ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
R - 2009
B.E. (PART TIME) ELECTRONICS AND INSTRUMENTATION ENGINEERING
I - VII SEMESTERS CURRICULA AND SYLLABI

SEMESTER I

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2
# B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING

## LIST OF ELECTIVES

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PTMA2111
APPLIED MATHEMATICS
(Common to all branches of B.E / B.Tech (PT) Programmes)
L T P C
3 0 0 3

UNIT I MATRICES
9
Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of
eigenvalues and eigenvectors – Cayley – Hamilton Theorem – Diagonalization of matrices
- Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of
quadratic forms .

UNIT II FUNCTIONS OF SEVERAL VARIABLES
9
Partial derivatives – Homogeneous functions and Euler’s theorem – Total derivative –
Differentiation of implicit functions – Change of variables – Jacobians – Partial
differentiation of implicit functions – Taylor’s series for functions of two variables - Maxima
and minima of functions of two variables.

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

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

UNIT V LAPLACE TRANSFORMS
9
Existence conditions – Transforms of elementary functions – Basic properties –
Transforms of derivatives and integrals – Initial and Final value theorems – Inverse
transforms – Convolution theorem – Transform of periodic functions – Application to
solution of linear ordinary differential equations with constant coefficients.

TOTAL : 45 PERIODS

TEXT BOOKS
(2007).
(2007).

REFERENCE BOOKS
UNIT I  ULTRASONICS  9

UNIT II  LASERS  9

UNIT III  FIBER OPTICS & APPLICATIONS  9
Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – Double crucible technique of fibre drawing - Splicing, Loss in optical fibre – attenuation, dispersion, bending - Fibre optical communication system (Block diagram) - Light sources - Detectors - Fibre optic sensors – temperature and displacement - Endoscope.

UNIT IV  QUANTUM PHYSICS  9

UNIT V  CRYSTAL PHYSICS  9
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – ‘d’ spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – Polymorphism and allotropy - Crystal defects – point, line and surface defects- Burger vector.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
UNIT I  WATER TREATMENT AND POLLUTION CONTROL  

UNIT II  FUELS  
Classification of fuels-Proximate and ultimate analysis of coal- coke manufacture-Otto Hoffman by product method-cracking-thermal and catalytic (fixed bed and fluidized bed)- petroleum-refining-factions-composition and uses synthetic petrol-fischer drops methods-Bergius process- knocking-octane number and cetane number-Preparation, composition and uses of producer gas, water gas and natural gas. Flue gas analysis- Orsat apparatus- gross and net calorific values- calculation of minimum requirement of air(simple calculations)- Explosive range – spontaneous ignition temperature

UNIT III  THERMODYNAMICS AND SURFACE CHEMISTRY  

UNIT IV  ELECTROCHEMISTRY - CORROSION AND CATALYSIS  

UNIT V  POLYMERS-COMPOSITES AND NANO CHEMISTRY  
Polymers-definition-classification-thermoplastics and thermosetting plastics differences Preparation, properties and uses of polystyrene, bakelite, PET, polyurethane, Teflon, ureaformaldehyde, polycarbonates-Elastomers-Preparation, properties of Buna-S, nitrile, neoprene and butyl rubber, silicon rubber. Composites-FRP. Nanochemistry-introduction to nanochemistry- preparation and properties of nonmaterial-nano rods, nano wires-nanotubes-carbon nanotubes and their applications.

TOTAL : 45 PERIODS

TEXT BOOKS  

REFERENCE BOOKS  
AIM
To introduce the concepts and investigate the behavior of electric circuits by analytical techniques

OBJECTIVE
• To introduce the basic concepts of single phase, three phase and DC Electrical circuits
• To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
• To introduce the methods of circuit analysis using Network theorems

UNIT I BASIC CIRCUIT CONCEPTS

UNIT II TRANSIENT ANALYSIS OF FIRST AND SECOND ORDER CIRCUITS

UNIT III SINUSOIDAL STEADY STATE ANALYSIS
Concept of phasor and complex Impedance / Admittance – Analysis of simple series and parallel circuits – active power, reactive power, apparent power (volt ampere), power factor and energy calculations - concept of complex power – phasor diagram, impedance triangle and power triangle –series and parallel resonance circuits – Q factor, half-power frequencies and bandwidth of resonant circuits.

UNIT IV MULTIDIMENSIONAL CIRCUIT ANALYSIS & NETWORK THEOREMS

UNIT V COUPLED CIRCUITS AND THREE PHASE CIRCUITS

TOTAL : 45 PERIODS
TEXT BOOKS

REFERENCES

PTGE2114 COMPUTER PRACTICE L T P C
0 0 3 2

AIM
To provide hands on experience in Operating system, Application software and ‘C’ programming

OBJECTIVE
At the end of the course, students will be able to have a clear understanding of basic commands used in Operating system
Work in various application softwares like Word, Spreadsheet packages.
Develop programmes in ‘C’.

UNIT I OPERATING SYSTEM AND OFFICE PACKAGES 15

UNIT II C PROGRAMMING 15

UNIT III ADVANCED C PROGRAMMING 15

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCE
AIM:
To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

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

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

UNIT – II Fourier Transform

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

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

UNIT – V Z- Transform and Difference Equations

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
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

UNIT II FET, UJT AND SCR
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
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
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
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.

TOTAL : 45 PERIODS

TEXT BOOKS
REFERENCES

PTEI2253  DIGITAL LOGIC CIRCUITS  LT P C
30 0 3

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

OBJECTIVES
• To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.
• To study implementation of combinational circuits
• To study the design of various synchronous and asynchronous circuits.
• To expose the students to various memory devices.

UNIT I  NUMBER SYSTEMS AND BOOLEAN ALGEBRA  9
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  9

UNIT III  SYNCHRONOUS SEQUENTIAL CIRCUITS  9
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  9
Analysis of asynchronous sequential machines, state assignment, asynchronous Design problem.

UNIT V  MEMORY DEVICES, PROGRAMMABLE LOGIC DEVICES AND LOGIC FAMILIES  9
Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

TOTAL : 45 PERIODS
TEXT BOOKS

REFERENCES

PTEI2201 ELECTRICAL MACHINES LT P C
3 0 0 3

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

UNIT II TRANSFORMERS

UNIT III SYNCHRONOUS MACHINES
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
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

TOTAL: 45 PERIODS
PTGE 2021 ENVIRONMENTAL SCIENCE AND ENGINEERING

L T P C 3 0 0 3

AIM:
To create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional endeavour that they participate.

OBJECTIVE:
- At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

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

Field study of common plants, insects, birds

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

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

TOTAL: 45 PERIODS

TEXT BOOKS
REFERENCES

PTEI2252 TRANSUDER ENGINEERING

AIM
To provide adequate knowledge in sensors and transducers.

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

UNIT I SCIENCE OF MEASUREMENTS AND INSTRUMENTATION OF TRANSUDUCERS

UNIT II CHARACTERISTICS OF TRANSUDUCERS

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

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSUDUCERS
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.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
2000.

PTEE2254 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS L T P C 3 0 0 3

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

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

UNIT I IC FABRICATION
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
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
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.

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

PTEI2251  INDUSTRIAL INSTRUMENTATION – I  L T P C
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  
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
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
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

TEXT BOOKS

REFERENCES

TOTAL : 45 PERIODS
AIM
To provide sound knowledge in the basic concepts of linear control theory and design of control system.

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

UNIT I SYSTEMS AND THEIR REPRESENTATION

UNIT II TIME RESPONSE

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

UNIT IV STABILITY OF CONTROL SYSTEM

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

TOTAL : 45 PERIODS

TEXT BOOKS

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

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 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 gauge and load cell.

**OBJECTIVES**
1. To identify and study the characteristics of strain gauge and load cell.
2. To determine the sensitivity of strain gauge 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 gauge.
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 gauge 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 TRANSDUCERS.

(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 values of unknown resistances.

**EQUIPMENT**
1. Resistors – 1 No
2. Galvanometer – 1 No
3. Regulated Power supply – 1 No
4. Bread board – 1 No
5. Decade resistance box – 1 No
6. Multimeter – 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 $V_s$.

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

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

UNIT I VARIABLE HEAD TYPE FLOWMETERS 9

UNIT II QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS 9

UNIT III ELECTRICAL TYPE FLOW METER 9

UNIT IV LEVEL MEASUREMENT 9

UNIT V MEASUREMENT OF VISCOITY, HUMIDITY AND MOISTURE 9

TOTAL : 45 PERIODS

TEXT BOOKS

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

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

UNIT I INTRODUCTION 9
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 9
Amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver. Frequency division multiplexing. Time Division multiplexing.

UNIT III DIGITAL COMMUNICATION 9
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 9
Data Communication codes, error control, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

UNIT V SATELLITE AND OPTICAL FIBRE COMMUNICATION SYSTEM 9
Introduction to satellite communication, Optical Fiber communication, Television Engineering, Microwave communication and Cellular communication

TOTAL : 45 PERIODS

TEXT BOOKS

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

OBJECTIVES
- To study the Architecture of 8085 & 8086, 8051
- To study the addressing modes & instruction set of 8085 & 8051.
- To introduce the need & use of Interrupt structure 8085 & 8051.
- To develop skill in simple program writing for 8051 & 8085 and applications
- 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   9
Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter – Interfacing with 8085 - A/D and D/A converter interfacing.

UNIT IV  8051 MICRO CONTROLLER   9

UNIT V     MICRO CONTROLLER PROGRAMMING & APPLICATIONS  9
Data Transfer, Manipulation, Control & I/O instructions – Simple programming exercises key board and display interface – Closed loop control of servo motor- stepper motor control - Washing Machine Control.

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
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
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
AVL trees – Binary Heaps – B-Tree – Hashing – Separate chaining – open addressing – Linear probing

UNIT IV GRAPHS

UNIT V ALGORITHM DESIGN AND ANALYSIS

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES
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

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<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Quantity required</th>
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</thead>
<tbody>
<tr>
<td></td>
<td><strong>Hardware Required</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Computers (Pentium-4)</td>
<td>40 Nos with one server</td>
</tr>
<tr>
<td>2.</td>
<td>Dot matrix printer</td>
<td>3 Nos</td>
</tr>
<tr>
<td>3.</td>
<td>Laser Printer</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>4.</td>
<td>UPS (5 KVA)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Software Required</strong></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Turbo C++</td>
<td>40 Nodes</td>
</tr>
<tr>
<td>6.</td>
<td>(Java 2 SDK)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JDK 5.0 update 6 (1.5.0 - Internal Version No.)</td>
<td>40 Nos.</td>
</tr>
</tbody>
</table>
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
- 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.
- To give unique methods of separation of closely similar materials, the most powerful being gas chromatography.
- To study important methods of analysis of industrial gases. Awareness and control of pollution in the environment is of vital importance.
- 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.
- 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

UNIT II  CHROMATOGRAPHY  9

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

TOTAL : 45 PERIODS
TEXT BOOKS
2. R.K. Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999

REFERENCES

PTEI2352 PROCESS CONTROL L T P C
3 0 0 3

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

OBJECTIVES
- To study the basic characteristics of first order and higher order processes.
- To get adequate knowledge about the characteristics of various controller modes and methods of tuning of controller.
- To study about various complex control schemes.
- To study 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
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

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

PTEC2361   DIGITAL SIGNAL PROCESSING  L T P C
3 0 0 3

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, Nyquist 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
UNIT IV DESIGN OF DIGITAL FILTERS 9
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 9
Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial Processors

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

PTEI2304 INDUSTRIAL INSTRUMENTATION LABORATORY L T P C 0 0 3 2

OBJECTIVE
The training gained by the student in this area will be of immerse 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/cm\(^2\) 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/cm\(^2\) 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 fixed 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.

PROCEDURE
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 cark stopper should be installed at the lower and of the tube.
5. The cark 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
   i. Maintain the vacuum pressure in the cylinder and switch on the vacuum pressure transmitter setup.
   ii. Measure the output voltage in Volts for the corresponding vacuum pressure in mbars.
   iii. Vary the vacuum pressure in cylinder and follow the step 2 for different values.
   iv. Draw the graph between output voltage Vs. vacuum pressure in mbars.

EQUIPMENT
   Vacuum pressure setup
   Vacuum pressure transmitter
   Voltmeter

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 empty level to 4mA.
   b) Fill the container with 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 selecting 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 measures 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 wave length:**
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 p^h^- value of Test Solutions**

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

**EXERCISE**
Find the pH values of the test solutions.

**PROCEDURE**
1. Switch on the P_H meter
2. Connect the glass electrode to the P_H-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 pH is < 7 and if alkaline than the pH > 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.

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**PTEI2402**  
**LOGIC AND DISTRIBUTED CONTROL SYSTEM**  
**LTPC 3003**

**AIM**
To illustrate the concept of programmable logic controllers and distributed control system.

**OBJECTIVES**
- To give an introductory knowledge about PLC and the programming languages.
- To give adequate knowledge about application of PLC.
- To give basic knowledge in the architecture and local control unit of distributed control system.
- To give adequate information in the interfaces used in DCS.
- To give basic knowledge about Computer Controlled Systems.

**UNIT I**  
**PROGRAMMABLE LOGIC CONTROLLER**  
UNIT II  APPLICATIONS OF PLC  9
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  9

UNIT IV  DISTRIBUTED CONTROL SYSTEM  9
DCS - Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities.

UNIT V  INTERFACES IN DCS  9
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

PTEI2353 DIGITAL SYSTEM DESIGN

AIM
The course is designed to introduce the fundamental concepts and design of digital system.

OBJECTIVES
- To introduce the most common digital logic families.
- To provide introduction to programmable logic devices such as PLA, PAL, FPGA, CPLD etc.
- To provide introduction to Digital Memories. Such as ROM, RAM, SRAM, etc.
- To discuss case studies on Digital System design.

UNIT I  DIGITAL LOGIC FAMILIES  9
TTL, CMOS, NMOS, Dynamic MOS, ECL, I2L, Operating conditions, Parameters, Interpreting data sheets. Power supply grounding considerations for digital ICs, TTL – to – CMOS Interface, CMOS – to – TTL interface.
UNIT II  PROGRAMMABLE LOGIC DEVICES  9
Programmable logic Arrays, Programmable array logic, Realizing logic function using
Multiplexers, Decoders, ROM, PLA, PAL. Design of sequential Networks using PAL, PLA
– Programable Gate arrays – FPGA – CPLD.

UNIT III  DIGITAL MEMORIES  9
The role of Memory in a system – memory types and terminology – ROM – types of ROM
– RAM – SRAM – DRAM – Expanding word size and capacity – Applications.

UNIT IV  DIGITAL SYSTEM DESIGN CASE STUDIES  9
Multiplexing displays – Frequency counters – Time measurement – Digital voltmeter –
PRBS generator – Interfacing with flash memory.

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
3. Miron Abramonic, Melvin. A. Rrewer, Arthur.D. Friedman,Digital system testing and
testable design, Jaico publishing house.

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

PTCS2364  EMBEDDED SYSTEM  L T P C
3 0 0 3

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
9
Introduction to embedded real time systems – The build process for embedded systems – Embedded system design process-Embedded compurtory 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
AIM
To provide adequate knowledge in digital instruments, display devices and virtual instrumentation.

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

UNIT I  DIGITAL INSTRUMENTS 9
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 9

UNIT III  RS 232 AND RS 485 9

UNIT IV  VIRTUAL INSTRUMENTATION 9
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 9

TOTAL : 45 PERIODS

TEXT BOOKS
**REFERENCES**


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**PTEI2403**

**VLSI DESIGN**

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**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**

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**

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**


**UNIT IV**

**DESIGN OF COMBINATIONAL ELEMENTS AND REGULAR ARRAY LOGIC**

NMOS PLA – Programmable Logic Devices - Finite State Machine PLA – Introduction to FPGA.
UNIT V  VHDL PROGRAMMING  9

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

PTEI2404  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
• To expose the students to the basic concepts of optical fibres and their properties.
• To provide adequate knowledge about the Industrial applications of optical fibres.
• To expose the students to the Laser fundamentals.
• To provide adequate knowledge about Industrial application of lasers.
• 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
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
Holography – Basic principle – Methods – Holographic interferometry and application,
Holography for non-destructive testing – Holographic components – Medical applications
of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumors of
vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

TOTAL : 45 PERIODS

TEXT BOOKS
   India, 1985.
2. J. Wilson and J.F.B. Hawkes, ‘Introduction to Opto Electronics’, Prentice Hall of India,

REFERENCES

PTCS2351 ARTIFICIAL INTELLIGENCE

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 BOOK

REFERENCES

PTCS2071 COMPUTER ARCHITECTURE

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

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
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  9

UNIT II  PROCESS SCHEDULING AND SYNCHRONIZATION  9

UNIT III  STORAGE MANAGEMENT  9

UNIT IV  FILE SYSTEMS  9

UNIT V  I/O SYSTEMS  9

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
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
- To study about the concepts of windows programming models, MFC applications, drawing with the GDI, getting inputs from Mouse and the Keyboard.
- To study the concepts of Menu basics, menu magic and classic controls of the windows programming using VC++.
- To study the concept of Document/View Architecture with single & multiple document interface, toolbars, status bars and File I/O Serialization.
- To study about the integrated development programming event driven programming, variables, constants, procedures and basic ActiveX controls in visual basic.
- 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

UNIT II RESOURCES AND CONTROLS
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. The C button class – C list box class – C static class - The font view application – C edit class – C combo box class – C scrollbar class. Model dialog boxes – Modeless dialog boxes.

UNIT III DOCUMENT / VIEW ARCHITECTURE
UNIT IV  FUNDAMENTALS OF VISUAL BASIC  

UNIT V  DATABASE PROGRAMMING WITH VB  

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

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

OBJECTIVES
- To provide an overview of different methods of power generation with a particular stress on thermal power generation.
- To bring out the various measurements involved in power generation plants.
- To provide knowledge about the different types of devices used for analysis.
- To impart knowledge about the different types of controls and control loops.
- 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  
Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil temperature control – cooling system

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

PTEI2022  INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES  
AIM
To expose the students to the Instrumentation applied in petrochemical industries.

OBJECTIVES
- To expose the students to the basic processing in petroleum industry.
- To provide adequate knowledge about the unit operations.
- To impart knowledge pertaining to the petroleum products and the chemicals obtained from them.
- To provide adequate knowledge about the measurement of various parameters in petrochemical industry.
- To expose the students to the various control loops in Petrochemical Industry.
UNIT I  PETROLEUM PROCESSING  9
Petroleum exploration – Recovery techniques – Oil – Gas separation - Processing wet
gases – Refining of crude oil.

UNIT II  OPERATIONS IN PETROLEUM INDUSTRY  9
Thermal cracking – Catalytic cracking – Catalytic reforming – Polymerisation –
Alkylation – Isomerization – Production of ethylene, acetylene and propylene from
petroleum.

UNIT III  CHEMICALS FROM PETROLEUM PRODUCTS  9
Chemicals from petroleum – Methane derivatives – Acetylene derivatives – Ethylene
derivatives – Propylene derivatives – Other products.

UNIT IV  MEASUREMENTS IN PETROCHEMICAL INDUSTRY  9
Parameters to be measured in refinery and petrochemical industry – Selection and
maintenance of measuring instruments – Intrinsic safety of Instruments.

UNIT V  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

PTEI2023  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
- To study about MEMS and parts of MEMS
- To study the design methodology of MEMS for various mechanics.
- To study about actuators in MEMS.
- To study about MEMS based circuits.
- To study about optical and RF based MEMS.
UNIT I INTRODUCTION TO MEMS
MEMS and Microsystems, Miniaturization, Typical products, Micro Sensors, Micro actuation, MEMS with micro actuators, Micro accelerometers and Micro fluidics, MEMS materials, Micro Fabrication

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

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

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

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

UNIT V CHARACTERISATION TECHNIQUES

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
1. G Timp (Editor), Nanotechnology, AIP press/Springer, 1999
AIM
To introduce the concept of analyzing the digital image fundamentals and digital image processing.

OBJECTIVES
- To study the digital image fundamentals and its applications.
- To study various filters used in digital image processing.
- To study about segmentation & representation schemes.
- To study about recognition & interpretation methods.
- To study about image compression.

UNIT I DIGITAL IMAGE FUNDAMENTALS
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
1D DFT, 2D transforms – DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, SVD, Wavelet Transform.

UNIT III IMAGE ENHANCEMENT AND RESTORATION

UNIT IV IMAGE SEGMENTATION AND RECOGNITION
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
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
AIM
To understand the advanced communication engineering concepts.

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

UNIT I  SPREAD SPECTRUM COMMUNICATION
- Spread spectrum techniques-spread spectrum 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, Bluetooth-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 aperture and air surveillance radar-ECCM and bistatic radar

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES
AIM
To provide adequate knowledge in Random signal processing.

OBJECTIVES
- Detail study of time averaging, ensemble averaging & study of power spectral density.
- Detail study of parametric & non-parametric estimation.
- Detail study of adaptive filters & its applications.
- Introduction study of multivariable digital signal processing.

UNIT I DISCRETE RANDOM SIGNAL PROCESSING

UNIT II SPECTRUM ESTIMATION

UNIT III LINEAR ESTIMATION AND PREDICTION
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

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING
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.

TOTAL : 45 PERIODS

TEXT BOOKS
REFERENCES

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

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

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS

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

TOTAL : 45 PERIODS
TEXT BOOKS

REFERENCES

PTGE2022 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

UNIT I INTRODUCTION 9

UNIT II TQM PRINCIPLES 9
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 9

UNIT IV TQM TOOLS & TECHNIQUES II 9

UNIT V QUALITY SYSTEMS 9

TOTAL : 45 PERIODS

TEXT BOOK
REFERENCES

PTGE2025 PROFESSIONAL ETHICS IN ENGINEERING L T P C
3 0 0 3

UNIT I ENGINEERING ETHICS 9

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9
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 9

UNIT IV RESPONSIBILITIES AND RIGHTS 9

UNIT V GLOBAL ISSUES 9

TOTAL : 45 PERIODS

TEXT BOOKS
REFERENCES

PTIC2401 DIGITAL CONTROL SYSTEM

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

OBJECTIVES
• To study the importance of sample data control system.
• To give adequate knowledge about signal processing in digital control.
• To study the importance of modeling of discrete systems and stability analysis of discrete data system.
• To study the importance of state space representation for discrete data system.
• To introduce the design concept for digital controllers.

UNIT I COMPUTER CONTROLLED SYSTEM

UNIT II SIGNAL PROCESSING IN DIGITAL CONTROL
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

UNIT IV STATE VARIABLE ANALYSIS OF DIGITAL CONTROL SYSTEMS
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 feedback and dead beat
observers.

TOTAL : 45 PERIODS

TEXT BOOKS
1. C.M. Houpis, G.B. Lamont, 'Digital Control Systems—Theory, Hardware, Software',

REFERENCES
   1995.

PTCS2461 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
• To expose the concepts of feed forward neural networks.
• To provide adequate knowledge about feed back neural networks.
• To teach about the concept of fuzziness involved in various systems.
• To provide adequate knowledge about fuzzy set theory.
• To expose the ideas of GA and EP in optimization and control.

UNIT I ANN - INTRODUCTION 9
Introduction – Biological neuron – Artificial neuron – Neuron modeling – Learning rules –
Single layer – Multi layer feed forward network – Back propagation – Learning factors.

UNIT II ANN - ARCHITECTURE AND APPLICATIONS 9
Feedback networks – Discrete time Hopfield networks – Transient response of continuous
time networks – Process modeling using ANN- Neuro controller for inverted pendulum.

UNIT III FUZZY SYSTEMS 9
Classical sets – Fuzzy sets – Fuzzy relations – Fuzzification - Membership functions –
Defuzzification – Methods of defuzzification – Fuzzy rules.

UNIT IV FUZZY LOGIC CONTROL 9
Membership function – Knowledge base – Decision-making logic – Optimisation of
membership function using neural networks – Adaptive fuzzy system- FLC for inverted
pendulum- Home heating system- Introduction to Neuro-fuzzy systems.
UNIT V  OPTIMIZATION TECHNIQUES

TOTAL : 45 PERIODS

TEXT BOOKS

REFERENCES

I'm pursuing B.Tech in electronic instrumentation in final year which course is best to gave a 100% job in core branch pls tell me sir. Hello sir I'm completed my B.E electronics engg. in 2012. But I have a no job bcuz rajasthan have very shoteet of electronics engg. industry then pls suggest to after I'm completed my B.E I have a join short term or long term courses in electronics or M.E pls suggest me… I hope u r solving my problem.
