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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# Choice Based Credit System

## B.E. Electronics and Instrumentation Engineering

### Regulations – 2015

### Curricula and Syllabi I - VIII Semesters

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Centre For Academic Courses
Anna University, Chennai-800 025.
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COURSE DESCRIPTION:
This course aims at developing the language skills necessary for the first year students of Engineering and Technology.

OBJECTIVES:
• To develop the four language skills – Listening, Speaking, Reading and Writing.
• To improve the students’ communicative competence in English.
• To teach students the various aspects of English language usage.

CONTENTS

UNIT I  GREETING AND INTRODUCING ONESELF  12
Listening – Types of listening – Listening to short talks, conversations; Speaking – Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family/friend; Reading – Skimming a passage – Scanning for specific information; Writing – Guided writing - Free writing on any given topic (My favourite place/ Hobbies/ School life, writing about one’s leisure time activities, hometown, etc.);
Grammar – Tenses (present and present continuous) -Question types - Regular and irregular verbs;
Vocabulary – Synonyms and Antonyms.

UNIT II  GIVING INSTRUCTIONS AND DIRECTIONS  12
Listening – Listening and responding to instructions; Speaking – Telephone etiquette - Giving oral instructions/ Describing a process – Asking and answering questions; Reading – Reading and finding key information in a given text - Critical reading - Writing –Process description (non-technical);
Grammar – Tense (simple past & past continuous) – Use of imperatives – Subject – verb agreement – Active and passive voice; Vocabulary – Compound words – Word formation – Word expansion (root words).

UNIT III  READING AND UNDERSTANDING VISUAL MATERIAL  12
Listening – Listening to lectures/ talks and completing a task; Speaking – Role play/ Simulation – Group interaction; Reading – Reading and interpreting visual material; Writing – Jumbled sentences – Discourse markers and Cohesive devices – Essay writing (cause & effect/narrative); Grammar – Tenses (perfect), Conditional clauses – Modal verbs; Vocabulary – Cause and effect words; Phrasal verbs in context.

UNIT IV  CRITICAL READING AND WRITING  12
Listening – Watching videos/ documentaries and responding to questions based on them; Speaking Informal and formal conversation; Reading – Critical reading (prediction & inference); Writing – Essay writing (compare & contrast/ analytical) – Interpretation of visual materials; Grammar – Tenses (future time reference); Vocabulary – One word substitutes (with meanings) – Use of abbreviations & acronyms – Idioms in sentences.

UNIT V  LETTER WRITING AND SENDING E-MAILS  12
Listening – Listening to programmes/broadcast/ telecast/podcast; Speaking – Giving impromptu talks, Making presentations on given topics- Discussion on the presentation; Reading – Extensive reading; Writing – Poster making – Letter writing (Formal and E-mail); Grammar – Direct and Indirect speech – Combining sentences using connectives; Vocabulary – Collocation;
TEACHING METHODS:
Interactive sessions for the speaking module.
Use of audio – visual aids for the various listening activities.
Contextual Grammar Teaching.

EVALUATION PATTERN:
Internals – 50%
End Semester – 50%

TOTAL: 60 PERIODS

LEARNING OUTCOMES:
- Students will improve their reading and writing skills
- Students will become fluent and proficient in communicative English
- Students will be able to improve their interpersonal communication

TEXTBOOK:

REFERENCES:
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student’s Book& Workbook) Cambridge University Press, New Delhi: 2005
COURSE OBJECTIVES

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I  DIFFERENTIAL CALCULUS  12
Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II  FUNCTIONS OF SEVERAL VARIABLES  12

UNIT III  INTEGRAL CALCULUS  12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV  MULTIPLE INTEGRALS  12

UNIT V  DIFFERENTIAL EQUATIONS  12
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.

TOTAL: 60 PERIODS

COURSE OUTCOMES

- Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
• Improved facility in algebraic manipulation.
• Fluency in differentiation.
• Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
• Understanding the ideas of differential equations and facility in solving simple standard examples.

TEXT BOOKS

REFERENCES
OBJECTIVE:
- To introduce the concept and different ways to determine moduli of elasticity and applications.
- To instill the concept of sound, reverberation, noise cancellation, and ultrasonic generation, detection and applications.
- To inculcate an idea of thermal properties of materials, heat flow through materials and quantum physics.
- To promote the basic understanding of interferometers, principles and applications of lasers, optical fibers and sensors.
- To establish a sound grasp of knowledge on the basics, significance and growth of single crystals.

UNIT I  PROPERTIES OF MATTER  9

UNIT II  ACOUSTICS AND ULTRASONICS  9

UNIT III  THERMAL AND MODERN PHYSICS  9

UNIT IV  APPLIED OPTICS  9

UNIT V  CRYSTAL PHYSICS  9
Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, ditections and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - structure and significance of NaCl, CsCl, ZnS and graphite - crystal imperfections: point defects, line defects – Burger vectors, dislocations and stacking faults – Growth of single crystals: Bridgman and Czochralski methods.

TOTAL: 45 PERIODS
OUTCOME:
- The students will understand different moduli of elasticity, their determination and applications.
- The students will gain knowledge on the properties of sound, noise cancellation, and production, detection and applications of ultrasonics.
- The students will acquire sound knowledge on thermal expansion and thermal conductivity of materials. Further they will gain an idea of quantum physics.
- The students will gain knowledge on interferometers, lasers and fiber optics.
- The students will secure knowledge on the basics of crystal structures and their significance. Further they gain basic ideas of growing single crystals.

TEXTBOOKS:

REFERENCES:

CY7151 ENGINEERING CHEMISTRY L T P C
3 0 0 3

COURSE OBJECTIVES
- To develop an understanding about fundamentals of polymer chemistry.
- Brief elucidation on surface chemistry and catalysis.
- To develop sound knowledge photochemistry and spectroscopy.
- To impart basic knowledge on chemical thermodynamics.
- To understand the basic concepts of nano chemistry.

UNIT I POLYMER CHEMISTRY
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers: Tg, tacticity, molecular weight-weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension.

UNIT II SURFACE CHEMISTRY AND CATALYSIS

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT IV CHEMICAL THERMODYNAMICS
Second law: Entropy-entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Free energy and work function: Helmholtzand 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 V NANO CHEMISTRY
Basics—distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Preparation of nanoparticles—sol-gel and solvothermal. Preparation of carbon nanotube by chemical vapour deposition and laser ablation. Preparation of nanowires by VLS growth, electrochemical deposition and electro spinning. Properties and uses of nanoparticles, nanoclusters, nanorods, nanotubes and nanowires.

TOTAL: 45 PERIODS

COURSE OUTCOMES
• Will be familiar with polymer chemistry, surface chemistry and catalysis.
• Will know the photochemistry, spectroscopy and chemical thermodynamics.
• Will know the fundamentals of nano chemistry.

TEXT BOOKS


REFERENCES


GE7151 COMPUTING TECHNIQUES

Common to all branches of Engineering and Technology

OBJECTIVES:

• To learn programming using a structured programming language.
• To provide C programming exposure.
• To introduce foundational concepts of computer programming to students of different branches of Engineering and Technology.

UNIT I INTRODUCTION
Introduction to Computers – Computer Software – Computer Networks and Internet - Need for logical thinking – Problem formulation and development of simple programs - Pseudo code - Flow Chart and Algorithms.

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS

UNIT IV POINTERS
Macros - Storage classes –Basic concepts of Pointers– Pointer arithmetic - Example Problems - Basic file operations

UNIT V FUNCTIONS AND USER DEFINED DATA TYPES

TOTAL : 45 PERIODS
OUTCOMES

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

- Write C program for simple applications
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Perform simple search and sort.
- Use programming language to solve problems.

TEXT BOOKS


REFERENCES


BS7161 BASIC SCIENCES LABORATORY L T P C
(Common to all branches of B.E. / B.Tech Programmes) 0 0 4 2

PHYSICS LABORATORY: (Any Seven Experiments)

OBJECTIVE:

- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves, band gap determination and viscosity of 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. Uniform bending – Determination of young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
   b) Compact disc - Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.
11. Post office box - Determination of Band gap of a semiconductor.

OUTCOME:
Upon completion of the course, the students will be able
- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids.

CHEMISTRY LABORATORY:

(Minimum of 8 experiments to be conducted)

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.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 60 PERIODS

TEXTBOOKS
OBJECTIVES

- To understand the basic programming constructs and articulate how they are used to develop a program with a desired runtime execution flow.
- To articulate where computer programs fit in the provision of computer-based solutions to real world problems.
- To learn to use user defined data structures.

LIST OF EXPERIMENT

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
10. Program using structures and unions.

TOTAL: 60 PERIODS

OUTCOMES

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

- Write and compile programs using C programs.
- Write program with the concept of Structured Programming
- Identify suitable data structure for solving a problem
- Demonstrate the use of conditional statement.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

30 Systems with C compiler
COURSE OBJECTIVES

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- 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 the 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 MATRICES


UNIT II VECTOR CALCULUS

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

UNIT III ANALYTIC FUNCTION

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions \( w = z + c, \frac{1}{z}, z^2 \) - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION


UNIT V LAPLACE TRANSFORMS

COURSE OUTCOMES

Upon successful completion of the course, students should be able to:

- Evaluate real and complex integrals using the Cauchy integral formula and the residue theorem
- Appreciate how complex methods can be used to prove some important theoretical results.
- Evaluate line, surface and volume integrals in simple coordinate systems
- Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
- Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

TEXT BOOKS


REFERENCES


PH7252  MATERIALS SCIENCE FOR TECHNOLOGISTS  L T P C
(Common to E & I and Rubber and Plastics Technology Branches)  3 0 0 3

OBJECTIVE:

- To make the students to understand the basics of phase diagrams and various crystal growth techniques
- To equip the students to have a knowledge on different types of electron theory, basics of applied quantum mechanics and about superconductors
- To introduce the importance of semiconducting materials, physics of semiconducting materials and applications of semiconductors in device fabrication
- To familiarize the students to magnetic materials, theory and types of magnetizations, dielectric materials and their application.
• To provide the students a sound platform towards learning about advanced materials and their applications.

UNIT I  MATERIALS PREPARATION AND PROCESSING  9

UNIT II  CONDUCTING MATERIALS  9

UNIT III  SEMICONDUCTING MATERIALS  9
Origin of band gap in solids (qualitative) - Concept of effective mass of electron and hole – Carrier concentration in an intrinsic semiconductor (derivation) – Fermi level – Variation of Fermi level with temperature – electrical conductivity – Band gap determination – Carrier concentration in n-type and p-type semiconductors (derivation) – Variation of Fermi level with temperature and impurity concentration – Compound semiconductors – Hall effect – Determination of Hall coefficient – Solar cells – LED and photodiode.

UNIT IV  MAGNETIC AND DIELECTRIC MATERIALS  9

UNIT V  NEW MATERIALS AND APPLICATIONS  9

TOTAL: 45 PERIODS

OUTCOME:

Students will be able to
• acquire knowledge of phase diagram and important crystal growing techniques.
• familiarize with conducting materials, and properties and applications of superconductors.
• gain knowledge on semiconducting materials based on energy level diagrams, its types, temperature effect. Also, fabrication methods for semiconductor devices will be understood.
• realize with theories of magnetic materials, understand the dielectric behavior of insulating materials and ferroelectric materials.
• familiarize with ceramics, FRP, shape memory alloys and important technological applications.
REFERENCES:

GE7152 ENGINEERING GRAPHICS LT P C 3 2 0 4

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

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) 1
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HANDSKETCHING 14
Basic Geometrical constructions, Curves used in engineering practices–Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 14
Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 14
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 14
Sectioning of 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.

30
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.

L=45+T=30, TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course the student will be able to
• Perform free hand sketching of basic geometrical shapes and multiple views of objects.
• Draw orthographic projections of lines, planes and solids
• Obtain development of surfaces.
• Prepare isometric and perspective views of simple solids.

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 study the nature and facts about environment.
- To find 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  14
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II  ENVIRONMENTAL POLLUTION  8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III  NATURAL RESOURCES  10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.
UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT


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

TEXTBOOKS:


REFERENCES:


EI7201 ANALYSIS OF ELECTRIC CIRCUITS

COURSE OBJECTIVES

- To introduce basic concepts of AC and DC circuits and to explore the basics of R,L, C circuits.
- To explore various network theorems.
- To introduce the concept of transient analysis of first and second order linear circuits.
- To explore the concept of resonance in Series and Parallel circuits.
- To explore the concept of two port networks and the analysis of three-phase balanced and unbalanced circuits.

UNIT I D.C and A.C CIRCUIT FUNDAMENTALS

Linear, Nonlinear, Unilateral, Bilateral, Active and Passive elements. Voltage and Current Sources.

UNIT II STEADY STATE ANALYSIS OF NETWORKS 10

UNIT III TRANSIENT ANALYSIS OF FIRST AND SECOND ORDER LINEAR CIRCUITS 9

UNIT IV RESONANCE AND COUPLED CIRCUITS 8

UNIT V THREE PHASE CIRCUITS AND TWO PORT NETWORKS 10

TOTAL : 45 PERIODS

COURSE OUTCOMES
At the end of the course, the students will

- Be able to analyze the basic concepts of A.C and D.C circuits.
- Be able to solve the electrical circuits using the network theorems.
- Be able to understand the transient analysis of first and second order linear networks.
- Be able to understand the concept of resonance in series and parallel circuits.
- Be able to analyze three phase circuits and be in a position to understand the concept of two port networks.

TEXT BOOKS
REFERENCES


EI7251 SIGNALS AND SYSTEMS

COURSE OBJECTIVES

- To introduce the representation and classification of continuous-time and discrete-time signals.
- To impart knowledge on the methods and impact of analog to digital conversion and digital to analog conversion.
- To teach the analysis of CT and DT systems through various transform techniques such as Laplace transform, Fourier transform and Z-transform.
- To familiarize the concept of random signals and their statistical properties.

UNIT I INTRODUCTION TO CT SIGNALS AND SYSTEMS

Introduction to signals and systems and their classifications. Definition of CT signal, Representation of elementary CT signals: Impulse, Pulse, Step, Ramp, Exponential, Sinusoidal. Classification of CT signals: periodic and a-periodic, power and energy, deterministic and random signals. Definition of CT system, Classification and characterization with examples: Static & dynamic, causal & non causal, linear & non linear, time variant & time invariant, stable & unstable, FIR & IIR.

UNIT II ANALYSIS OF CT SIGNALS AND SYSTEMS

Time domain analysis:-solutions of differential equation. Fourier series and Fourier transform analysis of signals, spectrum of CT signals, Laplace Transform analysis of signals and systems, Analysis of random signals.

UNIT III DISCRETIZATION AND SIGNAL RECONSTRUCTION

Discretization of signals: sample and hold circuit, Sampling:- Sampling theorem, selection of sampling rate, Types of sampling, Aliasing:- Aliasing effects, Anti-aliasing filter, Quantization:- Quantization errors due to truncation and rounding in fixed and floating point representations, signal reconstruction:-Interpolation using zero-order hold & first order hold.
UNIT IV
CLASSIFICATION AND ANALYSIS OF DISCRETE TIME SIGNALS 9

UNIT V
TRANSFORM TECHNIQUES FOR DT SIGNALS AND SYSTEMS 9

TOTAL : 45 PERIODS

COURSE OUTCOMES
At the end of the course, the students
• Will gain ability to generate different types of CT and DT signals.
• Will be capable to analyze and characterize any given CT or DT system and obtain the time response and frequency response.
• Will gain knowledge on the application of transform techniques.
• Will be familiarized with random signals and their statistical properties.

TEXT BOOKS
2. Tarun Kumar Rawat, Signals and Systems,Oxford University Press,2010

REFERENCES

GE7162 ENGINEERING PRACTICES LABORATORY
L 0 T 0 P 4 C 2
(Common to all Branches of B.E. / B.Tech. Programmes)

COURSE OBJECTIVES
• To provide exposure to the students with hands-on experience on various Basic Engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.
GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICES

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.
- Laying pipe connection to the delivery side of a pump.
- Practice in connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK

- Sawing, planing and making joints like T-Joint, Mortise and Tenon joint and Dovetail joint.

STUDY

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

2. ELECTRICAL ENGINEERING PRACTICES

- Basic household wiring using Switches, Fuse, Indicator and Lamp etc.,
- Stair case light wiring
- Tube – light wiring
- Preparation of wiring diagrams for a given situation.
- Study of Iron-Box, Fan Regulator and Emergency Lamp

GROUP – B (MECHANICAL AND ELECTRONICS)

3. MECHANICAL ENGINEERING PRACTICES

WELDING

- Arc welding of Butt Joints, Lap Joints, and Tee Joints
- Gas welding Practice.
- Basic Machining - Simple turning, drilling and tapping operations.
- Study and assembling of the following:
  a. Centrifugal pump
  b. Mixie
c. Air Conditioner.

DEMONSTRATION ON FOUNDRY OPERATIONS.

4. ELECTRONIC ENGINEERING PRACTICES

- Soldering simple electronic circuits and checking continuity.
- Assembling electronic components on a small PCB and Testing.
- Study of Telephone, FM radio and Low Voltage Power supplies.

TOTAL: 60 PERIODS

COURSE OUTCOMES

- Ability to fabricate carpentry components and to lay pipe connections including plumbing works.
- Ability to use welding equipments to join the structures
- Ability to do wiring for electrical connections and to fabricate electronics circuits.

EI7211 CIRCUIT SIMULATION LABORATORY

COURSE OBJECTIVES

- To learn and practice generation and characterization of continuous and discrete time signals
- To analyze time and frequency response of DT signals
- To explore various network theorems using simulation software.

LIST OF EXPERIMENT

1. Generation of Continuous Time (CT) and Discrete Time (DT) signals
   (i) Standard signals: – impulse, step, ramp, exponential
   (ii) Periodic and a-periodic signals
   (iii) Deterministic and random signals

2. CT and DT system characterization:
(i) Linearity
(ii) Time invariance
(iii) Causality
(iv) Stability

3. Time response & Frequency response of DT systems
4. Discretization and Reconstruction of signals
   (i) Sampling and aliasing effects
   (ii) A/D conversion
   (iii) D/A conversion
5. Statistical analysis of random signals
6. Verification Kirchhoff’s laws, Thevenin’s and Norton’s theorems.
7. Verification of Superposition, Maximum Power transfer and Reciprocity theorems.
10. Determination of self and mutual inductances and coupling coefficient of coupled coils.
11. Power and power factor measurement in three phase circuits by two wattmeter method.
12. Determination of Z, Y and h parameters of a two port network.

TOTAL : 60 PERIODS

COURSE OUTCOMES
At the end of the course, the students
- Will be able to generate and characterize continuous and discrete time signals
- Will be in a position to analyze random signals.
- Able to solve electrical circuits using network theorems.
- Able to determine Z, Y and h parameters of a two port network.
OBJECTIVES:

The basic concepts and tools of the subject covered are:

- Solving systems of linear equations, Matrix operations.
- Vector spaces and subspaces; linear independence and span of a set of vectors, basis and dimension; the standard bases for common vector spaces.
- Inner product spaces: Cauchy-Schwarz inequality, orthonormal bases, the Gramm-Schmidt procedure, orthogonal complement of a subspace, orthogonal projection.
- Linear Transformations: kernel and range of a linear transformation, the Rank-Nullity Theorem, linear transformations and matrices, change of basis, similarity of matrices.
- Eigenvalues and eigenvectors, diagonalizability of a real symmetric matrix, canonical forms.
- Mathematical foundations of numerical techniques for solving linear system, eigenvalue problems and generalized inverses.

UNIT I  VECTOR SPACES  12

Vector spaces – Subspaces – Linear combinations and Linear system of equations – Linear independence and Linear dependence – Bases and Dimensions.

UNIT II  LINEAR TRANSFORMATION AND DIAGONALIZATION  12

Linear transformation - Null spaces and Ranges - Dimension theorem - Matrix representation of a Linear transformations - Eigenvalues and eigenvectors - Diagonalizability.

UNIT III  INNER PRODUCT SPACES  12

Inner product, norms - Gram-Schmidt orthogonalization process - Adjoint of linear operations - Least square approximation.

UNIT IV  NUMERICAL SOLUTION OF LINEAR SYSTEM OF EQUATIONS  12


UNIT V  NUMERICAL SOLUTION OF EIGENVALUE PROBLEMS AND GENERALISED INVERSES  12


TOTAL: 60 PERIODS

OUTCOMES:

- The students can able to solve system of linear equations , to use matrix operations and vector spaces using algebraic methods.
- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
Apply numerical methods to obtain approximate solutions to mathematical problems.

Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.

Analyse and evaluate the accuracy of common numerical methods.

TEXT BOOKS:

REFERENCES :

EI7301 ELECTRICAL AND ELECTRONIC MEASUREMENTS LT P C
3 0 0 3

COURSE OBJECTIVES
- To provide knowledge in the specific area of electrical measuring instruments. Emphasis is laid on the meters used to measure current, voltage, resistance, inductance and capacitance.
- To have an adequate knowledge in the measurement techniques for power and energy.
- Elaborate discussion about potentiometer and to impart knowledge on various instrument transformers and to understand the calibration of various meters.
- In-depth understanding and idea of analog and digital instruments.
- Detailed study of display and recording devices.

UNIT I MEASUREMENT OF ELECTRICAL PARAMETERS

UNIT II POWER AND ENERGY MEASUREMENTS
UNIT III  POTENTIOMETERS AND INSTRUMENT TRANSFORMERS  9

UNIT IV  ANALOG AND DIGITAL INSTRUMENTS  9

UNIT V  DISPLAY AND RECORDING DEVICES  9

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. An ability to compare the working principles, merits, demerits and errors of different types of electrical instruments and can understand about different instruments that are used for measurement purpose.
2. Understanding of how different bridge networks are constructed and balanced for finding out values of resistance, capacitance and inductance.
3. An ability to apply knowledge of electronic instrumentation for measurement of electrical quantities.
4. Able to apply the principles and practices for instrument design and development to real world problems.

TEXT BOOKS:

REFERENCES:

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To impart basic knowledge on different AC & DC Machines.
- To introduce the concept of special machines and to motivate the students to solve simple/complex problems related to AC & DC machines.
- Enable the student to choose machines for specific applications.
- Make the students familiar with the testing and controlling of different machines.

UNIT I  MAGNETIC CIRCUITS AND TRANSFORMERS  9

UNIT II  POLYPHASE INDUCTION MOTOR  9

UNIT III  DC MACHINES  9

UNIT IV  SYNCHRONOUS MACHINES  9

UNIT V  SPECIAL MACHINES  9

TOTAL : 45 PERIODS

COURSE OUTCOMES (Cos)

1. Acquire knowledge to solve problems associated with DC and AC Machines.
2. Ability to test and control different machines based on the familiarity of basic concepts and working principle.
3. Ability to choose appropriate machines for a given application while carrying out projects.
4. Applying the knowledge gained to choose appropriate machines for specific application useful for the society.
5. Interested to know about the latest developments related to machines and to learn their concepts even after the completion of the course.

TEXT BOOKS:


REFERENCES:


3. NPTEL Video Lecture series on “Electrical Machines I” and “Electrical Machines II” by Dr. Krishna Vasudevan, IIT Madras.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI7303 ELECTRONICS FOR ANALOG SIGNAL PROCESSING I 4 0 0 4

COURSE OBJECTIVES

- To introduce the students to the construction, operation, characteristics and applications of various semiconductor diodes and transistors.
- To impart knowledge on different types of configurations and biasing circuits for BJT and FET.
- To impart knowledge on single & multi-stage amplifiers, power amplifiers and oscillators.
- To enable the students to analyze a given BJT / FET amplifier circuit for voltage gain, current gain, input impedance, output impedance and bandwidth.
- To enable the students to design transistor amplifiers and oscillators for a given set of specifications.

UNIT I SEMICONDUCTOR DIODES 12

PN junction diode: Forward and reverse characteristics, Applications in Rectifier, Switching, Clipper, Clamper and Protection circuits - Zener diode: Forward and reverse characteristics, Application as voltage regulator, Introduction to special diodes: Schottky diode, Varactor diode, Laser diode, Photodiode – UJT characteristics and application as relaxation oscillator, Thyristors: Characteristics and applications of SCR, DIAC and TRIAC.
UNIT II BJT AMPLIFIERS 12

UNIT III FET AMPLIFIERS 12

UNIT IV MULTISTAGE AND FEEDBACK AMPLIFIERS 12

UNIT V OSCILLATORS AND POWER AMPLIFIERS 12

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)
1. Apply the knowledge of semiconductor device fundamentals to understand the operation of any diode or transistor based circuit.
2. Analyze a given transistor amplifier end evaluate its performance with respect to gain, impedance and bandwidth.
3. Design single stage / multistage BJT/FET amplifiers for a given set of specifications. Select an appropriate diode / transistor circuit for a specific application.

TEXT BOOKS:

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EI7304   FUNDAMENTALS OF PNEUMATICS AND HYDRAULICS   L T P C
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COURSE OBJECTIVES
• To introduce the fundamentals of hydraulic and pneumatic systems and their applications.
• To provide knowledge about the components involved in hydraulic and pneumatic systems.
• To select the control strategy for hydraulic and pneumatic systems.
• To gain basic safety precaution for hydraulic and pneumatic systems.
• To understand the concept of interfacing these systems with PLC and various microcontrollers.

UNIT I    FLUID POWER PRINCIPLES AND FUNDAMENTALS


UNIT II    HYDRAULIC SYSTEM AND COMPONENTS
UNIT III  CONTROL OF HYDRAULIC SYSTEMS


UNIT IV  PNEUMATIC SYSTEM

Compressors – Filter, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust Valves, Pneumatic actuators – Introduction to Fluidics – Pneumatic logic circuits AND,OR, MEMORY, etc.

UNIT V  ELECTRO HYDRAULIC AND ELECTROPNEUMATIC CIRCUITS


TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to select hydraulic or pneumatic components and to design for automation.
2. Gain knowledge on control of hydraulic and pneumatic systems.
3. Ability to select proper control scheme for the given applications.
4. Capable of proper installation, fault finding and maintenance of hydraulic and pneumatic systems.

TEXT BOOKS:


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TOTAL: 45 PERIODS
COURSE OBJECTIVES

- Get to know the methods of measurement, classification of transducers and to analyze error.
- To understand the behavior of transducers under static and dynamic conditions and hence to model the transducer.
- Get exposed to different types of resistive transducers and their application areas.
- To acquire knowledge on capacitive and inductive transducers.
- To gain knowledge on variety of transducers and get introduced to MEMS and Smart transducers.

UNIT I  SCIENCE OF MEASUREMENTS AND CLASSIFICATION OF TRANSDUCERS  12

UNIT II  CHARACTERISTICS OF TRANSDUCERS  12
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  12
Principle of operation, construction details, characteristics and applications of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezo-resistive sensor and humidity sensor.

UNIT IV  VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS  12

UNIT V  OTHER TRANSDUCERS  12

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Ability to apply the mathematical knowledge and science & engineering fundamentals.
gained to solve problems pertaining to measurement applications.
2. Be able to analyze the problems related to sensors & transducers.
3. Be able to select the right sensor/transducer for a given application.
4. Be able to determine the static and dynamic characteristics of transducers using software packages.

TEXT BOOKS:

REFERENCES:

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

• To obtain the no load characteristics of D.C and A.C machines.
• To obtain the load characteristics of D.C and A.C machines.
• To find out regulation characteristics of A.C. generator and Transformer.
• To obtain the speed characteristics of D.C motor.
• To obtain the control of special machines like stepper motor.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of self excited DC generator.
2. Open circuit and load characteristics of separately excited DC generator.
3. Speed control of separately excited DC shunt motor.
4. Load test on DC shunt and series motors.
5. Regulation of three- phase alternator.
7. Load test on single phase transformer.
8. No load and Blocked rotor test on three phase induction motor.
9. Load test on single phase induction motor.
11. Study of AC drives.
12. Study of DC drives.

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Ability to make use of basic concepts to obtain the no load and load characteristics of D.C and A.C. machines.
2. Analyze and draw conclusion from the characteristics obtained by conducting experiments on machines.
3. Ability to carry out the Experiments in batches to motivate the Team work.
4. Ability to prepare reports of the experiments carried out in the laboratory.

**MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES**

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**EI7312 ELECTRONICS FOR ANALOG SIGNAL PROCESSING LABORATORY**

**COURSE OBJECTIVES**

- To facilitate the students to study the characteristics of various semiconductor devices.
- To provide practical knowledge on the analysis of rectifiers, regulators, amplifiers and oscillators.
- To enable the students to design rectifiers, regulators, amplifiers and oscillators for a given set of specifications.
- To impart hands-on training to the students on e-CAD tools used for designing electronic circuits.

**LIST OF EXPERIMENTS**

2. (a) PN junction diode characteristics and application as a rectifier.
   (b) Zener diode characteristics and application as a regulator.
3. Characteristics of BJT amplifier in CE configuration and determination of h-parameters.
5. Characteristics of UJT and application as a relaxation oscillator.
6. Characteristics of SCR and application as a controlled rectifier.
7. Design of Voltage divider bias for BJT and FET circuits for a given operating point.
10. Design of Wien Bridge oscillator and Colpitts oscillator circuits.
12. Simulation of at least four of the above experiments using e-CAD tools.

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Gain knowledge on the proper usage of various electronic equipment and simulation tools for design and analysis of electronic circuits.
2. Get hands-on experience in studying the characteristics of semiconductor devices.
3. Ability to analyze various electronic circuits such as diode rectifiers, controlled rectifiers, voltage regulators, transistor amplifiers and oscillators.
4. Ability to present the results in oral form as well as in written form as a report.
5. Ability to interpret the results and draw meaningful conclusions.
6. Ability to work as a member of a team while carrying out experiments.

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MA7356 PROBABILITY AND RANDOM PROCESSES
(Branch specific course) 4 0 0 4

OBJECTIVES:

- To provide the necessary basic concepts in probability and random processes and apply them in random signals, linear systems etc. in communications engineering.
- The students will have an exposure of various distributions.
UNIT I  RANDOM VARIABLES  
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II  TWO-DIMENSIONAL RANDOM VARIABLES  
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III  RANDOM PROCESSES  
Classification – Stationary process – Markov process - Poisson process – Random telegraph process.

UNIT IV  CORRELATION AND SPECTRAL DENSITIES  

UNIT V  LINEAR SYSTEMS WITH RANDOM INPUTS  
Linear time invariant system – System transfer function – Linear systems with random inputs – Auto-correlation and Cross-correlation functions of input and output - White noise.

TOTAL : 60 PERIODS

OUTCOMES:
- Students will be able characterize probability models using probability mass (density) functions & cumulative distribution functions
- Students will be able to describe a random process in terms of its mean and correlation functions.
- Students will demonstrate knowledge in special processes like Poisson, Renewal processes.

TEXTBOOKS:

REFERENCES:
COURSE OBJECTIVES

- To study various number systems, Boolean expressions and simplifications.
- To study, analyze and design of the combinational logic circuits for arithmetic operations.
- To study, analyze and design of sequential circuits, registers and counters.
- To study, analyze and design asynchronous sequential circuits and to know the functions of ASM charts.
- To learn memory components, PLA, PAL and the basic of HDL.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES


UNIT II COMBINATIONAL LOGIC


UNIT III SYNCHRONOUS SEQUENTIAL LOGIC


UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC

Analysis and design of asynchronous sequential circuits – Reduction of state and flow tables – Race-free state assignment – Arithmetic State Machines: Introduction, components, features, examples.

UNIT V MEMORY AND PROGRAMMABLE LOGIC DEVICES


TOTAL : 45 PERIODS

COURSE OUTCOMES(COs)

At the end of the course, the student should have the ability:

1. To apply mathematics knowledge of number systems, Boolean expressions / functions.
2. To analyze the combinational and sequential circuits.
3. To design combinational logic circuits for different problems.

4. To design sequential logic circuits for various problems.

5. To investigate various programmable logic devices.

TEXT BOOKS:


REFERENCES:


MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI7402 ELECTRONICS FOR ANALOG SIGNAL PROCESSING II

COURSE OBJECTIVES

- To introduce the basics of operational amplifiers, their characteristics and their configurations.
- To impart knowledge about the concepts and applications of timer, PLL, ADC and DAC.
- To enable the students to analyze the given integrated circuit and evaluate the output.
- To enable the students to design signal conditioning circuits using operational amplifiers.
- To enable the students to design multi-vibrator circuits using OPAMP / Timer for switching
Applications.

UNIT I OPERATIONAL AMPLIFIERS 12

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIER 12
Differentiator and Integrator: ideal and practical circuits, V to I and I to V converters - Instrumentation amplifier circuit analysis, Instrumentation amplifier IC – Active Filters: Low pass, High pass, Band pass and Band reject filters – Comparator, Schmitt trigger, Multi-vibrators, Triangular wave generator, Sine wave generator, Function generator - Clipper and Clamper – Log and Antilog amplifiers.

UNIT III TIMER AND PHASE LOCKED LOOP 12

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 12

UNIT V SPECIAL FUNCTION IC’S 12

TOTAL: 60 PERIODS

COURSE OUTCOMES (COs)
1. Ability to interpret data sheet of a given analog IC.
2. Ability to apply the knowledge of analog IC’s to understand the operation of a given electronic circuit involving IC’s.
3. Ability to analyze an electronic circuit involving IC’s and evaluate its output.
4. Ability to design an analog IC based electronic circuit for a given application.
5. Compare the performance of IC based circuits with discrete component circuits for the same application.

TEXT BOOKS:
REFERENCES:

4. NPTEL video lectures on “Electronics for Analog Signal Processing II” by Prof. K.R.K. Rao, IITM.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI7403 FUNDAMENTALS OF THERMODYNAMICS AND FLUID MECHANICS

COURSE OBJECTIVES

- To understand the basic laws of thermodynamics.
- To make the students to familiarize with the concepts, laws and methodologies for the analysis of gas turbines and compressors.
- To understand the basic concepts of fluid mechanics.
- To explore the working principle of different types of pumps and Hydraulic turbines.

UNIT I BASIC CONCEPTS AND LAWS OF THERMODYNAMICS


Second law of thermodynamics applied to Heat engines, Refrigerators & Heat pumps. Carnot's
theorem and clausius inequality – Concept of entropy applied to reversible and irreversible processes – Third law of thermodynamics.

**UNIT II  INTRODUCTION TO APPLICATIONS OF THERMODYNAMICS  9**

Air standard cycles – Thermodynamics assumption – Otto cycle, diesel cycle and Brayton cycle (air standard efficiency, mean effective pressure and power)

Air compressors: classification, single and multistage compressors, inter-cooler in compression process.

Refrigerators: classification, vapour compression and absorptions systems, Eco-friendly refrigerants.

Heat Transfer: introduction to modes of heat transfer with examples.

**UNIT III  BASIC CONCEPT OF FLUID MECHANICS & FLOW OF FLUIDS  9**

Fluid: Properties and types.

Pressure: laws of pressure, types of pressure, pressure measurement using manometers and mechanical gauges. Viscosity: Kinematic and dynamic viscosity.

Fluid kinematics and dynamics – Types of fluid flow – velocity – rate equation of continuity – energy of a liquid in motion – head of a liquid – Bernoulli’s theorem

**UNIT IV  DIMENSIONAL AND MODEL ANALYSIS  9**

Dimension – need for dimensional analysis, Rayleigh’s and Buckingham’s method applied to flow problems, limitation of dimensional analysis.

Model analysis – similitude, dimensionless numbers and their significance, similarity laws, model studies, limitation of scale models.

**UNIT V  HYDRAULIC MACHINES  9**

Introduction and classification of hydraulic machines. Reciprocating pump: constructional details, working principle, co-efficient of discharge, slip, power required.

Centrifugal pump: classification and working principle, specific speed.

Turbines: classification, working principle of a Pelton wheel turbine.

TOTAL : 45 PERIODS

**COURSE OUTCOMES (COs)**

1. Ability to understand and apply the basic laws of thermodynamics and fluid mechanics for different applications.
2. Ability to use the basic concepts and methodologies for the analysis of gas turbine and compressors.
3. Ability to understand the need of dimensional and model analysis.
4. Ability to understand the working principle of different types of pumps and hydraulic turbines.

**TEXT BOOKS:**


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EI7404 INDUSTRIAL INSTRUMENTATION I LT P C 3 0 0 3

COURSE OBJECTIVES

- To make students understand the various measuring techniques for force, torque, speed, acceleration, vibration, density, viscosity, humidity, moisture, temperature and pressure.

UNIT I UNIT I MEASUREMENT OF FORCE, TORQUE AND SPEED 8
Different types of load cells: Hydraulic, Pneumatic, Strain gauge, Magneto-elastic 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 8
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 – Densitometers: Pressure type densitometers, Float type densitometers, Ultrasonic densitometer and gas densitometer.
UNIT III  MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE


UNIT IV  TEMPERATURE MEASUREMENT


UNIT V  PRESSURE MEASUREMENT

Units of pressure – Manometers: Different types, Elastic type pressure gauges: Bourdon tube, Bellows, Diaphragms and Capsules - 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 – Pressure gauge selection, installation and calibration using dead weight tester.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to understand the construction and working of instruments used for measurement of force, torque, speed, acceleration, vibration, density, viscosity, humidity, moisture, temperature and pressure.
2. Ability to select instruments according to the application.
3. Understand the concept of calibration of instruments and gain knowledge about temperature measurement devices.
4. Ability to design signal conditioning circuits and compensation schemes for temperature measuring instruments.

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COURSE OBJECTIVES

- To introduce the students to the principles of analog and digital communication.
- To impart knowledge on the modulation and demodulation techniques, pulse communication systems and digital data transmission techniques.
- To facilitate the students in analyzing the performance of transmitters and receivers.
- To familiarize the students with the principles of multi-user communication systems.

UNIT I  AMPLITUDE AND FREQUENCY MODULATION

UNIT II  PULSE AND SPREAD SPECTRUM MODULATION
Pulse Modulation: Sampling theorem, Principles of PAM, PPM, PWM, PCM, DPCM, DM and ADM, Quantization noise in PCM. Spread spectrum modulation: Pseudo noise sequence, Direct sequenced spread spectrum, Frequency hopping spread spectrum.

UNIT III  BASEBAND PULSE TRANSMISSION
Baseband coding techniques: Polar / Bipolar, RZ/NRZ and Manchester - M-ary PAM transmission, Baseband receiver: Error probability, Optimum and matched filter techniques, Optimum linear receiver, Probability of error.

UNIT IV  PASSBAND DIGITAL TRANSMISSION
Digital modulation systems: Pass band transmission model, Asynchronous transmission, ASK, BFSK, BPSK and QPSK - Coherent reception - Signal space representation - Probability of error - Comparison of data transmission systems.

UNIT V  COMMUNICATION SYSTEMS
Concept of multiplexing: FDM and TDM. Multiple Access: FDMA, TDMA and CDMA. Telephone switching - Mobile telephonic communication - Satellite communication - Radar system - Microwave communication.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Gain knowledge about the principles of communication techniques.
2. Ability to understand the importance of each type of modulation system for specific applications.
3. Ability to solve simple problems pertaining to transmission power, Modulation index, Bandwidth, Probability of error, SNR, etc.
4. Get acquainted with the principle and operation of microwave, satellite radar and telephone communication systems.
TEXT BOOKS:


REFERENCES:


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COURSE OBJECTIVES

- To design, implement and verify digital combinational circuits such as adders, decoders, encoders, magnitude comparators and multiplexers.
- To design and analyze sequential logic circuits such as counters and shift registers.
- To understand the principles of HDL and verify the operation of logic circuits through simulation.

LIST OF EXPERIMENTS

1. (a) Verification of logic gates – NAND, NOR, AND, OR, XOR, XNOR and NOT.
   (b) Study of flip-flops – SR, JK, D and T flip-flops.
2. Realization of Boolean expressions using gates.
3. Design of code converter, Encoder and Decoder using gates.
4. Implementation of Combinational logic circuits using MUX and Decoder ICs.
5. Design of Adders using gates and parallel adder using IC.
6. Implementation of Asynchronous counters with 7-segment display.
7. Implementation of Synchronous counters with 7-segment display.
8. Implementation of universal shift registers using flip-flops and IC.
9. Simulation of combinational logic circuits using HDL.
10. Simulation of sequential logic circuits using HDL.
11. Porting of combinational and sequential logic circuits into FPGA/CPLD.
12. Design of combinational / sequential logic circuit for instrumentation application such as Alarm / Interlock.

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Ability to apply Boolean theorems for simplifying logical expressions.
2. Ability to design and analyze combinational logic circuits and sequential logic circuits.
3. Ability to develop logic circuits (combinational / sequential) for instrumentation applications.
4. Ability to present the results in oral form as well as in written form as a report and graph.
5. Ability to interpret the results of analysis and draw meaningful conclusions.
6. Ability to work as a member of a team while carrying out experiments.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To make the students aware of basic concepts of measurement and operation of different types of transducers.
- To make the students conscious about static and dynamic characteristics of different types of transducer.

LIST OF EXPERIMENTS

1. Static and Dynamic characteristics of Thermocouple (J,K,E) with and without thermowell.
2. Static and Dynamic characteristics of RTD and Thermistor.
5. Sensitivity analysis of strain gauge bridges (quarter, half and full).
6. a. Static characteristic of flapper-nozzle system.
   b. Loading effect on resistive potentiometer.
7. Characteristic of seismic type accelerometer.
8. Measurement of inductance (Anderson), capacitance (Schering) and resistance (Kelvin double) using bridges.
    b. Design and testing of Instrumentation amplifier.
10. Design of cold junction compensation for Thermocouples and lead wire compensations for RTD.
11. Design of signal conditioning circuits for high output impedance sensor (pH).
12. PC Based Data Acquisition system.

TOTAL: 60 PERIODS

COURSE OUTCOMES (COs)

1. Understand the concepts of measurement, error and uncertainty.
2. Understand the static and dynamic characteristics of measuring instruments.
3. Gain knowledge about the principle of operation and characteristics of different types of resistance, capacitance and inductance transducers.
4. Acquire knowledge of operation and applications of special transducers.
5. Acquire knowledge of interfacing and analyzing different stages of signal conditioning units.
6. Ability to present the results in oral form as well as in written form as a report.
7. Ability to interpret the results and draw meaningful conclusions.
8. Ability to work as a member of a team while carrying out experiments.

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EI7501 CONTROL SYSTEMS

COURSE OBJECTIVES

- To make the students familiarize about various representations of systems.
- To develop linear models mainly state variable model and Transfer function model from Non Linear systems.
- To make the students analyze linear systems in time domain and frequency domain.
- To train the students to design compensator for system(s) using time and frequency domain techniques.

UNIT I MODELING OF LINEAR TIME INVARIENT SYSTEM (LTIV) 12
Control system: Open loop and Closed loop – Feedback control system characteristics – First principle modeling: Mechanical, Electrical and Hydraulic systems – Transfer function representations: Block diagram and Signal flow graph.

UNIT II STATE SPACE MODEL OF LTIV AND LTV SYSTEMS 12

UNIT III TIME DOMAIN AND STABILITY ANALYSIS 12

UNIT IV  FREQUENCY DOMAIN ANALYSIS  12

UNIT V  DESIGN OF FEED BACK CONTROL SYSTEM  12
Design specifications – Lead, Lag and Lag-lead compensators using Root locus and Bode plot techniques – Introduction to Non-linear system.

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Ability to develop various representations of system based on the knowledge of Mathematics, Science and Engineering fundamentals.
2. Ability to do time domain and frequency domain analysis of various models of linear system.
3. Ability to come out with solution for complex control problem.
4. Ability to interpret characteristics of the system to develop mathematical model.
5. Ability to design appropriate controller for the given specifications.

TEXT BOOKS:


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68
COURSE OBJECTIVES

- To analyze and to implement the basic data structures and algorithms.
- To select suitable data structures for software development.
- To know the different types of sorting and their efficiencies.
- To select a suitable search technique for the chosen problem.
- To solve problems using non-linear data structures.

UNIT I ARRAYS AND LINKED LISTS

Linear arrays: Representation of linear arrays, insertion and deletion in linear arrays -
Multidimensional arrays: Representation of n-dimensional arrays in memory – Linked list:
Representation in memory, List traversal, Insertions and deletions – Sorted linked list: Searching,
insertion and deletion – Introduction to doubly linked list, circular and header linked lists.

UNIT II STACKS AND QUEUES

Stack: Representation of stack with arrays and linked lists, Simple applications, Recursive functions
and its implementations – Queues: Representation of queue with arrays and linked lists,
Implementation of Circular queue and Priority queue, Representation of double ended queues.

UNIT III TREES

Binary Trees: Types of binary trees, Representation of binary trees in memory, Recursive and non-
recursive traversals – Binary Search Tree: Search, insertion and deletion – Representation of AVL
tree – Heap Tree: Search, insertion and deletion – Construction of a minimum weighted path length
tree – Conversion of general tree to binary tree representation – Thread representation in binary
trees.

UNIT IV GRAPHS

Definitions – Representation of graph with adjacency matrix and linked list – Path matrix: Shortest
path algorithms – Warshall’s algorithm, Dijkstra’s algorithm – Minimum spanning trees: Prim’s
algorithm and Kruskal’s algorithm – Graph traversal: Breadth first search tree and depth first search
and tree – Topological sorting.

UNIT V SEARCHING AND SORTING

Search: Binary search, Interpolation search – Hashing: Hash function, collision, rehashing, extendible
hashing – Collision resolution: Open addressing, Separate chaining – Sorting: Selection, Bubble,
Insertion, Merge, Quick and Heap sorting.

TOTAL : 45 PERIODS
COURSE OUTCOMES (COs)

At the end of the course, the student should have the ability:

1. To apply mathematics knowledge to represent different types of expressions.
2. To analyze and solve problems logically.
3. To develop software programs with relevant data representation.
4. To investigate complex problems with a suitable data structure.
5. To learn new programming concepts / data representation.

TEXT BOOKS:


REFERENCES:


MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To make students understand the various measuring techniques for flow and level
- To make students understand different type of transmitters.

UNIT I VARIABLE HEAD TYPE FLOWMETERS


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


UNIT III ELECTRICAL TYPE FLOW METERS


UNIT IV LEVEL MEASUREMENT


UNIT V TRANSmitters


TOTAL : 45 PERIODS

COURSE OUTCOMES

1. Ability to understand the construction, installation and working of different variable head type flow meters.
2. Able to understand the construction, working and calibration of different quantity flow meters, variable area flow meters, mass flow meters, electrical type, open channel and solid flow meters.
3. Gain knowledge about the construction, working and calibration of different type of transmitters.
4. Able to choose appropriate flow meters or level sensor for an application.
TEXT BOOKS:


REFERENCES:


MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI7504 MICROPROCESSORS, MICROCONTROLLERS AND APPLICATIONS LT P C 3 0 0 3

COURSE OBJECTIVES

- To get familiarized with architecture, addressing modes and instructions of 8085 & 8086 microprocessor.
- To get exposed to high Performance and advanced architectures.
- To gain knowledge on essential peripherals and the associated interfacing ICs.
- To get acquainted with 8-bit microcontroller and be able to program in assembly and C-language.
- To design microcontroller based system/application.
UNIT I ARCHITECTURE OF 8085/8086 PROCESSOR

UNIT II ADVANCED ARCHITECTURES

UNIT III PERIPHERALS AND THEIR 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 ARCHITECTURE & PROGRAMMING

UNIT V 8051: INTERFACING AND SYSTEM DESIGN

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Ability to understand the architecture of any advanced Processor to keep in pace with technological challenges.
2. Apply the acquired Programming skills and relate to any Processor/microcontroller in a multidisciplinary project.
3. Able to utilize the IT tools like TASM, MASM and Proteus to develop electronic prototyping and thereby establishing real time control.
4. Ability to develop/design microcontroller based system paving way for automation and continuous development.

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COURSE OBJECTIVES
- To understand and implement basic data structures using C / C++
- To apply linear and non-linear data structures in problem solving

LIST OF EXPERIMENTS
1. Implementation of selection sort, bubble sort and insertion sort.
2. Implementation of binary search and interpolation search.
3. Implementation of merge sort algorithm.
4. Implementation of quick sort algorithm.
5. Conversion of infix expression into postfix expression.
7. Implementation of insertion and deletions in a linked list.
8. Implementation of linear queue with a linked list.
10. Implementation of priority queues.
11. Implementation of binary search tree; traversals; sorting.
12. Implementation of heap sort from heap tree.

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)
At the end of the course, the student should have the ability:
1. To implement mathematical knowledge in programming concepts.
2. To show the problem analysis in programming.
3. To develop applications based program using data structures.
4. To investigate different data structures to solve problems.
5. To learn new tools and to implement through programming languages.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To develop skill in program writing for 8085, 8086 processors and 8051 microcontroller.
- To gain Practical knowledge on interfacing hardware and associated software.
- To get trained to Programming and interfacing using simulators.
- To get exposed to programming and interfacing using ARM7, ARM11, MSP430, and PIC microcontroller.

LIST OF EXPERIMENTS

ASSEMBLY LANGUAGE PROGRAMMING

1. a) Understanding the instruction set of 8085 µp.
   b) PROGRAMMING using Arithmetic, Logical instructions of 8085 microprocessor.
2. a) Understanding the instruction set of 8086 µp.
   b) Programming using String manipulation instructions (Compare & Scan) of 8086 microprocessor.
3. a) Understanding the instruction set of 8051 µc.
   b) Programming using Arithmetic, Logical and Bit manipulation instructions of 8051 microcontroller

SIMULATION EXPERIMENTS

4. Turbo assembler Programming (using arithmetic, logical, string instructions) of 8086.
5. Interfacing Keyboard / LCD with µc.
6. Interfacing ADC/DAC/ stepper motor with µc.

Hardware based Experiments using 8085 / 8086 / 8051 / ARM7 / ARM11 / MSP430 and PIC MICROCONTROLLER

7. Interfacing ADC and DAC with µp / µc.
8. Data transfer between computer and µp / µc.
9. a) Interfacing Keypad (4 x 4) with µp / µc.
    b) Interfacing LCD with µp / µc.
10. I²C based RTC/ EEPROM/ 7-Segment display Interface with µp / µc.
11. Interfacing limit Switches/ Push buttons/ Solenoid valves/ Pumps with µp / µc.
12. a) Realization of PID algorithm in μp / μc.
   b) μp / μc based control of temperature / Level process.

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Ability to exploit the features/instruction of the microprocessor and microcontroller to develop microprocessor/microcontroller based system.
2. Provide automation solutions to the real-time processes and thereby improving the efficiency.
3. Facilitate interdisciplinary projects based on the acquired programming skills.
4. Ability to present the results in oral form as well as in written form as a report
5. Ability to interpret the results and draw meaningful conclusions.
6. Ability to work as a member of a team while carrying out experiments.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI7601 DISCRETE TIME SIGNAL PROCESSING

COURSE OBJECTIVES

- To introduce the basic concepts of Digital Signal processing.
- To make the students familiarize various mathematical tools for analyzing Discrete Time Systems.
- To make the students design Digital Filters based on the Filter specifications.
- To provide the exposure to the architectures of DSP processors.
- To implement various algorithms in DSP for solving Real-time problem.
UNIT I  INTRODUCTION  12
Digital signal processing: Block diagram, advantages and applications, Linear and circular
convolution, convolution techniques for long duration sequence, autocorrelation and cross
correlation, aliasing effects in time domain – Review of DTFS, DTFT and Z-Transform.

UNIT II  DFT AND FFT  12
DFT properties, magnitude and phase representation – Direct computation of DFT –
FFT: Radix 2 DIT & DIF algorithms, computational complexity, DFT and IDFT using FFT
algorithms.

UNIT III  DIGITAL IIR FILTERS  12
Introduction, design procedures for digital IIR filters, frequency transformation techniques –
Digital Butterworth and Chebyshev IIR filter design using impulse invariant and bilinear
transformation – Realization of IIR filters.

UNIT IV  DIGITAL FIR FILTERS  12
Introduction, advantages of FIR over IIR filters - linear phase filters – Windowing technique:
Rectangular, Triangular, Hamming, Hanning and Kaiser windows – Realization of FIR filter
structures.

UNIT V  FINITE WORD LENGTH EFFECTS AND DSP PROCESSORS  12
Finite word length Effect – Fixed and floating point number representation, Quantization
errors – Finite word length effects in IIR and FIR filters – Introduction to DSP architectures –
addressing modes and Instruction set.

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)
- Ability to apply various mathematical tools for analyzing discrete time system based on
  the knowledge of mathematics
- Ability to design digital filters.
- Ability to come out with solutions for solving simple/complex problem.
- Ability to use DSP Processor for real-time implementation.

TEXT BOOKS:
   and Applications”, Pearson Education, New Delhi, 2003 / PHI.

REFERENCES:
   Sons,1986.
4. NPTEL Video Lecture series on, “Digital Signal Processing” by Prof. S.C. Dutta Roy, IIT
   Delhi.
COURSE OBJECTIVES

- To introduce technical terms and nomenclature associated with Process control domain.
- To familiarize the students with characteristics, selection, sizing of control valves.
- To introduce students to the fundamentals of system identification.
- To provide an overview of the features associated with Industrial type PID controller.
- To make the students understand the various PID tuning methods.
- To elaborate different types of control schemes such as cascade control, feed-forward control and Model Based control schemes.

UNIT I   PROCESS DYNAMICS  12

UNIT II   CONTROL VALVE  12
Actuators: Pneumatic and electric actuators – I/P converter – Control Valve Terminology - Characteristic of Control Valves: Inherent and Installed characteristics - Valve Positioner – Modeling of a Pneumatically Actuated Control Valve – Valve body: Commercial valve bodies – Control Valve Sizing: ISA S 75.01 standard flow equations for sizing Control Valves – Cavitation and flashing – Materials for Control Valves – Control Valve selection

UNIT III  CONTROL ACTIONS  12
UNIT IV  PID CONTROLLER TUNING – SINGLE LOOP REGULATORY CONTROL & ENHANCEMENT TO SINGLE LOOP REGULATORY CONTROL


UNIT V  MODEL BASED CONTROL SCHEMES & INTRODUCTION TO MULTI-LOOP REGULATORY CONTROL & CASE STUDIES


TOTAL : 60 PERIODS

COURSE OUTCOMES (COS)
1. Ability to understand technical terms and nomenclature associated with Process control domain.
2. Ability to build models using first principles approach as well as analyze models.
3. Ability to Design, tune and implement PID Controllers to achieve desired performance for various processes.
4. Ability to Analyze Systems and design & implement control Schemes for various processes.
5. Ability to use appropriate software tools (Example: MATLAB/SCILAB) for analysis and design of Process Control System.
6. Ability to Identify, formulate and solve problems in the Process Control Domain.

TEXT BOOKS:

REFERENCES:
EI7603 PROJECT MANAGEMENT AND FINANCE

COURSE OBJECTIVES

- To outline the need for project management.
- To outline the importance of finance and accounting.
- To demonstrate knowledge and understanding of the engineering and management principles.
- To function effectively as an individual, and as a member or leader in diverse teams.

UNIT I PROJECT MANAGEMENT, PROJECT SELECTION AND PROJECT


UNIT II PROJECT IMPLEMENTATION, MONITORING AND CONTROL


UNIT III PROJECT EVALUATION, AUDITING AND OTHER RELATED TOPICS IN PROJECT MANAGEMENT

Project Evaluation – Project auditing – Phase of project audit – Project closure reports, computers, e-markets in Project Management.

UNIT IV FINANCE AND ACCOUNTING

UNIT V WORKING CAPITAL MANAGEMENT AND CAPITAL BUDGETING


TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to prepare project feasibility report, Project preparation Implementation.
2. Ability to understand the role and responsibility of the Professional Engineer.
3. Be able to assess social, health, safety issues based on the reasoning received from the contextual knowledge.

TEXT BOOKS:


REFERENCES:


MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE DESCRIPTION
This course aims to help the students acquire the employability skills necessary for the workplace situations. It also attempts to meet the expectations of the employers by giving special attention to language skills, presentation skills, group discussion skills and soft skills. This will be achieved through expert guidance and teaching activities focusing on employability skills.

COURSE 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 reading skills, writing skills, and soft skills necessary for the workplace situations
• To make them employable graduates

CONTENTS
UNIT I READING AND WRITING SKILLS 9
Reading: skimming & scanning strategies – note making skills – interpreting visual material (charts & tables) – critical reading – fast reading necessary for reading letters & files - preparing job applications - writing covering letter and résumé - applying for jobs online - email etiquette – writing official letters (placing an order, letters to consumers, etc. ) writing reports – collecting, analyzing and interpreting data

UNIT II SOFT SKILLS 9
Hard skills & soft skills – soft skills: self-management skills & people skills - training in soft skills - persuasive skills – sociability skills – interpersonal skills – team building skills – leadership skills – problem solving skills – adaptability - stress management – motivation techniques – life skills -

UNIT III PRESENTATION SKILLS 9
Preparing slides with animation related to the topic – organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentation

UNIT IV GROUP DISCUSSION SKILLS 9
Participating in group discussions – understanding group dynamics - brainstorming the topic — questioning and clarifying –GD strategies (expressing opinions, accepting or refusing others opinions, turn taking) – activities to improve GD skills – viewing recorded GD - mock GD

UNIT V INTERVIEW SKILLS 9

TOTAL: 45 PERIODS

LEARNING OUTCOMES
• Students will be able to make presentations and participate in group discussions with high level of self-confidence.
• Students will be able to perform well in the interviews
• They will have adequate reading and writing skills needed for workplace situations
REFERENCES:

EXTENSIVE READING

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

EI7611  INDUSTRIAL INSTRUMENTATION LABORATORY

COURSE OBJECTIVES
- To make the students aware about calibration of meters, sensors and transmitters.
- To make the students conscious about the working and operation of different types of analytical Instruments.
- To identify, formulate, and analyze problems regarding sensors and transmitter
- To use research-based knowledge and research methods for interpretation of data from sensors.

LIST OF EXPERIMENTS
1. a) Testing of pressure gauge using dead weight tester.
   b) Level measurement using d/p transmitter including elevation consideration.
2. a) Calibration of thermocouple and RTD using temperature calibrator.
   b) Calibration of temperature transmitter using multifunction calibrator.
3. Calibration of ammeter, voltmeter and wattmeter using multifunction calibrator.
4. a) Calibration and configuration of smart transmitter using HART communicator.
   b) Calibration and configuration of transmitters using loop calibrator.


8. Interfacing Different types of flow meter with PC using DAQ.


10. a) Temperature Measurement using IR Thermometer.
    b) Measurement of Level and Pressure using fiber optics system.

11. a) Testing of Rotameter.
    b) Installation of d/p based level Transmitter.


TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Ability to experimentally measure industrial process parameters such as flow, level, temperature, pressure and viscosity.
2. Ability to measure and analyze pH, conductivity, UV absorbance and transmittance.
3. Ability to measure and analyze physiological parameters such as BP, ECG and pulse rate.
4. Ability to calibrate sensors and transmitters.
5. Ability to present the results in oral form as well as in written form as a report and graph.
6. Ability to interpret the results and draw meaningful conclusions.
7. Ability to work as a member of a team while carrying out experiments.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

To impart theoretical and practical skills in

- Process Identification
- Tuning of PID controller including Auto-tuning
- PID Enhancements (Cascade and Feed-forward Control Schemes) and
- Design and Implementation of basic and advanced Control schemes

using the facilities available in the Process Control lab.

LIST OF EXPERIMENTS

Simulation Based Experiments

1. Interpretation of P & ID (ISA S5.1)
2. Simulation of Lumped/ Distributed Parameter System.
3. Identification of Transfer function model of a Typical Industrial Process using non-parametric identification methods.
5. Design and Implementation of Feed forward and Cascade control schemes on the simulated model of a Typical Industrial Process.
6. (i) Analysis of MIMO system.
   (ii) Design and implementation of Multi-loop PID schemes on the simulated model of a Typical Industrial Process.

Hardware Based Experiments (Experiments Carried out On the Skid Mounted Plants)

7. (i) Study of a Process Control Training plant.
   (ii) Determination of characteristics of a Pneumatically Actuated Control valve (with and without Positioner).
8. Design and implementation of ON-OFF controller for the Temperature Process.
9. Control of flow process using industrial type PID controller.
10. PC based control of level process.
11. On-line monitoring and control of a pilot plant using an industrial type distributed control system.
12. Design and implementation of advanced control scheme (adaptive controller or model predictive Control scheme) on the skid mounted pilot plant.
COURSE OUTCOMES (COs)

1. Gain hands on experience in working with SKID mounted pilot plants (Flow/Level/Temperature/Pressure Control Loop(s))
2. Get exposed to simulation tools such as MATLAB/LABVIEW/ASPEN.
3. Be able to build dynamic models using the input-output data of a process.
4. Get acquainted with PID implementation issues and be able to tune the PID controller.
5. Ability to obtain servo and regulatory responses and be able to analyze and draw meaningful conclusions.
6. Be able to design and implement simple adaptive control scheme and model based control scheme.
7. Be able to present the results in written and oral forms.
8. Ability to work as a Member in a group.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To represent the linear time invariant System in discrete State Space form.
- To analyze the controllability, observability and stability of a Discrete Time System.
- To estimate model parameters from input/output measurements.
- To design Digital Controllers.
- To design controllers for multi-loop and multivariable systems.

UNIT I DISCRETE STATE-VARIABLE TECHNIQUE 12
State equation of discrete time system with sample and hold – State transition equation – Methods of computing the state transition matrix – Decomposition of discrete time transfer functions – State diagram representations of Discrete time systems - Controllability and observability of linear time invariant discrete time system – Stability tests of discrete time system – State Observer.

UNIT II SYSTEM IDENTIFICATION 12

UNIT III DIGITAL CONTROLLER DESIGN 12

UNIT IV MULTI-LOOP REGULATORY CONTROL 12

UNIT V MULTI-VARIABLE REGULATORY CONTROL 12

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Ability to build mathematical models from input-output data.
2. Ability to analyze the controllability, Observability and stability of Discrete time systems.
3. Able to design digital controllers for multi-loop and multi-variable systems.

TEXT BOOKS:


REFERENCES:


MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI7702 LOGIC AND DISTRIBUTED CONTROL SYSTEM

COURSE OBJECTIVES

- To give an overview of the automation technologies such as PLCs, SCADA and DCS used in industries.
- To provide a fundamental understanding of the different languages used for PLC programming.
- To provide insight into some of the advanced principles those are evolving for present and future automation.

UNIT I PLC & SCADA

PLC: Evolutions of PLCs – Programmable Controllers – Architecture, I/O modules – Comparative study of Industrial PLCs.
SCADA: Remote terminal units- Master station - Communication architectures.
UNIT II BASICS OF PLC PROGRAMMING (LADDER)  9

UNIT III PLC PROGRAMMING (OTHER LANGUAGES)  9
Functional block programming - Sequential function chart – Instruction list – Structured text programming – PLC controlled sequential Process Examples.

UNIT IV DISTRIBUTED CONTROL SYSTEM  9
DCS: Evolution & types – Hardware architecture – Field control station – Interfacing of conventional and smart field devices (HART and FF enabled) with DCS Controller – Communication modules – Operator and Engineering Human interface stations – Study of any one DCS available in market.

UNIT V ADVANCED TOPICS IN AUTOMATION  9
Introduction to Networked Control systems – Plant wide control – Internet of things – Cloud based Automation – OLE for Process Control – Safety PLC – Case studies: PLC - SCADA - DCS.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Ability to understand all the important components such as PLC, SCADA, DCS, I/O modules and field devices of an industrial automation system.
2. Ability to develop PLC program in different languages for industrial sequential applications.
3. Able to select and use most appropriate automation technologies for a given application.
4. Ability to gain knowledge on the recent developments in industrial automation.

TEXT BOOKS:

REFERENCES:
4 NPTEL Notes on, “Programmable Logic Control System” by Department of Electrical Engg., IIT Kharagpur.
MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI7711 INDUSTRIAL AUTOMATION LABORATORY

COURSE OBJECTIVES
To teach the importance of measurement for monitoring, control and to impart theoretical and practical skills in

- Sensor Data acquisition, Data analysis, Data processing and Data visualization.
- Interfacing Conventional and Smart Field Devices (Transmitters & Control Valves) with Industrial Type Programmable Logic Controller and Distributed Control System
- Understanding the Instruction set of Programmable Logic Controller.
- Programming of Industrial Type Programmable Logic Controller (Ladder Logic, Function Block Programming, Sequential Function Chart and Instruction List)

LIST OF EXPERIMENTS
1. Interfacing Level Transmitter and Control Valve with Personal Computer.
2. (i) Study of PLC Field Device Interface Modules (AI, AO, DI, DO Modules)
   (ii) Interfacing Analog/Digital Input/output Devices with Industrial Type PLC
3. Simple exercises using the Instruction Set of an Industrial Type PLC.
4. PLC Exercises-I (Hardware Implementation)
   i. Filling/draining control operation.
   ii. Reversal of DC motor direction.
5. PLC Exercises-II (Hardware Implementation)
   i. Traffic light control.
   ii. Alarm Annunciator Sequence.
6. Control of Level Process using an Industrial Type PLC

9. (i) Study of DCS Field Device Interface Modules (AI, AO, DI, DO, H1 Modules)
   (ii) Interfacing Analog/Digital Input/Output Devices with an Industrial Type DCS

10. Implementation of Feedback Control Scheme in DCS using IEC 61131-3 Function Block Programming method.

11. (i) Interfacing HART and FF enabled Field Devices with Industrial Type DCS.
    (ii) Demonstration of PID Control in Field Devices.

12. Interfacing Wireless HART enabled Field Devices with DCS.

TOTAL : 60 PERIODS

COURSE OUTCOMES (COs)

1. Gain hands on experience in working with Industrial Automation Systems (Industrial Type DCS & PLC)
2. Be able to Configure Function Blocks and develop Feedback Control Schemes.
3. Ability to monitor and Control a pilot plant using Industrial Type DCS/PLC
4. Be able to analyze & interpret results and draw meaningful conclusions.
5. Be able to present the results in written and oral forms.
6. Ability to work as a Member in a group.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To impart knowledge on the design of signal conditioning circuits for the measurement of Level, temperature etc.
- To develop the skills needed to design, fabricate and test Analog/ Digital PID controller, Data Loggers and Alarm Annunciator.
- To develop various modules for final year project as per industrial standards and practices.
- To make the student familiarize with the design of orifice and control valve sizing.

LIST OF EXPERIMENTS

10. Development of Software Program for sizing Control Valve.
12. (a) Preparation of documentation of Instrumentation Project.  
    (b) Preparation of Project Scheduling, Installation Procedure and Safety Regulations

TOTAL: 60 PERIODS

COURSE OUTCOMES (COs)

1. Ability to carry out the design and fabrication of conventional and smart transmitters for key process variables such as Flow, Level and Temperature.
2. Ability to realize On/Off controllers, PID controllers and PLC.
3. Ability to design data loggers and alarm circuits for an industrial application requirement.
4. Able to develop software programs for sizing control valve, orifice and rotameter.
5. Capable of preparing documentation for Instrumentation projects.

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COURSE OBJECTIVES

The student should be made to:

- To use the knowledge acquired in various subjects of Electronics and Instrumentation Engineering and carry out Mini Project. This will motivate students to come up with new designs, Fabrication, Developing algorithms and software programs expressing their ideas in a novel way.
- 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.
- Get exposure to work in an industrial environment.

MINI PROJECT

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. Carryout the design/fabrication or develop codes/programs to achieve the objectives. Demonstrate the novelty of the project through the results and outputs.

The progress of the mini project is evaluated based on a minimum of two 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 evaluation will be made based on this report and a viva-voce examination, conducted internally by a 3 member committee appointed by Head of the Department.

(OR)

INDUSTRIAL TRAINING/INTERNSHIP (6 WEEKS – DURING SUMMER VACATION)

The student may undergo Industrial Training /Internship and the credits earned will be indicated in the mark sheet. If the student earns three credits in Industrial Training /Internship, the student may drop one professional Elective. In such cases Industrial Training / internship needs to be undergone continuously from one organization only. The student is allowed to undergo a maximum of 6 weeks Industrial Training /Internship during the entire duration of study.

The Industrial Training/Internship shall carry 100 marks and shall be evaluated through continuous assessment only. The progress of the Industrial Training/Internship is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department At the end of industrial training/Internship, the student shall submit a brief report on the training undergone and a certificate from the organization concerned. The evaluation will be made based on this report and a viva-voce Examination, Conducted internally by a three member Departmental Committee constituted by the Head of the Department. Certificate (issued by the organization)) submitted by the student shall be attached to the mark list and sent.
to Additional Controller of Examination by the Head of the Department.

TOTAL : 90 PERIODS

COURSE OUTCOMES (COs)

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

1. select a good project and able to work in a team leading to development of hardware/software product.
2. prepare a good technical report and able to present the ideas with clarity.
3. Gain Knowledge on various terminologies related to industrial environment.
4. Able to work efficiently as a member of different teams related to multidisciplinary projects.
5. Acquire skills to communicate efficiently and gain management skills related to industry / research organizations.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI7811  PROJECT WORK

COURSE 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 research literature 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/fabrication of Sensor/Activator/Controller, a research investigation, a computer or management project or a design problem.

The progress of the project is evaluated based on a minimum of two 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.

**TOTAL: 300 PERIODS**

**COURSE OUTCOMES (COs)**

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

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

**MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES**

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COURSE OBJECTIVES

- To provide an overview of the features associated with Industrial type PID controller.
- To make the students understand the various PID Controller Design methods and about PID stabilization for Linear Time-invariant models.
- To develop the skills needed to design adaptive and non-linear PID control schemes.
- To provide basic knowledge about Fractional-order systems and Fractional-order controller and to lay the foundation for the systematic approach to Design controller for fractional order systems.

UNIT I  INTRODUCTION

UNIT II  PID CONTROLLER DESIGN

UNIT III  PID STABILIZATION

UNIT IV  ADAPTIVE/NON-LINEAR PID CONTROL SCHEMES
Gain Scheduled PID Controller - Self-tuning PI/PID Controller – PID Types Fuzzy Logic Controller – Predictive PID Control.

UNIT V  INTRODUCTION TO FRACTIONAL ORDER SYSTEM AND FRACTIONAL ORDER PID CONTROLLER

TOTAL : 45 PERIODS

COURSE OUTCOMES(COs)
1. Ability to determine the advanced Features supported by the Industrial Type PID Controller.
2. Ability to Design, tune and implement P/PI/PID Controllers to achieve desired Performance for various processes.
3. Ability to design and implement adaptive PID controllers and Non-linear PID Control schemes.
4. Ability to Analyze Fractional-order systems, Fractional-order- controller and Design controller for fractional order systems.

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EI7002 ANALYTICAL INSTRUMENTS

COURSE OBJECTIVES

- To understand the theory and operational principles of instrumental methods for identification and quantitative analysis of chemical substances by different types of spectroscopy.
- To impart fundamental knowledge on gas chromatography and liquid chromatography.
- To integrate a fundamental understanding of the underlying principles of physics as they relate to specific instrumentation used for gas analyzers and pollution monitoring instruments.
- To impart knowledge on the important measurement in many chemical processes and laboratories handling liquids or solutions.
- To understand the working principle, types and applications of NMR and Mass spectroscopy.

UNIT I SPECTROPHOTOMETRY

UNIT II CHROMATOGRAPHY
UNIT III  INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS  

Gas analyzers – Oxygen, NO₂ and H₂S types, IR analyzers, thermal conductivity detectors, 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  


UNIT V  NUCLEAR MAGNETIC RESONANCE AND MASS SPECTROMETRY  


TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Understand the fundamental principles of selective analytical instruments used in medical diagnosis, quality assurance & control and research studies.
2. Assess and suggest a suitable analytical method for a specific purpose, and evaluate sensitivity, important sources of interferences and errors, and also suggest alternative analytical methods for quality assurance.
3. Critically evaluate the strengths and limitations of the various instrumental methods.
4. Develop critical thinking for interpreting analytical data.

TEXT BOOKS:


REFERENCES:

4. NPTEL lecture notes on, “Modern Instrumental methods of Analysis” by Dr.J.R. Mudakavi, IISC, Bangalore.
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EI7003 APPLIED SOFT COMPUTING LT P C 3 0 0 3

COURSE OBJECTIVES

- Get familiarized with different architectures and training algorithms of neural networks.
- Get exposed to the various neural modeling and control techniques with case study using simulation tool box.
- Gain Knowledge on fuzzy set theory and fuzzy rules.
- Able to design and implement the fuzzy logic controller with case study using simulation tool box.
- Capable of designing hybrid control schemes, selected optimization algorithms with case study using simulation tool box.

UNIT I ARTIFICIAL NEURAL NETWORK (ANN) 9

UNIT II NEURAL NETWORKS FOR MODELING AND CONTROL 9

UNIT III FUZZY SET THEORY 9

UNIT IV FUZZY LOGIC FOR MODELING AND CONTROL 9
Modeling of non-linear systems using fuzzy models: TSK model – Fuzzy logic controller: Fuzzification, Knowledge base, Decision making logic, Defuzzification – Adaptive fuzzy systems.
Case Study – Familiarization with fuzzy logic toolbox.

UNIT V HYBRID CONTROL SCHEMES

TOTAL : 45 PERIODS

COURSE OUTCOMES(COs)
1. Be able to analyze problems to formulate models and develop control schemes using soft computing techniques for non-linear systems.
2. Be able to apply engineering fundamentals to use hybrid schemes and optimization algorithms to obtain solution for complex engineering problems.
3. Be capable of using modern IT tool boxes to simulate case studies

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COURSE OBJECTIVES

- To make students understand various physiological signal measurements, Identification and classification.
- To make students understand various Biomedical Instruments used for Bio-potential measurement and non-electrical parameter measurement.
- To make students familiarized with the medical imaging and understanding the concept of assisting and therapeutic devices.

UNIT I  BASIC CONCEPTS OF MEDICAL INSTRUMENTATION  9

UNIT II  ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS  9

UNIT III  NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES  9

UNIT IV  MEDICAL IMAGING SYSTEMS  9

UNIT V  LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES  9

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Able to understand the operation of different medical devices.
2. Able to measure and analyze the Biological signals.
3. Able to apply these instruments in diagnosis, therapeutic treatment and imaging fields.

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COURSE OBJECTIVES

- To give an overview of different Fault Detection and Diagnosis methods.
- To present an overview of various types of fault detection schemes using Limit Checking, Parameter estimation methods, Principle Component Analysis.
- To impart knowledge and skills needed to design and detect sensor and actuators faults using structured residual approach as well as directional structured residual approach.
- To impart knowledge and skills needed design and detect faults in sensor and actuators using GLR and MLR based Approaches.
- To impart knowledge and skills needed to detect and quantify and compensate stiction in Control valves.

UNIT I INTRODUCTION & ANALYTICAL REDUNDANCY CONCEPTS


UNIT II FAULT DETECTION AND DIAGNOSIS USING LIMIT CHECKING AND PROCESS IDENTIFICATION METHODS


UNIT III FAULT DETECTION AND DIAGNOSIS USING PARITY EQUATIONS


UNIT IV FAULT DIAGNOSIS USING STATE ESTIMATORS


UNIT V CASE STUDIES


TOTAL : 45 PERIODS
COURSE OUTCOMES (COs)
1. Ability to explain different approaches to Fault Detection and Diagnosis.
3. Ability to design and detect sensor and actuators faults using structured residual approach as well as directional structured residual approach.
4. Ability to design and detect faults in sensor and actuators using GLR and MLR based Approaches.
5. Ability to detect and quantify and compensate stiction in Control valves.

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COURSE OBJECTIVES

• To discuss about theory behind light propagation in optical fibers, types of optical fibers, dispersion characteristics for various types of optical fibers and attenuation measurement system.
• To provide an overview of recent advances in fiber optic sensor technology.
• To provide knowledge on principle of laser generation, laser system and its types.
• To emphasize how lasers have been used for industrial applications.
• To acquaint the students with fundamentals of holography.

UNIT I  OPTICAL FIBER AND THEIR PROPERTIES

UNIT II  INDUSTRIAL APPLICATION OF OPTICALFIBER
Fiber optic sensors – Fiber optic instrumentation system for measurement of fiber 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

UNIT IV  INDUSTRIAL APPLICATION OF LASERS
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

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Understand the principle, transmission, dispersion and attenuation characteristics of optical fibers
2. Apply the gained knowledge on optical fibers for its use as communication medium and as sensor as well which have important applications in production, manufacturing industrial and biomedical applications.
4. Students will gain ability to apply laser theory for the selection of lasers for a specific Industrial and medical application.
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COURSE OBJECTIVES

• To provide wide information dealing with nano material and its necessity.
• To understand the impact of various steps needed to be followed in nano material preparation.
• To analyze methods involving preparation of nano scale devices.
• To provide knowledge about working nature and neighborhood condition regarding the preparation.
• To Explore the properties of various types of nano materials.

UNIT I  INTRODUCTION

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

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Will be familiar with various preparation methods of nano material
2. Will be in a position to learn and keep in pace with recent nano scale materials
3. To draw well-founded conclusions applying the knowledge acquired from research and research methods of nano science and MEMS.

TEXT BOOKS:

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EI7008 INSTRUMENTATION IN PETROCHEMICAL INDUSTRY LT P C 3 0 0 3

COURSE OBJECTIVES

• To introduce the students the method of oil recovery and the steps involved in oil gas production process.
• To make the students understand the process behavior of some of the important unit operations in petrochemical industry through mathematical model.
• To familiarize the students to apply knowledge to select the appropriate control strategy for the selective process.
• To provide information about the most important derivatives obtained from petroleum products.
• To help the students in understanding selection and maintenance of instruments in petrochemical industry.

UNIT I OIL EXTRACTION AND OIL GAS PRODUCTION

Techniques used for oil discovery – Oil recovery methods – oil rig system - Overview of oil gas production – oil gas separation – Gas treatment and compression – Control and safety systems.

UNIT II IMPORTANT UNIT OPERATIONS IN REFINERY

UNIT III DERIVATIVES FROM PETROLEUM
Derivatives from methane – Methanol Production – Acetylene production - Derivatives from acetylene —Derivatives from ethylene – Derivatives from propylene.

UNIT IV IMPORTANT PETROLEUM PRODUCTS & MEASUREMENTS
BTX from Reformate – Styrene – Ethylene oxide/Ethylene glycol – polyethylene – Polypropylene – PVC production. Parameters to be measured in refinery and petrochemical industry – Selection and maintenance of measuring instruments.

UNIT V SAFETY IN INSTRUMENTATION SYSTEMS

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Gain knowledge on oil gas production process and important unit operations in a refinery
2. Having gained the process knowledge, ability to develop and analyze mathematical model of selective processes.
3. Able to develop, analyze and select appropriate control strategy for selective unit operations in a refinery.
4. Gain knowledge on the most important chemical derivatives obtained from petroleum products.
5. Understand safety instrumentation followed in process industries.

TEXT BOOKS:

REFERENCES:

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COURSE OBJECTIVES

- To impart basic knowledge on Instrumentation standards.

UNIT I STANDARDS ORGANIZATION

Standards: Introduction International and National Standards organization: IEC, ISO, NIST, IEEE, ISA, API, BIS, DIN, JISC and ANSI.


UNIT II ISA STANDARDS


UNIT II ISA STANDARDS - CONTROL VALVE AND ACTUATOR

Control Valve Standards (ISA75): 75.01, 75.04, 75.05, 75.7, 75.11, 75.13, 75.14, 75.23, 75.24, 75.26.
Valve Actuator (ISA 96): 96.01, 96.02, 96.03, 96.04.

UNIT IV ISA STANDARDS - FOSSIL AND NUCLEAR POWER PLANTS

Fossil Power Plant Standards (ISA 77): 77.14, 77.22, 77.30, 77.41, 77.42, 77.44, 77.60, 77.70.
Nuclear Power Plant Standards (ISA67): 67.01, 67.02, 67.03, 67.04, 67.06.

UNIT V BS , ISO, IEC, & ANSI


TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to understand the role of standards organization.
2. Ability to interpret and follow different standards while carrying out installation of sensors, transmitters, Industrial automation systems, PLC programming, documentation, equipment selection in hazardous area and instrument specification forms.
3. Ability to understand and follow different standards while performing control valve sizing, actuator sizing and orifice sizing etc.
4. Ability to interpret and follow different standards while carrying out monitoring and control of fossil fuel power plants and nuclear power plants.
TEXT BOOKS:


3. ISA standard 5, “Documentation of Measurement and Control Instruments and Systems”, ISA, North Carolina, USA.

4. ISA standard 12, “Electrical Equipment for Hazardous Locations”, ISA, North Carolina, USA.

5. ISA standard 20, “Instrument Specification Forms”, ISA, North Carolina, USA.

6. ISA standard 37, “Measurement Transducers”, ISA, North Carolina, USA.

7. ISA standard 75, “Control Valve Standards”, ISA, North Carolina, USA.

8. ISA standard 96, “Valve Actuator”, ISA, North Carolina, USA.


10. ISA standard 67, “Nuclear Power Plant Standards”, ISA, North Carolina, USA.


MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To impart knowledge on PIC microcontroller and ARM processor.
- To introduce the architecture and instruction set of PIC 16F87x.
- To make them familiar with ports, timer, CCP modules, interrupts, peripherals and interfacing of PIC 16F87x.
- To introduce the architecture and assembly language programming of ARM LPC 2148.
- To make them learn the ARM organization and instruction set.

UNIT I PIC INTRODUCTION 9

UNIT II PORTS, COUNTERS, TIMER, CCP MODULE AND INTERRUPTS 9
PIC16F87I2C I/O Ports, Counters, Timers CCP Modules – Interrupts.

UNIT III PERIPHERALS AND INTERFACING 9
16F87xI2C Bus Peripherals Chip Access – Analog to Digital Converter – UART.

UNIT IV ARM LPC2148 INTRODUCTION 9

UNIT V ARM LPC2148 ORGANIZATION 9
3-Stage Pipeline ARM Organization – 5-Stage Pipeline ARM Organization – ARM Implementation – ARM Instruction Set.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Able to apply the knowledge of PIC microcontroller and ARM processor to solve simple operations.
2. Able to apply the microcontroller programming skills to design and carry out projects which will be useful for the society.
3. Ability to identify and formulate engineering problems and should be in a position to use the microcontrollers appropriately.
4. Ability to formulate and work in multidisciplinary projects.
5. Capability to learn and keep in pace with latest microcontrollers.
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REFERENCES:

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114
COURSE OBJECTIVES

- To teach the students the general principles of model predictive control scheme.
- To provide a comprehensive description of model predictive control schemes namely as dynamic matrix control, generalized predictive control scheme and State space based model predictive control scheme.
- To highlight the key features of MPC for its Industrial Success.
- To introduce the skills required to formulate both unconstrained and constrained optimal control schemes.
- To develop the skills needed to design Model Predictive Control schemes to achieve the desired performance.

UNIT I       MODEL PREDICTIVE CONTROL SCHEMES
Introduction to Model Predictive Control - Model Predictive Control Elements - Model Predictive Control Schemes: Dynamic Matrix Control and Model Algorithmic Control – Case Studies

UNIT II      GENERALIZED PREDICTIVE CONTROL SCHEME
Generalized Predictive Control Scheme – Simple Implementation of Generalized Predictive Control Scheme for Industrial Processes – Multivariable Generalized Predictive Control Scheme – Case Studies

UNIT III     STATE SPACE BASED MODEL PREDICTIVE CONTROL SCHEME
State Space Model Based Predictive Control Scheme - Review of Kalman Update based filters – State Observer Based Model Predictive Control Schemes – Case Studies

UNIT IV     CONSTRAINED MODEL PREDICTIVE CONTROL SCHEME
Constraints Handling: Amplitude Constraints and Rate Constraints – Constraints and Optimization – Constrained Model Predictive Control Scheme – Case Studies.

UNIT V     ADVANCED TOPICS IN MPC
Robust Model Predictive Control Scheme – Adaptive Model Predictive Control Scheme – Multiple-Model based Model Predictive Control Scheme - Fast Methods for Implementing Nonlinear Model Predictive Control Scheme – Case Studies

TOTAL : 45 PERIODS

COURSE OUTCOMES(COs)
1. Ability to explain the advantages and disadvantages of various MPC schemes.
2. Ability to design both unconstrained and constrained model predictive controllers.
3. Ability to explain the advanced Features supported by the MPC Scheme.
4. Ability to Identify, formulate and solve problem in the field of Process Control domain using MPC.
5. Ability to implement MPC algorithms in MATLAB/SCILAB.

TEXT BOOKS:

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EI7012 NON-LINEAR CONTROL SYSTEMS LT P C 3 0 0 3

COURSE OBJECTIVES

- To understand the nature of non-linear systems and to analyze the stability of such systems
- To develop suitable models of non-linear systems and to develop suitable controllers for such systems
- To understand the chaotic and bifurcation behavior of non-linear systems
- To linearize the non-linear systems.

UNIT I NON-LINEAR SYSTEMS

UNIT II STABILITY OF NON-LINEAR SYSTEMS
UNIT III  MODELLING AND CONTROL OF NON-LINEAR SYSTEMS  
9
Models for Nonlinear systems - Hammerstein and Wiener models - Input signal design for 
Identification – On-line parameter estimation for nonlinear systems – Nonlinear PID controller - Gain 
scheduling control – case studies

UNIT IV  CHAOS AND BIFURCATION BEHAVIOR  
9
Introduction to Chaos - The Lorenz Equations – Test for chaos - Bifurcation Behavior of ordinary 
differential equations - Types of Bifurcations - Limit Cycle Behavior and Hopf Bifurcation.

UNIT V  LINEARIZATION  
9
Methods of linearization – Taylor’s series expansion – Jacobean method - state model for systems – 
Role of Eigen values and Eigenvectors – State transition matrix and its properties – Controllability and 
observability – Stabilizability and Detectability

TOTAL: 45 PERIODS

COURSE OUTCOMES(COs):

1. Ability to apply mathematical knowledge and basics of science and engineering to develop 
model for non-linear system.
2. Ability to analyze non-linear system based on the first principle model.
3. Ability to come out the solution for complex non-linear system.
4. Ability to develop various control schemes for non-linear systems.
5. Ability to linearize non-linear system for developing linear control,

TEXT BOOKS:

systems”.

REFERENCES:

2. Bequette, B.W., “Process Control Modeling, Design and Simulation”, Prentice Hall of India, 
2008.
4. Steven E. LeBlanc, and Donald R. Coughanowr, “Process Systems Analysis and Control”, 3rd 
2002.

7. NPTEL Lecture on “Non-linear system Analysis” by Prof. Laxmidhar Behera, IIT Kanpur.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI7013 NUCLEAR POWER PLANT INSTRUMENTATION

COURSE OBJECTIVES

- To introduce students to the fundamentals of nuclear power reactor.
- The construction and principle of operation of the different sensing and indicating devices used at nuclear power plants will be explained to students.
- To study about the various types of Nuclear power Reactor.
- To characterize radioactive wastes based on the analysis of radioactive waste generation.
- To elaborate different types of control schemes involved in nuclear power plant.

UNIT I FUNDAMENTAL CONSIDERATIONS IN NUCLEAR POWER REACTOR


UNIT II MEASURING INSTRUMENTS AND ANALYZER IN NUCLEAR POWER PLANT


UNIT III TYPES OF NUCLEAR POWER REACTOR


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UNIT IV  NUCLEAR WASTE DISPOSAL AND REACTOR SAFETY  
9

UNIT V  MODELING AND CONTROL OF NUCLEAR POWER REACTOR  
9
Multipoint Kinetics modeling of Large reactors: Introduction, Derivation of Multipoint Kinetics model, Selection of suitable nodalization scheme, Application to the AHWR Thermal hydraulics model, Coupled Neutronics – Thermal Hydraulics model – Reactor Stability Analysis – Control of Nuclear Power: General features of Reactor control, Methods of control, control loops, Effectiveness of control rods, Output Feedback control design - Direct block diagonalization and composite control of Three time scale systems – Design of Fast output sampling controller for Three time scale systems.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Ability to recognize and recall the basics of nuclear reactor terminology, definitions, and concepts associated with nuclear reactor physics.
2. Ability to understand the types of radiation measurement equipment and nuclear power plant instrumentation.
3. Ability to identify and analyze the specific features of different types of nuclear reactors.
4. Ability to understand the role and responsibility of effective nuclear waste disposal.
5. Ability to apply their mathematical knowledge and engineering principles to model the nuclear reactor and able to control the reactor.

TEXT BOOKS:

REFERENCES:
4. NPTEL Video Lectures on “Nuclear Reactors and Safety - An Introduction” by Dr. G. Vaidyanathan.
5. NPTEL Video Lectures on “Nuclear Science & Engineering” by Dr. Santanu Ghosh.
6. NPTEL Video Lectures on “Nuclear Reactor Technology” by Dr. K.S. Rajan.
7. NPTEL Video Lectures on “Nuclear Physics: Fundamentals and Applications” by Prof. H.C. Verma
MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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EI7014 OPTIMAL CONTROL

COURSE OBJECTIVES

- To impart knowledge and skills needed to design Linear Quadratic Regulator for Time-invariant and Time-varying Linear system (Continuous time and Discrete-time systems)
- To introduce concepts needed to design optimal controller using Dynamic Programming Approach and H-J-B equation.
- To introduce concepts needed to design optimal controller in the presence of state constraints and time optimal controller.
- To give exposure to different type of optimal control problems such as time-optimal, fuel optimal, energy optimal control problems.

UNIT I CALCULUS OF VARIATIONS AND OPTIMAL CONTROL


UNIT II LINEAR QUADRATIC OPTIMAL CONTROL SYSTEM


UNIT III DISCRETE TIME OPTIMAL CONTROL SYSTEMS

Variational calculus for Discrete time systems – Discrete time optimal control systems: Fixed-final state and open-loop optimal control and Free-final state and open-loop optimal control - Discrete time linear state regulator system – Steady state regulator system.

120
UNIT IV  PONTRYAGIN MINIMUM PRINCIPLE & DYNAMIC PROGRAMMING  9

UNIT V  CONSTRAINED OPTIMAL CONTROL SYSTEMS  9

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Ability to design Linear Quadratic Regulator for Time-invariant and Time-varying linear system (Continuous time and Discrete-time systems).
3. Ability to design optimal controller in the presence of state constraints.
4. Ability to solve different type of optimal control problems such as time-optimal, fuel optimal and energy optimal control problems.

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COURSE OBJECTIVES

- Comprehensive introduction to various power electronic devices, their structure, operating principle and characteristics
- Give exposure to Various topologies, working principle and analysis of controlled rectifiers and ac controllers
- Detailed knowledge on Classifications, structure, operating principle of dc choppers
- Introduction to different types of Inverters, their principle of operation and waveform control
- Overview on dc and ac drives and their control using power electronic circuits.

UNIT I  POWER SEMICONDUCTOR DEVICES AND CHARACTERISTICS  

UNIT II  CONTROLLED RECTIFIERS AND AC CONTROLLERS  

UNIT III  DC TO DC CONVERTERS  
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  DRIVES AND CONTROL  
Static and Dynamic equations of dc and ac machines – Electrical breaking – Rectifier and chopper control of DC drives – Principles of v/f control of AC drives – Open loop and Closed loop schemes for DC and AC drives (Block diagram approach only) – Introduction to vector control of AC drives.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Ability to explain various devices and their structure, operating characteristics in the field of electronics.
2. Ability to classify, analyze and design, Control rectifier, chopper and inverter.
3. Will have ability to apply power electronic circuits for the control of popular applications.
4. Exposure to design and analyze PE circuit using simulation software.
TEXT BOOKS:

REFERENCES:
5. NPTEL Lecture Series on “Power Electronics” by Dr.B.G.Fernandes, IIT Bombay.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES
- To make the students aware of basic concepts of safety instrumented system, standards and risk analysis techniques.
- To make the students understand different layers of protection.
- To make students conscious about safety instrumentation applications.

UNIT I  INTRODUCTION

UNIT II  PROTECTION LAYERS AND SAFETY REQUIREMENT SPECIFICATIONS

UNIT III  SAFETY INTEGRITY LEVEL (SIL)
Evaluating Risk, Safety Integrity Levels, SIL Determination Method : As Low As Reasonably Practical ( ALARP ), Risk matrix, Risk Graph, Layers Of Protection Analysis ( LOPA ) – Issues related to system size and complexity –Issues related to field device safety – Functional Testing.

UNIT IV  SYSTEM EVALUATION

UNIT V  CASE STUDY

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Able to understand the role of safety instrumented system in the industry.
2. Be able to identify and analyze the hazards.
3. Able to select the safety integrity level for an application.
4. Able to understand the importance of safety environment in industry.
TEXT BOOKS:

REFERENCES:

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To elaborate the concept of estimating the state variables of a system using state estimation algorithms.
- To elaborate the concept of estimating the parameters of the Input-output models using parameter estimation algorithms.
- To make the student understand the various closed loop system identification techniques.
- To make the students understand the use of ANN, Fuzzy Logic, ANFIS for modeling of non-linear system and to get familiarized with the ANN and Fuzzy Logic tool boxes.
- To provide the background on the practical aspects of conducting experiments for real time system identification.

UNIT I KALMAN UPDATE BASED FILTERS & PARTICLE FILTER  

UNIT II PARAMETER ESTIMATION METHODS  

UNIT III CLOSED-LOOP IDENTIFICATION  

UNIT IV NONLINEAR SYSTEM IDENTIFICATION  

UNIT V PRACTICAL ASPECTS OF IDENTIFICATION  
Practical aspects: experimental design – input design for identification, notion for persistent excitation, drifts and de-trending – outliers and missing data – pre-filtering – robustness – Model validation and Model structure determination – Case studies.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Ability to design and implement state estimation schemes.
2. Ability to develop various models (Linear & Nonlinear) from the experimental data.
3. Be able to select a suitable model and parameter estimation algorithm for the identification of systems.
4. Be able to carry out the verification and validation of identified model.
5. Will gain expertise on using the model for prediction and simulation purposes and for developing suitable control schemes.
TEXT BOOKS:

REFERENCES:

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COURSE OBJECTIVES

- Gain knowledge on different types of power plants.
- Study about the important process variables and their measurements.
- To understand the important control loops involved in thermal power plants.
- To analyze the various parameters related to steam turbines.

UNIT I  OVERVIEW OF POWER GENERATION

UNIT II  MEASUREMENTS IN POWER PLANTS

UNIT III  BOILER CONTROL – I

UNIT IV  BOILER CONTROL – II

UNIT V  TURBINE MONITORING AND CONTROL
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

COURSE OUTCOMES (COs)

1. Able to understand and analyze the process diagram of hydel, thermal, nuclear, wind and solar power plants.
2. Will be in a position to select instruments for monitoring various parameters related to thermal power plant.
3. Able to develop, analyze and select appropriate control strategy for various systems involved in thermal power plant.
4. Gain knowledge on the important terms related to turbine monitoring system and able to analyze the problems related to turbine governing.

TEXT BOOKS:

REFERENCES:

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COURSE OBJECTIVES

- Study the unit operations involved for transportation, mixing and separation of solids.
- Study the unit operations involved for transportation, mixing and separation of fluids.
- Understand the basic operations involved with heat exchangers, Distillation and chemical reactions.
- Gain knowledge about the operations of evaporators and crystallizers, drying and cooling towers.
- Gain knowledge on the operation of dryers, distillation column, refrigerators and chemical reactors.

UNIT I MECHANICAL OPERATIONS- I

UNIT II MECHANICAL OPERATIONS-II

UNIT III HEAT TRANSFER- I AND ITS APPLICATIONS
Heat exchangers: Single pass and multi pass heat exchangers, condensers, reboilers Combustion process in thermal power plant, Distillation: Binary distillation, Batch distillation, controls and operations, Chemical reactors.

UNIT IV HEAT TRANSFER- II

UNIT V CASE STUDY
Unit Operations and Control schemes applied to Thermal Power plant, Steel Industry, Paper and Pulp Industry, Leather Industry.

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)
1. Apply the knowledge on solids & fluids to handle the raw materials.
2. Select and apply relevant handling techniques to convert the solids and fluids for specific applications.
3. Come out with solutions for simple/complex problems in heat transfer and design the heat exchange equipment for different applications such as distillation, boilers.
4. Able to carry out multidisciplinary projects using heat transfer, mass transfer concepts.
5. Gain ability for lifelong learning of new techniques and developments in various types of unit operations in industries.

TEXT BOOKS:


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MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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COURSE OBJECTIVES

- To give an overview of the Industrial data communications systems.
- To provide a fundamental understanding of common principles, various standards, protocols.
- To provide insight into some of the new principles those are evolving for future networks.

UNIT I DATA NETWORK FUNDAMENTALS

UNIT II MODBUS AND HART

UNIT III PROFIBUS AND FF

UNIT IV AS INTERFACE (AS-i), DEVICENET AND INDUSTRIAL ETHERNET

UNIT V WIRELESS COMMUNICATION
Wireless sensor networks: Hardware components – energy consumption of sensor nodes – Network architecture – sensor network scenario. Wireless HART – Existing Wireless Options: IEEE 802.15.4 - ISA 100 – Zigbee – Bluetooth – their relevance to industrial applications

TOTAL : 45 PERIODS

COURSE OUTCOMES (COs)

1. Gain knowledge on various industrial data communication networks, protocols and their selection.
2. Able to select and use most appropriate networking technologies and standards for a given application.
3. Ability to design and ensuring that best practice is followed in installing and commissioning the data communications links to ensure they run fault-free.
4. Ability to understand requirements of industrial application and provide wired or wireless solution.
TEXT BOOKS:


REFERENCES:


5. NPTEL Lecture notes on, "Computer Networks" by Department of Electrical Engg., IIT Kharagpur.

MAPPING COURSE OUTCOMES WITH PROGRAMME OUTCOMES

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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  9
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)  9
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 stake-holders- 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  9
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  9

UNIT V  DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS  9
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.

**TEXT BOOKS:**

**REFERENCES**
1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005

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

REFERENCES:

GE 7351 ENGINEERING ETHICS AND HUMAN VALUES (Common to all branches) L T P C 3 0 0 3

OBJECTIVES
- To emphasise into awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - codes of ethics – Importance of Industrial Standards - a balanced outlook on law – anticorruption- occupational crime - the challenger case study.

UNIT IV ENGINEER’S RIGHTS AND RESPONSIBILITIES ON SAFETY

UNIT V GLOBAL ISSUES
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-Sample code of conduct.

TOTAL : 45 PERIODS
OUTCOMES

- Students will have the ability to perform with professionalism, understand their rights, legal, ethical issues and their responsibilities as it pertains to engineering profession with engaging in lifelong learning with knowledge of contemporary issues.

TEXT BOOKS


REFERENCES


GE7652 TOTAL QUALITY MANAGEMENT

AIM

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

OBJECTIVES

- To understand the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- To understand the TQM Principles.
- To learn and apply the various tools and techniques of TQM.
- To understand and apply QMS and EMS in any organization.

UNIT I INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM —Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.
UNIT II TQM PRINCIPLES
Leadership--The Deming Philosophy, Quality council, Quality statements and Strategic planning–
Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service
Quality, Kano Model and Customer retention – Employee involvement – Motivation, Empowerment,
Team and Teamwork, Recognition & Reward and Performance Appraisal–Continuous process
improvement –Juran Trilogy, PDSA cycle, 5s and Kaizen - Supplier partnership – Partnering, Supplier
selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I
The seven traditional tools of quality – New management tools – Six-sigma Process Capability–
Bench marking – Reasons to bench mark, Bench marking process, What to Bench Mark,
Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the
findings, Pitfalls and Criticisms of Bench Marking – FMEA – Intent of FMEA, FMEA Documentation,
Stages, Design FMEA and Process FMEA.

UNIT IV TQM TOOLS & TECHNIQUES II
Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM –
Concepts, improvement needs – Performance measures-- Cost of Quality - BPR.

UNIT V QUALITY MANAGEMENT SYSTEM
Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific
Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—
Documentation—Internal Audits—Registration--ENVIRONMENTAL MANAGEMENT SYSTEM:
Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—
Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to apply TQM concepts in a selected enterprise.
• Ability to apply TQM principles in a selected enterprise.
• Ability to apply the various tools and techniques of TQM.
• Ability to apply QMS and EMS in any organization.

TEXT BOOK:
1. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield, Mary B. Sacre, Hemant Urdhwareshe and
Rashmi Urdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised Third

REFERENCES:
South-Western (Thomson Learning), 2005.
GE7072 FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them into design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT


UNIT II REQUIREMENTS AND SYSTEM DESIGN


UNIT III DESIGN AND TESTING


UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT


UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY

The Industry - Engineering Services Industry - Product Development in Industry versus Academia –The IPD Essentials - Introduction to Vertical Specific Product Development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical
OUTCOMES:
Upon completion of the course, the students will be able to:
- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business
  Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES:
2. Peter F Drucker, “People and Performance”, Butterworth – Heinemann [Elsevier], Oxford,
   2004.
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design",