe the performance of DC shunt generators under load/no load conditions
- Compare the characteristics of different types of DC motors and induction motors under loaded conditions
- Analyze the performance of transformers on no load/load conditions
- Analyze the linear systems and controllers using Software Package.
- Determine the transfer functions of DC generator and DC motor.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of separately excited and self excited D.C. generator.
2. Load test on D.C. shunt motor.
3. Swinburne’s test and speed control of D.C. shunt motor.
4. Load test on single phase transformer and open circuit and short circuit test on single phase transformer
5. Regulation of three phase alternator by EMF and MMF methods.
7. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
10. Stability Analysis of Linear system.
11. Study the effect of P, PI, PID controllers.

TOTAL: 45 PERIODS
13E149 COMMUNICATION SKILLS AND TECHNICAL SEMINAR L T P C 0 0 3 2

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

- Express themselves fluently and appropriately in social and professional contexts.
- Develop the sub-skills required for paper presentations and group discussions.
- Acquire the soft skills and interpersonal skills which will help them to excel in their workplace.

A) LANGUAGE FUNCTIONS (15 hrs)
1. Compare and contrast
2. Giving reasons
3. Reporting
4. Expressing agreement and disagreement
5. Evaluating different standpoints
6. Analyzing a problem and giving solution.
7. Describing daily routines, events, and weather
8. Describing Objects
9. Defending a point of view
10. Talking about future plans and intentions

Language Functions:
The teacher should build micro activities to develop the use of language required to handle these Sub-functions of communication. In the process, the learners should get used to the linguistic. Elements needed for these functions.

B) SPEECH PRACTICE (15 hrs)
The themes are:
1. Cloning
2. Artificial satellites
3. Renewable sources
4. Telecommunication
5. Cyber Revolution
6. Space research
7. Polythene pollution
8. Fossil fuels
10. Ecological threats
11. Water resources
12. Nuclear technology
13. Scientific farming
14. Thermal power plants
15. Nano Technology
16. Robotics
17. Artificial intelligence
18. Role of Fibre Optics
19. Exploration of Mars
20. Gas turbines
21. Indian space missions
22. Converting agricultural wastes for useful purposes
23. Developments in transportation
24. Scientific Farming
25. Impact of global warming
26. Desalination of water
27. Technology for national security
28. Industrial development and ecological issues
29. Recent trends in Automobiles
30. Hazards of E-waste
31. Mobile Jammer
32. Touch Screen Technology
33. Tidal Power
34. 3G Technology
35. Tsunami Warning System
36. Blue Tooth Technology

Seminar presentation on the themes allotted:
Each student should collect materials from Books, Internet, Journals and Newspapers for his/her theme and prepare a short Seminar Paper for 4 to 5 Pages. The presentation should be for 10 minutes using power point frames. It should be followed by a Viva Voce during which others should come forward to question, clarify, supplement or evaluate.

C) GROUP DISCUSSION / DEBATE (10hrs)
Grouping (each group consisting of 12 members)
Topics (12 topics – 3 topics to be selected by each group - to be practiced in cycles)

Group Discussion / Debate Topics:
1. Advertising is a legalized form of lying - Discuss.
2. Communicative competency in English is the golden key for success in the Global arena.
3. Is it just to force people to retire?
4. Attitude decides one’s altitude in life.
5. Should an aspiring student go for a course which is in demand or for a course which he/she likes?
6. Is westernization a cultural degradation or enrichment?
7. Is Brain drain a threat to India?
9. Do Mobile phones spoil the youth?
10. No two generations see eye to eye- Discuss.
11. Is scientific advancement a boon or a bane?
12. Does ragging develop friendship?

D) SPEAKING ON THE GIVEN PICTURE/DIAGRAM/CHART/TABLE (5 hrs)
RECORD LAY OUT:
Every student has to maintain a record in which he/she has to incorporate the following details.
- First page containing learner details and the topic of specialization
- Use of appropriate Language used in Language Function should be listed.
- Three newspaper cuttings or journal or internet sources related to the specialized theme. (To be pasted on the pages)
- 10 Quiz questions of the specialized topic with expected answers.
- The seminar paper presented by the learner (to be pasted).
- Notes of observation - Lab. (Details about Interview skills – GD – Soft skills )
- The record should be duly signed by the course teacher and submitted to the External Examiner for verification during the semester practical.

REFERENCES
COURSE OUTCOMES

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

CO1: outline the importance of instrumentation in industrial processes
CO2: explain the theory and operation of flow, level, viscosity, humidity and moisture measuring instruments.
CO3: compare available types of industrial instruments and made the proper selection for application under consideration.
CO4: explain the procedures for calibration of flow meters.
CO5: solve fundamental problems related to: flow, level, viscosity, Humidity and moisture.
CO6: participate in class discussions.

UNIT I VARIABLE HEAD TYPE FLOW METERS

Variable head type flow meters: - Orifice plate, Venturi tube, Flow nozzle and Dall tube – Installation of head flow meters – Conditioning Orifice Plates- Pitot tube.

UNIT II QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS


UNIT III ELECTRICAL TYPE FLOW METER


UNIT IV LEVEL MEASUREMENT

Level measurement:- Float, Displacer type and Bubbler system – Electrical level gauge:- Resistance and Capacitance – Nuclear radiation - Ultrasonic level transmitters - Guided Wave Radar Level Transmitters – vibration and microwave level switches – Boiler drum level measurement. Leading manufacturers of flow and level instruments with specifications. (Non-descriptive).

UNIT V MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE

Viscosity:- Say bolt viscometer and Rotameter type viscometer – Consistency meters – Dry and wet bulb psychrometers – Hot wire electrode type hygrometer, Dew cell and Electrolysis type hygrometer – Commercial type dew point meter – Moisture measurement:- Different methods of moisture measurements- Moisture measurement in Instrument air supply.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS


REFERENCES


E-LEARNING RESOURCES

2. Industrial Flow measurement:http://eprints.hud.ac.uk/5098/1/macrabtreefinalthesis.
13EI52 INTEGRATED CIRCUITS AND APPLICATIONS  

COURSE OUTCOMES

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

CO1: explain the IC fabrication procedure and the characteristics of Operational Amplifiers.

CO2: design the circuits for signal analysis and describe the applications of Op-amp ICs.

CO3: illustrate the internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.

UNIT I  IC FABRICATION  12

Brief overview of microelectronic fabrication technology—Epitaxial Growth, masking and etching, Diffusion, Ion Implantation Processes—Description—Difference between discrete and integrated BJTs—cross-section of a MOSFET (enhancement and depletion type)—NMOS—PMOS—CMOS. Realization of monolithic ICs and packaging.

UNIT II  CHARACTERISTICS OF OPERATIONAL AMPLIFIER  12


UNIT III  APPLICATIONS OF OPERATIONAL AMPLIFIER  12


UNIT IV  SPECIAL ICs  12

555 Timer circuit—Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs

UNIT V  APPLICATION ICs  12

IC voltage regulators—LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

L:45 T:15 TOTAL: 60 PERIODS

TEXT BOOKS


REFERENCES


13EI53 INDUSTRIAL MICROCONTROLLERS AND APPLICATION

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: learn importance of microcontroller in designing embedded applications
CO2: learn use of hardware and software tools
CO3: develop interfacing to real world devices

UNIT I  INTRODUCTION TO MICROCONTROLLERS
8 bit Microprocessor and Microcontroller architecture, comparison, advantages and applications of
each Harvard and Von Neumann architecture, RISC and CISC comparison. Survey of 8 bit
controllers and its features. Definition of embedded system and its characteristics. Role of
microcontroller in embedded system. Software and hardware tools for development of
microcontroller based system such as assembler, compiler, IDE, Emulators, debugger, programmer,
development board.

UNIT II  8051 MICROCONTROLLER ARCHITECTURE
MCS-51 architecture, family devices & its derivatives. Port architecture, memory organization,
Interrupt structure, timers and its modes & serial communication and modes. Overview of Instruction
set.

UNIT III  PIC MICROCONTROLLER ARCHITECTURE
PIC18f architecture, registers, memory Organization and types, stack, oscillator options, BOD, power
down modes and configuration bit settings. Port structure, interrupt structure & timers of PIC18F.
Brief summary of Peripheral support Overview of instruction set, MPLAB IDE & C18 Compiler.

UNIT IV  PIC MICROCONTROLLER PROGRAMMING
MSSP structure, UART, SPI, I2C, ADC, Comparators Interfacing serial port, ADC, RTC with I2C
and EEPROM with SPI. Use of timers with interrupts,PWM generation. All programs in embedded C.

UNIT V  PIC MICROCONTROLLER APPLICATIONS
Interfacing of switches, LED, LCD, Keypad, All programs in embedded C. Design of DAS system,
Design of frequency counter with display on LCD, Design of Digital Multimeter, Design of DC
Motor control using PWM Should cover necessary signal conditioning of input stage, hardware
interfacing with PIC Microcontroller and algorithm or flowchart.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS
1. K.J. Ayala, “The 8051 Microcontroller architecture, programming & Applications”, Penram
   Internal publishing (India), 2014.

REFERENCE

E-LEARNING RESOURCES
1. 18F xxx reference manual- www.microchip.com
2. I2C,EEPROM,RTC data sheets from www.ti.com
13EI54 MODERN CONTROL SYSTEMS

COURSE OUTCOMES

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

CO1: solve ordinary differential equations using Laplace Transformation and Inverse Laplace transformation.
CO2: describe the concept of sampling, digital data and discrete time systems.
CO3: model first and second-order linear dynamic systems such as mechanical, electrical and thermal-fluid systems.
CO4: determine stability analysis for the various dynamic systems.

UNIT I STATE SPACE ANALYSIS OF CONTINUOUS TIME SYSTEMS

State variable representation – State model of linear system, Conversion of state variable form to transfer function, State space representation using physical, phase and canonical variables, Eigen values and Eigenvectors – Solution of state equation – Concepts of controllability and observability.

UNIT II TRANSFORM AND SAMPLED DATA SYSTEMS


UNIT III STATE SPACE ANALYSIS OF DISCRETE TIME SYSTEMS

State variables – Canonical forms – Digitalization – Solution of state equations – Controllability and Observability – Effect of sampling time on controllability – Pole placement by state feedback – Linear observer design – First order and second order problems.

UNIT IV DIGITAL CONTROL


UNIT V NONLINEAR SYSTEMS


TEXT BOOKS


REFERENCES


E-Learning Resources

1. http://nptel.ac.in/courses/108103008/
13E155  PROFESSIONAL ETHICS AND HUMAN VALUES
(Commmmon to all branches)

COURSE OUTCOMES
Upon completion of this course, the student will be able to
CO1: Understood the core values that shape the ethical behavior of an engineer
CO2: Exposed awareness on professional ethics and human values.
CO3: Known their role in technological development

UNIT I  HUMAN VALUES
Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for
Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT II  ENGINEERING ETHICS
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral
autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of
Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical
theories.

UNIT III  ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced
outlook on law - the challenger case study

UNIT IV  SAFETY, RESPONSIBILITIES AND RIGHTS
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile
island and chernobyl case studies. Collegiality and loyalty - respect for authority - collective
bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee
rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V  GLOBAL ISSUES
Multinational corporations - Environmental ethics - computer ethics - weapons development -
engineers as managers-consulting engineers-engineers as expert witnesses and advisors -Moral
leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian
Institute of Materials Management, Institution of electronics and telecommunication engineers
(IETE),India, etc.

L: 45, TOTAL: 45 PERIODS

TEXT BOOKS
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India,
   New Delhi, 2004.
3. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey,
   2004 (Indian Reprint)

REFERENCES
   and Cases”, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
13EI56  COMMUNICATION SYSTEMS  

COURSE OUTCOMES

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

- CO 1: Explain the basic concepts of Analog transmission and reception techniques.
- CO 2: Discuss the fundamental concepts of Digital Communication.
- CO 3: Describe the concepts of telemetry system.

UNIT I  AMPLITUDE MODULATION

Principles of amplitude modulation – AM envelope, frequency spectrum and bandwidth, modulation index and percent modulation, AM power distribution, AM modulator circuits – low level AM modulator, medium power AM modulator, AM transmitters – low level transmitters, high level transmitters, Receiver parameters. AM reception: AM receivers – TRF, Superheterodyne receivers, Double Conversion AM receivers.

UNIT II  ANGLE MODULATION

Angle Modulation – FM and PM wave forms, phase deviation and modulation index, frequency deviation, phase and frequency modulators and demodulators, frequency spectrum of a angle modulated waves, Bandwidth requirement, Broadcast band FM, Average power FM and PM modulators – Direct FM and PM, Direct FM transmitters, Indirect transmitters, Angle modulation Vs. amplitude modulation. FM receivers: FM demodulators, PLL FM demodulators, FM noise suppression, Frequency Vs. phase Modulation.

UNIT III  PULSE MODULATION

Pulse modulations – concepts of sampling and sampling theorems, PAM, PWM, PPM, PTM, quantization and coding: PCM, DM, slope overload error. ADM, DPCM

UNIT IV  DIGITAL MODULATION

Introduction, Binary PSK, DPSK, Deferentially encoded PSK, QPSK, M-ary PSK, QASK, Binary FSK, MSK, Duo-binary encoding – Performance comparison of various systems of Digital Modulation.

UNIT V  BIOMEDICAL TELEMETRY SYSTEM

Components of telemetry system, Bio-telemetry and its importance, Single and multi-channel biotelemetry, ECG telemetry system, Temperature telemetry system, Telemetry of Respiration, Multi-patient telemetry, Implantable telemetry for blood pressure and blood flow systems, transmission of analog physiological signals over telephone line, Essential parameter for telemedicine and applications.

L:45 TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

13E157        INDUSTRIAL MICROCONTROLLERS LABORATORY

L  T  P  C
0  0  3  2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: capable for programming in the microcontroller
CO2: interface the real world input and output signal

LIST OF EXPERIMENTS

1. Study of PIC Microcontroller Kit
2. Write a program for interfacing button, LED, relay & buzzer as follows
   • when button 1 is pressed relay and buzzer is turned ON and LED’s start chase from left to right
   • when button 2 is pressed relay and buzzer is turned OFF and LED start chasing from right to left
3. To display message on LCD without using any standard library function.
4. Interfacing 4X4 keypad and displaying key pressed on LCD OR on HyperTerminal.
5. Generate square wave using timer with interrupt
6. Interfacing serial port with PC both side communication.
7. Interfacing DS1307 RTC chip using I2C and display date and time on LCD
8. Interfacing EEPROM 24C128 using SPI to store and retrieve data
9. Interface analog voltage 0-5V to internal ADC and display value on LCD
10. Generation of PWM signal for DC Motor control.

P:45 TOTAL: 45 PERIODS
13EI58  LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY  L  T  P  C
0  0  3  2

COURSE OUTCOMES

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

CO1: demonstrate the linear and digital integrated circuits used in simple system configuration.
CO2: design the circuits for signal analysis using Op-amp ICs.

LIST OF EXPERIMENTS

1. Study of Basic Digital IC’s. (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF, D FF)
2. Implementation of Boolean Functions, Adder/Subtractor circuits.
3. Code converters, Parity generator and parity checker, 2s Complement, Encoders and Decoders using suitable IC’s.
4. Counters: Design and implementation of 4-bit modulo counter.
5. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC’s.
6. Multiplexer/De-multiplexer: Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer
7. Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.
9. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC’s.
10. Study of VCO and PLL ICs:
   i. Voltage to frequency characteristics of NE/SE 566 IC.
   ii. Frequency multiplication using NE/SE 565 PLL IC.

P:45 TOTAL: 45 PERIODS
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: model the real time process
CO2: design the controller
CO3: determine the controller parameter
CO4: implement the complex control loop with suitable final control element

UNIT I INTRODUCTION TO PROCESS CONTROL 12

UNIT II CHARACTERISTICS OF CONTROLLER 12

UNIT III ANALOG CONTROLLER AND TUNING 12
Electronic controllers to realize various control actions – Pneumatic Controllers – Simple performance criteria – IAE, ISE, ITAE and ¼ decay ratio –select the type of feedback controller – Tuning of controllers – Ziegler-Nichol’s method and Cohen Coon method.

UNIT IV CONTROL SYSTEMS WITH MULTIPLE LOOPS 12
Cascade control – Feed forward control – Ratio control – Selective control systems – Split range control – Adaptive and inferential control - Case study of control schemes of binary distillation column.

UNIT V FINAL CONTROL ELEMENT 12
Final control operation – Signal conversion - I/P converter – Pneumatic and electric actuators – Classification of control valves – Valve positioner – Control valves characteristics –Control valve sizing – Cavitations and flashing – Selection of control valves.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

E-LEARNING RESOURCES
2. http://elearning.vtu.ac.in/06IT64.html
13EI62  ANALYTICAL INSTRUMENTATION

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO1: describe the various techniques and methods of spectral analysis which occur in the various regions of the spectrum.

CO2: apply knowledge in the analysis of separation of components in a complex mixture using chromatographic techniques and also in the determination of elements in a chemical analysis using electromagnetic resonance techniques.

CO3: extend their views in the qualitative and quantitative estimation of industrial gases and also in the control of environmental pollution.

CO4: outline the latest ideas on Ion-selective electrodes, Radiation detectors and Microscopic techniques which have potential applications in chemical analysis for identifying the components.

UNIT I  COLORIMETRY AND SPECTROPHOTOMETRY

UNIT II  CHROMATOGRAPHY AND ELECTROMAGNETIC RESONANCE TECHNIQUES

UNIT III  INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS

UNIT IV  pH METERS AND RADIATION DETECTORS

UNIT V  MICROSCOPIC TECHNIQUES

L: 45  TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCE

E-LEARNING RESOURCE
1. http://www.chemistryland.com/CHM130FieldLab/Lab2/Lab2.html
13EI63  DIGITAL SIGNAL PROCESSING TECHNIQUES  

L  T  P  C
3  1  0  4

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: classify the different types of signals and systems.
CO2: describe the different transforms and analyze the discrete time signals and systems.
CO3: realize the use of LTI filters for filtering different real world signals.

UNIT I  INTRODUCTION  12
Mathematical representation of Continuous and discrete time signals: Classification of Signals – Periodic, Aperiodic, even, odd, energy and power signals, Deterministic and random signals, complex exponential and sinusoidal signals, periodicity, spectral density. Sampling theorem in time domain, sampling of analog signals, DT signals, Classification of the discrete time systems with its properties.

UNIT II  Z TRANSFORM  12
Need for transform, relation between Laplace transform and Z transform, Properties of ROC and properties of Z transform, Relation between pole locations and time domain behavior, causality and stability considerations for LTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations.

UNIT III  DISCRETE FOURIER TRANSFORMS  12
DFT, Properties of DFT, circular convolution, linear convolution, Computation of linear convolution using circular convolution, FFT, decimation in time and decimation in frequency using Radix-2 FFT algorithm.

UNIT IV  FILTER DESIGN  15
IIR Filter Design: Concept of analog filter design, Design of IIR filters from analog filters, IIR filter design by approximation of derivatives, IIR filter design by impulse invariance method, Bilinear transformation method, warping effect. Characteristics of Butterworth filters and Chebyshev filters, Butterworth filter design.
FIR Filter Design: Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using windows and frequency sampling method.
Filter realization using direct form, cascade form and parallel form

UNIT V  INTRODUCTION OF DIGITAL SIGNAL PROCESSOR AND APPLICATIONS  09
Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing. General Architecture of DSP, Case Study of TMS320C67XX. Application of DSP to Voice Processing, Music processing and Image processing.

L: 45 T:15 TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES
13EI64 BIOMEDICAL INSTRUMENTATION

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO1: name and explain the organs of Nervous, cardio vascular and respiratory system of human body.
CO2: classify and select the transducers for biomedical applications.
CO3: explain the working of electrical & non-electrical physiological measurement devices and imaging instruments.
CO4: explain the working of rehabilitation and assisting devices.

UNIT I PHYSIOLOGY AND TRANSDUCERS

UNIT II ELECTRO-PHYSIOLOGICAL MEASUREMENT

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENT

UNIT IV MEDICAL IMAGING AND TELEMETRY

UNIT V REHABILITATION AND ASSISTIVE DEVICES
Rehabilitation: Definition, Introduction to Concept of Rehabilitation, Types of rehabilitation: Sensory & Motor rehabilitation. Electronic Travel Appliances (ETA) : Path Sounder, Ultrasonic Torch, Nottingham Obstacle Sensors, Polarized Ultrasonic Travel aids, Materials used for wheel chairs, Type of Wheel Chairs, Tricycle, Walkers. Types and working of Pacemakers – Defibrillators – Diathermy – Heart Lung machine.

L: 45 T:15 TOTAL:60 PERIODS

TEXT BOOKS

REFERENCES
13EI65 PRODUCT DESIGN AND DEVELOPMENT  
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**COURSE OUTCOMES**

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

- **CO1**: illustrate Product development design and theories in developing a product.
- **CO2**: infer different process and plans involved in Product development.
- **CO3**: explain Scopes in identifying Customer needs and Technical Process in Product development.
- **CO4**: select different concepts in Product design, selection and testing.
- **CO5**: outline the concepts of Intellectual Property Rights, Patents.

**UNIT I  INTRODUCTION**  
9

**UNIT II  PRODUCT DEVELOPMENT & PLANNING**  
9
**Product Development Process:**

**Product Planning:**
Product Planning Process, Four Types of Project Development Project-Process, Identify Opportunities, Evaluate & Prioritize Project, Allocate Resources and Plan Timing, Complete Pre-Project Planning.

**UNIT III  SCOPES IN PRODUCT DEVELOPMENT**  
9
**Technical & Business Concern:**

**Identifying Customer needs:**
Customer Satisfaction-Gathering Customer needs-Organizing & Prioritizing Customer needs.

**Benchmarking & Engineering Specification:**
Benchmarking Approach-Examples of Benchmarking: Coffee Mills

**UNIT IV  CONCEPT-GENERATION, SELECTION & TESTING**  
9
**Concept Generation:**

**Concept Selection:**
Integral part of product Development process-Structured Method-Concept Screening-Concept Scoring-Caveats

**Concept Testing:**
Seven Step Method of Testing a Product-Purpose, Survey Population & Format, Communicate, Customer response, Result analysis

**UNIT V  PROTOTYPING, PATENTS & IPR, PRODUCT DEVELOPMENT ECONOMICS**  
9
**Prototyping:**
Basics-Principles-Technologies-Planning for Prototyping

**Intellectual Property Rights:**
IPR-Overview of Patents-utility Patents-7 step process in preparing a patent

**Product Development Economics:**
Elements of Economic Analysis-Economic Analysis Process (4 step Process)-Qualitative Analysis

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

REFERENCE

E-LEARNING RESOURCE
1. www.nasscom.in
13EI67  COMPUTER CONTROL OF PROCESS LABORATORY  L  T  P  C  0  0  3  2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: analyze the dynamics of different order process in analytically, simulation basis and experimentally
CO2: design and develop the electronic controller
CO3: analyze the closed loop behaviour of various process variable
CO4: implement the complex control loop

LIST OF EXPERIMENTS
1. Dynamics of first and second order systems
2. Simulation of different order processes with and without transportation lag
3. Characteristics of various transmitter
4. Realization of on-off controller using operational amplifier
5. Realization of Proportional controller using operational amplifier
6. Characteristics of control valve with and without positioned
7. Closed loop response of flow control loop
8. Closed loop response of level control loop
9. Closed loop response of temperature control loop
10. Closed loop response of pressure control loop
11. Tuning of controllers
12. Study of complex control system (ratio/cascade/feed forward)

P:45 TOTAL: 45 PERIODS
13EI68  INDUSTRIAL INSTRUMENTATION AND TELEMETRY  L  T  P  C  0  0  3  2

LABORATORY

COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: measure the flow rate using differential pressure flow meters calibrate the variable area flow meter and pressure gauges
CO2: operate analytical instruments for the measurement of pH, Conductivity and absorptivity of a solution.
CO3: construct and demonstrate Amplitude and Frequency modulation using MATLAB.
CO4: perform measurements of Industrial parameters like Viscosity, Level and Torque.

LIST OF EXPERIMENTS
1. Determination of Discharge coefficient of Orifice plate and Venturi meter.
4. UV-Visible Spectrophotometer.
5. Level Measurement using Differential pressure Transmitter.
6. Pressure gauge calibration using Dead Weight Tester.
7. Calibration of Rotameter.
11. Pulse rate/Respiration rate Measurements.
15. Generation of Unit Impulse Signal and Sine Signal.

P:45 TOTAL: 45 PERIODS
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: describe the basic concepts of optical fibres and their properties.
CO2: illustrate principles of optical fibres in Industrial applications
CO3: explain Industrial application and Medical applications in Lasers.

UNIT I  OPTICAL FIBRES AND THEIR PROPERTIES      9
Principles of light propagation through a fibre-Different types of fibres and their properties, fibre characteristics - Absorption losses – Scattering losses - Dispersion-Connectors and splicers – Fibre termination- Optical sources – Optical detectors.

UNIT II  INDUSTRIAL APPLICATIONS OF OPTICAL FIBRES   9

UNIT III  LASER FUNDAMENTALS        9

UNIT IV  INDUSTRIAL APPLICATIONS OF LASERS    9
Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect– Material processing–Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT V  HOLOGRAM AND MEDICAL APPLICATIONS      9

TEXT BOOKS

REFERENCES
13EIAB  EMBEDDED SYSTEMS  L  T  P  C
(Common to EIE and EEE)  3  0  0  3

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO1: describe the general principles of the microprocessor architecture
CO2: describe the general process of embedded system development and important embedded system terminologies
CO3: outline Systems Software Development, device driver development and the operating system concepts
CO4: distinguish real time tasks and scheduling concepts
CO5: develop program for embedded systems.

UNIT I INTRODUCTION TO MICROPROCESSOR ARCHITECTURE  9
Introduction-Instruction word formats-Representation of instructions and data-Addressing techniques-Branch and jump instructions-Flags –Condition codes-Status registers-Subroutine calls-Interrupts-Storage hierarchies-Virtual memory-Cache memory-Pipelined computers-RISC and CISC architecture -Cortex-A15 processor-Arduino controller

UNIT II INTRODUCTION TO EMBEDDED SYSTEM  9
Model of an embedded system-Microprocessor vs Microcontroller-Figures of merit for an embedded system-Classification of microcontroller unit:4/8/16/32 bits-Current trends-The hardware point of view: Microcontroller unit - A popular 8-bit microcontroller unit - Memory for embedded system-Low power design-Pullup and pull down resistors-Examples of embedded system : Mobile phone, Automotive electronics, Biomedical applications.

UNIT III SOFTWARE DESIGN ASPECTS  9
Software development tools: Embedded program development-Downloading the hex file to the non-volatile memory-Hardware simulator-Operating system concepts: Embedded operating system-Network operating system - Layers of an operating system-Functions performed by an operating system - Some terms associated with operating system and computer usage-The kernel-Tasks/Process-Scheduling algorithms-Threads-Interrupt handling-Inter process communication -Task synchronization-Semaphores-Priority inversion

UNIT IV CYPRESS'S PSOC  9
The PsoC family-PSoC1-the internal architecture of PSoC-The digital sub system-GPIO pins-Digital applications using PSoC-The analog section-System resources-PSoC3 and PSoC5- A survey of contemporary real time operating systems : PSOS, VRTX, QNX-Benchmarking real time systems – Basics

UNIT V PROGRAMMING IN EMBEDDED C  9
Getting the most out of C:Integer data types-Mixing data types-Useful typesets -Manipulating bits in memory-Manipulating bits in I/O ports-Accessing memory mapped I/O devices-Structures - Variant access-Mixing C and assembly : Programming in assembly-Register usage conventions-Typical use of addressing options-Instruction sequencing-Procedure call and return-Parameter passing-Retrieving parameters-Embedded C-PIC programming using MPLAB.

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

E-LEARNING RESOURCE
COURSE OUTCOMES

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

CO1: describe the general principles of MOS Technology
CO2: describe the design process of MOS Technology
CO3: outline subsystem design and layout principles of VLSI circuits.
CO4: summarize basic Programming Concepts of HDL.
CO5: develop system design for various FPGA applications.

UNIT I  MOS TECHNOLOGY  9
Introduction to IC Technology- MOS and VLSI Technology -MOS transistors: Enhancement and Depletion mode transistor actions- Fabrication of NMOS, CMOS and BiCMOS transistors-Thermal aspects of processing - BiCMOS Technology - Production of E beam Masks-MOS electrical properties: $I_{DS}$ Vs $V_{DS}$ relationships, Threshold voltage- Trans conductance $g_{m}$, Output conductance and Pull up to pull down ratio determination- BiCMOS Inverters-Latch up in CMOS circuits

UNIT II  DESIGN PROCESSES AND SCALING EFFECTS  9
MOS and BiCMOS circuit design: Stick diagrams- Lambda based design rules-Layout diagrams-Symbolic diagrams-Scaling models-Scaling factors for device parameters-Limitations of scaling-Limits due to sub threshold currents-Limits on logic levels and supply voltage due to noise

UNIT III  SUBSYSTEM DESIGN AND LAYOUT  9
Switch logic-GATA logic: Two input nMOS, CMOS and BiCMOS nand gates-Two input nMOS, CMOS and BiCMOS nor gates - Combinational logic: Parity generator- Multiplexers-Clocked sequential circuits: Two phase clocking-Charge storage-Register elements and Shift register-System considerations: Bus lines arrangements-Pre-charged bus concepts-Power dissipation and Power distribution buses.

UNIT IV  SPECIFICATION USING VERILOG HDL  9
Basic concepts- identifiers- gate primitives- gate delays- operators- timing controls-procedural assignments conditional statements-Data flow and RTL- structural ,gate level, switch level modeling- Design hierarchies-Behavioral and RTL modeling- Test benches-Structural, gate level description of decoder- equality detector- comparator- priority encoder- half adder- full adder- Ripple carry adder- D latch and D flip flop.

UNIT V  SYSTEM DESIGN AND FPGA  9
System Design Examples : Design of eight inputs signed parallel adder/multiplier-Traffic Light Controller- Real Time Clock-Digital Input/ Output Card-FPGA –System design applications using FPGA- Case Studies: FPGA technology for UAV communications and control- FPGA PID Controller

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

E-LEARNING RESOURCES
   Case-Study-of-PID-Control-in-an-FPGA
COURSE OUTCOMES

Upon completion of this course, the students will be able to
CO1: explain the exploration, recovery and separation processes of petroleum industry.
CO2: list all the products of petroleum and their uses.
CO3: use the relevant modern measuring instruments of various parameters in petroleum refinery.
CO4: explain the control loops employed in petroleum industry.
CO5: apply appropriate precautions using safety instruments for process and workers.

UNIT I PETROLEUM PROCESSING

UNIT II OPERATIONS IN PETROLEUM INDUSTRY
Thermal cracking – Catalytic cracking – Catalytic reforming – Polymerisation – Alkylation – Isomerization – Production of ethylene, acetylene and propylene from petroleum.

UNIT III CHEMICALS FROM PETROLEUM PRODUCTS
Methane derivatives – Acetylene derivatives – Ethylene derivatives – Propylene derivatives

UNIT IV MEASUREMENTS IN PETROCHEMICAL INDUSTRY

UNIT V CONTROL LOOPS IN PETROCHEMICAL INDUSTRY
Control loops of catalytic crackers and pyrolysis unit – Control loops of polyethylene production – Control loops of vinyl chloride production – Control loops of PVC production – pollution control Practices in petrochemical sector.

TEXT BOOKS

REFERENCES
13EIAE TESTING AND CALIBRATION OF INSTRUMENTS  

COURSE OUTCOMES

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

CO1: gain knowledge on test measurement
CO2: define key terms related to calibration and interpret the meaning of each
CO3: select the proper calibration procedure
CO4: testing and calibration of different parameters

UNIT I TEST MEASUREMENT INSTRUMENTATION


UNIT II INTRODUCTION TO CALIBRATION


UNIT III CALIBRATION REQUIREMENTS AND SERVICES

Calibration procedure, calibration procedure content, calibration datasheet, P&IDs, loop diagrams, Instrument Specification Forms, Manufacturer’s Specifications, Calibration Intervals, Safety Considerations, Calibration Status Labels, In-House Calibration Services, calibration management and maintenance

UNIT IV TESTING OF INSTRUMENTS

Voltage-Voltmeter, Current-Ammeter and Resistance-Ohmmeter, Temperature-Thermocouple, Pressure-Primary pressure sensing elements-Diaphragm, Bourdon tube

UNIT V CALIBRATION INSTRUMENTATION

Temperature Instrument, Pressure Instrument, Level Instrument, Flow Instrument Calibration

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS


REFERENCES

2. WIKA Handbook Pressure & Temperature Measurement

E-LEARNING RESOURCES

1. http://www.pyro-electric.in
2. support.fluke.com/calibration
COURSE OUTCOMES
Upon completion of this course, the students will be able to
CO1: explain the different airplane control systems
CO2: relate the principles and operation of different aircraft systems.
CO3: describe the principles and operation of Engine systems and auxiliary systems.
CO4: explain the working of instruments used in aircraft system.

UNIT I  AIRPLANE CONTROL SYSTEMS
Conventional Systems - fully powered flight controls - Power actuated systems – Modern control systems - Digital fly by wire systems - Auto pilot system active control Technology.

UNIT II  AIRCRAFT SYSTEMS
Hydraulic systems - Study of typical workable system - components - Pneumatic systems - Advantages - Working principles - Typical Air pressure system – Brake system - Typical Pneumatic power system - Components, Landing Gear systems – Classification.

UNIT III  ENGINE SYSTEMS
Fuel systems for Piston and jet engines - Components of multi engines. Lubricating systems for piston and jet engines - Starting and Ignition systems - Typical examples for piston and jet engines.

UNIT IV  AUXILIARY SYSTEM
Basic Air cycle systems - Vapour Cycle systems, Evaporative vapour cycle systems - Evaporative air cycle systems - Fire protection systems, Deicing and anti icing systems.

UNIT V  INSTRUMENTS

L:45  TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO1: explain the key aspects of biomedical information processing, communication and system standards.

CO2: apply knowledge in the development of health care applications using medical databases.

CO3: extend their views in fulfilling the clinical testing needs of the medical fraternity in a hospital.

CO4: outline the recent advances in computer assisted medical informatics.

UNIT I  INTRODUCTION

UNIT II  CIS and CPR

UNIT III  COMPUTERS IN CLINICAL LABORATORY AND MEDICAL IMAGING
Automated clinical laboratories – Automated methods in hematology, cytology and histology, Intelligent Laboratory Information System – Computerized ECG, EEG and EMG – Computer assisted medical imaging: Nuclear medicine, Ultrasound imaging-Ultrasoundography, Computed X-ray tomography and Radiation therapy planning.

UNIT IV  COMPUTER ASSISTED MEDICAL DECISION-MAKING

UNIT V  RECENT ADVANCES IN MEDICAL INFORMATICS

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCE

E-LEARNING RESOURCE
13EIAH INDUSTRIAL DRIVES AND CONTROL

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO1: explain the fundamentals of electric drives and speed control characteristics.
CO2: analyze various power electronic circuits like converters, choppers, inverters and control circuits for electric drives
CO3: apply various modulation techniques of ac drive and digital techniques for industrial applications
CO4: explain the performance of converter fed and inverter fed motors for industrial applications

UNIT I ELECTRICAL DRIVES
Components of Electric drive system-Types of Electrical Drives (DC & AC)- Motor-Load Dynamics-Speed Torque conventions and multi quadrant operation-Load Torque Components-Nature and classification of Load Torques-Constant Torque and Constant Power operation of a drive-Steady state stability

UNIT II CONVERTER FED DC DRIVES
Single phase and three phases fully controlled converter - Performance of converter fed separately excited DC Motor- Multiquadrant operation of fully controlled rectifier fed motor

UNIT III CHOPPER FED DC DRIVES
Principle of operation and control techniques-Waveforms of various modes of operation of chopper fed DC drives.

UNIT IV INVERTER FED INDUCTION MOTOR DRIVE
Voltage source inverter-Current source inverter-1-phase, 3-phase Non-PWM and 3-phase PWM VSI fed induction motor drives.PWM techniques

UNIT – V DIGITAL CONTROL AND DRIVE APPLICATIONS

L: 45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

E-LEARNING RESOURCES
1. http://electrical-all.blogspot.in/p/power-electronics-basics.html