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* Common to all B.E. / B.Tech. Programmes
+ Offering English Language Laboratory as an additional subject (with no marks) during 2nd semester may be decided by the respective Colleges affiliated to Anna University Chennai.

A. CIRCUIT BRANCHES

I Faculty of Electrical Engineering
   1. B.E. Electrical and Electronics Engineering
   2. B.E. Electronics and Instrumentation Engineering
   3. B.E. Instrumentation and Control Engineering

II Faculty of Information and Communication Engineering
   1. B.E. Computer Science and Engineering
   2. B.E. Electronics and Communication Engineering
   3. B.E. Bio Medical Engineering
   4. B.Tech. Information Technology

B. NON – CIRCUIT BRANCHES

I Faculty of Civil Engineering
   1. B.E. Civil Engineering

II Faculty of Mechanical Engineering
   1. B.E. Aeronautical Engineering
   2. B.E. Automobile Engineering
   3. B.E. Marine Engineering
   4. B.E. Mechanical Engineering
   5. B.E. Production Engineering

III Faculty of Technology
   1. B.Tech. Chemical Engineering
   2. B.Tech. Biotechnology
   3. B.Tech. Polymer Technology
   4. B.Tech. Textile Technology
   5. B.Tech. Textile Technology (Fashion Technology)
   7. B.Tech. Plastics Technology
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(Applicable to the students admitted from the Academic year 2008 – 2009 onwards)

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B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING

LIST OF ELECTIVES - R 2008

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## ELECTIVE IV

<table>
<thead>
<tr>
<th>No.</th>
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<tr>
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<td>Total Quality Management</td>
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<td>14.</td>
<td>GE2025</td>
<td>Professional Ethics In Engineering</td>
<td>3</td>
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<td>15.</td>
<td>IC2401</td>
<td>Digital Control System</td>
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<tr>
<td>16.</td>
<td>CS2461</td>
<td>Applied Soft Computing</td>
<td>3</td>
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AIM:
To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

OBJECTIVES:
1. To help students develop listening skills for academic and professional purposes.
2. To help students acquire the ability to speak effectively in English in real-life situations.
3. To inculcate reading habit and to develop effective reading skills.
4. To help students improve their active and passive vocabulary.
5. To familiarize students with different rhetorical functions of scientific English.
6. To enable students write letters and reports effectively in formal and business situations.

UNIT I
Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading & predicting content, Reading and interpretation, extended definitions, Process description

SUGGESTED ACTIVITIES:
1. Exercises on word formation using the prefix ‘self’ - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings and predicting the content – Reading advertisements and interpretation.

UNIT II

SUGGESTED ACTIVITIES:
Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.

1. Listening comprehension exercises to categorise data in tables.
2. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits – Writing analytical paragraphs on different debatable issues.

UNIT III
Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations.

SUGGESTED ACTIVITIES:
Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. (Eg: object –verb / object – noun)
1. Speaking exercises involving the use of stress and intonation – Group discussions– analysis of problems and offering solutions.
2. Reading comprehension exercises with critical questions, Multiple choice question.

UNIT IV  
12  
Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV / Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

SUGGESTED ACTIVITIES:  
1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking - Role play – group discussions – Activities giving oral instructions.

UNIT V  
9  
Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

SUGGESTED ACTIVITIES:  
1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

TOTAL : 60 PERIODS

TEXT BOOK:  

REFERENCES:  

EXTENSIVE READING:  

NOTE:  
The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.
MA2161 MATHEMATICS – II  

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

UNIT II  
VECTOR CALCULUS  
12  

UNIT III  
ANALYTIC FUNCTIONS  
12  
Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV  
COMPLEX INTEGRATION  
12  

UNIT V  
LAPLACE TRANSFORM  
12  
Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

TOTAL : 60 PERIODS

TEXT BOOKS:

REFERENCES:
UNIT I  CONDUCTING MATERIALS

UNIT II  SEMICONDUCTING MATERIALS

UNIT III  MAGNETIC AND SUPERCONDUCTING MATERIALS
Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV  DIELECTRIC MATERIALS

UNIT V  MODERN ENGINEERING MATERIALS
Metallic glasses: preparation, properties and applications.
Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA

TOTAL : 45 PERIODS

TEXT BOOKS:
2. Charles P. Poole and Frank J.Ownen, 'Introduction to Nanotechnology’, Wiley India(2007) (for Unit V)
REFERENCES:

CY2161 ENGINEERING CHEMISTRY – II L T P C 3 0 0 3

AIM
To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

OBJECTIVES
• The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
• Principles of corrosion control
• Chemistry of Fuels and combustion
• Industrial importance of Phase rule and alloys
• Analytical techniques and their importance.

UNIT I ELECTROCHEMISTRY
Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes – Standard Hydrogen electrode – Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox - Fe²⁺ vs dichromate and precipitation – Ag⁺ vs Cl⁻ titrations) and conduct metric titrations (acid-base – HCl vs, NaOH) titrations,

UNIT II CORROSION AND CORROSION CONTROL

UNIT III FUELS AND COMBUSTION
UNIT IV  PHASE RULE AND ALLOYS  9
Statement and explanation of terms involved – one component system – water system –
condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic
systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless

UNIT V  ANALYTICAL TECHNIQUES  9
Beer-Lambert’s law (problem) – UV-visible spectroscopy and IR spectroscopy – principles –
instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame
photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame
photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) –
estimation of nickel by atomic absorption spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

ME2151  ENGINEERING MECHANICS  L T P C
3 1 0 4

OBJECTIVE
At the end of this course the student should be able to understand the vectorial and scalar
representation of forces and moments, static equilibrium of particles and rigid bodies both in two
dimensions and also in three dimensions. Further, he should understand the principle of work and
energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to
understand the laws of motion, the kinematics of motion and the interrelationship. He should also
be able to write the dynamic equilibrium equation. All these should be achieved both conceptually
and through solved examples.

UNIT I  BASICS & STATICS OF PARTICLES  12
Introduction – Units and Dimensions – Laws of Mechanics – Lame’s theorem, Parallelogram and
triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector
operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and
Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in
space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.
UNIT II  EQUILIBRIUM OF RIGID BODIES  12

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  12

UNIT IV  DYNAMICS OF PARTICLES  12

UNIT V  FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS  12
Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

TOTAL: 60 PERIODS

TEXT BOOK:

REFERENCES:
UNIT I  BASIC CIRCUITS ANALYSIS  12

UNIT II  NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS:  12
Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III  RESONANCE AND COUPLED CIRCUITS  12

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

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

TOTAL :60 PERIODS

TEXT BOOKS:

REFERENCES:
UNIT I CIRCUIT ANALYSIS TECHNIQUES

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS

UNIT III SEMICONDUCTOR DIODES

UNIT IV TRANSISTORS
Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

UNIT V SPECIAL SEMICONDUCTOR DEVICES
(Total : 60 PERIODS
(Qualitative Treatment only)

TEXT BOOKS:

REFERENCES:
GE2151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L T P C

3 0 0 3

(Common to branches under Civil, Mechanical and Technology faculty)

UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS 12
Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS 12

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

UNIT IV DIGITAL ELECTRONICS 12
Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12
Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL : 60 PERIODS

TEXT BOOKS:

REFERENCES:
A – CIVIL ENGINEERING

UNIT I
SURVEYING AND CIVIL ENGINEERING MATERIALS 15


UNIT II
BUILDING COMPONENTS AND STRUCTURES 15

FOUNDATIONS: Types, Bearing capacity – Requirement of good foundations.


TOTAL : 30 PERIODS

B – MECHANICAL ENGINEERING

UNIT III
POWER PLANT ENGINEERING 10

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

UNIT V
REFRIGERATION AND AIR CONDITIONING SYSTEM 10

TOTAL: 30 PERIODS

REFERENCES:
LIST OF EXPERIMENTS

1. UNIX COMMANDS
   Study of Unix OS - Basic Shell Commands - Unix Editor

2. SHELL PROGRAMMING
   Simple Shell program - Conditional Statements - Testing and Loops

3. C PROGRAMMING ON UNIX
   Dynamic Storage Allocation-Pointers-Functions-File Handling

TOTAL: 45 PERIODS

HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

HARDWARE:

1 UNIX Clone Server
33 Nodes (thin client or PCs)
Printer – 3 Nos.

SOFTWARE:

OS – UNIX Clone (33 user license or License free Linux)
Compiler - C

LIST OF EXPERIMENTS

1. Determination of Young’s modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
5. Spectrometer dispersive power of a prism.
6. Determination of Young’s modulus of the material – uniform bending.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.
• The lab examinations will be held only in the second semester.
LIST OF EXPERIMENTS
1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using BaCl₂ vs Na₂SO₄
4. Potentiometric Titration (Fe²⁺ / KMnO₄ or K₂Cr₂O₇)
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.

• A minimum of FIVE experiments shall be offered.
• Laboratory classes on alternate weeks for Physics and Chemistry.
• The lab examinations will be held only in the second semester.

List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using B spline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility – 30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.
LIST OF EXPERIMENTS

EE2155  ELECTRICAL CIRCUIT LABORATORY
(Common to EEE, EIE and ICE)

1. Verification of ohm’s laws and Kirchoff’s laws.
2. Verification of Thevenin’s and Norton’s Theorem
3. Verification of superposition Theorem
4. Verification of maximum power transfer theorem.
5. Verification of reciprocity theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis.
8. Transient response of RL and RC circuits for DC input.
10. Frequency response of single tuned coupled circuits.

TOTAL: 45 PERIODS

EC2155  CIRCUITS AND DEVICES LABORATORY

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

TOTAL : 45 PERIODS
10. ENGLISH LANGUAGE LABORATORY (Optional)

L T P C
0 0 2 - 5

1. LISTENING:
Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

2. SPEAKING:
Pronouncing words & sentences correctly – word stress – Conversation practice.

CLASSROOM SESSION
   Group Discussions etc
2. Goal setting – interviews – stress time management – situational reasons

EVALUATION
(1) Lab Session – 40 marks
   Listening – 10 marks
   Speaking – 10 marks
   Reading – 10 marks
   Writing – 10 marks

(2) Classroom Session – 60 marks
   Role play activities giving real life context – 30 marks
   Presentation – 30 marks

NOTE ON EVALUATION
1. Examples for role play situations:
   a. Marketing engineer convincing a customer to buy his product.
   b. Telephone conversation – Fixing an official appointment / Enquiry on availability of flight or train tickets / placing an order. etc.
2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics or visuals could be provided and students could be asked to talk about it.

REFERENCES:

LAB REQUIREMENTS
1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders.
OBJECTIVES
The course objective is to develop the skills of the students in the areas of Transforms and Partial Differential Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I FOURIER SERIES

UNIT II FOURIER TRANSFORM

UNIT III PARTIAL DIFFERENTIAL EQUATIONS
Formation of partial differential equations - Lagrange’s linear equation - Solution of standard types of first order partial differential equations – Linear partial differential equations of second and higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat equation (Insulated edges excluded) – Fourier series solutions in cartesian coordinates.

UNIT V Z-TRANSFORM AND DIFFERENCE EQUATIONS

TUTORIALS = 15  TOTAL = 60 PERIODS

TEXTBOOKS

REFERENCES
OBJECTIVES

- To create an awareness on the various environmental pollution aspects and issues.
- To give a comprehensive insight into natural resources, ecosystem and biodiversity.
- To educate the ways and means to protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

Definition, scope and importance – need for public awareness – forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their ground water, floods, drought, conflicts over water, dams-benefits and problems – mineral resources: use effects on forests and tribal people – water resources: use and over-utilization of surface 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 II ECOSYSTEMS AND BIODIVERSITY

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 III ENVIRONMENTAL POLLUTION

Definition – causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards – solid waste management: causes, effects and control measures of urban and industrial 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 IV  SOCIAL ISSUES AND THE ENVIRONMENT


UNIT V  HUMAN POPULATION AND THE ENVIRONMENT


TEXT BOOKS:

REFERENCES:

EI2201  ELECTRICAL MACHINES (Common to EIE & ICE)  L T P C  3 1 0 4

AIM
To impart basic knowledge on Electrical machines, principles and its behavior.

OBJECTIVES
At the end of this course, student would have been exposed to:
- Theory of structures, operating principle, characteristics, and applications of D.C and A.C rotating machines and transformers in detail.
- Introductory knowledge on Special Machines.

UNIT I  D.C. MACHINES
Construction of D.C. Machines - Principle and theory of operation of D.C. generator - EMF equation - Characteristics of D.C. generators - Armature reaction – Commutation - Principle of operation of
D.C. motor - Voltage equation - Torque equation - Types of D.C. motors and their characteristics – Starters - Speed control of D.C. motors - Applications.

UNIT II TRANSFORMERS 9

UNIT III SYNCHRONOUS MACHINES 8
Principle of alternators:- Construction details, Equation of induced EMF and Vector diagram - Synchronous motor:- Starting methods, Torque, V curves, Speed control and Hunting.

UNIT IV INDUCTION MACHINES 9
Induction motor:- Construction and principle of operation, Classification of induction motor, Torque equation, Condition for maximum torque, Equivalent Circuit, Starting methods and Speed control of induction motors.

UNIT V SPECIAL MACHINES 7

L = 45 TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

EI2203 ELECTRONIC DEVICES AND CIRCUITS (Common to EIE & ICE) L T P C
3 0 0 3

AIM
To provide an exposure to various electronic devices and electronic circuits.

OBJECTIVES
• At the end of the course, students’ will have the knowledge about functioning of various types of devices and design of various electronic circuits.
UNIT I  SEMICONDUCTOR DIODE AND BJT  9
PN Junction – Current components in a PN diode – Junction capacitance – Junction diode
switching time – Zener diode – Varactor diode – Tunnel diode – Schottky diode – Transistor
Structure – Basic Transistor operation – Transistor characteristics and parameters – The transistor
as a switch, as an amplifier – Transistor bias circuits:- Voltage divider bias circuits, base bias
circuits, emitter bias circuits, collector feedback bias circuits – DC load line – AC load line- bias
stabilization, thermal runaway and thermal stability.

UNIT II  FET, UJT and SCR  9
JFET characteristics and parameters – JFET biasing, self bias, voltage divider bias – Q point,
stability over temperature – MOSFET D-MOSFET, E-MOSFET – MOSFET characteristics and
parameters – MOSFET biasing, zero bias, voltage divider bias method, drain feedback bias –
Characteristics and applications of UJT, SCR, DIAC, TRIAC.

UNIT III  AMPLIFIERS  9
CE, CC and CB amplifiers - Small signal low frequency transistor amplifier circuits - h parameter
representation of a transistor - Analysis of single stage transistor amplifier using parameters voltage
gain, current gain, input impedance and output impedance-frequency response - RC coupled
amplifier. Classification of Power amplifiers:- Class A, B, AB and C Power amplifiers-Push-Pull and
Complementary Symmetry Push-Pull amplifiers - Design of power output, efficiency and cross-over
distortion.

UNIT IV  FEEDBACK AMPLIFIERS AND OSCILLATORS  9
Advantages of negative feedback - Voltage/current, series/shunt feedback-Positive feedback -
Condition for oscillators - Phase shift - Wein Bridge – Hartley - Colpitts and crystal oscillators.

UNIT V  PULSE CIRCUITS AND POWER SUPPLIES  9
RC wave shaping circuits - Diode clamps and clippers – Multivibrators -Schmitt triggers - UJT -
Saw tooth oscillators - Single and polyphase rectifiers and analysis of filter circuits - Design of zener
and transistor series voltage regulators - Switched mode power supplies.

L = 45 TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM:
To master the design and applications of linear, tree, and graph structures. To understand various algorithm design and analysis techniques.

UNIT I  LINEAR STRUCTURES  9
Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists – Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and queues

UNIT II  TREE STRUCTURES  9
Need for non-linear structures – Tree ADT – tree traversals – left child right sibling data structures for general trees – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT

UNIT III  BALANCED SEARCH TREES AND INDEXING  9
AVL trees – Binary Heaps – B-Tree – Hashing – Separate chaining – open addressing – Linear probing

UNIT IV  GRAPHS  9

UNIT V  ALGORITHM DESIGN AND ANALYSIS  9

L = 45 TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
AIM
To provide adequate knowledge in electrical measurements and instrumentation.

OBJECTIVES
To make the students to gain a clear knowledge of the basic laws governing the operation of electrical instruments and the measurement techniques.

i. Emphasis is laid on the meters used to measure current & voltage.
ii. To have an adequate knowledge in the measurement techniques for power and energy, power and energy meters are included.
iii. Elaborate discussion about potentiometer & instrument transformers.
iv. Detailed study of resistance measuring methods.
v. Detailed study of inductance and capacitance measurement.

UNIT I MEASUREMENT OF VOLTAGE AND CURRENT

UNIT II MEASUREMENT OF POWER AND ENERGY

UNIT III POTENTIOMETERS & INSTRUMENT TRANSFORMERS
DC potentiometer – Basic circuit, standardization – Laboratory type (Crompton’s) – AC potentiometer – Drysdale (polar type) type – Gall-Tinsley (coordinate) type – Limitations & applications – C.T and P.T construction, theory, operation and characteristics.

UNIT IV RESISTANCE MEASUREMENT

UNIT V IMPEDANCE MEASUREMENT

L = 45  T = 15  Total = 60

TEXT BOOKS
REFERENCES

EE2207
ELECTRON DEVICES AND CIRCUITS LABORATORY
(B.E. (EEE), B.E. (E&I) and B.E. (I & C)
(Revised)

2. Characteristics of Transistor under common emitter, common collector and common base configurations.
3. Characteristic of FET.
4. Characteristic of UJT.
5. Characteristics of SCR, DIAC and TRIAC.
6. Photo diode, phototransistor Characteristics and study of light activated relay circuit.
7. Static characteristics of Thermistors.
8. Single phase half wave and full wave rectifiers with inductive and capacitive filters.
9. Differential amplifiers using FET.
10. Study of CRO.

P: 45 TOTAL : 45 PERIODS

REQUIREMENT FOR A BATCH OF 30 STUDENTS

<table>
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<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
<th>Quantity available</th>
<th>Deficiency %</th>
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<td>Regulated Power Supply</td>
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<td>2.</td>
<td>Dual Tree CRO (20 MHz)</td>
<td>15</td>
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<td>3.</td>
<td>Function Generator</td>
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<td>4.</td>
<td>3½ Digit digital multimeter</td>
<td>10</td>
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<td>5.</td>
<td>Bread Boards</td>
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<td>Diode</td>
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<td>10.</td>
<td>UJT</td>
<td>5 Nos.</td>
<td></td>
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</tr>
<tr>
<td>11.</td>
<td>Photo Diode</td>
<td>5 Nos.</td>
<td></td>
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<tr>
<td>12.</td>
<td>Photo Transistor</td>
<td>5 Nos.</td>
<td></td>
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<tr>
<td>13.</td>
<td>Thermistors</td>
<td>5 Nos.</td>
<td></td>
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<tr>
<td>14.</td>
<td>OP-amp</td>
<td>10 Nos.</td>
<td></td>
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</tr>
<tr>
<td>15.</td>
<td>Milli Ammeter (0-100mA)</td>
<td>15 Nos.</td>
<td></td>
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</tr>
<tr>
<td>16.</td>
<td>Micro Ammeter (0-50μA)</td>
<td>10 Nos.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Low range voltmeter (0-30V)</td>
<td>10 Nos.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Resistor of various ranges</td>
<td>50 Nos.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Capacitors of various ranges</td>
<td>50 Nos.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Connecting wires</td>
<td>Sufficient Nos</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EE2209 DATA STRUCTURES AND ALGORITHMS LABORATORY
(Common to EEE, EIE & ICE) L T P C 0 0 3 2

Aim:
To develop skills in design and implementation of data structures and their applications.
1. Implement singly and doubly linked lists.
2. Represent a polynomial as a linked list and write functions for polynomial addition.
3. Implement stack and use it to convert infix to postfix expression.
4. Implement array-based circular queue and use it to simulate a producer-consumer problem.
5. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
6. Implement binary search tree.
7. Implement insertion in AVL trees.
9. Implement hashing techniques.
10. Perform topological sort on a directed graph to decide if it is acyclic.
11. Implement Dijkstra’s algorithm using priority queues.
12. Implement Prim’s and Kruskal’s algorithms.
13. Implement a backtracking algorithm for Knapsack problem
14. Implement a branch and bound algorithm for traveling salesperson problem
15. Implement any randomized algorithm.

P: 45  TOTAL : 45 PERIODS

REQUIREMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
<th>Quantity available</th>
<th>Deficiency %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Computer(Pentium 4)</td>
<td>40 Nos with one server</td>
<td></td>
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</tr>
<tr>
<td>2.</td>
<td>Dot matrix printer</td>
<td>3 Nos</td>
<td></td>
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<tr>
<td>3.</td>
<td>Laser Printer</td>
<td>2 Nos</td>
<td></td>
<td></td>
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<tr>
<td>4.</td>
<td>UPS (5 KVA)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Turbo C</td>
<td>40 Nodes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EI2208 ELECTRICAL MACHINES LABORATORY
(Common to EIE & ICE) L T P C 0 0 3 2

1. Open circuit characteristic of DC Shunt Generator.
2. Load test on DC Shunt Generator.
3. Speed control of DC Shunt Motor.
4. Brake test on DC Shunt Motor.
5. Brake test on DC Series Motor.
6. Regulation characteristic of three - phase Alternator.
8. Load test on Single - phase Transformer
11. ‘V’ curves of Synchronous Motor.

P: 45  TOTAL : 45 PERIODS
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
<th>Quantity available</th>
<th>Deficiency %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>D.C motor – Generator set</td>
<td>2 set</td>
<td>2 set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D.C motor – Shunt Generator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D.C motor – Compound Generator</td>
<td></td>
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<tr>
<td>5.</td>
<td>Single phase transformers</td>
<td>7 Nos.</td>
<td></td>
<td></td>
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<tr>
<td>6.</td>
<td>Three phase transformers</td>
<td>2 Nos.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>D.C. Motor – Alternator set</td>
<td>4 sets</td>
<td></td>
<td></td>
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<tr>
<td>8.</td>
<td>Three phase Induction Motor (Squirrel cage)</td>
<td>3 Nos.</td>
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<td></td>
</tr>
<tr>
<td>11.</td>
<td>Resistive load</td>
<td>5 Nos.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 phase – 2 , single phase - 3</td>
<td></td>
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</tr>
<tr>
<td>12.</td>
<td>Inductive load</td>
<td>1 No.</td>
<td></td>
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</tr>
<tr>
<td>14.</td>
<td>Three phase Auto transformer</td>
<td>3 Nos.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Moving Coil Ammeter of different ranges</td>
<td>20 Nos.</td>
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</tr>
<tr>
<td>16.</td>
<td>Moving Coil Voltmeter of different ranges</td>
<td>20 Nos.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Moving Iron Ammeter of different ranges</td>
<td>20 Nos.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Moving Iron voltmeter of different ranges</td>
<td>20 Nos.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Wire wound Rheostats of different ratings</td>
<td>30 Nos.</td>
<td></td>
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<tr>
<td>20.</td>
<td>Tachometers</td>
<td>10 Nos.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
22. Double element wattmeters of different ranges | 4 Nos.
23. Power factor meter | 2 Nos.
24. Digital multimeter | 5 Nos.
25. Three point starter, four point starter, DOL starter, manual star / delta starter, semi automatic and fully automatic star / delta starter | 1 No each for study experiment
26. SCR based semi and fully controlled rectifier module | 2 Nos.
27. SCR based chopper module | 2 Nos.
28. SCR based inverter module | 2 Nos.
29. SCR based AC voltage regulation module | 2 Nos.
30. SCR, MOSFET, IGBT Trainer module | Each 2 Nos.

EE2253  CONTROL SYSTEMS  L T P C
(Common to EEE, EIE & ICE)  3 1 0 4

AIM
To provide sound knowledge in the basic concepts of linear control theory and design of control system.

OBJECTIVES
i  To understand the methods of representation of systems and to desire their transfer function models.
ii To provide adequate knowledge in the time response of systems and steady state error analysis.
iii To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
iv To understand the concept of stability of control system and methods of stability analysis.
v To study the three ways of designing compensation for a control system.

UNIT I  SYSTEMS AND THEIR REPRESENTATION  9
UNIT II  TIME RESPONSE  9
Time response – Time domain specifications – Types of test input – I and II order system response

UNIT III  FREQUENCY RESPONSE  9
Frequency response – Bode plot – Polar plot – Determination of closed loop response from open
loop response – Correlation between frequency domain and time domain specifications.

UNIT III  STABILITY OF CONTROL SYSTEM  9
Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root
locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability
criterion.

UNIT IV  COMPENSATOR DESIGN  9
Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots.

\[ L = 45 \quad T = 15 \quad TOTAL : 60 PERIODS \]

TEXT BOOKS

REFERENCES
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004

EI2251  INDUSTRIAL INSTRUMENTATION – I  L T P C
(Common to EIE & ICE)  3 0 0 3

AIM
To equip the students with relevant knowledge to suit the industrial requirements.

OBJECTIVES
To provide sound knowledge about various techniques used for the measurement of industrial
parameters.
Discussion of load cells, torque meter and various velocity pick-ups.
Exposure to various accelerometer pick-ups, vibrometers, density and viscosity pick-ups.
To have an adequate knowledge about pressure transducers.
To have an idea about the temperature standards, calibration and signal conditioning used in
RTD’s.
To have a sound knowledge about thermocouples and pyrometry techniques.
UNIT I  MEASUREMENT OF FORCE, TORQUE AND VELOCITY  9

UNIT II  MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY  9
Accelerometers:- LVDT, Piezo-electric, Strain gauge and Variable reluctance type accelerometer – Mechanical type vibration instruments – Seismic instruments as an accelerometer – Vibrometers : Calibration of vibration pickups – Units of density and specific gravity – Baume scale, and API scale- Pressure head type densitometers- Float type densitometers – Ultrasonic densitometer-Bridge type gas densitometer.

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

UNIT IV  TEMPERATURE MEASUREMENT  9
Definitions and standards-Primary and secondary fixed points –Calibration of thermometers - Different types of filled in system thermometer-Sources of errors in filled in systems and their compensation-Bimetallic thermometers – Electrical methods of temperature measurement-Signal conditioning of industrial RTDs and their characteristics-3 lead and 4 lead RTDs - Thermistors.

UNIT V  THERMOCOUPLES AND RADIATION PYROMETERS  9

L = 45  TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
AIM
To provide adequate knowledge in sensors and transducers.

OBJECTIVES
i. To impart knowledge about the principles and analysis of sensors.
ii. Discussion of errors and error analysis.
iii. Emphasis on characteristics and response of transducers.
iv. To have an adequate knowledge in resistance transducers.
v. Basic knowledge in inductance and capacitance transducers and exposure to other transducers.

UNIT I   SCIENCE OF MEASUREMENTS AND INSTRUMENTATION OF TRANSDUCERS

UNIT II   CHARACTERISTICS OF TRANSDUCERS

UNIT III   VARIABLE RESISTANCE TRANSDUCERS
Principle of operation, construction details, characteristics and application of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezoresistive sensor and humidity sensor.

UNIT IV   VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS

UNIT V   OTHER TRANSDUCERS
Piezoelectric transducer, Hall Effect transducer – Different types of Photo detectors- Digital transducers – Smart sensors - Fibre optic sensors, SQUID sensors, Film sensors, MEMS – Nano sensors.

L = 45   TOTAL = 45 PERIODS

TEXT BOOKS

REFERENCES:
AIM

To introduce the fundamentals of digital circuits, combinational and sequential circuit.

OBJECTIVES

i. To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.

ii. To study implementation of combinational circuits

iii. To study the design of various synchronous and asynchronous circuits.

iv. To expose the students to various memory devices.

UNIT I NUMBER SYSTEMS AND BOOLEAN ALGEBRA

Review of number systems; types and conversion, codes. Boolean algebra: De-Morgan’s theorem, switching functions and simplification using K-maps and Quine McCluskey method.

UNIT II COMBINATIONAL CIRCUITS


UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS

Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits – Completely and incompletely specified sequential circuits - state diagram; state reduction; state assignment, Counters – synchronous, a synchronous, updown and Johnson counters; shiftregisters.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS

Analysis of asynchronous sequential machines, state assignment, asynchronous Design problem.

UNIT V MEMORY DEVICES, PROGRAMMABLE LOGIC DEVICES AND LOGIC FAMILIES

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

L = 45 T = 15 TOTAL = 60 PERIODS

TEXT BOOKS:


REFERENCES:

EE2254  LINEAR INTEGRATED CIRCUITS AND APPLICATIONS  L T P C
          (Common to EEE, EIE & ICE)  3 0 0 3

AIM:
To introduce the concepts for realizing functional building blocks in ICs, fabrications & application of ICs.

OBJECTIVES:
  i.  To study the IC fabrication procedure.
  ii. To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
  iii. To study the applications of Op-amp.
  iv.  To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.

UNIT I  IC FABRATION  9
IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs.

UNIT II  CHARACTERISTICS OF OPAMP  9
Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer, differentiator and integrator.

UNIT III  APPLICATIONS OF OPAMP  9
Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

UNIT IV  SPECIAL ICs  9
555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs.

UNIT V  APPLICATION ICs  9
IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

L = 45  TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES

i. To expose the fundamentals of thermodynamics and to be able to use it in accounting for the bulk behaviour of the sample physical systems.

ii. To integrate the basic concepts into various thermal applications like IC engines, gas turbines, steam boiler, steam turbine, compressors, refrigeration and air conditioning.

iii. To enlighten the various modes of heat transfer and their engineering applications.

   Use of standard steam tables, refrigeration tables and heat transfer data book are permitted)

UNIT I  BASIC CONCEPTS AND LAWS OF THERMODYNAMICS  12


UNIT II  IC ENGINES  8


UNIT III  STEAM BOILERS AND TURBINES  8

Formation of steam - Properties of steam – Use of steam tables and charts – Steam power cycle (Rankine) - Modern features of high-pressure boilers – Mountings and accessories – Testing of boilers.

Steam turbines: Impulse and reaction principle – Velocity diagrams – Compounding and governing methods of steam turbines (qualitative treatment only) - Layout and working principle of a steam power plant.

UNIT IV  COMPRESSORS, REFRIGERATION AND AIR CONDITIONING  8


Refrigeration - Various methods of producing refrigerating effects (RE) – Vapour compression cycle: P-H and T-S diagram - Saturation cycles - Effect of subcooling and super heating - (qualitative treatment only) - Airconditioning systems – Basic psychrometry - Simple psychrometric processes - Types of airconditioning systems -Selection criteria for a particular application (qualitative treatment only).

UNIT V  HEAT TRANSFER  9


Convection: Free convection and forced convection - Internal and external flow –Simple Empirical relations.

Radiation: Black–Gray bodies - Radiation Shape Factor (RSF) - Cooling of electronic components - Thermoelectric cooling – Chip cooling.

L = 45   T = 15   TOTAL : 60 PERIODS
TEXT BOOKS:

REFERENCES

EI2257 TRANSUCERS AND MEASUREMENTS LABORATORY
(Common to EIE & ICE)  L T P C
0 0 3 2

OBJECTIVES
The aim of this lab is to train the students in handling the different kinds of transducers like LVDT, Hall effect, Thermocouple etc., which he often meets in his study and also to impart the students an adequate knowledge and work experience of the different types of AC and DC bridges, electronic measurement methods for different electronic instruments.

1. Displacement versus output voltage characteristics of a potentiometric transducer.
2. Characteristics of Strain gauge and Load cell.
3. Characteristics of LVDT, Hall effect transducer and Photoelectric tachometer.
4. Characteristic of LDR, thermistor and thermocouple.
5. Step response characteristic of RTD and thermocouple and Study of smart transducers.
6. Wheatstone and Kelvin’s bridge for measurement of resistance.
7. Schering Bridge for capacitance measurement and Anderson Bridge
8. for inductance measurement.
10. Calibration of Ammeter and Voltmeter using Student type potentiometer.
11. Design, Construction and calibration of series and shunt type
12. ohmmeters.

P = 45 TOTAL = 45 PERIODS

DETAILED SYLLABUS

1. LOADING EFFECT ON POTENTIOMETER

   AIM
   To study the loading effect on potentiometer circuit.

   OBJECTIVES
   i. To observe the output, input calibration curve using FET voltmeter has the output device.
   ii. To observe the output, input characteristic with an voltmeter whose input impedance is finite.
   iii. To observe the linearity which decreases with a decrease in the input impedance of the output meter.
EXERCISE
1. In the potentiometer circuit, displacement is given to the wiper arm and the corresponding output is observed with 2 meters (one is a FET voltmeter and the other is a meter with a finite input impedance).
2. For various input displacements, output voltage from the two different meters are recorded and tabulated.
3. Plot the graph output Vs input displacement for both cases.

EQUIPMENT
1. Potentiometer – Linear displacement transducer kit – 1 No
2. Regulated power supply – 1 No
3. FET voltmeter, ordinary voltmeter – 1 No

2. CHARACTERISTICS OF STRAIN GAUGE AND LOAD CELL

AIM
To study the characteristics of strain guage and load cell.

OBJECTIVES
1. To identify and study the characteristics of strain guage and load cell.
2. To determine the sensitivity of strain guage and load cell.
3. To determine the Young’s modulus and hence the guage factor of the given strain guage.

EXERCISE
1. Load and Unload the load cell and strain guage.
2. Measure the corresponding voltages during both loading and unloading and plot the calibration curve.
3. Find the Young’s Modulus and gauge factor from the graph.

EQUIPMENT
1. Strain guage and Load cell kit. – 1 No
2. Variable power supply – 1 No
3. Loads for measurement - A set

3. CHARACTERISTICS OF LVDT, HALL EFFECT TRANSDUCER AND PHOTOELECTRIC TACHOMETER.
3.(A) CHARACTERISTICS OF LVDT

AIM
To study the operation and characteristics of LVDT

OBJECTIVES
1. To study the displacement of the core from its null position.
2. To study the variation of output voltage with change in displacement.

EXERCISE
1. Adjust the potentiometer knob present in the LVDT kit to bring the core to Null position (set the output voltage to be ‘0’ volts)
2. Rotate the knob in the positive direction such that the LVDT scale moves in steps of 1cm and measure the corresponding output voltage.
3. Tabulate the readings.
4. Repeat the above procedure for negative displacement.
5. Plot the characteristic curve between displacement and output voltage.
EQUIPMENTS
1. LVDT trainer kit – 1 No
2. Power supply – 1 No

3.(b)  HALL EFFECT TRANSDUCER
AIM
To study the characteristics of Hall effect transducer.

OBJECTIVE
1. To determine the positive hall voltage at the bottom of the transducer.
2. To determine the negative hall voltage.
3. To identify and study the characteristics of hall effect transducer.
4. To measure the displacement of a structural element.

EXERCISE
1. Study the internal configuration of Hall effect IC.
2. Patch the circuit diagram as per patching diagram.
3. Place the north pole of the magnet above the scale and take the reading air gap between hall IC and magnet to output voltage.
4. Place the south pole of the magnet above the scale and take the reading for different distances and plot the graph between air gap voltmeter readings.

EQUIPMENTS
1. Hall effect characteristics trainer – 1 No
2. Power supply – 1 No
3. Voltmeter – 1 No

3.(c)  PHOTOELECTRIC TACHOMETER
AIM
To study the characteristics of photoelectric tachometer using the servo motor speed control trainer kit.

OBJECTIVES
1. To calculate the number of pulses generated in the photoelectric pick up.
2. To study the variation of speed with the variation of the input voltage.

EXERCISE
1. Connect the circuit as per instructions given in the manual.
2. Adjust the power supply.
3. Vary the speed of the motor by using rotary potentiometer and note down the readings.
4. Calculate number of pulses generated in the photoelectric pick up.
5. Draw the graph between voltage and speed.

EQUIPMENTS
1. Speed control trainer kit – 1 No
2. Power supply – 1 No
3. Wires - Some
4. Multimeter – 1 No

4.CHARACTERISTIC OF LDR, THERMISTOR AND THERMOCOUPLE.
(a) CHARACTERISTICS OF LDR
AIM
To determine the characteristics of LDR
OBJECTIVES
1. To determine the change in resistance for corresponding change in light intensity.
2. To determine the output voltage for corresponding change in voltage.

EXERCISE
1. The lamp for LDR is selected by using a select switch.
2. Initially the lamp is kept away from LDR.
3. Now the distance is decreased gradually and the corresponding values of voltages and resistances are taken.
4. Repeat the above steps for various positions of lamp.

EQUIPMENTS
Photo conductive trainer kit – 1 No
Multimeter – 1 No
Connecting wires – 1 No

(b) CHARACTERISTICS OF THERMISTOR

AIM
To determine the characteristics of thermistor

OBJECTIVES
To measure the resistance value for the corresponding changes in temperature.

EXERCISE
1. Measure the initial temperature of water.
2. Take another vessel full of water and boil it to 100°C.
3. Note down the readings for every 5°C fall of temperature in thermistor, thermometer and output voltage readings.
4. Plot the Thermistor characteristics.

EQUIPMENTS
1. Thermistor Trainer kit – 1 No
2. Heater – 1 No
3. Thermistor – 1 No
4. Thermometer – 1 No
5. Voltmeter – 1 No

4(c) CHARACTERISTICS OF THERMOCOUPLE

AIM
To determine the characteristics of thermocouple.

OBJECTIVES
1. To determine the voltage for corresponding change in temperature.

EXERCISE
1. Measure the initial temperature and temperature of boiling water (100°C)
2. Calibrate the thermocouple in the hot water and measure the 5°C temperature fall in thermocouple.
3. The output voltage is noted for corresponding fall in temperature.

EQUIPMENT
1. Thermocouple trainer kit – 1 No
2. Thermocouple – 1 No
3. Voltmeter – 1 No
4. Heater – 1 No

5. STEP RESPONSE CHARACTERISTIC OF RTD AND THERMOCOUPLE AND STUDY OF SMART TRANSUDCERS.

(a). STEP RESPONSE CHARACTERISTICS OF RTD AND THERMOCOUPLE

AIM
To study the step response characteristic of RTD and thermocouple.

OBJECTIVE
a. To analyse the change in temperature due to change in emf in case of thermocouple.
b. To analyse the change in temperature due to change in resistance in case of RTD.
c. To observe the transients when step input [i.e sudden change in the input] is given.

EXERCISE
1. Calibrate the RTD and thermocouple at room temperature and 100°C alternatively.
2. Bring down the sensor to room temperature and provide a sudden change of input temperature to boiling point (i.e) 100°C.
3. Start the stop clock and tabulate the time taken for every 5°C rise of temperature.
4. Plot the step response for both the sensors.

EQUIPMENT
1. Thermocouple and RTD trainer kit – 1 No
2. Thermometer – 1 No
3. Heater – 1 No
4. Thermocouple and RTD sensors – 1 No
5. Voltmeters – 1 No
   I/P trainer kit – 1 No
   Pressure source – 1 No
   Control valve etc – 1 No

6. WHEATSTONE AND KELVIN’S BRIDGE FOR MEASUREMENT OF RESISTANCE.

(A) MEASUREMENT OF MEDIUM RESISTANCE USING WHEATSTONE’S BRIDGE

AIM
To measure the value of unknown resistance using Wheatstone’s Bridge.

EXERCISE
Find the value of unknown resistance.

PROCEDURE
1. Connections are given as per the circuit diagram.
2. Supply is switched on.
3. When the unknown resistance is connected, the bridge becomes unbalanced.
4. The bridge is balanced by varying standard resistance.
5. The value of unknown resistance is calculated by the given formula.
6. The above steps are repeated for different value of unknown resistances.

EQUIPMENT
1. Resistors – 1 No
(b) **KELVIN’S DOUBLE BRIDGE**

**AIM**
To find the unknown value of low resistance using Kelvin’s Double Bridge.

**EXERCISE**
Find the unknown value of low resistance.

**PROCEDURE**
1. Connections are given as per the circuit diagram.
2. Supply is switched on.
3. The bridge becomes unbalanced when unknown resistance R is connected.
4. The bridge is balanced by varying standard resistance.
5. Unknown resistance is calculated using balance equation.
6. The above steps are repeated for various values of unknown resistance.

**EQUIPMENT**
1. Power supply – 1 No
2. Fixed resistance – 1 No
3. Unknown resistors – 1 No
4. Decade resistance box – 1 No
5. Multimeter – 1 No
6. Galvanometer – 1 No
7. Bread board – 1 No

7. **SCHERING BRIDGE FOR CAPACITANCE MEASUREMENT AND ANDERSON BRIDGE FOR INDUCTANCE MEASUREMENT.**

(a) **SCHERING’S BRIDGE**

**AIM**
To measure the unknown value of capacitance using Schering’s bridge.

**EXERCISE**
Measure the unknown value of capacitance.

**PROCEDURE**
1. Connections are given as per the circuit.
2. Supply is switched on.
3. When unknown value of capacitance is connected, bridge becomes unbalanced.
4. The bridge is balanced by varying the standard.
5. The unknown value of capacitance is calculated using the balance equation.
6. The above steps are repeated for different values of unknown capacitances.

**EQUIPMENT**
1. Resistors - Some set.
3. Decade Resistance box – 1 No.
4. Decade Capacitance box – 1 No.
5. CRO – 1 No.
6. Function Generator – 1 No.

(b) ANDERSON’S BRIDGE

AIM
To measure the unknown value of inductance using Anderson’s Bridge

EXERCISE
Measure the unknown value of inductance.

PROCEDURE
1. Connections are given as per the circuit diagram.
2. Supply is switched on.
3. When unknown value of inductance is connected the bridge becomes unbalanced.
4. The unknown value of inductance is calculated by using the balance equation.
5. The above step are repeated for different values of unknown inductance.

EQUIPMENT
1. Resistors – Some set
2. Decade Inductance box – 1 No.
3. Decade Condenser box – 1 No.
4. Regulated power supply – 1 No.
5. CRO – 1 No.
6. Bread board - 1 No.

8. CALIBRATION OF SINGLE-PHASE ENERGY METER AND WATTMETER.

(a) CALIBRATION OF SINGLE PHASE ENERGY METER

AIM
To calibrate the given energy meter using two substandard wattmeters and to obtain percentage error.

EXERCISE
Calibrate the given energy meter and draw % error Vs load graph.

PROCEDURE
1. Connections are given as per the circuit diagram.
2. The value of load current is adjusted to desire value.
3. When the red mark on the disk of the energy meter passes the observation point, the stopwatch is started and the number of revolution made by the disc is noted.
4. The load current is maintained by adjusting the load.
5. When the disc of the energy meter completes desired number of revolutions the stopwatch is stopped and the time taken is noted.
6. The procedure is repeated for different values of wattmeter reading and time taken, number of revolutions of the disc is noted down.
7. The graph is plotted between percentage error and load.

EQUIPMENT
1. Wattmeter – 2 No
2. Voltmeter – 1 No  
3. Ammeter – 1 No  
4. Resistive load – 1 No  

(b) CALIBRATION OF WATTMETER 

AIM  
To calibrate the given wattmeter using direct loading.  

EXERCISE  
Calibrate the given wattmeter and draw the graph between % error and load current.  

PROCEDURE  
1. Connections are given as per the circuit diagram.  
2. Supply is given at no load condition.  
3. Resistive load is applied in steps and the readings are tabulated.  
4. Graph is drawn between % error and load current.  

EQUIPMENT  
1. Ammeter – 1 No  
2. Voltmeter – 1 No  
3. Wattmeter – 1 No  
4. Load – 1 No  

9. CALIBRATION OF AMMETER AND VOLTMETER USING STUDENT TYPE POTENTIOMETER.  

(a) CALIBRATION OF AMMETER  

AIM  
To calibrate the given ammeter using standard ammeter  

EXERCISE  
Calibrate the given ammeter and draw the graph between % error and \( A_s \).  

PROCEDURE  
1. Connections are given as per the circuit diagram.  
2. The standard ammeter should be selected properly.  
3. Supply is switched on.  
4. At no load condition the readings of all the meters are noted.  
5. By gradually increasing the load, the respective readings are taken from the meters.  
6. The readings are tabulated and % error is calculated from the formula.  
7. Graph is drawn between \( A_s \) and % error.  
8. The procedure is repeated for both ac and dc supply.  

EQUIPMENT  
2. Ammeter – 1 No.  
3. Variable resistive load – 1 No.  
4. RPS – 1 No.  

(b) CALIBRATION OF VOLTMETER  

AIM  
To calibrate the given voltmeter using standard voltmeter.  

EXERCISE  
Calibrate the given voltmeter and draw the graph between % error and \( V_s \).  

47
PROCEDURE
1. Connections are given as per the circuit diagram.
2. The standard voltmeter should be selected properly.
3. Supply is switched on.
4. At no load condition the readings of all the meters are noted.
5. By gradually increasing the voltage, the respective readings are taken from the meters.
6. The readings are tabulated and % error is calculated from the formula.
7. Graph is drawn between $V_s$ and % error.
8. The procedure is repeated for both ac and dc supply.

EQUIPMENT
1. Standard voltmeter – 1 No.
2. Voltmeter – 1 No.
3. Auto transformer – 1 No.
4. RPS – 1 No.

10. DESIGN AND CALIBRATION OF SERIES AND SHUNT TYPE OHMMETERS.

(a) SERIES TYPE OHMMETERS

AIM
To conduct a suitable experiment to measure an unknown medium resistance (1Ω - 0.1MΩ) with the series type ohmmeter.

OBJECTIVE
The instrument most commonly used to check the continuity (a complete circuit), or to measure the resistance of a circuit or circuit element, is the OHMMETER. The ohmmeter is widely used to measure resistance and check the continuity of electrical circuits and devices.

OHMMETER SAFETY PRECAUTIONS
The following safety precautions and operating procedures for ohmmeters are the MINIMUM necessary to prevent injury and damage.

☐ Be certain the circuit is deenergized and discharged before connecting an ohmmeter.

☐ Do not apply power to a circuit while measuring resistance.

☐ When you are finished using an ohmmeter, switch it to the OFF position if one is provided and remove the leads from the meter.

☐ Always adjust the ohmmeter for 0 (or 0 in shunt ohmmeter) after you change ranges before making the resistance measurement.

EXERCISE
1. Place the resistance to be measured is in series with the internal resistors and the meter movement of the ohmmeter.
2. Note down the reading of the meter and calculate the practical value.
3. Calculate the theoretical value.
4. Find the difference and error between the theoretical and practical values.
5. Measure the Resistor using Ammeter – Voltmeter method and compare the result with the Ohmmeter method.
6. Calculate the difference and %error.
7. To implement the continuity test, consider any one electronic circuit and check the continuity

EQUIPMENT
1. Ohmmeter (Analog Multimeter) – 1No
2. Voltmeter - 1 No
3. Ammeter - 1 No
4. Resistor - 1 No
5. RPS - 1 No

(b) SHUNT TYPE OHMMETER

AIM
i. To conduct a suitable experiment to measure an unknown medium resistance (1Ω - 0.1MΩ) with the series type ohmmeter.
ii. To compare the result with the Ammeter – Voltmeter method

EXERCISE
1. Place the resistance to be measured in shunt (in parallel) with the meter movement of the ohmmeter.
2. Note down the reading of the meter and calculate the practical value.
3. Calculate the theoretical value
4. Find the difference and error between the theoretical and practical values.
5. Measure the Resistor using Ammeter – Voltmeter method and compare the result with the Ohmmeter method.
6. Calculate the difference and %error.
7. To implement the continuity test, consider any one electronic circuit and check the continuity

EQUIPMENT
1. Ohmmeter(Analog Multimeter) – 1No
2. Voltmeter - 1 No
3. Ammeter - 1 No
4. Resistor - 1 No
5. RPS - 1 No

EI2258 THERMODYNAMICS LABORATORY (Common to EIE & ICE)
L T P C 0 0 3 2

THERMODYNAMICS LAB
1. Valve timing and port timing diagrams for IC Engines.
2. Performance test on a Petrol Engine.
3. Performance test on a Diesel Engine.
6. Performance test on a Refrigerator (Determination of COP)
7. Determination of heat transfer Coefficient (Free and forced convection)
8. Test to estimate frictional losses in pipe flow.
9. Test on reaction turbine for obtaining the characteristics curves and to design values of specific speed, discharge, output and efficiency.
10. Test on impulse turbine to obtain its characteristics curves and hydraulic design values.

**LIST OF EQUIPMENTS**

<table>
<thead>
<tr>
<th>S.NO</th>
<th>APPARATUS</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Engine – cut section models.</td>
<td>1 Set</td>
</tr>
<tr>
<td>2.</td>
<td>Single cylinder petrol engine with Mechanical dynamometer.</td>
<td>1 Set</td>
</tr>
<tr>
<td>3.</td>
<td>Multi cylinder petrol engine with hydraulic dynamometer.</td>
<td>1 Set</td>
</tr>
<tr>
<td>4.</td>
<td>Multi cylinder diesel engine with Electrical dynamometer.</td>
<td>1 Set</td>
</tr>
<tr>
<td>5.</td>
<td>Steam boilers with suitable mountings and accessories.</td>
<td>1 Set</td>
</tr>
<tr>
<td>6.</td>
<td>Refrigeration Test Rig.</td>
<td>1 No.</td>
</tr>
<tr>
<td>7.</td>
<td>Forced convection Heat transfer Test set up.</td>
<td>1 No.</td>
</tr>
<tr>
<td>8.</td>
<td>Free convection Heat transfer test set up.</td>
<td>1 No.</td>
</tr>
<tr>
<td>9.</td>
<td>Apparatus for measuring pipe friction</td>
<td>1 No.</td>
</tr>
<tr>
<td>10.</td>
<td>Francis turbine</td>
<td>1 No.</td>
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<tr>
<td>11.</td>
<td>Pelton wheel</td>
<td>1 No.</td>
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<tr>
<td>12.</td>
<td>Turgo impulse wheel</td>
<td>1 No.</td>
</tr>
<tr>
<td>13.</td>
<td>Stop watches</td>
<td>6 Nos.</td>
</tr>
</tbody>
</table>
AIM

To study various digital & linear integrated circuits used in simple system configuration.

1. Study of Basic Digital IC’s. (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF, D FF)

2. Implementation of Boolean Functions, Adder/ Subtractor circuits.

3a) Code converters, Parity generator and parity checking, Excess-3, 2s Complement, Binary to Gray code using suitable IC’s.

3(b) Encoders and Decoders: Decimal and Implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC’s.

4. Counters: Design and implementation of 4-bit modulo counters as synchronous and Asynchronous types using FF IC’s and specific counter IC.

5. Shift Registers:
   Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC’s.

6. Multiplex/ De-multiplex:
   Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer

7. Timer IC application:
   Study of NE/SE 555 timer in Astable, Monostable operation.

8. Application of Op-Amp:
   Slew rate verifications, inverting and non-inverting amplifier, Adder, comparator, Integrater and Differentiator.

9. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC’s.

10. Study of VCO and PLL ICs:
    i. Voltage to frequency characteristics of NE/ SE 566 IC.
    ii. Frequency multiplication using NE/SE 565 PLL IC.

\[ P = 45 \ \text{TOTAL: 45 PERIODS} \]

DETAILED SYLLABUS

1. STUDY OF BASIC DIGITAL IC’S.
   (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF, D FF)

   AIM
   To test of ICs by using verification of truth table of basic ICs.
EXERCISE
Breadboard connection of ICs with truth table verification using LED’s.

2. IMPLEMENTATION OF BOOLEAN FUNCTIONS, ADDER/ SUBTRACTOR CIRCUITS.
[Minimizations using K-map and implementing the same in POS, SOP from using basic gates]

AIM
Minimization of functions using K-map implementation and combination Circuit.

EXERCISE
1. Realization of functions using SOP, POS, form.
2. Addition, Subtraction of atleast 3 bit binary number using basic gate IC’ s.

3a) CODE CONVERTERS, PARITY GENERATOR AND PARITY CHECKING, EXCESS 3, 2S COMPLEMENT, BINARY TO GREY CODE USING SUITABLE ICS.

AIM
Realizing code conversion of numbers of different bar.

EXERCISE
1. Conversion Binary to Grey, Grey to Binary;
   1’s. 2’s complement of numbers addition, subtraction,
2. Parity checking of numbers using Gates and with dedicated IC’s

3b) Encoders and Decoders: Decimal and Implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable ics.

EXERCISE
1. Decimal to binary Conversion using dedicated ICs.
2. BCD – 7 Segment display decoder using dedicated decoder IC& display.

3. COUNTERS: DESIGN AND IMPLEMENTATION OF 4-BIT MODULO COUNTERS AS SYNCHRONOUS AND ASYNCHRONOUS TYPES USING FF IC’S AND SPECIFIC COUNTER IC.

AIM
Design and implementation of 4 bit modulo counters.

EXERCISE
1. Using flipflop for up-down count synchronous count.
2. Realization of counter function using dedicated ICs.

5. SHIFT REGISTERS:
Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC’s.

AIM
Design and implementation of shift register.

EXERCISE
1. Shift Register function realization of the above using dedicated IC’s
   For SISO, SIPO, PISO, PIPO, modes of atleast 3 bit binary word.
2. Realization of the above using dedicated IC’s.
6. MULTIPLEX/ DE-MULTIPLEX.
Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer

AIM
To demonstrate the addressing way of data channel selection for multiplex De-multiplex operation.

EXERCISE
1. Realization of mux-demux functions using direct IC’s.
2. Realization of mux-demux using dedicated IC’s for 4:1, 8:1, and vice versa.

7. TIMER IC APPLICATION. STUDY OF NE/SE 555 TIMER IN ASTABLE, MONOSTABLE OPERATION.

AIM
To design a multi vibrater circuit for square wave and pulse generation.

EXERCISE
1. Realization of Astable multivibrator & monostable multivibrator circuit using Timer IC.
2. Variation of R, C, to vary the frequency, duty cycle for signal generator.

8. APPLICATION OF OP-AMP-I
Slew rate verifications, inverting and non-inverting amplifier, Adder, comparator, Integrater and Differentiator.

AIM
Design and Realization of Op-Amp application.

EXERCISE
1. Verification of Op-Amp IC characteristics.
2. Op-Amp IC application for simple arithmetic circuit.
3. Op-Amp IC application for voltage comparator wave generator and wave shifting circuits.

9. STUDY OF ANALOG TO DIGITAL CONVERTER AND DIGITAL TO ANALOG CONVERTER: VERIFICATION OF A/D CONVERSION USING DEDICATED IC’S.

AIM
Realization of circuit for digital conversions.

EXERCISE
1. Design of circuit for analog to digital signal conversion using dedicated IC’s.
2. Realization of circuit using dedicated IC for digital analog conversion.

10. STUDY OF VCO AND PLL ICS
i) Voltage to frequency characteristics of NE/SE 566 IC.
ii) Frequency multiplication using NE/SE 565 PLL IC.

Aim
Demonstration of circuit for communication application

Exercise
1. To realize V/F conversion using dedicated IC’s vary the frequency of the generated signal.
2. To realize PLL IC based circuit for frequency multiplier, divider.
### REQUIREMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>DESCRIPTION OF EQUIPMENT</th>
<th>QUANTITY REQUIRED</th>
<th>QUANTITY AVAILABLE</th>
<th>DEFICIENCY %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Interface such as, A/D, D/A converter, DMA, PIC Serial, Interface, Temperatures controller, Stepper motor, Key board</td>
<td>4 each</td>
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<td>2.</td>
<td>CRO and function generator</td>
<td>3 each</td>
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<tr>
<td>3.</td>
<td>IC trainer Kit</td>
<td>15</td>
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<tr>
<td>4.</td>
<td>Analog AC trainer kit</td>
<td>4</td>
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<tr>
<td>5.</td>
<td>Components and bread boards</td>
<td>10 each</td>
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<td>6.</td>
<td>Chips IC – 7400</td>
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<td>Chips IC – 74153</td>
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<td>Chips IC – 7476</td>
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<td>Chips IC – 7420</td>
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<td>Chips IC – 7404</td>
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<td>20.</td>
<td>Chips LM – 317</td>
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</table>
EC2312  MICROPROCESSORS AND MICRO CONTROLLER  L T P C  3 0 0 3

AIM
To introduce Microprocessor Intel 8085 and 8086 and the Micro Controller 8051

OBJECTIVES
i. To study the Architecture of 8085 & 8086, 8051
ii. To study the addressing modes & instruction set of 8085 & 8051.
iii. To introduce the need & use of Interrupt structure 8085 & 8051.
iv. To develop skill in simple program writing for 8051 & 8085 and applications
v. To introduce commonly used peripheral / interfacing ICs

UNIT I  8085 and 8086 PROCESSOR  9

UNIT II  PROGRAMMING OF 8085 PROCESSOR  9
Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing - Look up table - Subroutine instructions - stack.
UNIT III PERIPHERAL INTERFACING FOR 8085
Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Keyboard display controller and 8253 Timer/ Counter – Interfacing with 8085 - A/D and D/A converter interfacing.

UNIT IV 8051 MICRO CONTROLLER

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS
Data Transfer, Manipulation, Control & I/O instructions – Simple programming exercises keyboard and display interface – Closed loop control of servo motor- stepper motor control - Washing Machine Control.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

EC2315 COMMUNICATION ENGINEERING

L T P C
3 0 0 3

AIM
1. To introduce the fundamental techniques of analog, digital and data communication.
2. To explain satellite and fiber optic communication and Networking systems.

OBJECTIVES
i. To understand basic signals, analog modulation, demodulation and radio receivers.
ii. To explain the characteristics and model of transmission medium.
iii. To understand source digitization, digital multiplexing and modulation.
iv. To understand data communication system and techniques.
v. To learn the basics of satellite and optical fiber communication systems.

UNIT I INTRODUCTION
Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, Path Loss, Gaussian white noise. Time and frequency domain representation of signals need for modulation

UNIT II ANALOG MODULATION SYSTEMS
Amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver. Frequency division multiplexing. Time Division multiplexing.
UNIT III  DIGITAL COMMUNICATION
Pulse code modulation, digital T-carrier system. Digital radio system. Digital modulation: Amplitude Shift Key, Frequency and phase shift keying, Quadrature Phase Shift Key – Modulator and demodulator, bit error rate calculation.

UNIT IV  DATA COMMUNICATION AND NETWORK PROTOCOL
Data Communication codes, error control, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

UNIT V  SATELLITE AND OPTICAL FIBRE COMMUNICATION SYSTEM
Introduction to satellite communication, Optical Fiber communication, Television Engineering, Microwave communication and Cellular communication

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

CS2311  OBJECT ORIENTED PROGRAMMING

AIM
To understand the concepts of object-oriented programming and master OOP using C++ and Java.

UNIT I
Object oriented programming concepts – objects-classes- methods and messages-abstraction and encapsulation-inheritance- abstract classes- polymorphism.
Introduction to C++- objects-classes-constructors and destructors

UNIT II

UNIT III
Exception handling - Streams and formatted I/O – file handling – namespaces – String Objects - standard template library.

UNIT IV
Introduction to JAVA , bytecode, virtual machines – objects – classes – Javadoc – packages – Arrays - Strings
UNIT V
Inheritance – interfaces and inner classes - exception handling – threads - Streams and I/O

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
1. ISRD Group, “Introduction to Object-oriented Programming and C++”, Tata

EI2301 INDUSTRIAL ELECTRONICS

AIM
To introduce the application of electronic devices for conversion, control and conditioning of electric power.

OBJECTIVES
i. To get an overview of different types of power semi-conductor devices and their switching characteristics.
ii. To understand the operation, characteristics and performance parameters of controlled rectifiers.
iii. To study the characteristics of DC and AC drives
iv. To learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods.
v. To know the practical application for power electronics converters in conditioning the power supply.

UNIT I POWER DEVICES
UNIT II  CONVERTERS  9
Introduction to half wave, full wave and bridge rectifiers – Single phase and three phase – Half controlled and fully controlled converters – Dual converters – Introduction to cyclo converters and ac controllers.

UNIT III  INVERTER AND CHOPPER  9

UNIT IV  DC AND AC DRIVES  9

UNIT V  OTHER APPLICATIONS  9

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES

EI2302  ANALYTICAL INSTRUMENTS  LT P C
3 0 0 3

AIM
The course is designed to equip the students with an adequate knowledge of a number of analytical tools which are useful for clinical analysis in hospitals, drugs and pharmaceutical laboratories and above all for environmental Pollution Monitoring.

OBJECTIVES
i. To provide various techniques and methods of analysis which occur in the various regions of the spectrum. These are the powerful tools used in Clinical and Research laboratories.
ii. To give unique methods of separation of closely similar materials, the most powerful being gas chromatography.
iii. To study important methods of analysis of industrial gases. Awareness and control of pollution in the environment is of vital importance.
iv. To bring out the latest ideas on ion-selective electrodes as well as biosensors which have potential applications in medical field, food and beverage industries.
v. To provide the important electromagnetic resonance and microscopic methods of analysis. Further they are both sensitive and specific and often are characterized by good accuracy. NMR & ESR and microscopic techniques are useful in structure determination.
UNIT I  COLORIMETRY AND SPECTROPHOTOMETRY  9
Special methods of analysis – Beer-Lambert law – Colorimeters – UV-Visible spectrophotometers –
Single and double beam instruments – Sources and detectors – IR Spectrophotometers – Types –
Attenuated total reflectance flame photometers – Atomic absorption spectrophotometers – Sources
and detectors – FTIR spectrophotometers – Flame emission photometers – Fluorescence
spectrophotometer

UNIT II  CHROMATOGRAPHY  9
Different techniques – Gas chromatography – Detectors – Liquid chromatographs – Applications –
High-pressure liquid chromatographs – Applications.

UNIT III  INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS  9
Types of gas analyzers – Oxygen, NO₂ and H₂S types, IR analyzers, thermal conductivity
analyzers, analysis based on ionization of gases. Air pollution due to carbon monoxide,
hydrocarbons, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

UNIT IV  pH METERS AND DISSOLVED COMPONENT ANALYZERS  9
Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes,
selective ion electrodes, ammonia electrodes, cyclic voltametry, biosensors, dissolved oxygen
analyzer – Sodium analyzer – Silicon analyzer.

UNIT V  ELECTRO MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES  9
NMR – Basic principles – NMR spectrometer - Applications. Electron spin Resonance spectroscopy
– Basic principles, Instrumentation and applications. Scanning Electron Microscope (SEM) – Basic
principles, Instrumentation and applications. Transmission Electron Microscope (TEM) – Basic

TOTAL : 45 PERIODS

TEXT BOOKS:
2. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999
   publishing & distribution, 1995.

REFERENCES:
   2003.
AIM
To equip the students with relevant knowledge to suit the industrial requirement.

OBJECTIVES
i. To study about humidity and moisture measurements.
ii. To study about mechanical flow meters and their installation.
iii. To study about area flow meters, mass flow meters and calibration.
iv. To know elaborately about non-content type flow meters.
v. To know about various types of level measurements adopted in industry environment.

UNIT I
VARIABLE HEAD TYPE FLOWMETERS

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

UNIT III
ELECTRICAL TYPE FLOW METER

UNIT IV
LEVEL MEASUREMENT

UNIT V
MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
AIM
To understand programming using instruction sets of processors and microcontroller.

8-bit Microprocessor
1. Simple arithmetic operations:
   • Addition / subtraction / multiplication / division.

2. Programming with control instructions:
   • Increment / Decrement.
   • Ascending / Descending order.
   • Maximum / Minimum of numbers.
   • Rotate instructions.
   • Hex / ASCII / BCD code conversions.

3. Peripheral Interface Experiments:
   • Simple experiments using 8251, 8279, 8254, 8259, 8255.

4. Interface Experiments:
   • A/D Interfacing.
   • D/A Interfacing.
   • Traffic light controller.

5. Programming practice on assembler and simulator tools.

8-bit Microcontroller
6. Demonstration of basic instructions with 8051 Microcontroller execution, including:
   • Conditional jumps, looping
   • Calling subroutines.
   • Stack parameter testing

7. Parallel port programming with 8051 using port 1 facility:
   • Stepper motor
   • D / A converter.

8. Programming Exercise on
   • RAM direct addressing
   • Bit addressing

9. Programming practice using simulation tools and C - compiler
   • Initialize timer
   • Enable interrupts.

10. Study of micro controllers with flash memory.

DETAILED SYLLABUS:
8-bit Microprocessor
1. SIMPLE ARITHMETIC OPERATIONS
   a. Addition / subtraction / multiplication / division.

   AIM
   To perform simple arithmetic operations using assembly language program.
EXERCISE
1. Write an assembly language program using 8085 instructions set to perform the following arithmetic operations
   1. Addition of two 8 bit numbers
   2. Subtraction of two 8 bit numbers
   3. Multiplication of two 8 bit numbers
   4. Division of two 8 bit numbers

2. PROGRAMMING WITH CONTROL INSTRUCTIONS
   a. Increment / Decrement.
   b. Ascending / Descending order.
   c. Maximum / Minimum of numbers.
   d. Rotate instructions.
   e. Hex / ASCII / BCD code conversions.

AIM
To write an assembly language program using the control instructions

EXERCISE
1. Using the control instructions of 8085 microprocessor write assembly language programs to perform the following
   1. Arrange the given array of data in ascending and descending order
   2. Find the maximum and minimum number in a group of data given.
   3. Conversion of the following
      1. ASCII to HEX code
      2. Conversion of HEX to ASCII code
      3. Conversion of BCD to HEX
      4. Conversion of HEX to BCD

3. PERIPHERAL INTERFACE EXPERIMENTS:
   a. Simple experiments using 8251, 8279, 8254, 8259, 8255.

4. INTERFACE EXPERIMENTS:
   A/D Interfacing.
   D/A Interfacing.
   Traffic light controller.

Aim
To write an assembly language program to convert Analog input to Digital output and Digital input to Analog output.

EXERCISE
1. Write an assembly language program (using 8085) to convert Analog input to Digital output
2. Write an assembly language programs to convert digital input into analog signal of following type.
   1. Square wave
   2. Triangular wave
   3. Sawtooth wave

5. PROGRAMMING PRACTICE ON ASSEMBLER AND SIMULATOR TOOLS.
   8-BIT MICRO CONTROLLER
6. DEMONSTRATION OF BASIC INSTRUCTIONS WITH 8051 MICRO CONTROLLER EXECUTION, INCLUDING:
- Conditional jumps, looping
- Calling subroutines.
- Stack parameter testing

AIM
To demonstrate use of control logic instructors.

EXERCISE
1. To write programs which can include instruction sets for jump, loop, cell, return, stack.
2. To observe the change in status registers and various relevant registers.

7. PARALLEL PORT PROGRAMMING WITH 8051 USING PORT 1 FACILITY:
   - Stepper motor
   - D / A converter.

AIM
To demonstrate the access of parallel port.

EXERCISE
1. To develop command words on choice of port, addressing of port pins.
2. To vary timing cycle of speed of motor, direction of motor.
3. To demonstrate generation of sine wave saw tooth, triangular wave of various frequency, amplitude.

8. PROGRAMMING EXERCISE ON
   - RAM direct addressing
   - Bit addressing

AIM
To write the program to check the content of memory locations using READ / WRITE instructions using different addressing modes.

EXERCISE
To READ / WRITE the content of RAM registers, bits and the RAM from location 1 to N and check the display with say LEDs.

9. PROGRAMMING PRACTICE USING SIMULATION TOOLS AND C – COMPILER

AIM
To use the facility of popular Micro controller programming tools like KEIL or RIDE software.

EXERCISE
1. To study the initializing of timer interrupt with context saving like increasing or decreasing the counter count.
2. To demonstrate use of instruction like cjne, djnz, jb etc.

10. STUDY OF MICRO CONTROLLERS WITH FLASH MEMORY.
AIM
To familiarize with loading and executing on flash memory.

EXERCISE
1. To write the program to generate sine wave, square wave etc.
2. To vary the frequency, amplitude of the signal.

TOTAL : 45 PERIODS

REQUIREMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>8085 Microprocessor Trainer with Power supply</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>8051 Micro controller Trainer Kit with power supply</td>
<td>10</td>
</tr>
<tr>
<td>3.</td>
<td>8255 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>8251 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>8259 Interface board</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>8279 Keyboard/Display Interface Board</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>8253 timer counter</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>ADC and DAC card</td>
<td>5 each</td>
</tr>
<tr>
<td>9.</td>
<td>Stepper motor with Controller</td>
<td>1</td>
</tr>
<tr>
<td>10.</td>
<td>Traffic Light Control System</td>
<td>1</td>
</tr>
<tr>
<td>11.</td>
<td>Regulation power supply</td>
<td>1</td>
</tr>
<tr>
<td>12.</td>
<td>Universal ADD-ON modules</td>
<td>3</td>
</tr>
<tr>
<td>13.</td>
<td>8 Digit Multiplexed Display Card</td>
<td>2</td>
</tr>
<tr>
<td>14.</td>
<td>Function Generator</td>
<td>3</td>
</tr>
<tr>
<td>15.</td>
<td>Multimeter</td>
<td>3</td>
</tr>
<tr>
<td>16.</td>
<td>C Compliers</td>
<td>2</td>
</tr>
<tr>
<td>17.</td>
<td>KEIL or RIDE software</td>
<td>2 licenses</td>
</tr>
</tbody>
</table>
CS2312  OBJECT- ORIENTED PROGRAMMING LAB  L T P C  0 0 3 2

AIM
To develop object-oriented programming skills using C++ and Java

1. Function overloading, default arguments in C++
2. Simple class design in C++, namespaces, objects creations
3. Class design in C++ using dynamic memory allocation, destructor, copy constructor
4. Operator overloading, friend functions
5. Overloading assignment operator, type conversions
6. Inheritance, run-time polymorphism
7. Template design in C++
8. I/O, Throwing and Catching exceptions
9. Program development using STL
10. Simple class designs in Java with Javadoc
11. Designing Packages with Javadoc comments
12. Interfaces and Inheritance in Java
13. Exceptions handling in Java
14. Java I/O
15. Design of multi-threaded programs in Java

TOTAL : 45 PERIODS

REQUIREMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Hardware Required</th>
<th>Quantity required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Computers (Pentium-4)</td>
<td></td>
<td>40 Nos with one server</td>
</tr>
<tr>
<td>2.</td>
<td>Dot matrix printer</td>
<td></td>
<td>3 Nos</td>
</tr>
<tr>
<td>3.</td>
<td>Laser Printer</td>
<td></td>
<td>2 Nos.</td>
</tr>
<tr>
<td>4.</td>
<td>UPS (5 KVA)</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Software Required

| 5.    | Turbo C++                |                   | 40 Nodes |
| 6.    | (Java 2 SDK)             |                   | 40 Nos. |
|       | JDK 5.0 update 6 (1.5.0 - Internal Version No.) | | |

66
Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students' overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them in their profession.

OBJECTIVES:

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

I. PC based session (Weightage 40%) 24 periods

A. English Language Lab (18 Periods)

1. LISTENING COMPREHENSION: (6)
   Listening and typing – Listening and sequencing of sentences – Filling in the blanks -Listening and answering questions.

2. READING COMPREHENSION: (6)
   Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3. SPEAKING: (6)
   Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

B. VIEWING AND DISCUSSING AUDIO-VISUAL MATERIALS (6 periods)
   (Samples are available to learn and practice)

1. RESUME / REPORT PREPARATION / LETTER WRITING (1)
   Structuring the resume / report - Letter writing / Email Communication - Samples.

2. PRESENTATION SKILLS: (1)
   Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. SOFT SKILLS: (2)
   Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples
4. **GROUP DISCUSSION:**
   Why is GD part of selection process? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD - Video samples

5. **INTERVIEW SKILLS:**
   Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video samples.

<table>
<thead>
<tr>
<th>II. Practice Session</th>
<th>(Weightage – 60%)</th>
<th>24 periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Resume / Report Preparation / Letter writing: Students prepare their own resume and report.</td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td>2. Presentation Skills: Students make presentations on given topics.</td>
<td>(8)</td>
<td></td>
</tr>
<tr>
<td>3. Group Discussion: Students participate in group discussions.</td>
<td>(6)</td>
<td></td>
</tr>
<tr>
<td>4. Interview Skills: Students participate in Mock Interviews</td>
<td>(8)</td>
<td></td>
</tr>
</tbody>
</table>

**REFERENCES:**

**LAB REQUIREMENTS:**
1. Teacher console and systems for students.
2. English Language Lab Software
3. Career Lab Software

**REQUIREMENT FOR A BATCH OF 60 STUDENTS**

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
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<tbody>
<tr>
<td>1.</td>
<td>Server</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>o PIV system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o 1 GB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o OS: Win 2000 server</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Audio card with headphones (with mike)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o JRE 1.3</td>
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<tr>
<td>2.</td>
<td>Client Systems</td>
<td>60 No.</td>
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<tr>
<td></td>
<td>o PIII or above</td>
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<tr>
<td></td>
<td>o 256 or 512 MB RAM / 40 GB HDD</td>
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<tr>
<td></td>
<td>o OS: Win 2000</td>
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<tr>
<td>o</td>
<td>Audio card with headphones (with mike)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JRE 1.3</td>
<td></td>
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<tr>
<td>3.</td>
<td><strong>Handicam Video Camera (with video lights and mic input)</strong></td>
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<td>1 No.</td>
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<td>4.</td>
<td>Television - 29”</td>
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<td></td>
<td>1 No.</td>
<td></td>
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<tr>
<td>5.</td>
<td>Collar mike</td>
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<tr>
<td></td>
<td>1 No.</td>
<td></td>
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<tr>
<td>6.</td>
<td>Cordless mikes</td>
<td></td>
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<td></td>
<td>1 No.</td>
<td></td>
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<tr>
<td>7.</td>
<td>Audio Mixer</td>
<td></td>
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<td></td>
<td>1 No.</td>
<td></td>
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<tr>
<td>8.</td>
<td>DVD Recorder / Player</td>
<td></td>
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<td></td>
<td>1 No.</td>
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<tr>
<td>9.</td>
<td>LCD Projector with MP3 /CD /DVD provision for audio / video facility - <strong>Desirable</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 No.</td>
<td></td>
</tr>
</tbody>
</table>

EI2304       INDUSTRIAL INSTRUMENTATION LABORATORY

**OBJECTIVE**
The training gained by the student in this area will be of immense help and ease for him in any industrial establishment.

1. Discharge coefficient of orifice plate
2. Calibration of pressure gauge
3. Torque measurement
4. Viscosity measurement
5. Vacuum pressure measurement
6. Level measurement using d/p transmitter
7. UV – Visible spectrophotometer
8. IR spectrophotometer
9. pH meter standardization and measurement of pH values of solutions

**TOTAL : 45 PERIODS**

**DETAILED SYLLABUS:**

1. **DISCHARGE COEFFICIENT OF ORIFICE PLATE**

   **AIM**
   
   To find the discharge co-efficient of orifice plate.

   **EXERCISE**
   
   Find the discharge co-efficient \( C_d \).

   **PROCEDURE**
   
   1. Open the outlet value completely and switch on the motor.
2. Now open the inlet value.
3. With a particular operating a the inlet value note the reading on two time of manometer and computer the value of x.
4. Compute the actual discharge using the collecting task and stop watch and the theoretical discharge.
5. Now change the opening of the inlet values and note the reading of monometer and compare and discharge.
6. Calculate the value of C_d.

EQUIPMENT
1. Orifice meter – 1 No
2. Stopwatch – 1 No

2. CALIBRATION OF PRESSURE GAUGE

AIM
To calibrate the given pressure gauge using dead weight tester.

EXERCISE
Calibrate the pressure gauge and discuss the graphs (i) Actual pressure Vs true pressure (ii) Actual pressure Vs Error

PROCEDURE
1. A standard weight of 0.5 Kg/cm² is kept on the piston plate form.
2. Pressure is applied to the chamber containing oil by rotating the hand operated wheel in the anti clock wise direction.
3. This is continued until piston carrying weight shows a list.
4. In the movement the pressure acts equally on the piston as well as on the gauge.
5. The reading shown by the gauge is taken as actual reading.
6. The same procedure is repeated for increasing weights on the platform in steps of 0.5 Kg/cm² and actual reading shown by the gauge is noted down.
7. Graphs are drawn between
   i. Actual pressure Vs true pressure.
   ii. Actual pressure Vs Error.

EQUIPMENT
1. Dead weight tester - 1 No
2. Pressure gauge and standard weight - 1 No

3. TORQUE MEASUREMENT

AIM
To determine the due to dead weights using strain torsion meter and to determine the unknown weight.

EXERCISE
Find the % error of the torque measurement.

PROCEDURE
1. Connect the strain gauge torsion meter to the power supply.
2. Now change or hanger is fixe to the shift, the torque is to subject.
3. Now keep the dead weights in the hanger gently.
4. Note the indicated torque value from the strain gauge torsion indicator.
5. Repeat the same for different weights (say 1Kg, 2Kg,) and tabulate the readings.
6. Now repeat the same procedure for the given unknown weight.
7. The unknown weight is interpreted from graph.

**EQUIPMENT**
1. Strain gauge torsion meter – 1 No
2. Dead weight – 1 No

4. **MEASUREMENT OF VISCOSITY USING SAYBOLT VISCOMETER**

**AIM**
To measure the viscosity using saybolt viscometer.

**EXERCISE**
Measure the viscosity using saybolt viscometer and draw the graph between voltage on x-axis and dynamo viscosity on y-axis.

**PROEDURE**
1. Viscosity determination shall be done in room free from dust rapid changes in temperature.
2. The oil in the cup and allow it to drain.
3. Pour oil in the cup and allow it to drain.
4. The cork stopper should be installed at the lower and of the tube.
5. The cork should be tight enough to prevent escape of oil.
6. Since the oil should be stirred well until a constant temperature is maintained both in the water and the oil.
7. After thermal equilibrium has been obtained.
8. Remove the thermometer from the oil bath.
9. 60ml of flask should be kept in position to collect oil from the tube.
10. Open the cork and start the stopwatch.
11. Record the time for the fall of 60mm of oil.
12. Vary the temperature of oil using temperature controller record the actual temperature.
13. Draw the graph between voltage on x-axis and dynamo viscosity on y-axis.

**EQUIPMENT**
1. Thermometer – 1 No
2. Stop watch – 1 No
3. 60ml flask – 1 No
4. Water – 1 No

5. **VACUUM PRESSURE MEASUREMENT**

**AIM**
To study the vacuum pressure gauge setup and measure the unknown vacuum pressure.

**EXERCISE**
1. Maintain the vacuum pressure in the cylinder and switch on the vacuum pressure transmitter setup.
2. Measure the output voltage in Volts for the corresponding vacuum pressure in mbars.
3. Vary the vacuum pressure in cylinder and follow the step 2 for different values.
4. Draw the graph between output voltage Vs. vacuum pressure in mbars.

**EQUIPMENT**
Vacuum pressure setup
Vacuum pressure transmitter
6. LEVEL MEASUREMENT USING DPT

AIM
To measure the level of liquid in the tank with the differential pressure transmitter and to calibrate the zero and span of the level in terms of 4-20 mA.

EXERCISE
Measure the liquid level and calibrate it in terms of 4-20 mA.

PROCEDURE
a) Weight the empty container and calibrate the daters level to 4mA.
b) Fill the container with the water and calibrate the full level to 20mA.
c) Now perform the experiment in the ascending order in steps of 5cms.
d) Repeat the same procedure for the descending order.
e) Tabulate the readings.
f) Draw the hastenis

EQUIPMENT
1. DPT - 1 No
2. Container - 1 No

7. UV-VISIBLE SPECTROPHOTOMETER

AIM
To find out the absorbance, % of transmittance and concentration for a given test solution, using UV spectrophotometer.

EXERCISE
Find out the absorbance, % of transmittance and concentration of the given test solutions.

PROCEDURE
1. Switch on the UV-spectrophotometer.
2. Switch on the lamp by electing the names of rating disc.
3. Place the reference solution in the first column of rotating disc.
4. Use any other column to place the test solution.
5. Select the operating mode. There are 4 types of operating modes:
    i. Single wavelength
    ii. Multiple wavelength
    iii. Scanning mode
    iv. Time scan mode
6. Select the mode. The 3 parameters to be measured are absorbance, % of transmittance and concentration for a given test solution.
   Note down the result from the 1st parameter.

EQUIPMENT
1. UV spectrophotometer – 1 No.
2. Curettes

8. IR – SPECTROPHOTOMETER

AIM
To measure and analyze the absorbance, percentage transmission concentration of the given samples using IR spectroscopy
EXERCISE
*wait for 30 minutes for IR source to be operated, then take the readings.

For IR wavelength is ABOVE 300nm :
Place reference sample in CELL No 2.
Place the sample to be analyzed in cell NO 1 or 3 or 4 or 5

Single wavelength:
As the name suggests, this mode is used to take readings at one wave length. Depends on the absorbance mode, transmittance mode, concentration mode the data will be displayed on the monitor. Each subsequent data can be transferred just by pressing Key of 117. After completion of the data transfer, Press ESC key to stop the reception.

Multi wavelength analysis:
This mode is similar to single wave length except that it takes readings at more than one wavelength. With this mode, readings can be taken at minimum 2 discrete readings and maximum 8 discrete wavelength. Any 8 wavelength can be selected in the range 200nm to 1000nm. Note the maximum wavelength of absorption.

EQUIPMENT
1. IR spectrophotometer sl-117
2. cuvette
3. Solution
4. Printer

9. Ph – Meter Measurement of pH-value of Test Solutions

AIM
To measure the pH values of the test solutions using pH-meter.

EXERCISE
Find the pH values of the test solutions.

PROCEDURE
1. Switch on the pH meter
2. Connect the glass electrode to the pH-meter
3. Take distilled water in a beaker and insert electrode in the beaker
4. The pH meter should show approximately test solutions. If Acidic than the \( P_H < 7 \) and if alkaline than the \( P_H > 7 \)

EQUIPMENT
1. pH meter – 1 No.
2. Test solutions – few types
4. Stand – 1 No.

10. MEASUREMENTS OF CONDUCTIVITY OF TEST SOLUTIONS.

AIM
To measure the conductivity of the given solution.

EXERCISE
(i) Solution under test is taken in a beaker.
(ii) Electrode is immersed into the solution.
(iii) The electrode terminal is connected to display unit.
(iv) Digital display shows the conductivity of the given solution in mho.
(v) Repeat the procedure for different samples.
(vi) Switch on the supply.

EQUIPMENT
(i) Solution under test.
(ii) Conductivity electrode.
(iii) Conductivity meter setup with display.

EI2351 MODERN ELECTRONIC INSTRUMENTATION

AIM
To provide adequate knowledge in digital instruments, display devices and virtual instrumentation.

OBJECTIVES
i. To make the students to gain a clear knowledge of the basics of digital instruments and measurement techniques.
ii. To have an adequate knowledge in various display and recording devices.
iii. To have an elaborate study of communication standards.
iv. To have a detailed study of virtual instrumentation and its applications.

UNIT I DIGITAL INSTRUMENTS
Digital voltmeters and multimeters – Microprocessor based DMM with auto ranging and self diagnostic features – Digital IC tester – Frequency, period, time interval and pulse width measurement.

UNIT II DISPLAY AND RECORDING DEVICES

UNIT III RS 232 AND RS 485

UNIT IV VIRTUAL INSTRUMENTATION
Virtual instrumentation – Definition, flexibility – Block diagram and architecture of virtual instruments – Virtual instruments versus traditional instruments – Review of software in virtual instrumentation – VI programming techniques – VI, sub VI, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, string and file input / output.

UNIT V DATA ACQUISITION CARDS

TOTAL : 45 PERIODS
TEXT BOOKS:

REFERENCES:

EI2352 PROCESS CONTROL

AIM
To provide basic knowledge of controllers, find control elements and the processes.

OBJECTIVES
i. To study the basic characteristics of first order and higher order processes.
ii. To get adequate knowledge about the characteristics of various controller modes and methods of tuning of controller.
iii. To study about various complex control schemes.
iv. To study about the construction, characteristics and application of control valves.

To study the five selected unit operations and a case study of distillation column control

UNIT I INTRODUCTION

UNIT II CONTROL ACTIONS AND CONTROLLERS
Basic control actions – characteristics of on-off, proportional, single-speed floating, integral and derivative control modes – P+I, P+D and P+I+D control modes – pneumatic and electronic controllers to realize various control actions.
UNIT III  OPTIMUM CONTROLLER SETTINGS  9

UNIT IV  MULTILOOP CONTROL  9
Feed-forward control – ratio control- cascade control – inferential control – split-range control – introduction to multivariable control – examples from distillation column and boiler systems.

UNIT V  FINAL CONTROL ELEMENT  9

45 T = 15 TOTAL : 60 PERIODS

TEXT BOOKS

REFERENCES
UNIT V  DESIGN FOR TESTABILITY  9
Teatability – Ad hoc design for testing techniques – controllability and observability by means of
scan registers – Generic scan based designa – Board level and system level DFT approaches.

TOTAL: 45 PERIODS

TEXT BOOKS:
2. Donald. P. Leach, Albert paul Malvino, Goutam Suha,’Digital Principles and Applications’ Tata
3. Miron Abramonicici, Melvin. A. Rrewer, Arthur.D. Friedman,Digital system testing and testable
design, Jaico publishing house.

REFERENCES:
edn.1992
5. Performance analysis of Handoff techniques based on Mobile Ip, TCP – migrate and SIP.

EC2361  DIGITAL SIGNAL PROCESSING  L T P C
3 1 0 4

AIM
To introduce the concept of analyzing discrete time signals & systems in the time and frequency
domain.

OBJECTIVES
• To classify signals and systems & their mathematical representation.
• To analyse the discrete time systems.
• To study various transformation techniques & their computation.
• To study about filters and their design for digital implementation.
• To study about a programmable digital signal processor & quantization effects.

UNIT I  INTRODUCTION  9
Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time
variance; classification of signals: continuous and discrete, energy and power; mathematical
representation of signals; spectral density; sampling techniques, quantization, quantization error,
Nyquisit rate, aliasing effect. Digital signal representation.

UNIT II  DISCRETE TIME SYSTEM ANALYSIS  9
Z-transform and its properties, inverse z-transforms; difference equation – Solution by z-transform,
application to discrete systems - Stability analysis, frequency response – Convolution – Fourier
transform of discrete sequence – Discrete Fourier series.

UNIT III  DISCRETE FOURIER TRANSFORM & COMPUTATION  9
DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm –
DIT & DIF - FFT using radix 2 – Butterfly structure.
UNIT IV DESIGN OF DIGITAL FILTERS
FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

UNIT V DIGITAL SIGNAL PROCESSORS
Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial Processors

TEXT BOOKS

REFERENCES

CS2364 EMBEDDED SYSTEM

AIM
To understand the basic concepts of embedded system design and its applications to various fields.

OBJECTIVES
To provide a clear understanding of

• Embedded system terminologies and its devices.
• Various Embedded software Tools
• Design and architecture of Memories.
• Architecture of processor and memory organizations.
• Input/output interfacing
• Various processor scheduling algorithms.
• Basics of Real time operating systems.
• Introduction to PIC and its applications

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS
Introduction to embedded real time systems – The build process for embedded systems – Embedded system design process-Embedded comptutory applications-Types of memory – Memory management methods.
UNIT II EMBEDDED SYSTEM ORGANIZATION 9

UNIT III PROGRAMMING AND SCHEDULING 9
Intel I/O instructions – Synchronization - Transfer rate, latency; interrupt driven input and output - Nonmaskable interrupts, software interrupts, Preventing interrupts overrun - Disability interrupts. Multithreaded programming – Context Switching, Preemptive and non-preemptive multitasking, semaphores. Scheduling-thread states, pending threads, context switching

UNIT IV REAL-TIME OPERATING SYSTEMS 9
Introduction to basic concepts of RTOS, Unix as a Real Time Operating system – Unix based Real Time operating system - Windows as a Real time operating system – POSIX – RTOS-Interrupt handling - A Survey of contemporary Real time Operating systems: PSOS, VRTX, VxWorks, QNX, 4C/OS-II, RT Linux – Benchmarking Real time systems - Basics

UNIT V PIC MICROCONTROLLER BASED EMBEDDED SYSTEM DESIGN 9
PIC microcontroller – MBasic compiler and Development boards – The Basic Output and digital input – Applications

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
5. Wayne Wolf, ‘Computer as Components’, Pearson Education

EI2311 BIOMEDICAL INSTRUMENTATION L T P C 3 0 0 3

AIM
The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance. The fundamental principles of equipment that are actually in use at the present day are introduced.

OBJECTIVES:
1. To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Biomedical applications of different transducers used.
2. To introduce the student to the various sensing and measurement devices of electrical origin. To provide awareness of electrical safety of medical equipments
3. To provide the latest ideas on devices of non-electrical devices.
iv. To bring out the important and modern methods of imaging techniques.
v. To provide latest knowledge of medical assistance / techniques and therapeutic equipments.

UNIT I PHYSIOLOGY AND TRANSDUCERS 9
Cell and its structure – Resting and Action Potential – Nervous system: Functional organisation of
the nervous system – Structure of nervous system, neurons - synapse –transmitters and neural
communication – Cardiovascular system – respiratory system – Basic components of a biomedical
system - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature
measurements - Fibre optic temperature sensors.

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS 9
Electrodes –Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle
and surface electrodes – Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers –
Isolation amplifier.
Electrical safety in medical environment: shock hazards – leakage current

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS 9
Measurement of blood pressure – Cardiac output – Heart rate – Heart sound –Pulmonary function
measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas
analysers : pH of blood –measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR
measurements.

UNIT IV MEDICAL IMAGING 9
Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography –
Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring –
Introduction to Biometric systems

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS 9
Lung machine – Audio meters – Dialysers – Lithotripsy

TOTAL : 45 PERIODS

TEXT BOOKS
Ltd., 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, ‘Bio-Medical Instrumentation and

REFERENCES
Sons, 1975.
EI2355 COMMUNICATION AND DSP LABORATORY

OBJECTIVE
To understand the concepts of various modulation techniques and to have an in-depth knowledge of various signal processing techniques.

1. Generation and Detection of Amplitude Modulation
2. Generation of Frequency Modulation and its Detection
3. Generation and Detection of PAM
4. Generation of BFSK and its Detection
5. Generation of standard inputs using simulation package
6. Analysis of Linear Systems [with Convolution and Deconvolution Operation]
7. FIR Filter Design (any one Technique)
8. IIR Filter Design (any one Technique)
9. Implementation of FFT algorithm
10. Implementation of Interpolation and Decimation function

TOTAL : 45 PERIODS

DETAILED SYLLABUS

1. GENERATION AND DETECTION OF AMPLITUDE MODULATION

AIM:
To study the working concept of Amplitude Modulation and detection

OBJECTIVE:
1. To study the modulation of message signal using high frequency carrier
2. To study the detection of message signal from the modulated signal

EXERCISE

MODULATION
1. Construct a modulation circuit using discrete components.
2. Using signal generators, give message signal and high frequency carrier.
3. Using CRO, observe Emax and Emin of modulated wave and find out modulation index

DETECTION
1. Construct demodulated circuit
2. Give modulated wave as input
3. Measure the amplitude and frequency of modulating signal

EQUIPMENTS REQUIRED
1. Signal Generators
2. Power supply
3. CRO

2. GENERATION OF FREQUENCY MODULATION AND ITS DETECTION

AIM:
To understand the working concept of Frequency Modulation and Detection

OBJECTIVE:
1. To study Frequency Modulation for the given modulated signal
2. To study Frequency Detection from the Frequency Modulated signal
EXERCISE

MODULATION
1. Construct a Frequency Modulation Circuit
2. Give Modulating Signal and Carrier using Signal Generators
3. Using CRO, Observe Frequency Deviation and calculate Modulation Index

DETECTION
1. Give Frequency Modulated Signal as input to the detector circuit
2. Using CRO, Observe Frequency and Amplitude of modulating signal.

EQUIPMENTS REQUIRED
1. Signal Generators
2. CRO
3. Power Supply

3. GENERATION AND DETECTION OF PAM
AIM: To study the working concept of PAM and its detection

OBJECTIVE
1. To study PAM for the given Message Signal using Pulse train
2. To study the detection of message signal from the PAM Signal

EXERCISE

MODULATION
1. Construct a circuit using discrete components
2. Give analog message signal, pulse train carrier using signal generators
3. Using CRO, Observe the amplitude of the pulses of PAM Signal

DETECTION
1. Give PAM Signal to the detection circuit
2. Observe the Amplitude and Frequency of Message signal

EQUIPMENTS REQUIRED
1. CRO
2. Signal Generators
3. Power Supply

4. GENERATION AND DETECTION OF BFSK
AIM: To study the concept of BFSK Generation and its Detection

OBJECTIVE
1. To study BFSK Concept for the given analog modulating Signal.
2. To Study the retrieved Modulating Signal from the BFSK Signal.

EXERCISE

MODULATION
1. Construct BFSK Circuit using discrete components
2. Using Signal Generators, Give Message input Pulse Carrier to the circuit
3. Observe the amplitude and difference frequencies of output pulse train

DETECTION
1. Construct a Detection Circuit
2. Give BFSK Signal to the circuit and observe the amplitude and frequency of output

EQUIPMENTS REQUIRED
1. CRO
2. Signal Generators
3. Power supply

5. GENERATION OF STANDARD TEST INPUTS USING SIMULATE PACKAGE

AIM:
To generate different signals (Signals and Sequences) Using MATLAB

OBJECTIVE:
1. To Generate Signals (Sine Wave, Exponential Wave, Sawtooth Wave)
2. To generate sequences (Impulse sequence, Step Sequence)

EXERCISE
1. Generate Signals using Sine, Exponential, Step Functions
2. Generate Sequences such as Impulse Sequences, Step Sequences using Expression Ex. Cos (2*pi*t)

SOFTWARE REQUIRED:
MATLAB

6. ANALYSIS OF LINEAR SYSTEM [WITH CONVOLUTION AND DECONVOLUTION OPERATION]

AIM:
To Study Linear Convolution of two sequences

OBJECTIVE:
1. To analyze Convolution and deconvolution of two sequences using CONV, DECONV Functions

EXERCISE:
1. Generate Convolved Sequences using CONV function
2. Generate Convolved output using FFT.

7. FIR FILTER DESIGN

AIM:
To Design FIR Low Pass, High Pass, Band Pass filters using MATLAB

OBJECTIVE:
1. To design FIR Low Pass, High Pass, Band Pass filters using Windowing Technique (Rectangular Window)

EXERCISE
1. Get the Passband and Stopband ripples
2. Get the Passband and Stopband edge frequencies
3. Get the sampling Frequency
4. Calculate the order of the filter
5. Find the window coefficients
6. Draw the magnitude and phase responses

**MATLAB FUNCTIONS**
- fir1, freqz

8. IIR Filter Design (any one technique)

**AIM:**
- To design a IIR Filter

**OBJECTIVE**
- To design Butterworth IIR Filter using MATLAB

**EXERCISE:**
1. Get the Passband and Stopband ripples
2. Get the Passband and Stopband edge Frequencies
3. Get the sampling Frequency
4. Calculate the order of the filter
5. Find the filter coefficients
6. Draw the magnitude and phase responses

**MATLAB FUNCTIONS**
- buttord, butter, freqz

9. IMPLEMENTATION OF FFT ALGORITHM

**AIM:**
- To find out FFT of the given sequence

**OBJECTIVE**
1. To find out FFT of the given Sequence using FFT function

**EXERCISE**
1. Find out FFT of the sequence using FFT function

**MATLAB FUNCTION**
- FFT

10. IMPLEMENTATION OF INTERPOLATION AND DECIMATION FUNCTION

**AIM:**
- To implementation of interpolate and decimate the given Signal

**OBJECTIVE**
- To interpolate and decimate the given signal

**EXERCISE**
Find out interpolation and Decimation of given signal using interpolate and decimate function

**MATLAB FUNCTION**
Interpolate, Decimate
OBJECTIVE

To experimentally verify the process control concepts on the selected process control loops.

1. Operation of interacting and non-interacting systems
2. Responses of different order processes with and without transportation lag
3. Response of on-off controller
4. Response of P+I+D controller
5. Characteristics of control valve with and without positioner
6. Operation of on-off controlled thermal process
7. Closed loop response of flow control loop
8. Closed loop response of level control loop
9. Closed loop response of temperature control loop
10. Closed loop response of pressure control loop
11. Tuning of controllers
12. Study of complex control system (ratio / cascade / feed forward)

TOTAL = 45 PERIODS

1. STUDY OF INTERACTING AND NON-INTERACTING SYSTEMS

AIM
To study the operation of interacting and non-interacting systems

EXERCISE
1. Connect the two tank system (Level process) in series (as non-interacting system)
2. Check whether level in tank is affected due to changes made in the second tank.
3. Connect the two tank system in series (as interfacing as system).
4. Check whether level in tank 1 is affected due to changes made in the second tank.
5. Determine the transfer function of individual and overall system.

EQUIPMENT
1. Two tank system with provision for making them as interfacing and non-interfacing. – 1 No
2. Level transmitters – 1 No
3. Recorder – 1 No

2. RESPONSE OF DIFFERENT ORDER PROCESSES WITH AND WITHOUT TRANSPORTATION DELAY
AIM
To determine the transient response of a first order process with and without transportation delay and second order process with and without transportation delay to step change in input.

EXERCISE
1. Record the transient response to a step change of first order process and second order process (Level or thermal (or) any process) with and without transportation lag.
2. Calculate the process gain, time constant and dead time of the process from the step response.

EQUIPMENT
1. Two tank system with provision for transportation delay (Non – interacting process)
2. Level transmitter – 1 No
3. Recorder – 1 No

3. RESPONSE OF P+I+D CONTROLLER

AIM
To investigate the operation of an electronic controllers with P, P+I and P+I+D action.

EXERCISE
1. Plot the response of P, P+I, P+D and P+I+D controllers to step and ramp inputs.
2. Determine the calibration of the proportional, Integral and derivative adjustments.

EQUIPMENT
1. Electronic PID controller – 1 No
2. Source for generating step and ramp inputs – 1 No
3. Recorder – 1 No
4. Digital Multimeter – 1 No

4. CHARACTERISTICS OF CONTROL VALVE WITH AND WITHOUT VALVE POSITIONER

AIM
To determine the flow – lift characteristics (Internet / Installed) of a control valve equipped with and without valve positioner.

EXERCISE
1. Plot the flow – lift characteristics of the given valve without positioner keeping
   (i) Constant $\Delta P$
   (ii) Variable $\Delta P$
2. Compute the valve gain at different operating points.
3. Plot the flow – lift characteristics of the given with positioner keeping.
   i. Constant $\Delta P$
   ii. Variable $\Delta P$
4. Compute the valve gain at different operating points.

EQUIPMENT
1. Control valve trainer (with position for varying $\Delta P$ across the valve) - 1 No
2. Flowmeter - 1 No
5. **CLOSED LOOP RESPONSE OF FLOW CONTROL LOOP**

**AIM**
To obtain the closed loop response of flow control loop for servo and regulator operation.

**EXERCISE**
1. Closed – loop connection is made in the flow process station.
2. The flow controller (P+I) is tuned using any one of the tuning techniques.
3. The response of the control loop is obtained for changes in the set point.
4. The response of the control loop is obtained for changes in the load variable.
5. The step 3 and 4 are repeated for different controller modes and settings.

**EQUIPMENT**
1. Flow process station with all accessories - 1 No
2. Analog / Digital PID controller - 1 No
3. Recorder - 1 No

6. **CLOSED LOOP RESPONSE OF LEVEL CONTROL LOOP**

**AIM**
To obtain the closed loop response of level control loop for servo and regulator operation.

**EXERCISE**
1. Closed loop connection is made in the level process station.
2. The level controller (P+I) is tuned using any one of the tuning techniques.
3. The response of the control loop is obtained for changes in the set point.
4. The response of the control loop is obtained for changes in the load variable.
5. The step 3 and step 4 are repeated for different controller modes and settings.

**EQUIPMENT**
1. Level process station with all accessories - 1 No
2. Analog / Digital PID controller - 1 No
3. Recorder - 1 No

7. **CLOSED LOOP RESPONSE OF TEMPERATURE CONTROL LOOP**

**AIM**
To obtain the closed loop response of temperature control loop for servo and regulator operation.

**EXERCISE**
1. Closed-loop connection is made in the temperature process station.
2. The temperature controller (P+I+D) is tuned using any one of the tuning techniques.
3. The response of the control loop is obtained for changes in the set point.
4. The response of the control loop is obtained for changes in the load variable.
5. The step 3 and 4 are repeated for different controller modes and settings.

**EQUIPMENT**
1. Temperature process station with all accessories - 1 No
2. Analog / Digital PID controller - 1 No
3. Recorder - 1 No

8. **CLOSED LOOP RESPONSE OF PRESSURE CONTROL LOOP**
AIM
To obtain the closed loop response of pressure control loop for servo and regulator operation.

EXERCISE
1. Closed – loop connection is made in the pressure process station.
2. The pressure controller (P+I) is tuned using any one of the tuning techniques.
3. The response of the control loop is obtained for changes in the set point.
4. The response of the control loop is obtained for changes in the load variable.
5. The step 3 and 4 are repeated for different controller modes and settings.

EQUIPMENT
1. Pressure process station with all accessories - 1 No
2. Analog / Digital PID controller - 1 No
3. Recorder - 1 No

9. TUNING OF PID CONTROLLER
AIM
To determine the controller settings of a given process using two popular tuning techniques.

EXERCISE
1. Plot the process reaction curve for the given process (higher order process)
2. From the reaction curve, calculate the process gain, time constant and dead time using the above process parameters calculate the $K_c$, $T_i$, $T_d$ valves using the appropriate thumb rules.
3. Conduct the closed loop test as per Z-N method [continuous cycling method] and determine the ultimate gain ($K_u$) and ultimate period ($P_u$), calculate the controller parameters ($K_c$, $T_i$, $T_d$) using Ziegler Nichol’s closed loop tuning approach.

EQUIPMENT
1. Process control trainer / real time process (level / thermal process) - 1 No
2. Recorder - 1 No
3. PID controller - 1 No

10. RESPONSE OF CASCADE CONTROL SYSTEM
AIM
To determine the closed loop performance of a cascade control system and compare it with that of conventional control system.

EXERCISE
1. The secondary and primary controllers are tuned using any one of the tuning techniques.
2. Obtain the closed loop response of cascade control system with the load variable entering the inner loop.
3. Obtain the closed loop regulating response with conventional control system.
4. Compare the performance of conventional control system and cascade control system internal of peak overshoot, setting time, I&E etc

EQUIPMENT
1. Cascade control system with flow as inner variable and liquid level as outer variable with following accessories.
2. Level transmitter - 1 No
3. Flow transmitter - 1 No
4. Control valve - 1 No
5. Analog / Digital PID controller - 1 No
6. Recorder - 1 No

EI2357  VIRTUAL INSTRUMENTATION LAB  L T P C  0 0 3 2

1. Creating Virtual Instrumentation for simple applications
2. Programming exercises for loops and charts
3. Programming exercises for clusters and graphs.
4. Programming exercises on case and sequence structures, file Input / Output.
5. Data acquisition through Virtual Instrumentation.
6. Developing voltmeter using DAQ cards.
7. Developing signal generator using DAQ cards.
8. Simulating reactor control using Virtual Instrumentation.
9. Real time temperature control using Virtual Instrumentation.
10. Real time sequential control of any batch process.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>SL.NO.</th>
<th>SPECIFICATIONS</th>
<th>QTY</th>
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<tbody>
<tr>
<td>1.</td>
<td>Laboratory Virtual Instrumentation Engineering Software Package</td>
<td>30 users</td>
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<td>2.</td>
<td>PCI /USB DAQ Boards</td>
<td>2 Nos.</td>
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<td>3.</td>
<td>Temperature Control Test Rig using Laboratory Virtual Instrumentation Engineering Software Package and Hardware Models</td>
<td>1 No.</td>
</tr>
<tr>
<td>4.</td>
<td>Sequential Control using Laboratory Virtual Instrumentation Engineering Software Package and Hardware Models.</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

EI2401  INDUSTRIAL DATA NETWORKS  L T P C  3 0 0 3

AIM
To learn more about the industrial data communication protocols.

OBJECTIVES:

i. To understand basic data networks
ii. To learn the basic of inter networking
iii. To have adequate knowledge in various communication protocol.
iv. To study industrial data communication.
UNIT I DATA NETWORK FUNDAMENTALS

UNIT II INTER NETWORKING

UNIT III HART AND FIELDBUS

UNIT IV MODBUS AND PROFIBUS PA/DP/FMS AND FF
MODBUS protocol structure – function codes – troubleshooting

UNIT V INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION
Industrial Ethernet : Introduction – 10Mbps Ethernet, 100Mbps Ethernet.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

EI2402 LOGIC AND DISTRIBUTED CONTROL SYSTEM
AIM
To illustrate the concept of programmable logic controllers and distributed control system.

OBJECTIVES
i. To give an introductory knowledge about PLC and the programming languages.
ii. To give adequate knowledge about application of PLC.
iii. To give basic knowledge in the architecture and local control unit of distributed control system.

iv. To give adequate information in the interfaces used in DCS.

v. To give basic knowledge about Computer Controlled Systems.

UNIT I PROGRAMMABLE LOGIC CONTROLLER

UNIT II APPLICATIONS OF PLC
Instructions in PLC – Program control instructions, math instructions, sequencer instructions – Use of PC as PLC – Application of PLC – Case study of bottle filling system.

UNIT III COMPUTER CONTROLLED SYSTEMS

UNIT IV DISTRIBUTED CONTROL SYSTEM
DCS - Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities.

UNIT V INTERFACES IN DCS
Operator interfaces - Low level and high level operator interfaces – Operator displays - Engineering interfaces – Low level and high level engineering interfaces – General purpose computers in DCS.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

EI2403 VLSI DESIGN

AIM
To introduce the technology and concepts of VLSI.

OBJECTIVES
To introduce MOS theory / Manufacturing Technology.
To study inverter / counter logic / stick / machine diagram / sequential circuits.
To study address / memory / arithmetic circuits.
To introduce FPGA architecture / principles / system design.
To get familiarised with VHDL programming behavioural/Structural/concurrent/ process.
UNIT I   BASIC MOS TRANSISTOR  9
Enhancement mode and Depletion mode – Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology – NMOS transistor current equation – Second order effects – MOS Transistor Model.

UNIT II   NMOS AND CMOS INVERTER AND GATES  9
NMOS and CMOS inverter – Determination of pull up / pull down ratios – Stick diagram – lambda based rules – Super buffers – BiCMOS & steering logic.

UNIT III   SUB-SYSTEM DESIGN AND LAYOUT  9

UNIT IV   DESIGN OF COMBINATIONAL ELEMENTS AND REGULAR ARRAY LOGIC  9
NMOS PLA – Programmable Logic Devices - Finite State Machine PLA – Introduction to FPGA.

UNIT V   VHDL PROGRAMMING  9

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

EI2404   FIBRE OPTICS AND LASER INSTRUMENTS  L T P C
3 0 0 3

AIM:
To contribute to the knowledge of Fibre optics and Laser Instrumentation and its Industrial and Medical Application.

OBJECTIVES:
1. To expose the students to the basic concepts of optical fibres and their properties.
2. To provide adequate knowledge about the Industrial applications of optical fibres.
3. To expose the students to the Laser fundamentals.
4. To provide adequate knowledge about Industrial application of lasers.
5. To provide adequate knowledge about holography and Medical applications of Lasers.
UNIT I  OPTICAL FIBRES AND THEIR PROPERTIES  9

UNIT II  INDUSTRIAL APPLICATION OF OPTICAL FIBRES  9

UNIT III  LASER FUNDAMENTALS  9

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

UNIT V  HOLOGRAM AND MEDICAL APPLICATIONS  9

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

EI2405  VLSI LABORATORY  L T P C
0 0 3 2

OBJECTIVE
To study synthesis, simulation and schematic of various digital combinational circuits using FPGA on Xilinx simulator.

1. Study of Synthesis tools
   • Half and full adder.
   • Decoder – 2 x 4, 3 x 8
   • Priority encoder.
   • Ripple adder.
• 4 – Bit ripple counter.
• Code conversion.
All the above synthesis in three modeling styles - data flow, structural and behavioral

2. Study of Simulation using tools
• Half adder.
• Multiplexer – 2 x 1, 4 x 1
• Demultiplexer – 1 x 2, 1 x 4
All the above synthesis in three modeling styles - data flow, structural and behavioral

3. Study of Simulation using tools
• Flipflop – D, T
• Priority encoder.
• Ripple adder.
• 4 – Bit ripple counter.
All the above synthesis in three modeling styles - data flow, structural and behavioral

4. Study of development tool for FPGAs for schematic entry and verilog
• Full adder, half adder.
• Demultiplexer – 1 x 2, 1 x 4.

5. Design and simulation of pipelined serial and parallel adder to add/ subtract 8 number of size, 12 bits each in 2’s complement.

6. Place and Root and Back annotation for FPGAs

7. Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2’s complement.

8. Study of FPGA board and testing on board LEDs and switches using verilog code.

9. Design a Realtime Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.) and demonstrate its working on the FPGA board.
• to display binary number on the FPGA.

10. Design of traffic light controller using verilog tools.
• Movement of vehicles in any direction or pedestrian in any direction.

DETAILED SYLLABUS

1. STUDY OF SYNTHESIS TOOLS
   Adder/encoder/decoder/counter/ converter.

AIM
To study the synthesis of various combinational circuits on Xilinx(ISE9.1) tool using Hardware Descriptive Language(HDL).

EXERCISE
Write a HDL program in three modeling styles - data flow, structural and behavioral.
using verilog and perform the synthesis of following combinational circuits
• Half and full adder.
• Decoder – 2 x 4, 3 x 8
• Priority encoder.
• Ripple adder.
• 4 – Bit ripple counter.
• Code conversion.

2. STUDY OF SIMULATION USING TOOLS
Adder/encoder/decoder/counter/multiplexer.

AIM
To study the simulation of various combinational circuits on Xilinx(ISE9.1) tool using Hardware Descriptive Language(HDL).

EXERCISE
Write a HDL program in three modeling styles - data flow, structural and behavioral. using verilog and simulate the following combinational circuits
• Half adder.
• Multiplexer – 2 x 1, 4 x 1
• Demultiplexer – 1 x 2, 1 x 4

3. STUDY OF SIMULATION USING TOOLS
Adder/encoder/decoder/counter/multiplexer.

AIM
To study the simulation of various combinational circuits on Xilinx(ISE9.1) tool using Hardware Descriptive Language(HDL).

EXERCISE
Write a HDL program in three modeling styles - data flow, structural and behavioral. using verilog and simulate the following combinational circuits
• Flipflop – D, T
• Priority encoder.
• Ripple adder.
• 4– Bit ripple counter

4. STUDY OF DEVELOPMENT TOOL FOR FPGAS FOR SCHEMATIC ENTRY AND VERILOG.
Adder /demultiplexer.

AIM
To draw the schematic and generate the verilog code.

EXERCISE
Draw the schematic using Xilinx(ISE9.1) tool and generate the verilog code for the following digital circuits and observe the simulated output
  a. Full adder, half adder.
  b. Demultiplexer – 1 x 2, 1 x 4.
5. DESIGN AND SIMULATION OF PIPELINED SERIAL AND PARALLEL ADDER TO ADD/SUBTRACT 8 NUMBER OF SIZE, 12 BITS EACH IN 2’S COMPLEMENT.

AIM
To design and simulate the pipelined 12 bit serial/parallel adder/subtractor.

EXERCISE
1. Write a verilog code to add/subtract 8 numbers of 12 bits each and verify the result after addition of every 2 numbers
2. Verify the result after adding all 8 numbers and simulate the output.

6. PLACE AND ROOT AND BACK ANNOTATION FOR FPGAS

AIM
To calculate the propagation delay produced by back annotated circuit from the already software designed circuit.

EXERCISE
Write the verilog code and develop the following combinational circuit using s/w in the design layout that is produced. Make the required changes in the rooting as per the required propagation delay.
1. Multiplexer/Demultiplexer
2. Encoder/Decoder.

7. DESIGN AND SIMULATION OF BACK ANNOTATED VERILOG FILES FOR MULTIPLYING TWO SIGNED, 8 BIT NUMBERS IN 2’S COMPLEMENT. DESIGN MUST BE PIPELINED AND COMPLETELY RTL COMPLIANT

AIM
To design and simulate back annotated circuit using verilog code.

EXERCISE
Write the verilog code and develop the following combinational circuit using s/w in the design layout that is produced.
1. Pipelined structure of multiplication of two signed 8 bit numbers.
2. View RTL model

8. STUDY OF FPGA BOARD AND TESTING ON BOARD LEDS AND SWITCHES USING VERILOG CODE.

AIM
To study the FPGA board and testing on-board LED’s and switches using ISE9.1 simulator.
EXERCISE
- Write the verilog code in three modeling styles - data flow, structural and behavioral to accept the input from switches and display the output in LEDs.
- Synthesis the program and view RTL model.
- Download the program into FPGA for testing on board LED's and switches.

9. Design a real-time clock (2 digits, 7 segments led displays each for hrs., mts, and secs.) and demonstrate its working on the FPGA board. An expansion card is required for the displays.
   c. to display binary number on the FPGA.

   AIM
   To design and test the real-time clock on FPGA board.

EXERCISE
- Write the verilog code to display hrs, mts and secs.
- Synthesis, simulate and download the program on the RTC board.

10. Design of traffic light controller using verilog tools.
    d. Movement of vehicles in any direction or pedestrian in any direction.

   AIM
   To design and test the traffic light controller using FPGA board.

EXERCISE
- Write the verilog code to implement different sequences of traffic light.
- Synthesis, simulate and download the program on the traffic light controller board.

**REQUIREMENT FOR A BATCH OF 30 STUDENTS**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the Equipments</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Software – Simulation, Synthesis, back annotation, place &amp; route</strong> Xilinx ISE (latest version)</td>
<td>5 User License (minimum)</td>
</tr>
<tr>
<td>2.</td>
<td>Spartan 2E boards</td>
<td>5 Nos.</td>
</tr>
<tr>
<td>3.</td>
<td>Spartan 3 AN boards</td>
<td>1 No.</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Add – on boards</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Real - time clock</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>2. Traffic light control</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>3. LED displays with switches</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>4. I/O boards</td>
<td>1 No.</td>
</tr>
<tr>
<td>5.</td>
<td>Multimeter</td>
<td>2 Nos.</td>
</tr>
</tbody>
</table>
OBJECTIVE

To have adequate knowledge in design of various signal conditioning circuits.

1. Design of Instrumentation amplifier.
2. Design of active filters.
3. Design of regulated power supply and design of V/I and I/V converters.
5. Design of signal conditioning circuit for strain gauge and RTD.
6. Design of orifice plate and rotameter.
7. Control valve sizing.
8. Design of PID controller (using operational amplifier and microprocessor)
10. Preparation of documentation of instrumentation project and project scheduling (process flow sheet, instrument index sheet and instrument specifications sheet, job scheduling, installation procedures and safety regulations).

TOTAL : 45 PERIODS

DETAILED SYLLABUS

DESIGN OF INSTRUMENTATION AMPLIFIER

AIM
To design an instrumentation amplifier based on the three operational amplifier configuration with a differential gain of 100.

EXERCISE
1. Develop the instrumentation amplifier with differential gain of 100 and draw the input Vs output characteristics of the three operational amplifier based instrumentation amplifier and make a comment on the response.
2. Compare the performance characteristics of Instrumentation amplifiers with commercial Monolithic Instrumentation amplifier.

EQUIPMENT
1. Dual power supply – 1 No
2. Digital Multimeters – 1 No
3. Resistors – 10 No
4. Operational Amplifiers – 4 No
5. Any commercial Monolithic Instrumentation amplifier – 2 No

1. DESIGN OF ACTIVE FILTERS

AIM
To design an active first order / second order Butterworth type Low – Pass / High Pass / Band-pass filter with the following specifications.

Low pass filter : Cut – off frequency : 1 KHz
High pass filter : Cut – off frequency : 1 KHz
Band pass filter : Cut off frequency : 1 KHz < f_c < 5 KHz
EXERCISE

1. Develop an active Butterworth first order (or) second order low pass and / or high – pass, band pass filter and determine experimentally the frequency response.

EQUIPMENT

1. Dual power supply - 1 No
2. Operational amplifiers - 2 Nos
3. Resistors - 10 Nos
4. Capacitors - 10 Nos
5. Signal generator - 1 No
6. C.R.O - No

3. DESIGN OF REGULATED POWER SUPPLY AND DESIGN OF V/I AND I/V CONVERTERS

(a) AIM:-
To Design a Regulated Power Supply.

EQUIPMENT

1. Diodes IN4007
2. 100 μF, 10 μF
3. IC 7805
4. Potentiometer
5. Ammeter and Voltmeter

EXERCISE

LINE REGULATION

1. Varying the Input Voltage (0 -15)V.
2. Note down the output voltage

LOAD REGULATION

1. Connect a variable Potentiometer across the output of the RPS.
2. Vary the potentiometer and note down the corresponding output current and voltage.

(b) AIM:-
To design a voltage to current converter and a current to voltage converter and verify the characteristics experimentally.

OBJECTIVES

1. To design a voltage to current converter (grounded load) with the following specification
   Input voltage range : (0 – 5) V
   Output current range : (4-20) mA (should be independent of load)
2. To design a current to voltage converter with the following specification
   Input current range : (4-20) mA
   Output voltage range : (0-5) V
EXERCISE

1. Determine experimentally the characteristics of voltage and current converter and plot output current versus input voltage and comment on the response.
2. Determine experimentally the characteristics of current to voltage converter and plot output voltage versus input current and comment on the response.

EQUIPMENT

1. Resistors - 10 No
2. Operational amplifiers - 5 No
3. Transistor (NPN / PNP) - 2 No
4. Dual power supply - 1 No
5. Digital Multimeters - 2 No
6. Loop analyzer - 1 No

3. DESIGN OF LINEARIZING CIRCUIT AND COLD-JUNCTION COMPENSATION CIRCUIT FOR THERMOCOUPLE

AIM
To design a cold – junction compensation circuit for thermocouple.

OBJECTIVE
To design a automatic reference correction circuit for thermocouple.(A solid – state temperature sensor or RTD can be used for the cold function measurement)

EXERCISE

1. Develop the circuit for reference junction compensation.
2. Keep the hot junction temperature at say 400°C.
3. Vary the cold – junction temperature from 30 – 90°C and observe the output voltage for with and without cold-junction compensation.
4. Plot the output voltage versus cold-junction temperature and comment on the response.

EQUIPMENT

1. Thermocouple - 1 Nos
2. Operational amplifier - 3 Nos
4. AD – 590 or RTD - 1 Nos
5. Resistors - 10 Nos
6. Dual power supply - 1 No
7. Multimeters - 1 No

5. DESIGN OF SIGNAL CONDITIONING CIRCUIT FOR STRAIN GAUGES AND RTD

(a) Aim:
To design Signal Conditioning Circuit for Strain Gauge.

Specification as follows
1. Input Range 0 to 1 Kg
2. Output Voltage 0 to 5 V
3. Device -Bourdon Strain Gauge (350 Ohm)

Equipment
1. Bonded Strain Gauge
2. Loads (100 gm to 1 Kg)
3. Operational Amplifier
4. RPS
5. Resistors

**Exercise:**
Develop Signal Conditioning Circuits for different loads and plot output voltage versus Load. Comment on Linearity

(b) **Aim**
To design a signal conditioning circuit to RTD. The specification are as follows
- Temperature Range : 30°C – 100°C (Approximately)
- Output voltage : 0 – 5 V DC
- Sensor : RTD (Pt 100)
- Current through RTD : Not to exceed 10mA

**Equipment**
1. RTD (Pt 100) - 1 No
2. Resistors - ?
3. Operational amplifiers - 4 Nos
4. Dual power supply - 1 No
5. Temperature bath - 1 No
6. Multimeter - 1 No
7. Trim Pot - 3 Nos

**Exercise**
1. Develop the signal conditioning circuit and plot the output voltage versus temperature and comment on the linearity.

7. **DESIGN OF ORIFICE PLATE AND ROTAMETER**

**Design of Orifice Plate**

**Aim:**
To Design an Orifice Plate for the given Specification.

**Equipment**
1. Pump and Reservoir
2. Pipeline with Orifice plate
3. Collecting Tank

**Exercise:**
1. Convert Electrical Signal to Differential Pressure
2. Determine the interval data
3. Calculate D/d
4. Calculate sizing factor

**Design of Rotameter**

**Aim:**
To Design a Rotameter for given Specification

**Equipment**
1. Pump and Reservoir
2. Pipeline with Orifice plate
3. Collecting Tank

**Exercise**
1. Switch On the Motor
2. Adjust the Rotameter to read the required flow rate.
3. Start the Timer
4. After 5 Min Note the Head in the tank.
5. Drain the tank.
6. Repeat the Procedure and Calculate Cd in each case

8. Control Valve Sizing
   **Aim:**
   To design a Control Valve and Study the flow lift Characteristics
   **Equipment:**
   1. Linear Control Valve
   2. On/OFF Control Valve
   3. Air Regulator
   4. Rotameter
   5. Pump
   **Exercise**
   1. By varying the inlet pressure note down the stem moment value and the flow rate.
   2. Draw the Graph for pressure Vs Flow rate, Stem Moment Vs Flow rate

9. Design of PID Controller

**Design of PID Controller using Op-Amp**
   **Aim:**
   To the study the response of P, PI, PD, PID Controllers using Op-Amp
   **Equipment**
   1. Signal Generator
   2. IC 741
   3. Resistors and Capacitors
   4. CRO
   5. Bread Board
   **Exercise**
   1. Design a Analog PID Controller for various values of Kp, Ki, Kd
   2. Apply the error Signal from signal Generator (Square, Sine)
   3. Note down the response from the CRO.

**Design of PID Controller using Microprocessor**
   **Aim:**
   To the study the response of P, PI, PD, PID Controllers using Microprocessor.
   **Equipment**
   1. Signal Generator
   2. Microprocessor based kit with ADC and DAC Section
   3. CRO
   **Exercise**
   1. Enter the PID Algorithm in Microprocessor
   2. Give the Error Signal to ADC Section of Microprocessor Kit.
   3. Execute the Microprocessor Program
   4. Note down the output response of PID Controller in the DAC Section Microprocessor Kit
AIM:
To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E Degree Course through periodic exercise.

MG2351 PRINCIPLES OF MANAGEMENT

UNIT I OVERVIEW OF MANAGEMENT

UNIT II PLANNING

UNIT III ORGANIZING

UNIT IV DIRECTING
Creativity and Innovation - Motivation and Satisfaction - Motivation Theories Leadership - Leadership theories - Communication - Hurdles to effective communication - Organization Culture - Elements and types of culture - Managing cultural diversity.

UNIT V CONTROLLING
Process of controlling - Types of control - Budgetary and non-budgetary control techniques - Managing Productivity - Cost Control - Purchase Control - Maintenance Control - Quality Control - Planning operations.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
UNIT I
PROBLEM SOLVING
Introduction – Agents – Problem formulation – uninformed search strategies – heuristics – informed
search strategies – constraint satisfaction

UNIT II
KNOWLEDGE AND REASON
Logical agents – propositional logic – inferences – first-order logic – inference in first-order logic –
forward chaining – backward chaining – resolution

UNIT III
PLANNING
Planning with state-space search – partial-order planning – planning graphs – planning and acting
in the real world

UNIT IV
UNCERTAIN KNOWLEDGE AND REASONING
Uncertainty – review of probability - probabilistic Reasoning – Bayesian networks – inferences in
Bayesian networks – Temporal models – Hidden Markov models

UNIT V
LEARNING
Learning from observation - Inductive learning – Decision trees – Explanation based learning –
Statistical Learning methods - Reinforcement Learning

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
1. David Poole, Alan Mackworth, Randy Goebel, ”Computational Intelligence : a logical

UNIT I
INSTRUCTION SET ARCHITECTURE
Introduction to computer architecture - Review of digital design – Instructions and addressing –
procedures and data – assembly language programs – instruction set variations

UNIT II
ARITHMETIC/LOGIC UNIT
Number representation – design of adders – design of simple ALUs – design of Multipliers and
dividers – design of floating point arithmetic unit

UNIT III
DATA PATH AND CONTROL
Instruction execution steps – control unit synthesis – microprogramming – pipelining – pipeline
performance
UNIT IV  MEMORY SYSTEM
Main Memory concepts – types of memory – cache memory organization – secondary storage –
virtual memory – paging

UNIT V  I/O AND INTERFACES
switching – threads and multithreading

TOTAL : 45 PERIODS

TEXT BOOKS
McGraw Hill, 2002

REFERENCES
Wiley India pvt Ltd, 2007

CS2411  OPERATING SYSTEMS

AIM
To learn the various aspects of operating systems such as process management, memory
management, file systems, and I/O management

UNIT I  PROCESSES AND THREADS
Introduction to operating systems – review of computer organization – operating system structures
concept – Process scheduling – Operations on processes – Cooperating processes – Interprocess
communication – Communication in client-server systems. Case study: IPC in Linux. Threads:
Multi-threading models – Threading issues. Case Study: Pthreads library

UNIT II  PROCESS SCHEDULING AND SYNCHRONIZATION
CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling –
Synchronization: The critical-section problem – Synchronization hardware – Semaphores – Classic
characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance –
Deadlock detection – Recovery from deadlock.
UNIT III  STORAGE MANAGEMENT 9
Memory Management: Background – Swapping – Contiguous memory allocation – Paging –
Segmentation – Segmentation with paging. Virtual Memory: Background – Demand paging –
Process creation – Page replacement – Allocation of frames – Thrashing. Case Study: Memory
management in Linux

UNIT IV  FILE SYSTEMS 9
– Protection. File-System Implementation: Directory implementation – Allocation methods – Free-
space management – efficiency and performance – recovery – log-structured file systems. Case
studies: File system in Linux – file system in Windows XP

UNIT V  I/O SYSTEMS 9
I/O Systems – I/O Hardware – Application I/O interface – kernel I/O subsystem – Streams –

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

CS2070  VISUAL LANGUAGES AND APPLICATIONS L T P C 3 0 0 3

AIM
To study the principles and techniques of windows programming using MFC, procedures,
resources, controls and database programming through the visual languages, Visual C++ and
Visual Basic.

OBJECTIVES
i. To study about the concepts of windows programming models, MFC applications,
drawing with the GDI, getting inputs from Mouse and the Keyboard.
ii. To study the concepts of Menu basics, menu magic and classic controls of the windows
programming using VC++.
iii. To study the concept of Document/View Architecture with single & multiple document
interface, toolbars, status bars and File I/O Serialization.
iv. To study about the integrated development programming event driven programming,
variables, constants, procedures and basic ActiveX controls in visual basic.
v. To understand the database and the database management system, visual data
manager, data bound controls and ADO controls in VB.
UNIT I  FUNDAMENTALS OF WINDOWS AND MFC  9
Drawing the lines – Curves – Ellipse – Polygons and other shapes. GDI pens – Brushes - GDI fonts - Deleting GDI objects and deselecting GDI objects. Getting input from the mouse: Client & Non-client - Area mouse messages - Mouse wheel - Cursor. Getting input from the keyboard: Input focus - Keystroke messages - Virtual key codes - Character & dead key messages.

UNIT II  RESOURCES AND CONTROLS  9
Creating a menu – Loading and displaying a menu – Responding to menu commands – Command ranges - Updating the items in menu, update ranges – Keyboard accelerators. Creating menus programmatically - Modifying menus programmatically - The system menu - Owner draw menus – Cascading menus - Context menus.

UNIT III  DOCUMENT / VIEW ARCHITECTURE  9
Creating & initializing a toolbar - Controlling the toolbar’s visibility – Creating & initializing a status bar - Creating custom status bar panes – Status bar support in appwizard. Opening, closing and creating the files - Reading & Writing – C file derivatives – Serialization basics - Writing serializable classes.

UNIT IV  FUNDAMENTALS OF VISUAL BASIC  10

UNIT V  DATABASE PROGRAMMING WITH VB  8

L = 45   T = 15   TOTAL : 60 PERIODS
TEXT BOOKS:

REFERENCES:

EI2021  POWER PLANT INSTRUMENTATION  L T P C  3 0 0 3

AIM
The course is designed to familiarize the student with the functions and instrumentation available in a modern power generation plant.

OBJECTIVES
i. To provide an overview of different methods of power generation with a particular stress on thermal power generation.
ii. To bring out the various measurements involved in power generation plants.
iii. To provide knowledge about the different types of devices used for analysis.
iv. To impart knowledge about the different types of controls and control loops.
v. To familiarize the student with the methods of monitoring different parameters like speed, vibration of turbines and their control

UNIT I  OVERVIEW OF POWER GENERATION

UNIT II  MEASUREMENTS IN POWER PLANTS
Electrical measurements – current, voltage, power, frequency, power – factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor.

UNIT III  ANALYZERS IN POWER PLANTS

UNIT IV  CONTROL LOOPS IN BOILER
UNIT V  TURBINE – MONITORING AND CONTROL  9
Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil
temperature control – cooling system

TOTAL : 45 PERIODS

TEXT BOOKS:
2. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press,

REFERENCES:
UNIT IV  CONTROL LOOPS IN PETROCHEMICAL INDUSTRY  9
Process control in refinery and petrochemical industry – Control of distillation column – Control of catalytic crackers and pyrolysis unit – Automatic control of polyethylene production – Control of vinyl chloride and PVC production.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

EI2023  MICRO ELECTRO MECHANICAL SYSTEMS  L T P C
3 0 0 3

AIM
The course is designed to familiarize the student with the functions and applications of MEMS.

OBJECTIVES
(i) To study about MEMS and parts of MEMS
(ii) To study the design methodology of MEMS for various mechanics.
(iii) To study about actuators in MEMS.
(iv) To study about MEMS based circuits.
(v) To study about optical and RF based MEMS.

UNIT I  INTRODUCTION TO MEMS  9
MEMS and Microsystems, Miniaturization, Typical products, Micro Sensors, Micro actuation, MEMS with micro actuators, Microaccelerometers and Micro fluidics, MEMS materials, Micro Fabrication

UNIT II  MECHANICS FOR MEMS DESIGN  9
Elasticity, Stress, strain and material properties, Bending of thin plates, Spring configurations, torsional deflection, Mechanical vibration, Resonance, Thermo mechanics – actuators, force and response time, Fracture and thin film mechanics, material, physical vapor deposition (PVD), chemical mechanical polishing (CMP)
UNIT III  ELECTRO STATIC DESIGN  9
Electrostatics: basic theory, electro static instability, Surface tension, gap and finger pull up, Electro static actuators, Comb generators, gap closers, rotary motors, inch worms, Electromagnetic actuators, bistable actuators.

UNIT IV  CIRCUIT AND SYSTEM ISSUES  9
Electronic interfaces, Feed back systems, Noise, Circuit and system issues, Case studies – Capacitive accelerometer, Peizo electric pressure sensor, Thermal sensors, radiation sensors, mechanical sensors, bio-chemical sensors Modeling of MEMS systems, CAD for MEMS.

UNIT V  INTRODUCTION TO OPTICAL AND RF MEMS  9
Optical MEMS, system design basics – Gaussian optics, matrix operations, Resolution, Case studies, MEMS scanners and retinal scanning, display, Digital Micro mirror devices, RF Memes – design basics, case study – Capacitive RF MEMS switch, Performance issues.

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES

GE2023  FUNDAMENTALS OF NANOSCIENCE  L T P C
3 0 0 3

UNIT I  INTRODUCTION  10
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II  PREPARATION METHODS  10
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  5
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

111
UNIT IV  PREPARATION ENVIRONMENTS  10
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  10

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
1. G Timp (Editor), Nanotechnology, AIP press/ Springer, 1999

EC2055  DIGITAL IMAGE PROCESSING  L T P C
3  0  0  3

AIM
To introduce the concept of analyzing the digital image fundamentals and digital image processing.

OBJECTIVES:
 i. To study the digital image fundamentals and its applications.
 ii. To study various filters used in digital image processing.
 iii. To study about the segmentation & representation schemes.
 iv. To study about recognition & interpretation methods.
 v. To study about image compression.

UNIT I  DIGITAL IMAGE FUNDAMENTALS  9
Elements of visual perception, psycho visual model, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical formulation.

UNIT II  IMAGE TRANSFORMS  9
1D DFT, 2D transforms – DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, SVD, Wavelet Transform.
UNIT III IMAGE ENHANCEMENT AND RESTORATION 9
Histogram modification and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median and filters, Homomorphic filtering, Color image enhancement. Image Restoration – degradation model, Inverse filtering – removal of blur, Wiener filtering, Geometric transformations – spatial transformations, Gray-Level interpolation,

UNIT IV IMAGE SEGMENTATION AND RECOGNITION 9
Edge detection. Image segmentation by region growing, region splitting and merging, edge linking.. Image Recognition – Patterns and pattern classes, Matching by minimum distance classifier, Matching by correlation, Image classification using neural network.

UNIT V IMAGE COMPRESSION 9
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Block Truncation Coding. Transform Coding – DCT and Wavelet. JPEG, MPEG. Standards, principles of Context based Compression.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

EC2056 ADVANCED COMMUNICATION ENGINEERING

AIM
To understand the advanced communication engineering concepts.

OBJECTIVES
i. To have a detailed knowledge of various spread spectrum techniques.
ii. To understand the basic principles of mobile communication and bluetooth technology.
iii. To have an exposure towards the high performance communication networks – ATM and ISDN
iv. To understand the operation of Radar and Navigational aids.

UNIT I SPREAD SPECTRUM COMMUNICATION 9
Spread spectrum techniques-spreading techniques-PN sequences-DSSS, RHSS-use of spread spectrum with CDMA
UNIT II MOBILE COMMUNICATION
Basic cellular system-performance criteria-operation of cellular system-cell splitting-interference GSM, GPRS, Blue tooth-the link controller, the link manager, the host controller interface, LLCAP, WLL, Multiple access techniques

UNIT III ATM
ATM's position in OSL model-B-ISDN protocol reference model-ATM functions and layers-ATM signaling principles, TM operation and maintenance-ATM protocol stack: lower layers, fibre based networks and its advantages-ATM physical layer media

UNIT IV ISDN
ISDN standards, ISDN interface and functions-UNI-ISDN protocol architecture, ISDN physical layer, ISDN dataline layer-Network interface

UNIT V RADAR AND NAVIGATIONAL AIDS
Radar block diagram and operation-Radar range equation-Prediction of range performance-Minimum detectable signal-Pulse repetition frequency and range ambiguities-CW and FM CW radar-Synthetic aperature and air surveillance radar-ECCM and bistatic radar

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

EC2057 ADVANCED DIGITAL SIGNAL PROCESSING L T P C 3 0 0 3

[Review of discrete-time signals and systems- DFT and FFT, Z-Transform, Digital Filters is recommended]

AIM To provide adequate knowledge in Random signal processing.

OBJECTIVES
i. Detail study of time averaging , ensamble averaging & study of power spectral density.
ii. Detail study of parametric & non – parametric estimation
iii. Detail study of adaptive filters & its applications
iv. Introduction study of multivariable digital signal processing.
UNIT I  DISCRETE RANDOM SIGNAL PROCESSING  9
Discrete Random Processes- Ensemble averages, stationary processes, Autocorrelation and Auto
covariance matrices. Parseval's Theorem, Wiener-Khintchine Relation- Power Spectral Density-
Periodogram Spectral Factorization, Filtering random processes. Low Pass Filtering of White
Noise. Parameter estimation: Bias and consistency.

UNIT II  SPECTRUM ESTIMATION  9
Estimation of spectra from finite duration signals, Non-Parametric Methods-Correlation Method ,
Periodogram Estimator, Performance Analysis of Estimators -Unbiased, Consistent Estimators-
Modified periodogram, Bartlett and Welch methods, Blackman –Tukey method. Parametric
equations, solutions using Durbin’s algorithm

UNIT III  LINEAR ESTIMATION AND PREDICTION  9
Linear prediction- Forward and backward predictions, Solutions of the Normal equations-
Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and
prediction , FIR Wiener filter and Wiener IIR filters.

UNIT IV  ADAPTIVE FILTERS  9
FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive
algorithm, Normalized LMS. Adaptive channel equalization-Adaptive echo cancellation-Adaptive
noise cancellation- Adaptive recursive filters (IIR).

UNIT V  MULTIRATE DIGITAL SIGNAL PROCESSING  9
Mathematical description of change of sampling rate - Interpolation and Decimation , Decimation
by an integer factor - Interpolation by an integer factor, Sampling rate conversion by a rational
factor, Filter implementation for sampling rate conversion- direct form FIR structures. Polyphase
filter structures, time-variant structures. Multistage implementation of multirate system.

TEXT BOOKS:
1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons,

REFERENCES:
2000.

EE 2023  ROBOTICS AND AUTOMATION  L T P C
3 0 0 3

AIM:
To provide comprehensive knowledge of robotics in the design, analysis and control point of view.
OBJECTIVES
i. To study the various parts of robots and fields of robotics.
ii. To study the various kinematics and inverse kinematics of robots.
iii. To study the Euler, Lagrangian formulation of Robot dynamics.
iv. To study the trajectory planning for robot.
v. To study the control of robots for some specific applications.

UNIT I BASIC CONCEPTS
Definition and origin of robotics – different types of robotics – various generations of robots –
degrees of freedom – Asimov’s laws of robotics – dynamic stabilization of robots.

UNIT II POWER SOURCES AND SENSORS
Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable
speed arrangements – path determination – micro machines in robotics – machine vision – ranging

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS
Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic
manipulator control circuits – end effectors – U various types of grippers – design considerations.

UNIT IV KINEMATICS AND PATH PLANNING
Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill climbing
techniques – robot programming languages

UNIT V CASE STUDIES
Multiple robots – machine interface – robots in manufacturing and non-manufacturing applications –
robot cell design – selection of robot.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:
Prentice Hall of India, New Delhi, 1994.
GE2022 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY SYSTEMS

TOTAL : 45 PERIODS

TEXT BOOK

REFERENCES

GE2025 PROFESSIONAL ETHICS IN ENGINEERING L T P C
(For Affiliated Colleges under R-2008) 3 0 0 3

UNIT I ENGINEERING ETHICS

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study
UNIT III  ENGINEER’S RESPONSIBILITY FOR SAFETY

UNIT IV  RESPONSIBILITIES AND RIGHTS

UNIT V  GLOBAL ISSUES

TOTAL : 45 PERIODS

TEXT BOOKS :

REFERENCES :

IC2401  DIGITAL CONTROL SYSTEM

AIM
To provide sound knowledge on the principles of discrete data control system

OBJECTIVES
i. To study the importance of sample data control system.
ii. To give adequate knowledge about signal processing in digital control.
iii. To study the importance of modeling of discrete systems and stability analysis of discrete data system.
iv. To study the importance of state space representation for discrete data system.
v. To introduce the design concept for digital controllers.
UNIT I COMPUTER CONTROLLED SYSTEM 9

UNIT II SIGNAL PROCESSING IN DIGITAL CONTROL 9
Sampling process – Frequency domain analysis – ideal samples – Shanon’s sampling theorem – generation and solution of process – linear difference equations – data reconstruction process – frequency domain characteristics.

UNIT III DISCRETE SYSTEM MODELLING 9

UNIT IV STATE VARIABLE ANALYSIS OF DIGITAL CONTROL SYSTEMS 9

UNIT V DESIGN OF DIGITAL CONTROL 9
Digital PI, PD and PID Controller – Position and velocity forms – state regulator design – design of state observers – dead beat control by state feed back and dead beat observers.

L = 45 T = 15 TOTAL : 60 PERIODS

TEXT BOOKS:

REFERENCES:

CS2461 APPLIED SOFT COMPUTING L T P C 3 0 0 3

AIM:
To cater the knowledge of Neural Networks, Fuzzy Logic Control, Genetic Algorithm and Evolutionary Programming and their applications for controlling real time systems.

OBJECTIVES:
1. To expose the concepts of feed forward neural networks.
2. To provide adequate knowledge about feed back neural networks.
3. To teach about the concept of fuzziness involved in various systems.
4. To provide adequate knowledge about fuzzy set theory.
5. To expose the ideas of GA and EP in optimization and control.
UNIT I ANN - INTRODUCTION

UNIT II ANN - ARCHITECTURE AND APPLICATIONS

UNIT III FUZZY SYSTEMS

UNIT IV FUZZY LOGIC CONTROL

UNIT V OPTIMIZATION TECHNIQUES

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES: