ANNA UNIVERSITY CHENNAI
CHENNAI - 600 025

UNIVERSITY DEPARTMENTS

REGULATIONS 2012
CURRICULA AND SYLLABI FOR
I TO VIII SEMESTER

B.E. ELECTRONICS AND
INSTRUMENTATION ENGINEERING
(FULL TIME)
Programme Educational Objectives

Bachelor of Electronics and Instrumentation Engineering curriculum is designed to prepare the graduates having attitude and knowledge to

1. have successful technical and professional careers in their chosen fields such as Process Control, Electronics & Information Technology.
2. engross in life long process of learning to keep themselves abreast of new developments in the field of Electronics & Instrumentation

Programme Outcomes

The graduates will have the ability to

a. Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and Instrumentation Engineering.
b. Identify and formulate Instrumentation Engineering problems from research literature and be able to analyze the problem using first principles of Mathematics and Engineering Sciences.
c. Come out with solutions for the complex problems and to design system components or process that fulfill the particular needs taking into account public health and safety and the social, cultural and environmental issues.
d. Draw well-founded conclusions applying the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significant conclusion.
e. Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities like electronic prototyping, modeling and control of systems/processes and also being conscious of the limitations.
f. Understand the role and responsibility of the Professional Instrumentation Engineer and to assess societal, health, safety issues based on the reasoning received from the contextual knowledge.
g. Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit the knowledge and the need for sustainable Development.
h. Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge ethical responsibilities.
i. Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinary projects.
j. Communicate efficiently the engineering facts with a wide range of engineering community and others, to understand and prepare reports and design documents; to make effective presentations and to frame and follow instructions.
k. Demonstrate the acquisition of the body of engineering knowledge and insight and Management Principles and to apply them as member / leader in teams and multidisciplinary environments.
l. Recognize the need for self and life-long learning, keeping pace with technological challenges in the broadest sense.

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UNIVERSITY DEPARTMENTS
ANNA UNIVERSITY :: CHENNAI 600 025
REGULATION – 2012
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**TOTAL NO OF CREDITS (INCLUSIVE OF I SEMESTER ) : 175**
## Electives for Electrical and Instrumentation Engineering

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HS8151  TECHNICAL ENGLISH I  L T P C
(For all branches of B.E / B.Tech programmes)  3 1 0 4

OBJECTIVES

• To enable all students of engineering and technology develop their basic communication skills in English.

• To give special emphasis to the development of speaking skills amongst the students of engineering and technology.

• To ensure that students use the electronic media such as internet and supplement the learning materials used in the classroom.

• To inculcate the habit of reading for pleasure.

UNIT I

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

UNIT II

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

UNIT III

Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading
- Reading and interpreting visual material; **Writing** - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause & effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; **Grammar** - Tenses (Past) - Use of sequence words - Adjectives; **Vocabulary** - Different forms and uses of words, Cause and effect words; **E-materials** - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

**UNIT IV**

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

**UNIT V**

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

**OUTCOMES:**

Learners should be able to

- speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- read different genres of texts adopting various reading strategies.
- listen/view and comprehend different spoken discourses/excerpts in different accents

TOTAL : 60 PERIODS
TEXT BOOKS

REFERENCE BOOKS

EXTENSIVE READERS

WEBSITE RESOURCES
• www.uefap.com
• www.eslcafe.com
• www.listen-to-english.com
• www.owl.english.purdue.edu
• www.chompchomp.com
OBJECTIVES:

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

UNIT I MATRICES


UNIT II INFINITE SERIES


UNIT II FUNCTIONS OF SEVERAL VARIABLES

UNIT IV  IMPROPER INTEGRALS


UNIT V  MULTIPLE INTEGRALS


OUTCOMES:

• This course equips students to have basic knowledge and understanding in one fields of materials and integral

TEXT BOOKS:


REFERENCES:


PH8151  ENGINEERING PHYSICS

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

OBJECTIVE

• To introduce the basic physics concepts relevant to different branches of Engineering and Technology.
UNIT I  PROPERTIES OF MATTER


UNIT II  ACOUSTICS AND ULTRASONICS


UNIT III  THERMAL PHYSICS


UNIT IV  APPLIED OPTICS


UNIT V  SOLID STATE PHYSICS

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

TOTAL : 45 PERIODS

OUTCOMES:
• The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXTBOOKS:

REFERENCE BOOKS:

OBJECTIVES:
• To make the students conversant with basics of polymer chemistry.
• To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
• To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
• To acquaint the students with the basics of nano materials, their properties and applications.

UNIT I CHEMICAL THERMODYNAMICS

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

UNIT II  POLYMER CHEMISTRY
Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III  KINETICS AND CATALYSIS

UNIT IV  PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT V  NANO CHEMISTRY

TOTAL : 45 PERIODS
OUTCOMES:
• The knowledge gained on polymer chemistry, thermodynamics, spectroscopy, kinetics and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.

TEXT BOOKS

REFERENCE BOOKS

GE8151 COMPUTING TECHNIQUES LT P C 3 0 0 3

OBJECTIVES:
The students should be made to:
• Learn the organization of a digital computer.
• Be exposed to the number systems.
• Learn to think logically and write pseudo code or draw flow charts for problems.
• Be exposed to the syntax of C.
• Be familiar with programming in C.
• Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION 8
UNIT II  C PROGRAMMING BASICS


UNIT III  ARRAYS AND STRINGS


UNIT IV  FUNCTIONS AND POINTERS


UNIT V  STRUCTURES AND UNIONS

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

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design C Programs for problems.
- Write and execute C programs for simple applications.

TEXTBOOKS

REFERENCES
OBJECTIVES:

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

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)

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

UNIT I PLANE CURVES AND FREE HAND SKETCHING

Basic Geometrical constructions, Curves used in engineering practices
Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES

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

UNIT III PROJECTION OF SOLIDS

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

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the
one of the principal planes and perpendicular to the other – obtaining true shape of section.

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

**UNIT V  ISOMETRIC AND PERSPECTIVE PROJECTIONS  **

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

**COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)  **

Introduction to drafting packages and demonstration of their use.

**TOTAL: 75 PERIODS**

**OUTCOMES:**

On Completion of the course the student will be able to

- perform free hand sketching of basic geometrical constructions and multiple views of objects.
- do orthographic projection of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- prepare isometric and perspective sections of simple solids.
- demonstrate computer aided drafting

**TEXT BOOK**


**REFERENCES**


PUBLICATION OF BUREAU OF INDIAN STANDARDS:

SPECIAL POINTS APPLICABLE TO UNIVERSITY EXAMINATIONS ON ENGINEERING GRAPHICS:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.
OBJECTIVES:
- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

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

TOTAL : 30 PERIODS

OUTCOMES:
- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.
OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry.

1. Estimation of HCl using Na$_2$CO$_3$ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

REFERENCE BOOKS

OBJECTIVES:
The student should be made to:

- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.
- Learn to use Arrays, strings, functions, structures and unions.

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

TOTAL: 45 PERIODS

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

- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

OBJECTIVES
- To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
1. CIVIL ENGINEERING PRACTICE

PLUMBING
Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

Laying pipe connection to the suction side of a pump – inlet. Laying pipe connection to the delivery side of a pump – outlet.

Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK
Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

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

2. ELECTRICAL ENGINEERING PRACTICE

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

GROUP – B (MECHANICAL AND ELECTRONICS)

3. MECHANICAL ENGINEERING PRACTICE

WELDING
- Arc welding of butt joints, lap joints, tee joints
- Gas welding Practice.
• Basic Machining
• Simple turning, drilling and tapping operations.
• Machine assembly Practice.
• Study and assembling the following:

Centrifugal pump, mixies and air conditioners.
• Demonstration on
  (a) Smithy operations like the production of hexagonal bolt.
  (b) Foundry operation like mould preparation for grooved pulley.

4. ELECTRONIC ENGINEERING PRACTICE

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

TOTAL: 45 PERIODS

OUTCOMES:
• ability to fabricate carpentry components and pipe connections including plumbing works.
• ability to use welding equipments to join the structures.
• ability to fabricate electrical and electronics circuits.
OBJECTIVES

• To make the students acquire listening and speaking skills meant for both formal and informal contexts

• To help them develop their reading skills by exposing them to different types of reading strategies

• To equip them with writing skills needed for academic as well as workplace situations

• To make them acquire language skills at their own pace by using e-materials and language lab component

UNIT I

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

UNIT II

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

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

UNIT IV

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

UNIT V

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

TOTAL: 60 PERIODS
OUTCOMES:
Learners should be able to
- speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
- write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
- listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXT BOOKS

REFERENCE BOOKS

EXTENSIVE READERS

WEB RESOURCES
1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
4. www.mindtools.com
5. www.esl.about.com
OBJECTIVES

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

UNIT I  DIFFERENTIAL EQUATIONS  9+3
Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

UNIT II  VECTOR CALCULUS  9+3
Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral -Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III  ANALYTIC FUNCTION  9+3
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = c, az, 1, z^2$ - Bilinear transformation.

UNIT IV  COMPLEX INTEGRATION  9+3
Line integral - Cauchy’s integral theorem – Cauchy’s integral formula – Taylor’s and Laurent’s series – Singularities – Residues – Residue theorem – Application of residue theorem for
evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V  LAPLACE TRANSFORMS  


TOTAL : 60 PERIODS

OUTCOMES:

• The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:


REFERENCES:


PH8252  PHYSICS FOR ELECTRONICS ENGINEERING  L T P C
(Common to ECE, EEE and E& I Branches)  3 0 0 3

OBJECTIVE:

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

UNIT I  ELECTRICAL PROPERTIES OF METALS


UNIT II  SEMICONDUCTORS


UNIT III  DIELECTRIC MATERIALS AND INSULATION

Matter polarization and relative permittivity: definition - dipole moment and polarization vector P-polarization mechanisms: electronic, ionic, orientational, interfacial and total polarization - frequency dependence - local field and Clausius-Mossetti equation - dielectric constant and dielectric loss - Gauss’s law and boundary conditions - dielectric strength and insulation break-down in gases, liquids and solids - capacitor materials - typical capacitor constructions - piezoelectricity, ferroelectricity and pyroelectricity - quartz oscillators and filters - piezo and pyroelectric crystals.

UNIT IV  MAGNETIC PROPERTIES AND SUPERCONDUCTIVITY

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

UNIT V  OPTICAL PROPERTIES OF MATERIALS


TOTAL : 45 PERIODS

OUTCOMES:
The student will be able to

- apply the electrical properties of matter while understanding the relevant electrical phenomenon.
- apply the concepts of semi conductors and understand the working principle of all types of semiconductor devices
- apply the concepts of dielectric materials and magnetic properties and understand the electrostatic, electromagnetic, electromechanical behavior of equipments.
- apply the optical properties of materials and understand the electro optic effects.

TEXT BOOKS:

REFERENCES:

AIM:
To impart knowledge in the Applied Chemistry topics relevant to electrical and electronics engineering.

OBJECTIVES:
- To know about the electrochemistry and it is applications.
• To understand the basic concepts about the batteries.
• Importance of Conductivity in Solids and specialty polymers.
• Treatment of water for domestic and industrial purpose.
• Familiarize with various type of material analysis.

UNIT I  ELECTROCHEMISTRY 9

UNIT II  ENERGY SOURCES 9

UNIT III  CONDUCTIVITY IN SOLIDS AND SPECIALTY POLYMERS 9
Electrical properties of solids- band theory of solids- types of energy bands- application of band theory to solids- semiconductors- types n and p types- super conductors. Classification of insulating materials based on function and physical state- thermal insulators- optical fibers- organic electronic materials- fullerenes. Introduction to thermoplastics and thermosetting plastics- phenolic and epoxy resins, silicone polymers, rubbers; polyelectrolytes, electrically conducting polymers, polymers with piezoelectric, pyroelectric and ferroelectric properties, photonic polymers, photo resists, basics of LCD and LED.

UNIT IV  WATER CHEMISTRY 9
Boiler feed water- requirements- formation of deposits in steam boilers and heat exchangers- disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation- external treatment (ion exchange method) - internal treatment (phosphate, calgon, carbonate, colloidal)- boiler compounds- caustic embrittlement- boiler corrosion- priming and foaming- desalination of brackish water – reverse osmosis.
UNIT V ANALYSIS OF MATERIALS


OUTCOMES:
• The knowledge gained on analysis materials, polymers, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS

REFERENCE BOOKS

EI8201 ELECTRIC CIRCUITS

OBJECTIVES
The student should be made to:
• analyze simple DC circuits using systemic analysis techniques (basic law).
• apply Thevenin’s theorem, Norton’s theorem and the superposition theorem to aid circuit analysis.

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• AC steady-state circuit concepts (impedance, reactance, etc) and perform AC steady state analysis.
• perform DC and AC steady-state power calculations.
• learn the concepts of three phase circuits.

UNIT I  D.C. CIRCUIT ANALYSIS


UNIT II  A.C.CIRCUIT FUNDAMENTALS AND ANALYSIS


UNIT III  RESONANCE AND COUPLED CIRCUITS


UNIT IV  THREE-PHASE CIRCUIT ANALYSIS


UNIT V  TRANSIENT ANALYSIS OF FIRST AND SECOND ORDER LINEAR CIRCUITS


TOTAL : 45 PERIODS
OUTCOMES:
At the end of the course, the student should be able to:
• systematically obtain the equations that characterize the performance of an electric circuit as well as solving both single phase and three-phase circuits in sinusoidal steady state.

TEXT BOOKS

REFERENCE BOOKS

EI8202 ELECTRONIC DEVICES, CIRCUITS AND APPLICATION

OBJECTIVES:
The student should be made to:
• understand principle of current flow through the p-n junction and relating this phenomena they will be taught to characterise and operate diodes, bipolar and field-effect transistors.
• learn the function and application of the diodes, bipolar junction and field effect transistors in electronic circuits.
• gain knowledge about the operation of multistage and differential amplifiers.
• design and analyse feedback amplifiers and oscillators.

UNIT I PN JUNCTION DEVICES
Semiconductor conductivity - drift current and diffusion current - PN junction - barrier voltage - diode equation - diffusion and transition capacitance - Application of diode as rectifier, clipper and clamper. Special devices and applications, Zener diode as voltage regulator, Schottky diodes for high speed switching, UJT relaxation oscillator, Thyristors - SCR, Diac and Triac.
UNIT II  BIPOLAR JUNCTION TRANSISTORS AND APPLICATIONS  


UNIT III  JFET, MOSFET AND THEIR APPLICATIONS  


UNIT IV  MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER  


UNIT V  FEEDBACK AMPLIFIERS AND OSCILLATORS  


(Practice Tutorial Problems for all the above topics.)

TOTAL : 45 PERIODS

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

- apply basic concepts of common semiconductor devices and electronic circuits for an application. The students will be capable to learn how to analyse simple but important applications of these devices in electronic circuits.

TEXT BOOKS
1. David A. Bell ,Electronic Devices and Circuits, Oxford University Press, 2010.

REFERENCES
EI8211  COMPUTER PRACTICE II  L T P C  0 0 3 2

OBJECTIVES
The student should be made to:
- To introduce various programs included in office suite to the students so that they can make use of the same for producing documents, present and visualize data using work sheets.
- To make them learn C programming language.

1. Shell Commands, Wild Cards, Escaping and Redirection.
2. Pipes, Tees and Command Substitution.
4. Shell Programs using Loops.
5. Simple Shell Programs using File I/O.
6. Advanced Shell Programs using File I/O.
7. Directories and inodes.
8. Simple programs using classes for understanding objects, member function, constructions and destructors.
9. Programs using operator overloading including unary operators, new and delete
10. Programs using inheritance concepts
11. Programs using virtual functions and dynamic polymorphism
12. Programs using templates.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Use any office suite
- Use spreadsheets for presentations of data
- Use spreadsheets to produce visualizations
- Write simple C programs using various constructs
- Improve upon it for developing programs of moderate complexity
OBJECTIVES:
The student should be made to:
- learn and to verify circuit theorems.
- analyse the frequency response of series and parallel resonance circuits.
- study the characteristics of ordinary and special diodes.
- design and understand the operation and characteristics of different transistor configurations.

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

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design and construct simple electronic circuits to accomplish a specific function, e.g., designing amplifiers, ADC converters etc.
- make decisions regarding their best utilization in a specific situation.
OBJECTIVES

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

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange’s Linear equation – Integral surface passing through a given curve – Classification of Partial Differential Equations - Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous PDE.

UNIT II FOURIER SERIES 9+3

Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION 9+3

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

UNIT IV FOURIER TRANSFORM 9+3

UNIT V  Z – TRANSFORM AND DIFFERENCE EQUATIONS 9+3

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

TOTAL : 60 PERIODS

OUTCOMES:

- The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

TEXT BOOK:


REFERENCES:


GE8351 ENVIRONMENTAL SCIENCE AND ENGINEERING  L T P C  3 0 0 3

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
• To study the dynamic processes and understand the features of the earth's interior and surface.
• To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

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

Field study of common plants, insects, birds

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

UNIT II ENVIRONMENTAL POLLUTION

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

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

UNIT III NATURAL RESOURCES

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

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT


UNIT V HUMAN POPULATION AND THE ENVIRONMENT


TOTAL : 45 PERIODS

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXT BOOKS

REFERENCE BOOKS

EI8301 ELECTRICAL AND ELECTRONIC MEASUREMENTS

OBJECTIVES:
The student should be made to:
- analyze the electric circuits using network theorems.
- learn the fundamentals of AC circuits like RL, RC and RLC circuits.
- Gain knowledge on Resonance theory and magnetic coupling.
- Study about poly phase circuits.

UNIT I MEASUREMENT OF ELECTRICAL PARAMETERS
Types of ammeters and voltmeters – PMMC Instruments, Moving Iron Instruments, Dynamometer type Instruments, Resistance measurement - Wheatstone bridge, Kelvin double bridge and Direct deflection methods, Measurement of Inductance - Maxwell Wein bridge, Hay’s bridge and Anderson bridge, Measurement of Capacitance - Schering bridge

UNIT II POWER AND ENERGY MEASUREMENTS
Electrodynamic type wattmeter – theory and its errors; LPF wattmeter, Phantom loading, Single phase Induction type energy meter theory and Adjustments, Calibration of wattmeter and Energy meters.

UNIT III POTENSIOMETERS AND INSTRUMENT TRANSFORMERS
Student type potentiometer, Precision potentiometer, A.C. Potentiometers – Polar and Co-

UNIT IV  ANALOG AND DIGITAL INSTRUMENTS  10

Wave analyzers, Signal and function generators, Distortion factor meter, Q meter, Digital voltmeter and multimeter, DMM with auto ranging and self diagnostic features, Frequency measurement.

UNIT V  DISPLAY AND RECORDING DEVICES  8

Cathode ray oscilloscope - Sampling and storage scopes –Seven segment and dot matrix displays, X-Y recorders, Magnetic tape recorders, Data loggers.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- understand the working principle of all types of common electrical and electronic instruments.
- Gain knowledge on analog and digital instruments.
- understand the different types of display and recording devices.

TEXT BOOKS:
3. J.J. Carr, Elements of Electronic Instrumentation and Measurement, Pearson Education India, New Delhi, 2011
4. H.S. Kalsi, Electronic Instrumentation, Tata McGraw-Hill, New Delhi, 2010

REFERENCES:
OBJECTIVES:

The student should be made to:
- study about the construction and working principle of DC machines, AC Machines, transformers, synchronous machines and induction machines.
- learn the procedure for selecting machines for different applications.

UNIT I  D.C. MACHINES


UNIT II  TRANSFORMERS

Principle, Theory of ideal transformer, EMF equation, Construction details of shell and core type transformers, Tests on transformers, Equivalent circuit, Phasor diagram, Regulation and efficiency of a transformer. Introduction to three, phase transformer connections.

UNIT III  SYNCHRONOUS MACHINES

Alternator - Construction and principle of operations Equation of induced EMF and Vector Diagram-Voltage regulation; Synchronous motor - Starting methods, Torque, V-curves, Speed control and Hunting.

UNIT IV  INDUCTION MACHINES

Induction motor, Construction and principle of operation, Classification of induction Motor, Torque equation, Condition for maximum torque, Equivalent Circuit, Power losses, Efficiency, Starting methods and Speed control.

UNIT V  SPECIAL MACHINES

Types of single phase motor, Double revolving field theory, Cross field theory, Capacitor start

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- gain knowledge about the construction, working principle and applications of DC machines, AC machines and special machines.

TEXT BOOKS:

REFERENCE BOOKS:

EI8303 OPERATIONAL AMPLIFIERS AND LINEAR INTEGRATED CIRCUITS

OBJECTIVES:
The student should be made to:
- study the fundamentals of integrated circuit’s fabrication and operation.
- learn the functions of linear and non-linear integrated circuits for specific applications.
- understand the operation of special function integrated circuits for Instrumentation and process control applications.
- get knowledge about the different types of A/D and D/A converters.
- gain knowledge on design and analysis of linear and non linear circuits using operational amplifiers.
UNIT I  FABRICATION OF IC AND OP-AMP SPECIFICATIONS  9

IC classification - fundamentals of monolithic IC technology - epitaxial growth, masking and etching, diffusion of impurities - Realization of monolithic ICs and packaging - Fabrication of diodes, capacitance, resistance - Operational amplifiers, specifications, frequency compensation - slew rate and methods of improving slew rate.

UNIT II  APPLICATIONS OF OPERATIONAL AMPLIFIERS  9


UNIT III  ANALOG MULTIPLIER AND PLL  9

Analysis of four quadrant and variable transconductance multipliers - Voltage controlled Oscillator - Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators.

UNIT IV  ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTORS  9

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

UNIT V  SPECIAL FUNCTION IC’S  9

Timers - Voltage regulators - linear and switched mode types - Switched capacitor filter - Frequency to Voltage converters - Tuned amplifiers - Power amplifiers - Isolation Amplifiers - Opto couplers.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- understand the fundamentals of integrated circuit’s fabrication and operation.
- apply the concepts of special function integrated circuits for Instrumentation and process control applications and concepts of different types of A/D and D/A converters.
OBJECTIVES:
The student should be made to:
• study about the concepts of measurement, error and uncertainty.
• gain knowledge on the static and dynamic characteristics of measuring instruments.
• Learn about the principle, operation and characteristics of different variable resistance transducers.
• understand the principle of operation and characteristics of different variable inductance transducers
• develop knowledge on operation and applications of piezo electric and Hall effect transducers.

UNIT I SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS 9

UNIT II CHARACTERISTICS OF TRANSDUCERS 9
Static characteristics – Accuracy, precision, resolution, sensitivity, linearity, span and range -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 9
Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezoresistive
sensor and humidity sensor.

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS

Induction potentiometer – Variable reluctance transducers – EI pick up – Principle of operation, construction details, characteristics and applications of LVDT – Capacitive transducer and types – Capacitor microphone – Frequency response.

UNIT V OTHER TRANSDUCERS


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

- understand the concepts of measurement, error and uncertainty .
- know the principle of operation and characteristics of different types of transducers.

TEXT BOOKS:

REFERENCE BOOKS:

EI8311 ELECTRICAL MACHINES LABORATORY

OBJECTIVES:
The student should be made to:
- understand the procedure to obtain the characteristics of DC and AC machines with
and without load.

1. Open circuit and load characteristic of DC Shunt Generator.
2. Speed control of DC Shunt Motor.
3. Load test on DC Shunt Motor.
4. Load test on DC Series Motor.
5. Regulation of three-phase Alternator.
7. Load test on Single-phase Transformer
8. Load test on Three-phase Induction Motor.
10. ‘V’ curves of Synchronous Motor.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• know about the characteristics of DC and AC machines with and without load.

EI8312 TRANSUDCERS AND MEASUREMENT LABORATORY L T P C 0 0 3 2

OBJECTIVES:
The student should be made to:
• know the procedure to obtain the static and dynamic characteristics of various types of transducers.
• study the procedure to measure unknown resistance, inductance and capacitance using bridge circuits.
• gain knowledge to calibrate electrical instruments.
• learn about the flapper nozzle system.

1. Characterisation of loading effect on Potentiometer.
2. Dynamic characteristics of various types of Thermocouple with and without thermo wells.
3. Design of cold junction compensation for Thermocouples.
4. Static and Dynamic characteristics of RTD and lead wire compensations.
5. Static characteristic of Thermistor and its linearization.
7. Calibration of Strain Gauge type force and torque transducers.
8. Calibration of magnetic and photoelectric type velocity transducers.
9. Static characteristic of flapper-nozzle system.
11. Study of Capacitive transducer.
14. Wheatstone and Kelvin’s bridge for measurement of resistance.
15. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.
17. Calibration of Voltmeter and Ammeter using potentiometer

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- obtain the static and dynamic characteristics of various types of transducers.
- measure unknown resistance, inductance and capacitance using bridge circuits.
- calibrate electrical instruments.

MA8353 NUMERICAL METHODS

OBJECTIVES
- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.
UNIT I  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  9+3


UNIT II  INTERPOLATION AND APPROXIMATION  9+3

Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III  NUMERICAL DIFFERENTIATION AND INTEGRATION  9+3


UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  9+3


UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  9+3

Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

OUTCOMES:
• Able to have a clear perception of the power of numerical techniques, ideas and to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.
TEXT BOOKS:

REFERENCES:

EI8401 CONTROL ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- gain knowledge about the different methods of representation of systems, their transfer function models and state space models.
- develop state space models of selective systems.
- learn about the time response of systems subjected to different test inputs and the associated steady state/dynamic errors.
- understand the open loop and closed loop frequency responses of systems, and analyze the stability and performance.
- Know about the concept of stability of control systems and methods of stability analysis using root locus approach and Routh-Hurwitz criterion.
- Know and practically implement the procedure to design lag, lead and lag-lead compensators for a control system.

UNIT I INTRODUCTION
Control System-Open and Closed Loop-Effect of Feedback-System representations-Transfer functions, Block diagrams, signal flow graphs, gain formula of Mechanical and Electrical Systems.
UNIT II STATE VARIABLE MODEL AND ANALYSIS


UNIT II TRANSFER FUNCTION MODEL AND ANALYSIS


UNIT IV FREQUENCY DOMAIN ANALYSIS OF TRANSFER FUNCTION MODELS

Frequency response – resonance peak – Bandwith – effect of adding poles and zeros – Magnitude and phase plots of typical systems– Gain margin – Phase margin-Bode plot– Nyquist’s stability criterion

UNIT V DESIGN OF CONTROL SYSTEMS


TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- apply concepts of Linear control theory and design for a system.

TEXT BOOKS:

REFERENCES:
EI8402 DIGITAL LOGIC THEORY L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:

- gain knowledge on implementation of logic circuits using gates.
- understand the basic concepts of Boolean algebra and combinational circuits.
- learn about the operation of flip flops and will be able to design a synchronous and asynchronous sequential circuits.
- study the basic concepts of state machine diagrams and its applications.
- Get exposure on programmable logic devices and VHDL programming.

UNIT I BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS

Boolean algebra - De-Morgan’s theorem - switching functions and simplification using K-maps method- Design of combinational circuits - adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Logic families - TTL and ECL. MOSFET logic –NMOS and CMOS.

UNIT II SYNCHRONOUS SEQUENTIAL CIRCUITS


UNIT III ASYNCHRONOUS SEQUENTIAL CIRCUITS

Analysis of asynchronous sequential circuits - state assignment - asynchronous design problems.

UNIT IV ALGORITHMIC STATE MACHINE

ASM Chart - Data path Subsystem - Control subsystem - Design examples- Binary multiplier, Weighing machine and Waveform generator.

UNIT V PROGRAMMABLE LOGIC DEVICES AND VHDL

ROM, PROM, EPROM, PLA, PLD, FPGA, VHDL : RTL Design – combinational logic – Types
OUTCOMES:
At the end of the course, the student should be able to:
- gain knowledge on the fundamental concepts and design of digital systems.
- Learn the function of flip flops and able to design a synchronous and asynchronous sequential circuits.
- understand programmable logic devices and VHDL programming.

TEXT BOOKS:

REFERENCES:

ME8403  FUNDAMENTALS OF THERMODYNAMICS AND FLUID MECHANICS  L T P C  3 1 0 4

OBJECTIVES:
The student should be made to:
- study the basic laws of thermodynamics, laws and methodologies for the analysis of gas turbines and compressors.
- Learn about the basic steaming process of boilers, Air conditioning and different modes of heat transfer.
- gain knowledge on the basic concepts of fluid mechanics.
- understand of the construction and working principle of pumps and hydraulic turbines.

UNIT I  LAWS OF THERMODYNAMICS AND BASIC IC ENGINE CYCLES  15
Systems zeroth law, first law of thermodynamics – concept of internal energy and enthalpy
applications to closed and open systems – second law of thermodynamics – concept of entropy – clausius inequality and principles of increase in irreversible processes. Basic IC engine and gas turbine cycles-- single and multistage reciprocating compressors.

UNIT II  THERMODYNAMICS OF REFRIGERATORS AND PUMPS  12

Properties of steam – Ranking cycle—Boilers and its accessories– Basic thermodynamics of refrigerators and heat pumps.-Basics of Heat transfer

UNIT III  BASIC CONCEPT OF FLUID MECHANICS &FLOW OF FLUIDS  12


UNIT IV  DIMENSIONAL AND MODEL ANALYSIS  9


UNIT V  PUMPS AND TURBINES  12


TOTAL : 60 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand the basic laws of thermodynamics, laws and apply it to various applications.
• know basic concepts of fluid mechanics.
• Know the construction and working principle of pumps and hydraulic turbines.

TEXT BOOKS
2. BANSAL.R.K,’Fluid Mechanics and Hydraulic Machines’, Laxmi Publications’ (P Ltd, 2005
REFERENCES

EI8404    INDUSTRIAL INSTRUMENTATION I    L T P C
                      3 0 0 3

OBJECTIVES:
The student should be made to:
- understand the construction and working of instruments used for measurement of force, torque, velocity, acceleration, vibration and density.
- study about the different types of pressure measurement techniques.
- learn the concept of calibration of instruments used for temperature and pressure measurement.
- gain knowledge on the design signal conditioning circuits and compensation schemes for temperature measuring instruments.
- learn how to select the instruments according to a specific application.

UNIT I    MEASUREMENT OF FORCE, TORQUE AND SPEED

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

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  
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 - I  
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  TEMPERATURE MEASUREMENT - II  
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

OUTCOMES:  
At the end of the course, the student should be able to:  
- understand the construction and working of instruments used for measurement of force, torque, velocity, acceleration, vibration and density, temperature and pressure.  
- select instruments according to the application.

TEXT BOOKS  
REFERENCE BOOKS

EI8405    MICROPROCESSOR, MICROCONTROLLER AND APPLICATIONS    L T P C

OBJECTIVES:
The student should be made to:
- know architecture of 8085, 8086 Microprocessors and 8051 microcontroller.
- learn assembly language programming in 8085, 8086 Microprocessors and 8051 microcontroller.
- understand the concept about peripherals and their interfacing with Microprocessors and microcontrollers.
- Gain knowledge on Microcontroller based systems for industrial applications.

UNIT I  8085 PROCESSOR

UNIT II  8086 PROCESSOR
Introduction to 8086 - Architecture –Maximum mode - Minimum mode - Addressing Modes - Instruction format - Instruction set – Assembly Language Programming – Interrupt system - Memory and I/O interfacing - Strings - procedures and Macros.

UNIT III  PERIPHERAL INTERFACING
Programmable Peripheral Interface (8255) - keyboard display controller (8279) – ADC - DAC Interface - Programmable Timer Controller (8254) - Programmable interrupt controller (8259)
Serial Communication Interface (8251) - DMA Controller (8257).

UNIT IV  MICROCONTROLLER  9

UNIT V  MICRO CONTROLLER BASED SYSTEM DESIGN  9

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- know architecture and development of assembly language programming of 8085, 8086 Microprocessors and 8051 microcontroller.
- Apply knowledge on Microcontroller based systems for industrial applications.

TEXTBOOKS

REFERENCES
OBJECTIVES:
The student should be made to:
• know the procedure to design and implement linear and non-linear circuits using linear ICs.
• gain knowledge on design and verification of combinational and sequential logic circuits.
• understand VHDL programming.

LINEAR IC APPLICATIONS
1. Comparator.
2. Differentiator and Integrator.
3. Adder and Subtractor.
4. Clipper and clamper.
5. Peak detector.
6. Timer IC Application.
7. VCO and PLL.
8. One experiment beyond the syllabus.

DIGITAL EXPERIMENTS
1. Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND gates, JK, RS, D flip-flops
2. Implementation of Boolean functions
3. Combinational logic design: Adder, Subtractor,
5. Sequential logic design: Counters (Synchronous and Asynchronous),
7. Simulation experiments: Design of Adder and counter using VHDL.
8. One experiment beyond the syllabus.
OUTCOMES:

At the end of the course, the student should be able to:
- design and implement linear and non-linear circuits using linear ICs.
- design and verify combinational and sequential logic circuits and get familiarized with VHDL programming.

EI8412 MICROPROCESSOR, MICROCONTROLLER AND APPLICATIONS LABORATORY L T P C 0 0 3 2

OBJECTIVES:

The student should be made to:
- Learn assembly level programs in 8085 and 8086 Microprocessors and 8051 microcontroller.
- know the procedure for Interfacing of peripheral devices such as PPI, Timer, ADC/ DAC with microprocessor and microcontroller.
- understand 8085/8255/8051 simulation software.
- gain knowledge on implementation of microprocessor based applications such as of Stepper Motor Controller, Traffic Light Controller, PID controller and Data Acquisition System

8085 BASED EXPERIMENTS:

2. Interfacing experiments (with 8279, 8255, 8251, ADC, DAC, Traffic Light and Stepper motor)

8051 BASED EXPERIMENTS:

1. Programming using Arithmetic, logical and Bit Manipulation instructions of 8051 microcontroller.
2. Programming and Verifying Timer, Interrupts and UART operations in microcontroller.
3. Interfacing ADC and DAC.
4. Interfacing (16X2) LCD Display.
5. Temperature measurement.
6. DC motor speed control.

8086 BASED EXPERIMENTS:
1. Programs for 16 bit Arithmetic, Sorting, Searching and String operations.
2. Macro assembler Programming for 8086. (Simulator)

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- write and debug assembly level programs in 8085 and 8086 Microprocessors and 8051 microcontroller.
- use 8085/8255/8051 simulation software.
- design and implement the microprocessor based applications such as of Stepper Motor Controller, Traffic Light Controller, PID controller and Data Acquisition System.

EI8501     INDUSTRIAL INSTRUMENTATION II     L T P C
            3 0 0 3

OBJECTIVES:
The student should be made to:
- learn the construction, installation and working of different variable head type flow meters.
- Know about the construction, working and calibration of different quantity flow meters, variable area flow meters and mass flow meters.
- gain knowledge about the construction, installation and working of electrical type, open channel and solid flow meters.
- Understand the principle, operation and application of different level measuring instruments.
- learn the principle and operation of viscosity, humidity and moisture measurement.

UNIT I     VARIABLE HEAD TYPE FLOWMETERS
Expression for flow rate through restriction (compressible and incompressible flow) - Orifice plate – different types of orifice plates – Cd variation – pressure tappings – Venturi tube – Flow nozzle – Dall tube – Elbow taps - Pitot tube – combined pitot tube - averaging pitot tube – installation and applications of head flow meters

UNIT II     QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS
Positive displacement flow meters – Nutating disc, Reciprocating piston and Oval gear flow

UNIT III ELECTRICAL TYPE FLOW METERS


UNIT IV LEVEL MEASUREMENT

Level measurement – Float gauges - Displacer type – D/P method - Bubbler system - Load cell – Electrical types:– Conductivity sensors – Capacitive sensors – Nucleonic gauge - Ultrasonic gauge – Boiler drum level measurement:– Differential pressure and Hydrastep methods - Solid level measurement.

UNIT V MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE


TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand the construction, installation and working of different variable head type flow meters.
• analyze the different level measuring instruments and gain knowledge about the principles of viscosity, humidity and moisture measurement.

TEXT BOOKS
REFERENCE BOOKS

EI8502 PRINCIPLES OF COMMUNICATION ENGINEERING

OBJECTIVES:
The student should be made to:
- learn the basic concept of Amplitude and Angle Modulation.
- Gain knowledge about different pulse modulation and Demodulation techniques.
- Study about the digital modulation techniques and evaluate the error probability.
- gain knowledge on various modes of communication systems.

UNIT I AMPLITUDE MODULATION
Basic principle of AM – Frequency spectrum and Bandwidth, Modulation index, AM power distribution and AM modulator circuits. AM transmitters. Low level transmitters and High level transmitters AM reception: AM Receivers, Tuned Radio Frequency receivers, Superheterodyne receivers and Double conversion AM receivers.

UNIT II ANGLE MODULATION
FM and PM waveforms, Frequency deviation, Phase deviation and Modulation index, Frequency spectrum of Angle modulated wave - Phase and Frequency modulator and demodulator, Direct FM transmitter, Indirect transmitters, Angle modulation versus Amplitude modulation, FM receivers and Frequency versus Phase Modulation.

UNIT III PULSE COMMUNICATION

UNIT IV DATA TRANSMISSION
Base band signal receiver:- Error probability, Optimum and matched filter techniques and
Coherent reception. Digital modulation systems:- Amplitude Shift Keying, Frequency Shift Keying and Phase Shift Keying, Comparison of data transmission systems.

**UNIT V COMMUNICATION SYSTEMS**


**OUTCOMES:**
At the end of the course, the student should be able to:
- understand the basic concept of Amplitude and Angle Modulation.
- gain knowledge on various modes of communication systems.

**TEXT BOOKS**

**REFERENCE BOOKS**

**EI8503 PRINCIPLES OF DIGITAL SIGNAL PROCESSING**

**OBJECTIVES:**
The student should be made to:
- gain knowledge on continuous/Discrete time signals and systems.
- Understand different sampling techniques and effects of quantization.
- gain knowledge on discrete and fast Fourier transform algorithms and their applications.
- learn the concepts of IIR and FIR filters.
UNIT I CONTINUOUS SIGNALS AND SYSTEMS

Classification of systems - Continuous, linear, time invariant, causal, stable systems - classification of signals - continuous, energy and power signals; mathematical representation of signals; spectra of standard signals.

UNIT II SAMPLING AND QUANTIZATION

Sampling techniques - Quantization - Quantization error - Nyquist rate - Aliasing effect – Digital signal representation - Truncation - Overflow errors in numerical computation - Interpolation.

UNIT III DISCRETE TIME SIGNALS AND SYSTEMS


UNIT IV DISCRETE FOURIER TRANSFORM & FFT

DFT properties, magnitude and phase representation - Direct computation of DFT, FFT - Radix 2 - DIT & DIF algorithms - Convolution - Application using FFT – Power spectrum.

UNIT V DESIGN OF DIGITAL FILTERS


TOTAL: 45 PERIODS

OUTCOMES:

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

- analyze continuous/Discrete time signals and systems.
- Apply discrete and fast Fourier transform algorithms and understand the concepts of IIR and FIR filters.

TEXT BOOKS

REFERENCES


OBJECTIVES:
The student should be made to:
- develop the skills for obtaining the mathematical model of processes.
- analyze the dynamic model of different processes and to understand the difference between lumped and distributed parameter models.
- Know about the different control action and their relative merits, demerits and applications.
- gain knowledge on the construction, operation, characteristics and selection of control valves.
- learn the different tuning methods for PID controllers.
- Develop knowledge about the different multi loop control schemes and their applications.

UNIT I PROCESS DYNAMICS

UNIT II CONTROL ACTIONS

UNIT III FINAL CONTROL ELEMENTS
I/P converter - Pneumatic and electric actuators – Valve Positioner – Control Valves – Characteristic of Control Valves:- Inherent and Installed characteristics – Modeling of pneumatic control valve – Valve body:-Commercial valve bodies – Control valve sizing – Cavitation and flashing – Selection criteria.

UNIT IV CONTROLLER TUNING
Evaluation criteria – IAE, ISE, ITAE and $\frac{1}{4}$ decay ratio - Tuning:- Process reaction curve method, Continuous cycling method and Damped oscillation method – Determination of optimum settings for mathematically described processes using time response and frequency response approaches –Auto tuning.
UNIT V  MULTILOOP CONTROL


TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• know about process dynamics, PID controllers and its tuning
• Gain knowledge about the construction, operation, characteristics and selection of control valves.
• Get familiarized with different multi loop control schemes and their applications.

TEXT BOOKS:

REFERENCE BOOKS:

EI8511  INDUSTRIAL INSTRUMENTATION LABORATORY  L T P C
0 0 3 2

OBJECTIVES:
The student should be made to:
• gain knowledge on the measuring instruments for accurate measure of process variables(flow, level, temperature, viscosity and pressure)
• get understanding about the usage of various types of analytical instruments such as pH, Conductivity, UV absorbance and transmittance.
• Learn about the calibration of Bio-medical measuring instruments.

1. Discharge coefficient of orifice plate
2. Calibration of pressure gauge
3. Torque measurement
4. Viscosity measurement
5. Vacuum pressure measurement
6. Level measurement using d/p transmitter
7. UV – Visible spectrophotometer
8. IR spectrophotometer
9. pH meter standardization and measurement of pH values of solutions
11. ECG measurement
12. Pulse rate measurement
13. One or two experiments beyond syllabus

TOTAL: 45 PERIODS

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

- effectively use the measuring instruments for accurate measure of process variables (flow, level, temperature, viscosity and pressure) and Bio-medical measuring instruments using calibrators
- Get familiarized with the usage of various types of analytical instruments such as pH, conductivity, UV absorbance and transmittance.

EI8512  PROCESS CONTROL LABORATORY

OBJECTIVES:
The student should be made to:

- Learn the procedure for obtaining the servo and regulatory responses of process control loops such as level, pressure, flow and temperature.
- Understand the procedure for obtaining the optimum controller settings using various tuning methods by experimental and mathematically described processes.
- Learn and analyze the control schemes for multiloop processes such as three tank and four tank systems.

LIST OF EXPERIMENTS
1. Study of Process Control Training Plant and Compact Flow Control Unit.
2. Characteristics of Pneumatically Actuated Control Valve (with and without Positioner).

72
3. Level Control and Pressure Control in Process Control Training Plant.
5. PID Implementation Issues.
6. Tuning of PID Controller for mathematically described processes
7. PID Enhancements (Cascade and Feed-forward Control Schemes)
8. Design and Implementation of Multi-loop PI Controller on the Three-tank system.
9. Analysis of Multi-input Multi-output system (Four-tank System).
10. Study of AC and DC drives.
11. Study of pH Control Test Rig.
12. Auto-tuning of PID Controller

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- conduct the experiments and obtain the servo and regulatory responses of process control loops such as level, pressure, flow and temperature.
- arrive the optimum controller settings using various tuning methods by experimental and mathematically described processes.
- analyze and design control schemes for multiloop processes such as three tank and four tank systems.

MG8651 ENGINEERING MANAGEMENT

OBJECTIVES:
The student should be made to:
- To make the students aware of the outline of managerial functions relating to manufacturing.

UNIT I MARKETING AND PERSONNEL MANAGEMENT

UNIT II  INVENTORY MANAGEMENT


UNIT III  OPERATIONS MANAGEMENT


UNIT IV  FINANCIAL MANAGEMENT


UNIT V  OPERATIONS RESEARCH TECHNIQUES

Replacement theory – Linear Programming - Transportation and assignment problems – Sequencing - Network Techniques - CPM and PERT.

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

• The students would be able to understand the basic application of operational tools and manufacturing.

TEXT BOOKS:

REFERENCES:
EI8601  
ANALYTICAL INSTRUMENTS  

OBJECTIVES:  
The student should be made to:  
- gain knowledge on various Spectro Photometers.  
- learn about the ion conductivity and dissolved component analyzer.  
- Understand the principle and operation of important instrumental methods for chemical analysis of gas samples.  
- understand the principle, types of applications of chromatography.  
- Study about the construction and working principle of X-ray, Nuclear Magnetic Resonance and Mass spectroscopy.

UNIT I  
COLORIMETRY AND SPECTROPHOTOMETRY  
Spectral methods of analysis— Beer-Lambert law — Colorimeters — UV-Visible spectrophotometers — Single and double beam instruments — Sources and detectors — IR Spectrophotometers — Types — Attenuated total reflectance flame photometers — Atomic absorption spectrophotometers — Sources and detectors — FTIR spectrophotometers — Flame emission photometers — Fluorescence spectrophotometer

UNIT II  
CHROMATOGRAPHY  
Different techniques — Techniques by chromatographic bed shape- Column chromatography-Planar Chromatography-Paper Chromatography-Thin layer Chromatography-Applications - Techniques by physical state of mobile phase- Gas chromatography — Sources- Detectors — Liquid chromatographs —sources- detectors- Applications — High-pressure liquid chromatographs — sources-detectors- Applications- Techniques by separation mechanism—Ion exchange chromatography-size-exclusion chromatography-Applications

UNIT III  
INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS  
Types of gas analyzers – Oxygen, NO₂ and H₂S types, IR analyzers, thermal conductivity
analyzers, analysis based on ionization of gases. Air pollution due to carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

UNIT IV PH METERS AND DISSOLVED COMPONENT ANALYZERS

Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes, selective ion electrodes, ammonia electrodes, cyclic voltametry, biosensors, dissolved oxygen analyzer – Sodium analyzer – Silica analyzer.

UNIT V NUCLEAR MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES


TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• acquire knowledge on number of analytical tools which are useful for industrial analysis, drugs and pharmaceutical labs.
• Get exposed to different chromatographic techniques, NMR and dissolved component analyzers.

TEXT BOOKS

REFERENCES
OBJECTIVES:
The student should be made to:

- study about the state space analysis for discrete data systems
- gain knowledge on parametric and non parametric methods of system identification.
- learn the procedure for designing various digital controllers
- Know about the steps for carrying out analysis and design of multiloop controllers for MIMO processes.
- Learn about the different multivariable controllers and their implementation issues.

UNIT I  DISCRETE STATE-VARIABLE TECHNIQUE  9
State equation of discrete data system with sample and hold – State transition equation –
Methods of computing the state transition matrix – Decomposition of discrete data transfer functions – State diagrams of discrete data systems – System with zero-order hold –
Controllability and observability of linear time invariant discrete data system – Stability tests of discrete-data system – State Observer - State Feedback Control.

UNIT II  SYSTEM IDENTIFICATION  9

UNIT III  DIGITAL CONTROLLER DESIGN  9

UNIT IV  MULTI-LOOP REGULATORY CONTROL  9
UNIT V  MULTIVARIABLE REGULATORY CONTROL


TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- carry out state space analysis for discrete data systems and able to design various digital controllers.
- Apply their knowledge on parametric and non parametric methods of system identification.
- Apply their knowledge on carrying out analysis and design of multiloop and multivariable controllers for MIMO processes.

TEXT BOOKS:

REFERENCE BOOKS
OBJECTIVES:
The student should be made to:
- study about the PIC Microcontroller, its architecture and programming.
- gain knowledge about the interrupts and timer of PIC microcontroller.
- study and understand the peripherals and interfacing devices with microcontrollers.
- Get introduced to the concept of ARM processor, its architecture and programming.
- Learn the ARM processor organization, execution, implementation and applications.

UNIT I  INTRODUCTION TO PIC MICROCONTROLLER


UNIT II  INTERRUPTS AND TIMER


UNIT III  PERIPHERALS AND INTERFACING


UNIT IV  INTRODUCTION TO ARM PROCESSOR


UNIT V  ARM ORGANIZATION

3-Stage Pipeline ARM Organization – 5-Stage Pipeline ARM Organization – ARM Instruction Execution - ARM Implementation – ARM Instruction Set – ARM coprocessor interface –
Architectural support for High Level Languages – Embedded ARM Applications.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Get familiarized with PIC Microcontroller, its architecture and programming.
- gain knowledge about the interrupts, timer and strings of PIC microcontroller.
- Gain knowledge about ARM processor, its architecture, programming and applications.

TEXT BOOKS:

REFERENCE:

HS8561 EMPLOYABILITY SKILLS
(LAB / PRACTICAL COURSE)
0 0 2 1
(Common to all branches of Fifth or Sixth Semester B.E / B.Tech programmes)

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

TOTAL: 30 PERIODS

REQUIREMENTS FOR A CLASS OF 30 STUDENTS
1. A PC or a lap top with one or two speakers
2. A Collar mike and a speaker
3. An LCD projector and a screen
4. CD’s and DVD’s on relevant topics

OUTCOMES:
At the end of the course, learners should be able to
- Take international examination such as IELTS and TOEFL
- Make presentations and Participate in Group Discussions.
- Successfully answer questions in interviews.

REFERENCE BOOKS
EXTENSIVE READERS

WEB RESOURCES
1. www.humanresources.about.com
2. www.careerride.com

EI8611 COMPUTER CONTROL OF PROCESSES LABORATORY L T P C 0 0 3 2

OBJECTIVES:
The student should be made to:

- learn the procedure to obtain the dynamic model of given process using parametric and non-parametric identification methods.
- design appropriate controllers for processes such as conical tank system, heat exchanger, AC DC servo system and four tank system.
- perform Sequential logic programming for discrete control applications and implement the same using PLCs.
- develop and implement control strategies in Industrial DCS and implement the schemes on level process Test Setup.
- study the procedure to build soft sensors using Kalman Filter

LIST OF EXPERIMENTS
1. Simulation of Lumped and Distributed Parameter Systems.
2. Identification of Linear Dynamic model (Black Box) of a Process using Parametric Methods.
3. Design of Digital Controllers for First-order plus dead-time process using Direct Synthesis Methods
4. PC based Control of Heat Exchanger.
5. Study of Distributed Control System (Delta V and CS 3000).
6. Implementation of Discrete Control Sequence using PLC.
7. Control of Level Process using Embedded Controller.
8. On-line Control using Distributed Control System.
10. Study of AC and DC Servo Control System
12. On-line Estimation of State Variables using Kalman Filter

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- develop dynamic model and control of given process using parametric and non-parametric identification methods.
- Get familiarised with Sequential logic programming for discrete control applications and implement the same using PLCs.
- Gain knowledge to develop and implement control strategies in Industrial DCS and implement the schemes on level process Test Setup.

EI8701 LOGIC AND DISTRIBUTED CONTROL SYSTEM

OBJECTIVES:
The student should be made to:
- study the fundamentals of Data Networks.
- gain knowledge about hardware architecture and software for PLCs and SCADAs.
- design PLC program using ladder logic programming, functional block programming and sequential functional chart for selected Industrial processes.
- study the Distributed Control System, its architecture and interfacing.
- Learn about selective Industrial data communication protocols such as HART and field bus communication suitable for an industrial application.

UNIT I DATA NETWORK FUNDAMENTALS


UNIT II PLC AND SCADA

Evolutions of PLCs – Sequential and Programmable Controllers – Architecture – Comparative
study of Industrial PLCS. – SCADA: Hardware and software, Remote terminal units, Master station, Communication architectures and open SCADA protocols.

UNIT III  PLC PROGRAMMING

Plc Programming: Ladder logic, Functional block programming, sequential function chart, Instruction list.

UNIT IV  DISTRIBUTED CONTROL SYSTEM

DCS – Various Architectures – Comparison – Local control unit – Process interfacing issues – Displace study of any one DCS available in market - case studies in DCS

UNIT V  HART AND FIELD BUS


TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Get familiarised to fundamentals of Data Networks and select Industrial data communication protocols such as HART and field bus communication suitable for an industrial application.
• Acquire knowledge about hardware architecture, software and programming of PLCs.
• Get exposed to Distributed Control System, its architecture and interfacing.

TEXT BOOKS

REFERENCES
1. T.A. Hughes, Programmable Controllers, Fourth edition, ISA press, 2005
2. Krishna Kant, Computer Based Industrial Control, Second edition, Prentice Hall of India, New Delhi, 2010

EI8702  VLSI DESIGN  LT P C 3 0 0 3

OBJECTIVES:
The student should be made to:
• gain knowledge about the characteristics of CMOS, NMOS and their fabrication.
• learn and design rules and layout for NMOS and CMOS.
• understand FPGA, CPLD and their architectures.
• Study about the principle of HDL, its synthesis, validation and verification.
• Gain practical knowledge on VHDL programming of combinational and sequential logic circuits

UNIT I  BASIC DEVICE CHARACTERISTICS 9
NMOS, PMOS, enhancement and depletion mode transistor, MOSFET threshold voltage, linear and saturated operation, standard NMOS and CMOS inverters- switching speed, transistor sizing and power dissipation, noise margin. Pass transistors and Transmission gates. CMOS device fabrication principles, CMOS latch-up. SPICE models and circuit simulation using PSPICE

UNIT II  DESIGN RULES AND LAYOUT 9
Purpose of design rules, NMOS and CMOS design rules and layout, Design of NMOS and CMOS inverters, NAND and NOR gates. Interlayer contacts, butting and buried contacts, stick diagrams, layout of parity generator, multiplexer and adder element. Design and layout of 1
bit shift register cell.

**UNIT III  FPGAs AND CPLDs**

Introduction to FPGA Architectures. SRAM-Based FPGAs. Permanently Programmed FPGAs. I10 cell, Introduction to CPLDs. FPGAs and CPLDs from Xilinx, Altera and Actel. Introduction to ASIC.

**UNIT IV  PRINCIPLES OF HDL**


**UNIT V  VHDL PROGRAMMING**

VHDL programs of encoder, decoder, multiplexer, adders, shift registers, counters and accumulator. Realizing PID controller in VHDL. Use of VHDL in process control applications.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

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

- Gain knowledge about the characteristics and design rules for CMOS, NMOS
- Get exposed to FPGA, CPLD, their architectures and capable of carrying out VHDL programming of combinational and sequential logic circuits
- understand the principle of HDL, its synthesis, validation and verification.

**REFERENCES**

OBJECTIVES:
The student should be made to:
- understand the various physiological signal measurements and various assisting devices.
- Gain knowledge about the recording of ECG, EEG, EMG and ERG signals and their analysis.
- learn about the techniques used for measurement of Blood, heart, lung and liver related parameters.
- Study different medical imaging systems and its applications.
- understand the concept of assisting and therapeutic devices.

UNIT I  BASIC CONCEPTS OF MEDICAL INSTRUMENTATION  6

UNIT II  ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS  12

UNIT III  NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES  9
UNIT IV MEDICAL IMAGING SYSTEMS


UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES


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

• gain knowledge about the recording of ECG, EEG,EMG and ERG signals and their analysis.
• Get familiarized about the techniques used for measurement of Blood, heart, lung and liver related parameters.
• Gain knowledge on different medical imaging systems and its applications.

TEXT BOOKS:

REFERENCES
OBJECTIVES:
- To use the knowledge acquired in Electrical and Electronics Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

STRATEGY:
To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carry out the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

OUTCOMES:
- Obtain the skills of conducting literature survey.
- Learn different field problems pertaining to Electrical Engineering and the existing solutions to them.
- Providing new or innovative solutions with the advent of emerging technologies
- Acquire hardware fabrication skills.

OBJECTIVES:
The student should be made to:
- design Instrumentation amplifier, active filters, RPS and signal converters.
- design and implement the signal conditioning circuits for transducers such as RTD, strain gauge and thermocouple.
- gain knowledge on the design and implementation of orifice plate, Rotameter, control valves and Differential pressure transmitter.
- design and implement PID controller using operational amplifiers, microprocessors and multichannel data acquisition system.
- learn the procedure to prepare P&I diagram and documentation of the project work on selected industrial processes.
LIST OF EXPERIMENTS

1. Design of Instrumentation amplifier.
2. Design of active filters – LPF, HPF and BPF
3. Design of regulated power supply and design of V/I and I/V converters.
4. Design of linearizing circuits and cold-junction compensation circuit for thermocouples.
5. Design of signal conditioning circuit for strain gauge and RTD.
6. Design of orifice plate and rotameter.
7. Design of Control valve (sizing and flow-lift characteristics)
8. Design of PID controller (using operational amplifier and microprocessor)
9. Design of a multi-channel data acquisition system
10. Design of multirange DP transmitter
12. Preparation of documentation of instrumentation project and project scheduling for the above case study. (process flow sheet, instrument index sheet and instrument specifications sheet, job scheduling, installation procedures and safety regulations).
13. One or two experiments beyond syllabus

TOTAL: 45 PERIODS

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

- Get exposed to the design and implementation of flow meters and to design signal conditioning circuits for transducers such as RTD, strain gauge and thermocouple.
- Design and implement PID controller using operational amplifiers, microprocessors and multichannel data acquisition system.
OBJECTIVES:
The student should be made to:

- learn methodology to select a good project and able to work in a team leading to development of hardware/software product.
- prepare a good technical report.
- Gain Motivation to present the ideas behind the project with clarity.

A Project topic must be selected either from published lists or the students themselves may propose suitable topics in consultation with their guides. The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

A project report is required at the end of the semester. The project work is evaluated jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

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

- select a good project and able to work in a team leading to development of hardware/software product.
- prepare a good technical report and able to present the ideas with clarity.

OBJECTIVES:
The student should be made to:

- gain knowledge on the methods of plotting Nyquist chart for multivariable system.
- develop state space models.
- design state feedback control schemes and state observers.
- learn the different types of non-linearities and phase plane analysis.
• understand the different methods of determining the stability of non-linear systems.

UNIT I FREQUENCY DOMAIN DESCRIPTIONS
Properties of transfer functions - poles and zeros of transfer function matrices – singular value analysis – Multivariable Nyquist plots.

UNIT II STATE SPACE APPROACH

UNIT III STATE FEEDBACK CONTROL AND STATE ESTIMATOR
State Feedback – Output Feedback – Pole placement technique – Full order and Reduced Order Observers – Deadbeat Observers – Dead beat Control

UNIT IV NON-LINEAR SYSTEMS

UNIT V STABILITY OF NON-LINEAR SYSTEMS

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• analyze MIMO systems methods of plotting Nyquist chart for multivariable system.
• analyze the state space models and capable to design state feedback control schemes and state observers.
TEXT BOOK:

REFERENCE BOOKS:

EI8002 APPLIED DIGITAL SIGNAL PROCESSING

OBJECTIVES:
The student should be made to:
- learn about different random signals and random processes.
- gain knowledge on different methods of spectrum estimation.
- understand the concepts of linear estimation and prediction.
- Know the procedure for design of different types of adaptive filters.
- Mathematically represent transfer function of signals using wavelet transforms and their applications.

UNIT I DISCRETE TIME RANDOM SIGNALS


UNIT II SPECTRUM ESTIMATION

UNIT III  LINEAR ESTIMATION AND PREDICTION  9

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

UNIT IV  ADAPTIVE FILTERS  9


UNIT V  WAVELET TRANSFORM  9

Short Time Fourier Transform - Continuous and discrete wavelet transform – Multi-resolution analysis, Application of wavelet transform - Cepstrum and Homomorphic filtering.

TOTAL : 45 PERIODS

OUTCOMES
At the end of the course, the student should be able to:
• understand the concept of multirate signal processing and random signal processing

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:
• study the fundamentals of Neural networks and their architecture.
• gain knowledge on the applications of Neural networks for modelling and control.
• Get introduced to the concept of fuzzy set theory
• Understand Fuzzy logic theory for modelling and control.
• Develop hybrid control Schemes and apply optimization algorithms.

UNIT I   ARTIFICIAL NEURAL NETWORK   9

UNIT II   NEURAL NETWORKS FOR MODELING AND CONTROL   9
Modeling of non-linear systems using ANN – Generation of training data – Optimal architecture – Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural network toolbox

UNIT III   FUZZY SET THEORY   9
Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality, union and intersection, complement (Yager and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions

UNIT IV   FUZZY LOGIC FOR MODELING AND CONTROL   9

UNIT V   HYBRID CONTROL SCHEMES   9
Fuzzification and rule base using ANN – Neuro fuzzy systems – ANFIS – Fuzzy neuron
– Introduction to GA – Optimization of membership function and rule base using Genetic Algorithm – Introduction to support vector machine – Particle swarm optimization – Case study – Familiarization with ANFIS toolbox

**OUTCOMES:**
At the end of the course, the student should be able to:
- understand the different ANN architecture and concept of Fuzzy Logic theory and their applications in modeling and control
- Get familiarity with hybrid control Schemes and selected optimization algorithms.

**TEXTBOOKS**

**REFERENCE BOOKS**

**EI8004 DATA BASE MANAGEMENT**

**OBJECTIVES:**
The student should be made to:
- understand the concepts of relational database system.
- gain knowledge about the design aspects of Database system
- gain the concept of transactions in Database
- learn the different techniques used for data storage
- know the current trends in object oriented database management system.
UNIT I  RELATIONAL DATABASES  9

UNIT II  DATABASE DESIGN  9
Entity-Relationship (ER) model – ER diagrams – Normalization – Functional dependencies – Non-loss decomposition – First, second, third normal forms and Boyce/ Codd normal form – Integrity and security – Triggers

UNIT III  TRANSACTIONS  9

UNIT IV  STORAGE TECHNIQUES  9

UNIT V  ADVANCED TOPICS  9
Query processing – Query optimization – Distributed databases – Architecture – Distributed transaction processing – Two phase commit protocol - Data warehousing and mining – Data warehouse architecture – Star and snowflake schema – Data extraction – Transformation – Cleaning – Loading into a data warehouse – Data mining fundamentals

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand relational database system and its design aspects.
• acquire the knowledge about the different techniques used for data storage and capable of understanding the current trends in object oriented database management system.
TEXTBOOKS:

REFERENCES:

EI8005 FIBRE OPTICS AND LASER INSTRUMENTATION L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
- study about the transmission characteristics of light and principles of TRI in optical fibers.
- Understand about the types of optical fibres and its applications for the measurement of pressure, temperature, level and strain etc.
- Know about the fundamentals of laser system, its mode of operation and their classifications.
- learn the applications of laser for measurement of distance, velocity etc and material processing.
- understand the principles of Holography, its application in NDT and the use of laser in biomedical application.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES 9

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES 9
Fibre optic sensors – Fibre optic instrumentation system for measurement of fibre characteristics – Different types of modulators – Interferometric method for measurement of length – Moire
fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain – fiber optic gyroscope – Polarization Maintaining fibers.

UNIT III  LASER FUNDAMENTALS  9

UNIT IV  INDUSTRIAL APPLICATION 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 – Material Removal and vaporization.

UNIT V  HOLOGRAM AND MEDICAL APPLICATIONS  9

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- understand the types of optical fibres and its application as fiber optic sensors
- Get familiarized on the applications of laser for measurement of distance, velocity, material processing, NDT and biomedical applications.

REFERENCE BOOKS:
OBJECTIVES:
The student should be made to:
• study the basics of data structures such as arrays, queues etc.
• gain knowledge about the advantages of data structures.
• learn the procedure to select appropriate sorting algorithms for a given application.
• study the basics of graph, its representation and implementation.
• understand storage structures and management.

UNIT I INTRODUCTION AND BASIC DATA STRUCTURES
Introduction – Arrays – Structures – Stacks and queues – Linked list – Array, list implementation and applications

UNIT II ADVANCED DATA STRUCTURES
Trees, preliminaries – Binary tree – Tree representation – Tree traversals - Binary search trees

UNIT III SORTING AND HASHING

UNIT IV GRAPHS ALGORITHMS

UNIT V STORAGE STRUCTURES AND MANAGEMENT

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Get familiarized with fundamentals of data structures used in computer science and able to design new algorithms or modify the existing ones for new applications.
TEXTBOOKS:

EI8007 FUNDAMENTALS OF DIGITAL IMAGE PROCESSING  L T P C 3 0 0 3

OBJECTIVES:
The student should be made to:
- learn and understand the fundamentals of digital image.
- gain knowledge on how images are enhanced to improve subjective perception.
- understand image restoration techniques.
- gain knowledge on image segmentation.
- study the principle of image compression.

UNIT I FUNDAMENTALS OF DIGITAL IMAGE 9
Elements of digital image processing systems - Vidicon and Digital Camera working principles - Elements of visual perception, brightness, contrast, hue, saturation, mach band effect - Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II IMAGE ENHANCEMENT 9
Histogram equalization and specification techniques - Noise distributions - Spatial averaging - Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters - Homomorphic filtering - Color image enhancement.

UNIT III IMAGE RESTORATION 9
UNIT IV IMAGE SEGMENTATION

Edge detection - Edge linking via Hough transform - Thresholding - Region based segmentation - Region growing - Region splitting and Merging - Segmentation by morphological watersheds - basic concepts - Dam construction - Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION

Need for data compression - Huffman, Run Length Encoding - Shift codes - Arithmetic coding - Vector Quantization - Transform coding - JPEG standard - MPEG.

OUTCOMES:
At the end of the course, the student should be able to:
- Gain knowledge about how image are enhanced to improve subjective perception.
- understand the image restoration techniques.
- Gain knowledge on image segmentation and compression.

TEXT BOOKS:

REFERENCES:

EI8008 FUNDAMENTALS OF NANOSCIENCE AND MEMS

OBJECTIVES:
The student should be made to:
- learn about nano science technology and its engineering applications.
• gain knowledge on different micro fabrication methods
• learn the concept of patterning and lithography for nano scale devices

• know about environmental requirements for nano fabrication facilities
• understand different techniques for nano scale characterisation

UNIT I  INTRODUCTION
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II  PREPARATION METHODS
Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III  PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV  PREPARATION ENVIRONMENTS
Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V  CHARACTERISATION TECHNIQUES
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• gain knowledge on different micro fabrication methods and get exposed to patterning and lithography for nano scale devices
• understand different techniques for nano scale characterisation
TEXT BOOKS

REFERENCES

EI8009 INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES

OBJECTIVES:
The student should be made to:
- understand the different oil recovery methods, oil gas separation and its processing.
- learn about the most important unit operations in petrochemical industries like cracking, reforming etc.
- gain knowledge on the important derivatives obtained from petroleum and its uses.
- Know about the most important variables to be monitored and measured in petrochemical industry and steps followed for ensuring intrinsic safety.
- study about the different control schemes applied to processes like distillation column, PVC production unit, cracking and reforming.

UNIT I OIL EXTRACTION AND PROCESSING

Techniques used for oil discovery - seismic survey - methods of oil extraction - oil rig system - Primary and Secondary recovery - Enhanced oil recovery - separation of gas and water from oil - control loops in oil gas separator - scrubber - coalescer

UNIT II PETROLEUM REFINING

Petroleum refining process - unit operations in refinery - thermal cracking - catalytic cracking - catalytic reforming - polymerization - isomerization - alkylation - Production of ethylene, acetylene and propylene from petroleum
UNIT III  CHEMICALS FROM PETROLEUM  9

Chemicals from methane, acetylene, ethylene and propylene - production routes of important petrochemicals such as polyethylene, polypropylene, ethylene oxide, methanol, xylene, benzene, toluene, styrene, VCM and PVC

UNIT IV  CONTROL LOOPS IN PETROCHEMICAL INDUSTRY  9

Control of binary and fractional distillation columns - Control of catalytic and thermal crackers - control of catalytic reformer - control of alkylation process - Control of polyethylene production – Control of VCM and PVC production

UNIT V  SAFETY IN INSTRUMENTATION SYSTEMS  9

Area and material classification as per National Electric Code (NEC) - Classification as per International Electrotechnical Commission (IEC) - Techniques used to reduce explosion hazards - Pressurization techniques - Type X, Type Y and Type Z - Intrinsic safety - Mechanical and Electrical isolation - Lower and Upper explosion limit

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand the oil recovery methods, oil gas separation and the important derivatives obtained from petroleum and its uses.
• gain knowledge on the most important variables to be monitored, measured and controlled on selected unit operations in petrochemical industry

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:

- learn the procedure to numerically solve different classes of optimization algorithms using appropriate optimization techniques (Linear, Non linear and dynamic)
- understand procedure to select appropriate optimization algorithms for a given application
- gain knowledge about genetic Algorithms and its application in process control and instrumentation.

UNIT I INTRODUCTION
Historical Development, Engineering application of Optimization, Formulation of design problems as mathematical programming problems, classification of optimization problems.– Case studies

UNIT II LINEAR PROGRAMMING
Graphical method, Simplex method, Revised simplex method, Duality in linear programming (LP), Transportation, assignment and other applications.

UNIT III NON LINEAR PROGRAMMING
Unconstrained optimization techniques, Direct search methods, Descent methods, Constrained optimization, Direct and indirect methods, Optimization with calculus, Khun-Tucker conditions.

UNIT IV DYNAMIC PROGRAMMING
Introduction, Sequential optimization, computational procedure, curse of dimensionality, Applications in Control Engineering

UNIT V ADVANCED TECHNIQUES OF OPTIMIZATION
Introduction- Genetic algorithms for optimization and search – Multi-objective evolutionary optimization - The role of Pareto - optimal problems in Engineering Design and their solution strategies based upon Genetic Algorithms – Usage in process control- Particle Swarm Optimization
OUTCOMES:
At the end of the course, the student should be able to:

- solve numerically different classes of optimization algorithms using appropriate optimization techniques (Linear, Non linear and dynamic) and able to select appropriate optimization algorithms for a given application

TEXT BOOK:

REFERENCE BOOKS:

EI8011 POWER ELECTRONICS DEVICES AND CIRCUIT

OBJECTIVES:
The student should be made to:

- understand the operation of controlled rectifiers, choppers, inverters and their applications.
- learn the principle of step up and step down choppers
- study about voltage source inverter, current source inverter and PWM.
- Gain knowledge about the applications of power semiconductor devices for the speed control of AC and DC motors.

UNIT I POWER SEMICONDUCTOR DEVICES AND CHARACTERISTICS

UNIT II  CONTROLLED RECTIFIERS


UNIT III  CHOPPERS

Step up and Step down Chopper – Chopper classification - quadrant of operation – Switching mode Regulators - Buck, Boost, Buck-Boost, and Cuk Regulators.

UNIT IV  INVERTERS


UNIT V  APPLICATION

Introduction to D.C and A.C drives – Electrical breaking - Open loop and Closed loop control of drives (Block diagram approach only) – Principle of vector control of AC drives - Stepper motor drives - Switched mode power supply - Introduction to HVDC and FACTS - Static VAR compensators.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand the operation of controlled rectifiers, choppers, inverters and their applications and gain knowledge in selection of power semiconductor devices for the speed control of AC and DC motors.

TEXT BOOKS:

REFERENCE BOOKS:

EI8012 REAL TIME EMBEDDED SYSTEMS

OBJECTIVES:
The student should be made to:
- gain knowledge on the selection of processor and software for embedded applications
- learn about the serial and parallel communication protocols.
- understand interrupt service mechanism and device drivers
- know the procedure to design RTOS based embedded system
- acquire knowledge on selected embedded system applications.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS
Build process for embedded systems - Structural units in Embedded processor, selection of processor & memory devices - DMA – memory mapping - Timer and Counting devices, Watchdog Timer, Real Time Clock - Software Embedded in a system - IDE, assembler, compiler, linker, simulator, debugger, In circuit emulator, Target Hardware Debugging, Boundary Scan.

UNIT II EMBEDDED NETWORKING

UNIT III DEVICE DRIVERS AND INTERRUPTS SERVICE MECHANISM
Programmed - I/O busy-wait approach without interrupt service mechanism - ISR concept - interrupt sources – multiple interrupts – context and periods for context switching, interrupt latency and deadline – Device Driver – Introduction to Basic Concept of Parallel port & Serial port Device Drivers.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN
Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in
RTOS, Multiprocessing and Multitasking, Preemptive and Non-Preemptive scheduling, Task communication-shared memory, message passing - Interprocess Communication – Synchronization between processes - Semaphores, Mailbox, Pipes, Priority inversion, Priority inheritance, Comparison of Real time Operating systems: VxWorks, \( \mu \text{C/OS-II} \), RT Linux.

**UNIT V  EMBEDDED SYSTEM APPLICATION WITH DEVELOPMENT**

Case Study of Washing Machine- Automotive Application – RFID - System, Application, Tag, Reader - Embedded Product Development Life Cycle, Objective, Need, different Phases & Modelling of the EDLC.

**TOTAL: 45 PERIODS**

**OUTCOMES:**
At the end of the course, the student should be able to:
- Gain knowledge on selection of processor and software for embedded applications and get exposed to serial and parallel communication protocols.
- design RTOS based embedded system

**TEXT BOOKS:**

**REFERENCES:**
2. Han-Way Huang, "Embedded system Design using C8051", Cengage Learning, 2009

**EI8013  REAL TIME OPERATING SYSTEMS**

**OBJECTIVES:**
The student should be made to:
- study the concepts of embedded programming and its implementation using C,C++
- learn the services provided by real time Operating systems.
• know about inter task communication and synchronization.
• understand Micro COS-11 and Vx works and its supported system level functions.
• learn the concept of RTOS using typical case studies.

UNIT I  CONCEPTS AND EMBEDDED PROGRAMMING IN C, C++


UNIT II  REAL TIME OPERATING SYSTEMS – PART - 1


UNIT III  COMMUNICATION AND SYNCHRONISATION

Shared data problem – Use of Semaphore(s) – Priority Inversion Problem and Deadlock Situations – Inter Process Communications using Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual (Logical) Sockets – Remote Procedure Calls (RPCs).

UNIT IV  REAL TIME OPERATING SYSTEMS – PART - 2

Study of Micro C/OS-II or Vx Works or Any other popular RTOS – RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions – Mailbox Related Functions – Queue Related Functions –

UNIT V  CASE STUDIES

Case Studies of Programming with RTOS – Understanding Case Definition – Multiple Tasks
and their functions – Creating a list of tasks – Functions and IPCs – Exemplary Coding Steps.

TOTAL : 45 PERIODS

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

- understand the concepts of embedded programming and its implementation using C,C++ and get exposed to Micro COS-11 and Vx works and its supported system level functions.
- Understand the concept of RTOS using typical case studies.

TEXT BOOKS

REFERENCES

EI8014 
ROBOTICS AND AUTOMATION

OBJECTIVES :
The student should be made to:

- To study and understand the evolution of robot technology and their classification.
- To introduce the methodology for mathematical representation of different types of robots.
- To acquire knowledge on construction of manipulators and their types.
- To learn the procedure for carrying out kinematics and path learning techniques.
- To expose knowledge on the case studies and design of robot machine interface.

UNIT I BASIC CONCEPTS

Brief history -Types of Robot – Technology - Robot classifications and specifications - Design
and control issues - Various manipulators – Sensors - work cell - Programming languages

**UNIT II DIRECT AND INVERSE KINEMATICS**

Mathematical representation of Robots - Position and orientation - Homogeneous transformation - Various joints - Representation using the Denavit Hattenberg parameters - Degrees of freedom - Direct kinematics - Inverse kinematics - PUMA 560 & SCARA robots - Solvability - Solution methods-Closed form solution

**UNIT III MANIPULATOR DIFFERENTIAL MOTION AND STATICS**

Linear and angular velocities - Manipulator Jacobian - Prismatic and rotary joints – Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance

**UNIT IV PATH PLANNING**

Definition - Joint space technique - Use of p-degree polynomial - Cubic polynomial - Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning

**UNIT V DYNAMICS AND CONTROL**

Lagrangian mechanics - 2 DOF Manipulator - Lagrange Euler formulation - Dynamic model -Manipulator control problem - Linear control schemes - PID control scheme - Force control of robotic manipulator

**TOTAL: 45 PERIODS**

**OUTCOMES:**
At the end of the course, the student should be able to:
- understand the evolution of robot technology and mathematically represent different types of robot.
- Get exposed to the case studies and design of robot machine interface.

**TEXTBOOKS**

REFERENCES

EI8015 SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- understand non parametric methods of system identification
- gain knowledge about different types of parametric estimation methods such as prediction error and instrumental variable methods.
- Learn about the recursive identification methods and their applications
- Know the design procedure of adaptive control schemes for linear and non linear systems
- explore the case studies on adaptive control system

UNIT I NON PARAMETRIC METHODS 9
Nonparametric methods: Transient analysis – frequency analysis – Correlation analysis – Spectral analysis.

UNIT II PARAMETER ESTIMATION METHODS 9
UNIT III  RECURSIVE IDENTIFICATION METHODS

The recursive least square method – the recursive instrumental variable methods- the recursive prediction error methods – Maximum likelihood. Identification of systems operating in closed loop: Identifiability considerations – direct identification – indirect identification

UNIT IV  ADAPTIVE CONTROL SCHEMES


UNIT V  ISSUES IN ADAPTIVE CONTROL AND APPLICATIONS

Stability – Convergence – Robustness – Applications of adaptive control

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• understand parametric and non parametric methods of system identification
• design appropriate adaptive control schemes for linear and non linear systems and get exposed to case studies of adaptive control system

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
The student should be made to:

- gain knowledge about different types of power plants.
- study about the methods used for measurement of process variables related to thermal power plant.
- learn the different control schemes for boiler and its auxiliary units.
- study the concept of burner management system.
- understand the different configuration of turbine control system.

UNIT I  OVERVIEW OF POWER GENERATION


UNIT II  MEASUREMENTS IN POWER PLANTS


UNIT III  BOILER CONTROL – I


UNIT IV  BOILER CONTROL – II


UNIT V  CONTROL OF TURBINE

Types of steam turbines – impulse and reaction turbines – compounding – Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation –
Automatic Load Frequency Control – Turbine oil system – Oil pressure drop relay – Oil cooling system – Turbine run up system.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- gain knowledge about different types of power plants, measurements involved in thermal power plant.
- understand the different control schemes for boiler, turbine and their auxiliary units.

TEXT BOOKS

REFERENCES

EI8017 UNIT OPERATIONS AND CONTROL

OBJECTIVES:
The student should be made to:
- study the unit operations involved for transportation, mixing and separation.
- Understand the basic operations involved with heat exchangers, evaporators and crystallisers.
- gain knowledge on the operation of dryers, distillation column, refrigerators and chemical reactors.
- study about the different unit operations involved in paper and pulp, steel industry, thermal power plant, pharmaceutical and leather industries

UNIT I UNIT OPERATIONS
Unit operations-transport of liquids, solids and gases adjusting particle size of bulk solids – mixing processes – separation processes.
UNIT II COMBUSTION PROCESSES


UNIT III OTHER OPERATIONS

Drying – distillation – refrigeration process – chemical reactions.

UNIT IV CASE STUDY – I

Operations in the manufacture of paper and pulp – operations in steel industry.

UNIT V CASE STUDY – II

Operations in thermal power plant – operations in pharmaceutical industry and leather industry.

TOTAL: 45 PERIODS

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

- gain knowledge of unit operation involved for transportation mixing and separation, heat exchangers, evaporators, crystallizers etc.
- Gain knowledge on unit operations involved in paper & pulp, steel, thermal power plant, pharmaceutical and leather industry

TEXT BOOK:

REFERENCES:
3. Liptak, B.G., Process measurement and analysis, Chilton Book Company, USA, 1995
OBJECTIVES:
The student should be made to:
- gain knowledge about basic concepts in Virtual Instrumentation and its related software.
- understand the concepts of Data acquisition, Timers and Counters for carrying out real time projects.
- study about the different communication networked modules
- know the procedure and implementation of modelling and control of real time processes in LabVIEW Platform..
- learn PC based digital storage oscilloscope, spectrum analyser, distributed monitoring and control devices.

UNIT I  INTRODUCTION
Virtual Instrumentation: Historical perspective - advantages - block diagram and architecture of a virtual instrument - Conventional Instruments versus Virtual Instruments - data-flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II  VI PROGRAMMING TECHNIQUES
VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, State machine, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

UNIT III  DATA ACQUISITION
Introduction to data acquisition, Sampling fundamentals, Input/Output techniques and Latest ADCs, DACs, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements – Issues involved in selection of Data acquisition cards – Data acquisition cards with serial communication - VI Chassis requirements. SCSI, PCI, PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

UNIT IV  VI TOOLSETS
Use of Analysis tools, Fourier transforms, power spectrum, correlation methods, windowing and filtering. Application of VI in process control designing of equipments like oscilloscope,
Digital multimeter, Design of digital Voltmeters with transducer input. Virtual Laboratory, Web based Laboratory

UNIT V  APPLICATIONS

Distributed I/O modules - Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.

TOTAL : 45 PERIODS

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

- Gain knowledge about basic concepts in Virtual Instrumentation and ability to design and implement process.
- Get exposed to PC based digital storage oscilloscope, spectrum analyser, distributed monitoring and control devices.

TEXTBOOKS:

REFERENCES:

EI8071  INDUSTRIAL DATA NETWORKS  L T P C
3 0 0 3

OBJECTIVES :
The student should be made to:

- gain knowledge on the serial interface standards.
- understand the principle of network architecture and protocol stack.
- study about the characteristics and functions of the individual layers of the protocol stack
- learn about the wired and wireless communication protocols used in industrial networks.
UNIT I  RS – 232 AND RS – 485  9

UNIT II  MODBUS DATA HIGHWAY (PLUS) AND HART PROTOCOLS  9

UNIT III  AS – INTREFACE AND DEVICENET  9
AS interfaces:- Introduction, Physical layer, Data link layer and Operating characteristics. Devicenet:- Introduction, Physical layer, Data link layer and Application layer.

UNIT IV  PROFIBUS PA/DP/FMS AND FF  9
Profibus:- Introduction, Profibus protocol stack, Profibus communication model, Communication objects, System operations and Troubleshooting – Foundation fieldbus versus Profibus.

UNIT V  INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION  9
Industrial Ethernet:- Introduction, 10Mbps Ethernet and 100Mbps Ethernet – Radio and wireless communication:- Introduction, Components of radio link, radio spectrum and frequency allocation and radio modems – Comparison of various industrial networks.

TOTAL : 45 PERIODS

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

- Gain knowledge on the serial interface standards, network architecture and protocol stack
- Get familiarized with the wired and wireless communication protocols used in industrial networks.

TEXT BOOKS:
2. Buchanan, W., “Computer Buses”, CRC Press, 2000,

REFERENCES:
GE8072 DISASTER MANAGEMENT

OBJECTIVES:
- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.
UNIT IV DISASTER RISK MANAGEMENT IN INDIA

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
OBJECTIVES:
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL : 45 PERIODS

OUTCOMES:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES: