ANNA UNIVERSITY, CHENNAI

AFFILIATED INSTITUTIONS

R - 2009

B.E. (PART TIME) ELECTRONICS AND INSTRUMENTATION ENGINEERING

I - VII SEMESTERS CURRICULA AND SYLLABI

SEMESTER I

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTMA2111	Applied Mathematics	3	0	0	3
2.	PTPH2111	Applied Physics	3	0	0	3
3.	PTCY2111	Applied Chemistry	3	0	0	3
4.	PTEE2151	Electric Circuit Analysis	3	0	0	3
PRACTICAL						
5.	PTGE2114	Computer Practice	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER II

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTMA2211	Transforms and Partial Differential Equations	3	0	0	3
2.	PTEI2203	Electronic Devices and Circuits	3	0	0	3
3.	PTEI2253	Digital logic Circuits	3	0	0	3
4.	PTEI2201	Electrical Machines	3	0	0	3
5.	PTGE2021	Environmental Science and Engineering	3	0	0	3
		TOTAL	**15**	**0**	**0**	**15**

SEMESTER III

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTEI 2252	Transducer Engineering	3	0	0	3
2.	PTEE 2254	Linear Integrated Circuits and Applications	3	0	0	3
3.	PTEI 2251	Industrial Instrumentation – I	3	0	0	3
4.	PTEE 2253	Control Systems	3	0	0	3
PRACTICAL						
1.	PTEI 2257	Transducers and Measurements Laboratory	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER IV

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTEI2303	Industrial Instrumentation – II	3	0	0	3
2.	PTEC2315	Communication Engineering	3	0	0	3
3.	PTEC2312	Microprocessor and Microcontroller	3	0	0	3
4.	PTEE 2204	Data Structures and Algorithms	3	0	0	3
PRACTICAL						
1.	PTCS2312	Object Oriented Programming Laboratory	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER V

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTEI2302	Analytical Instruments	3	0	0	3
2.	PTEI2352	Process Control	3	0	0	3
3.	PTEC2361	Digital Signal Processing	3	0	0	3
4.	E1	Elective – I	3	0	0	3
PRACTICAL						
1.	PTEI2304	Industrial Instrumentation Laboratory	0	0	3	2
		TOTAL	**12**	**0**	**3**	**14**

SEMESTER VI

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTEI2402	Logic and Distributed Control System	3	0	0	3
2.	PTEI2353	Digital System Design	3	0	0	3
	PTCS2364	Embedded System	3	0	0	3
4.	PTEI2351	Modern Electronic Instrumentation	3	0	0	3
5.	E2	Elective – II	3	0	0	3
		TOTAL	**15**	**0**	**0**	**15**

SEMESTER VII

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	PTEI2403	VLSI Design	3	0	0	3
2.	PTEI2404	Fibre Optics and Laser Instruments	3	0	0	3
2.	E3	Elective – III	3	0	0	3
3.	E4	Elective – IV	3	0	0	3
PRACTICAL						
1.	PTEI2451	Project Work	0	0	12	6
		TOTAL	**12**	**0**	**12**	**18**

B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING

LIST OF ELECTIVES

ELECTIVE I

SL.NO	CODE NO.	COURSE TITLE	L	T	P	C
1.	PTCS2351	Artificial Intelligence	3	0	0	3
2.	PTCS2071	Computer Architecture	3	0	0	3
3.	PTCS2411	Operating Systems	3	0	0	3
4.	PTCS2070	Visual Languages and Applications	3	0	0	3

ELECTIVE II

5.	PTEI2021	Power Plant Instrumentation	3	0	0	3
6.	PTEI2022	Instrumentation in Petrochemical Industries	3	0	0	3
7.	PTEI2023	Micro Electro Mechanical Systems	3	0	0	3
8.	PTGE2023	Fundamentals of NanoScience	3	0	0	3

ELECTIVE III

9.	PTEC2055	Digital Image Processing	3	0	0	3
10.	PTEC2056	Advanced Communication Engineering	3	0	0	3
11.	PTEC2057	Advanced Digital Signal Processing	3	0	0	3
12.	PTEE2023	Robotics and Automation	3	0	0	3

ELECTIVE IV

13.	PTGE2022	Total Quality Management	3	0	0	3
14.	PTGE2025	Professional Ethics In Engineering	3	0	0	3
15.	PTIC2401	Digital Control System	3	0	0	3
16.	PTCS2461	Applied Soft Computing	3	0	0	3

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

1. Grewal B.S., Higher Engineering Mathematics (40th Edition), Khanna Publishers, Delhi (2007).
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill Co. Ltd., New Delhi (2007).

REFERENCE BOOKS

1. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education (2007).
2. Veerarajan, T., Engineering Mathematics (For First Year), Tata McGraw-Hill Pub. Pvt Ltd., New Delhi (2006).

PTPH2111 APPLIED PHYSICS L T P C
3 0 0 3

UNIT I ULTRASONICS 9

Introduction – Production – magnetostriction effect - magnetostriction generatorpiezoelectric effect - piezoelectric generator- Detection of ultrasonic waves properties – Cavitations - Velocity measurement – acoustic grating - Industrial applications – drilling, welding, soldering and cleaning – SONAR - Non Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C –scan displays, Medical applications - Sonograms

UNIT II LASERS 9

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einstein's A and B coefficients - derivation. Types of lasers – He- Ne, CO_2 , Nd-YAG, Semiconductor lasers - homojunction and heterojunction (Qualitative)- Industrial Applications - Lasers in welding, heat treatment and cutting – Medical applications - Holography (construction and reconstruction).

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

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton effect - Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one-dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

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

1. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai, (2008).
2. Arumugam M. ' Engineering Physics', Anuradha Publications, Kumbakonam,(2007)
3. Sankar B.N and Pillai S.O. 'A text book of Engineering Physics', New AgeInternational Publishers, New Delhi, 2007.

REFERENCES

1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi (2003)
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics',S.Chand and company, Ltd., New Delhi, 2005.
3. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007)

PTCY2111 APPLIED CHEMISTRY L T P C
3 0 0 3

UNIT I WATER TREATMENT AND POLLUTION CONTROL 9

Treatment of water –impurities and disadvantages of hard water-Domestic and Industrial treatment - zeolite and ion exchange processes-Portable water-Boiler feed water – conditioning of boiler feed water. Scale and sludge formation –prevention –caustic embrittlement-boiler corrosion–priming and foaming Sewage treatment–Primary, secondary and tertiary treatment–significance of DO, BOD and COD-desalination – reverse osmosis. Control of water,air and land pollution.

UNIT II FUELS 9

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 9

Second law of thermodynamics-entropy and its significance- criteria for spontaneity- free energy-Gibbs, Helmholts and Gibbs-Helmholts equation-applications and problems – Adsorption –types of adsorption- adsorption of gases on solids- adsorption isotherm-Freundlich and Langmuir isotherms-adsorption of solutes from solutions- applications

UNIT IV ELECTROCHEMISTRY - CORROSION AND CATALYSIS 9

Reversible and irreversible cells-electrode potentials-types of electrodes-cell reactions-Nernst equations- electrochemical and galvanic series-fuel cells and solar cellscorrosion-chemical and electrochemical-factors affecting corrosion-sacrifical anodeimpressed current cathodic protection-surface treatment and protective coating- Catalysis – classification-characteristics of catalysis – auto catalysis- enzyme catalysis

UNIT V POLYMERS-COMPOSITES AND NANOCHEMISTY 9

Polymers-definition-classification-thermoplastics and thermosetting plastics differences Preparation, properties and uses of polystyrene, bakelite, PET, polyurethane, Teflon, ureafromaldehyde, polycarbonates-Elastomers-Preparation, properties of Buna-S, nitrile, neoperene and butyl rubber, silicon rubber. Composites-FRP. Nanochemistryintroduction to nanochemistry- preparation and properties of nonmaterial-nano rods, nano wires-nanotubes-carbon nanotubes and their applications.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Dhara S S A text book of Engineering Chemistry, S.Chand & Co Ltd, New Delhi,2002
2. Jain. P.C and Monica Jain, Engineering Chemistry,Dhanpet Rai & Sons, New Delhi 2001

REFERENCE BOOKS

1. Puri B R.,Sharma L R and Madhan S. Pathania, Principles of Physical Chemistry,Shoban Lal Nagin Chand & Co. Jalandar-2000.
2. G.B. Sergeev, Nanochemistry.Elsevier Science, New York,2006
3. V.R.Gowarikar, N.V.Viswanathan and Jayadev Sreedhar, Polymer Science, Wiley Eastern Limited, Madras (2006).

PTEE2151 ELECTRIC CIRCUIT ANALYSIS L T P C
3 0 0 3

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 9

Lumped circuits – circuit elements, ideal sources (independent and dependent), linear passive parameter R, L and C, V-I relationship of circuit elements – Sinusoidal voltage and current : RMS value, form factor – Kirchhoff's laws – analysis of series and parallel circuits – network reduction : voltage and current division, source transformation, star / delta transformation.

UNIT II TRANSIENT ANALYSIS OF FIRST AND SECOND ORDER CIRCUITS 9

Source free response of RL, RC and RLC circuits – forced (step and sinusoidal) response of RL, RC and RLC circuits – Time constant and natural frequency of oscillation – Laplace Transform application to the solution of RL, RC and RLC circuits - initial and final value theorems and their applications – concept of complex frequency – driving point and transfer impedance – poles and zeros of network function.

UNIT III SINUSOIDAL STEADY STATE ANALYSIS 9

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 9

Node-voltage analysis of multi node circuit with current sources – rules for constructing nodal admittance matrix [Y] V = I – Mesh-current analysis of multi node circuits with voltage sources – rules for constructing mesh impedance matrix [Z] for solving matrix equation [Z] I = V – Superposition theorem – Thevenin's theorem – Norton's theorem – Reciprocity theorem – Compensation theorem – Tellegen's Theorem – Millman's theorem – maximum power transfer theorem for variable resistance load, variable impedance load and variable resistance and fixed reactance load.

UNIT V COUPLED CIRCUITS AND THREE PHASE CIRCUITS 9

Coupled circuits : mutual inductance – coefficient of coupling – dot convention – analysis of simple coupled circuits . Three phase circuits : three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads(balanced and unbalanced) – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Van Valkenburg, Network Analysis, Prentice – Hall of India Private limited, New Delhi, 3rd Edition, 1991.
2. Joseph A. Edminister, Mahmood Nahvi, Electric Circuits, Schaum's Series, Tata McGraw-Hill, New Delhi, 2001.

REFERENCES

1. R.C.Dorf, Introduction to Electric Circuits, John Wiley & Sons Inc, New York, Second Edition, 1993.
2. Charles K. Alexender, Mathew N.O.Sadiku, Fundamentals of Electric circuit, McGraw Hill, N.Y, 2003.
3. Wiliam H.Hayt Jr, Jack E.Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002.

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

Operating system Concepts – using windows – File operations – Word Processing – Editing Commands – Preparation of documents – Formatting documents – use of spreadsheet package

UNIT II C PROGRAMMING 15

Simple C Programs – Control Structures – Preprocessor – Input – Output – Storage classes – Arrays – structures – union – Functions – Parameter passing – Recursion.

UNIT III ADVANCED C PROGRAMMING 15

Command Line Arguments – Pointers – Dynamic memory allocation – Linked Lists.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Taxali, PC Software for Windows made Simple, Tata McGraw Hill, 2002.
2. Stephen G. Kochan, Programming in C, Third Edition, Pearson Education, 2007.

REFERENCE

1. Brian W.Kernighan & Dennis M. Ritchie, The 'C' Programming Language, PHI, 2004.

PTMA2211 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
3 0 0 3

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 9

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 9

Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT – III PARTIAL DIFFERENTIAL EQUATIONS 9

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 9

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 9

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

TOTAL: 45 PERIODS

TEXT BOOKS

1. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCES

1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. Ramana, B.V. "Higher Engineering Mathematics" Tata McGraw Hill (2007).
3. Bali, N.P. and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

PTEI2203 ELECTRONIC DEVICES AND CIRCUITS 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 clampers 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

1. Millman and Halkias, "Electronic Devices and Circuits", Tata McGraw– Hill, 2007.
2. Floyd, T.L, "Electronic Devices" 6th Edition, Pearson Education, 2003.
3. Millman and Halkias, "Integrated Electronics", McGraw-Hill, 2004.

REFERENCES

1. Mottershead, A., "Electronic Devices and Circuits an Introduction",Prentice Hall of India, 2003.
2. Boylsted and Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall of India, 6th Edition, 1999.
3. Streetman, B. and Sanjay, B., "Solid State Electronic Devices", Prentice- Hall of India, 5th Edition, 2005.
4. Bell, D.A., "Electronic Devices and Circuits", Prentice Hall of India, 4th Edition, 1999.
5. Millman, J., Prakash Rao., M.S. and Taub, H., "Pulse Digital and Switching Wave Forms", McGraw-Hill, 2007.

PTEI2253 DIGITAL LOGIC CIRCUITS LT P C
3 0 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

Design of Logic gates. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates and multiplexers.

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 SEQUENCTIAL 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

1. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall of India, 2002.
2. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.

REFERENCES

1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.
2. Floyd, 'Digital Fundamentals', 8th edition, Pearson Education, 2003.
3. John F.Wakerly, 'Digital Design Principles and Practice', 3rd edition, Pearson Education, 2002.

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 12

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

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

UNIT III SYNCHRONOUS MACHINES 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

Types of single phase motor –Double revolving field theory – Cross field theory – Capacitor start capacitor run motors – Shaded pole motor – Repulsion type motor – Universal motor – Hysteresis motor - Permanent magnet synchronous motor – Switched reluctance motor – Brushless D.C motor.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Nagrath, I.J., and Kothari, D.P., " Electrical Machines", Tata McGraw - Hill, 1997.
2. Fitzgerald A.E, Kingsley C., Umans, S. and Umans S.D., "Electric Machinery", McGraw- Hill, Singapore, 2000.

REFERENCES

1. Theraja, B.L., "A Text book of Electrical Technology", Vol.II, S.C Chand and Co., New Delhi, 2007.
2. Del Toro, V., "Electrical Engineering Fundamentals", Prentice Hall of India, New Delhi, 1995.
3. Cotton, H., "Advanced Electrical Technology", Sir Isaac Pitman and Sons Ltd., London, 1999.

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 participates.

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 14

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

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

UNIT II ENVIRONMENTAL POLLUTION 8

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

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

UNIT III NATURAL RESOURCES 10

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

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, 2nd edition, Pearson Education, 2004.
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2006.

REFERENCES

1. R.K.Trivedi, “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, “Environmental Encyclopedia”, Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, “Environmental law”, Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, “Environmental Studies-From Crisis to Cure”, Oxford University Press, 2005.

PTEI2252 TRANSDUCER ENGINEERING L T P C
3 0 0 3

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 TRANSDUCERS 9

Units and standards – Calibration methods – Static calibration – Classification of errors – Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers.

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics – Accuracy, precision, resolution, sensitivity, linearity -Dynamic characteristics – Mathematical model of transducer – Zero, I and II order transducers. Response to impulse, step, ramp and sinusoidal inputs.

UNIT III VARIABLE RESISTANCE TRANSDUCERS 9

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

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE RANSDUCERS 9

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

UNIT V OTHER TRANSDUCERS 9

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

1. E.A. Doebelin, 'Measurement Systems – Applications and Design', Tata McGraw Hill, New York, 2000.
2. A.K. Sawhney, 'A course in Electrical & Electronic Measurement and Instrumentation', Dhanpat Rai and Co (P) Ltd., 2004.

REFERENCES

1. D. Patranabis, 'Sensors and Transducers', Prentice Hall of India, 1999.
2. John P. Bentley, 'Principles of Measurement Systems', III Edition, Pearson Education, 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 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.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. (2000)
2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

REFERENCES

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997

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

Electric balance – Different types of load cells – Hydraulic, pneumatic strain gauge-Magneto elastic and Piezo electric load cell – Different methods of torque measurements: strain gauge-Relative angular twist-Speed measurement:-Capacitive tacho-Dragcup type tacho-D.C and A.C tachogenerators – Stroboscope.

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

Thermocouples-Laws of thermocouple –Fabrication of industrial thermocouples –Signal conditioning of thermocouple output-Isothermal block reference junctions – Commercial circuits for cold junction compensation-Response of thermocouple –Special techniques for measuring high temperature using thermocouples – Radiation fundamentals- Radiation methods of temperature measurement –- Total radiation pyrometers-Optical pyrometers-Two colour radiation pyrometers – Fiber optic temperature measurement.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Doebelin, E.O., “Measurement systems Application and Design”, International Student Edition, 5th Edition, McGraw Hill Book Company, 2004.
2. Jone’s Instrument Technology, Vol.2, Butterworth-Heinemann, International Edition, 2003.
3. A.K. Sawhney, ‘A course in Electrical & Electronic Measurements and Instrumentation’, Dhanpath Rai & Co (P) Ltd, 2004.

REFERENCES

1. Liptak, B.G., “Instrumentation Engineers Handbook (Measurement)”, CRC Press, 2005
2. Patranabis,D., “Principles of Industrial Instrumentation”, 2nd Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1999.
3. Holman,P., “Experimental methods for Engineers”, 6th Edition, McGraw Hill Book Company, 2000.
4. Nakra, B.C., and Chaudry, K.K., “Instrumentation measurement and Analysis”, TataMcGraw Hill publishing Company Limited, 2004.

PTEE2253 **CONTROL SYSTEMS** **L T P C**
3 0 0 3

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 9

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE 9

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feed back control.

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 IV 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 V COMPENSATOR DESIGN 9

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

TOTAL : 45 PERIODS

TEXT BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi, 2003.

REFERENCES

1. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.
2. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004
4. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002.

PTEI2257 TRANSDUCERS AND MEASUREMENTS LABORATORY 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.
9. Calibration of Single-phase Energy meter and wattmeter.
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 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 to100^0C.
3. Note down the readings for every 5^0C 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 (100^0C)
2. Calibrate the thermocouple in the hot water and measure the 5^0C 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 100^0C alternatively.
2. Bring down the sensor to room temperature and provide a sudden change of input temperature to boiling point (i.e) 100^0C.
3. Start the stop clock and tabulate the time taken for every 5^0C 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 s 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
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. Bred 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 witched 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.
2. Capacitors – 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

1. Standard ammeter – 1 No.
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 beforemaking 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

PTEI2303 INDUSTRIAL INSTRUMENTATION – II L T P C
3 0 0 3

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

Variable head type flow meters: – Orifice plate – Venturi tube – Flow nozzle – Dall tube – Installation of head flow meters – Pitot tube.

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

Positive displacement flow meters: – Nutating disc, Reciprocating piston, Oval gear and Helix type flow meters – Inferential meter – Turbine flow meter – Area flow meter: – Rotameter – Theory and installation – Mass flow meter: – Angular momentum – Thermal, Coriolis type mass flow meters – Calibration of flow meters – Dynamic weighing methods.

UNIT III ELECTRICAL TYPE FLOW METER 9

Principle and constructional details of electromagnetic flow meter – Ultrasonic flow meters – Laser Doppler anemometer – Vortex shedding flow meter – Target flow meter – Guidelines for selection of flow meter – Open channel flow measurement – Solid flow rate measurement

UNIT IV LEVEL MEASUREMENT 9

Level measurement: – Float, Displacer type – Bubbler system – Electrical level gauge: – Resistance – Capacitance – Nuclear radiation and Ultrasonic type – Boiler drum level measurement: – Differential pressure method – Hydra step method.

UNIT V MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE 9

Viscosity: – Rotameter type viscometer – Consistency meters – Dry and wet bulb psychrometers – Hot wire electrode type hygrometer – Dew cell – Electrolysis type hygrometer – Commercial type dew point meter – Moisture measurement: – Different methods of Moisture measurement – Application of moisture measurement .

TOTAL : 45 PERIODS

TEXT BOOKS

1. Doebelin, E.O., “Measurement systems Application and Design”, International Student Edition, 5th Edition, McGraw Hill Book Company, 2004
2. Liptak, B.G., “ Instrumentation Engineers Handbook (Measurement)”, CRC Press, 2005
3. A.K. Sawhney, ‘A course in Electrical & Electronic Measurement and Instrumentation’,
4. Dhanpat Rai and Co (P) Ltd., 2004.

REFERENCES

1. Jain, R.K., “Mechanical and Industrial Measurments”, Khanna Publishers, Delhi, 1999.
   Eckman, D.P., “ Industrial Instrumentation”, Wiley Eastern Limited, 1990

PTEC2315 COMMUNICATION ENGINEERING L T P C
3 0 0 3

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 mulltiplexing.

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

1. Wayne Tomasi, 'Electronic Communication Systems', Pearson Education, 3rd Edition, 2001.
2. Roy Blake, 'Electronic Communication Systems', Thomson Delmar, 2nd Edition, 2002.

REFERENCES

1. William Schweber, 'Electronic Communication Systems', Prentice Hall of India, 2002.
2. G. Kennedy, 'Electronic Communication Systems', McGraw Hill, 4th edition, 2002.
3. Miller, 'Modern Electronic Communication', Prentice Hall of India, 2003
4. Simon Haykins, Communication systems, John Wiley,4th Edition,2001

PTEC2312 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

- 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

Hardware Architecture pintouts - Signals – Memory interfacing – I/O ports and data transfer concepts – Timing Diagram – Interrupt structure.

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

Functional block diagram - Instruction format and addressing modes – Timing Diagram Interrupt structure – Timer –I/O ports – Serial communication.

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

1. "Microprocessor and Microcontrollers", Krishna Kant Eastern Company Edition, Prentice – Hall of India, New Delhi , 2007.
2. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', Wiley Eastern Ltd., New Delhi.
2. The 8088 & 8086 Microprocessors , Walter A Tribal & Avtar Singh, Pearson, 2007, Fourth Edition.

PTEE2204 DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

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

Definitions – Topological sort – breadth-first traversal - shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal – biconnectivity – euler circuits – applications of graphs

UNIT V ALGORITHM DESIGN AND ANALYSIS 9

Greedy algorithms – Divide and conquer – Dynamic programming – backtracking – branch and bound – Randomized algorithms – algorithm analysis – asymptotic notations – recurrences – NP-complete problems

TOTAL: 45 PERIODS

TEXT BOOKS

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education Asia, 2002.
2. ISRD Group, “Data Structures using C”, Tata McGraw-Hill Publishing Company Ltd., 2006.

REFERENCES

1. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
2. R. F. Gilberg, B. A. Forouzan, “Data Structures: A Pseudocode approach with C”, Second Edition, Thomson India Edition, 2005.
3. Sara Baase and A. Van Gelder, “Computer Algorithms”, Third Edition, Pearson Education, 2000.
4. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Second Edition, Prentice Hall of India Ltd, 2001.

PTCS2312 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

S.No.	Description of Equipment	Quantity required
	Hardware Required	
1.	Computers (Pentium-4)	40 Nos with one server
2.	Dot matrix printer	3 Nos
3.	Laser Printer	2 Nos.
4.	UPS (5 KVA)	2
	Software Required	
5.	Turbo C++	40 Nodes
6.	(Java 2 SDK) JDK 5.0 update 6 (1.5.0 - Internal Version No.)	40 Nos.

PTEI2302 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

- 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

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, NO_2 and H_2S 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 principles – Instrumentation and applications. Mass spectrometers – Different types – Applications.

TOTAL : 45 PERIODS

TEXT BOOKS

1. G.W. Ewing, 'Instrumental Methods of Analysis', McGraw Hill, 1992.
2. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999
3. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, 'Instrumental Methods of Analysis', CBS publishing & distribution, 1995.

REFERENCES

1. Robert D. Braun, 'Introduction to Instrumental Analysis', McGraw Hill, Singapore, 1987.
2. R.S. Khandpur, 'Handbook of Analytical Instruments', Tata McGraw Hill publishing Co. Ltd., 2003.
3. Liptak, B.G, Process Measurement and Analysis, Chilton Book Company, 1995

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 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 9

Need for process control – mathematical model of first order level, pressure and thermal processes – higher order process – interacting and non-interacting systems – continuous and batch processes – self-regulation – servo and regulator operations.

UNIT II CONTROL ACTIONS AND CONTROLLERS 9

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

Evaluation criteria – IAE, ISE, ITAE and ¼ decay ratio – determination of optimum settings for mathematically described processes using time response and frequency response – Tuning – Process reaction curve method – Ziegler Nichols method – Damped oscillation method.

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

I/P converter – pneumatic and electric actuators – valve positioner – control valves – characteristics of control valves – inherent and installed characteristics – valve body – commercial valve bodies – control valve sizing – cavitation and flashing – selection criteria.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Stephanopoulis, G, Chemical Process Control, Prentice Hall of India, New Delhi, 1990.
2. Eckman. D.P., Automatic Process Control, Wiley Eastern Ltd., New Delhi, 1993.

REFERENCES

1. Pollard A.Process Control, Heinemann educational books, London, 1971.
2. Harriott. P., Process Control, Tata McGraw-Hill Publishing Co., New Delhi, 1991.

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

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 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

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 2003 / PHI.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata McGraw Hill, New Delhi, 2001.

REFERENCES

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, 'Discrete – Time Signal Processing', Pearson Education, New Delhi, 2003.
2. Emmanuel C Ifeachor and Barrie W Jervis ,"Digital Signal Processing – A Practical approach" Pearson Education, Second edition, 2002.
3. Steven W. Smith, "The Scientist and Engineer's Guide to Digital Signal Processing", Second Edition, California Technical Publishing San Diego, lifornia.(www.DSPguide.com)
4. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2003.

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
10. Measurements of conductivity of test 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.

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 cark stopper should be installed at the lower and of thetube.
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 cylinderand switch on the vacuum pressure transmitter setup.
ii. Measure the output voltage in Volts for the corresponding vacuum ppressure in mbars.
iii. Vary the vacuum pressure in cylinder and follow the step 2 for different values.
iv. Draw the graph between ouput voltage Vs. vacuum pressure in mbars.

EQUIPMENT

Vacuum presuure 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 interns of 4-20 mA.

EXERCISE

Measure the liquid level and calibrate it interms 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 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 3o 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 t 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 P_H meter should show approximately test solutions. If Acidic than the P_H is < 7 and if alkaline than the P_H >7

EQUIPMENT

1. pH meter – 1 No.
2. Test solutions – few types
3. Beaker – 2 Nos.
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 fro different samples.
(vi) Switch on the supply.

EQUIPMENT

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

PTEI2402 LOGIC AND DISTRIBUTED CONTROL SYSTEM L T P C
3 0 0 3

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 of 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 9

Evolution of PLC's – Components of PLC – Advantages over relay logic – Architecture of PLC– Programming devices - Discrete and Analog I/O modules – Programming languages –– Ladder diagram – Programming timers and counters – Design of PLC.

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

Basic building blocks of Computer controlled systems – SCADA – data Acquisition System – supervisory Control – Direct digital Control .

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

1. Petruzella, 'Industrial Electronics', McGraw Hill, Second edition, 1997.
2. Michael P. Lukas, 'Distributed Control System', Van Nostrand Reinhold Co., Canada, 1986.
3. John. W. Webb Ronald A Reis - Programmable Logic Controllers - Principles and Applications, Fourth edition, Prentice Hall Inc., New Jersey, 1998.

REFERENCES

1. T. Hughes, 'Programmable Logic Controllers', ISA press,2007.
2. Krishna Kant – Computer based Industrial Control, Prentice Hall, New Delhi, 1997.

PTEI2353 DIGITAL SYSTEM DESIGN L T P C

3 0 0 3

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, I^2L, 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 – Programmable 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

1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.
2. Donald. P. Leach, Albert paul Malvino, Goutam Suha,'Digital Principles and Applications' Tata McGraw – Hill , Sixth edition .
3. Miron Abramonici, Melvin. A. Rrewer, Arthur.D. Friedman,Digital system testing and testable design, Jaico publishing house.

REFERENCES

1. Theodore. F. Bogart,' Introduction to Digital Circuits', McGraw – Hill International edn.1992
2. Ronald J.Tocci, Neal .S. Widmer,'Digital System Principles and Applications', Pearson Education, 8th edition, Asia, 2002.
3. On demand public key management for wireless Ad Hoc networks.
4. Efficient hybrid security mechanisms for heterogeneous sensor networks.
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 computory applications-Types of memory – Memory management methods.

UNIT II EMBEDDED SYSTEM ORGANIZATION 9

Structural units in processor , selection of processor & memory devices – DMA – I/O devices : timer & counting devices – Serial communication using I^2C , CAN USB buses – Parallel communication using ISA , PCI ,PCI/X buses – Device drivers

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, ЧC/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:

1. Rajkamal, 'Embedded system-Architecture, Programming, Design', Tatamcgraw Hill, 2003.
2. Daniel W. Lewis, 'Fundamentals of Embedded Software', Prentice Hall of India, 2004.

REFERENCES:

1. Jack R Smith "Programming the PIC microcontroller with MBasic" Elsevier, 2007
2. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006
3. Rajib Mall "Real-Time systems Theory and Practice" Pearson Education 2007
4. Sriram. V.Iyer & Pankaj Gupta, 'Embedded real time systems Programming', Tata McGraw Hill, 2004.
5. Wayne Wolf, 'Computer as Components ', Pearson Education

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PTEI2351 MODERN ELECTRONIC INSTRUMENTATION LT P C
3 0 0 3

AIM

To provide adequate knowkedge 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 –Frequeny, period, time interval and pulse width measurement.

UNIT II DISPLAY AND RECORDING DEVICES 9

Cathode ray oscilloscope – General purpose and advanced types – Sampling and storage scopes – Wave analyzers – Signal and function generators – Distortion factor meter – Q meter – Seven segment and dot matrix display – X-Y recorders – Magnetic tape recorders – Digital recording and data loggers.

UNIT III RS 232 AND RS 485 9

Modern instrumentation and control systems – OSI model – EIA 232 Interface standard - EIA 485 Interface standard - EIA 422 Interface standard – 20 mA current loop – Serial Interface converters.

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

DAQ cards for VI applications – Requirements – DAQ modules with serial communication – Design of digital voltmeters with transducer input – Design of ON/OFF controller for temperature control applications.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Chris Nadovich, ‘Synthetic Instruments Concepts and Applications’, Elsevier, 2005.
2. Rick Bitter, Taqi Mohiuddin and Matt Nawrocki, ‘Labview Advanced Programming Techniques’, CRC Press, Second Edition, 2007.
3. S. Gupta and J.P. Gupta, ‘PC interfacing for data acquisition and process Control’, second Edition, Instrument Society of America, 1994.
4. Kalsi H.S., “Electronic Instrumentation”, Second Edition, Tata Mc Graw Hill Company, New Delhi, 2004.
5. Sawhney A.K., “A course in Electrical and Electronic Measurement and Instrumentation”, Dhanpat Rai and sons, New Delhi, 2003.

REFERENCES
1. Rahman Jamal and Herbert Picklik, LabVIEW – Applications and Solutions, National Instruments Release ISBN 0130964239.Rah
2. William Buchanan 'Computer Busses', CRC Press, 2000.
3. Rangan C.S., Sharma G.R., Mani V.S.V., "Instrumentation devices and Systems", Tata Mc Graw Hill Company, New Delhi,.2002.
4. Joseph J Carr, "Elements of Electronic Instrumentation and Measurement", Third Edition, Pearson Education, 2003.
5. David A. Bell, "Electronic Instrumentation and measurements", Second Edition, Prentice Hall of India, New Delhi, 2003.
6. Gupta J.B., "A course in Electrical and Electronic Measurement and Instrumentation", 12th Edition, Katson Publishing House, 2003.

PTEI2403 VLSI DESIGN L T P C
3 0 0 3

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

Structured design of combinational circuits – Dynamic CMOS & clocking – Tally circuits – (NAND-NAND, NOR-NOR and AOI logic) – EXOR structure – Multiplexer structures – Barrel shifter, high speed adder and multiplier circuits.

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

RTL Design – simulation and synthesis - Combinational logic – Types – Operators – Packages – Sequential circuit – Sub-programs – Test benches. (Examples: adders, counters, flipflops, FSM, Multiplexers / Demultiplexers).

TOTAL : 45 PERIODS

TEXT BOOKS

1. D.A.Pucknell, K.Eshraghian, 'Basic VLSI Design', 3rd Edition, Prentice Hall of India, New Delhi, 2003.
2. Rabey, J.M., Digital Integrated Circuits: A Design Perspective, Prentice Hall, 1955
3. Bhasker, J., VHDL Primer, Prentice Hall 1995

REFERENCES

1. Eugene D.Fabricius, 'Introduction to VLSI Design', Tata McGraw Hill, 1990.
2. N.H.Weste, 'Principles of CMOS VLSI Design', Pearson Eduction, India, 2002.
3. Zainalatsedin Navabi, 'VHDL Analysis and Modelling of Digital Systems', 2nd Edition, Tata McGraw Hill, 1998.
4. Douglas Perry, 'VHDL Programming by example', Tata McGraw Hill, 3rd Edition, 2003

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

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors and splicers – Fibre termination – Optical sources – Optical detectors.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES 9

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS 9

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

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

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

1. J.M. Senior, 'Optical Fibre Communication – Principles and Practice', Prentice Hall of India, 1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.

REFERENCES

1. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.
2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.
3. John F. Read, 'Industrial Applications of Lasers', Academic Press, 1978.
4. Monte Ross, 'Laser Applications', McGraw Hill, 1968

PTCS2351 ARTIFICIAL INTELLIGENCE L T P C
3 0 0 3

UNIT I PROBLEM SOLVING 9

Introduction – Agents – Problem formulation – uninformed search strategies – heuristics – informed search strategies – constraint satisfaction

UNIT II KNOWLEDGE AND REASON 9

Logical agents – propositional logic – inferences – first-order logic – inference in first-order logic – forward chaining – backward chaining – resolution

UNIT III PLANNING 9

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

UNIT IV UNCERTAIN KNOWLEDGE AND REASONING 9

Uncertainty – review of probability - probabilistic Reasoning – Bayesian networks – inferences in Bayesian networks – Temporal models – Hidden Markov models

UNIT V LEARNING 9

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

TOTAL : 45 PERIODS

TEXT BOOK

1. S. Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education, 2003.

REFERENCES

1. David Poole, Alan Mackworth, Randy Goebel, ”Computational Intelligence : a logical approach”, Oxford University Press, 1998.
2. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, Pearson Education, 2002.
3. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers, 1998.

PTCS2071 COMPUTER ARCHITECTURE L T P C

3 0 0 3

UNIT I INSTRUCTION SET ARCHITECTURE 9

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 9

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 9

Instruction execution steps – control unit synthesis – microprogramming – pipelining – pipeline performance

UNIT IV MEMORY SYSTEM 9

Main Memory concepts – types of memory – cache memory organization – secondary storage – virtual memory – paging

UNIT V I/O AND INTERFACES 9

I/O devices – I/O programming – polling – interrupts – DMA – buses – links – interfacing – context switching – threads and multithreading

TOTAL : 45 PERIODS

TEXT BOOKS

1. B. Parhami, “Computer Architecture”, Oxford University Press, 2005.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2002

REFERENCES

1. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software interface”, Third Edition, Elsevier, 2004.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Seventh Edition, Pearson Education, 2006.
3. Miles Murdocca “Computers Architecture and Organization An Integrated approach”, Wiley India pvt Ltd, 2007
4. John D. Carpinelli, “Computer systems organization and Architecture”, Pearson Education, 2001.

PTCS2411 OPERATING SYSTEMS L T P C
3 0 0 3

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

Introduction to operating systems – review of computer organization – operating system structures – system calls – system programs – system structure – virtual machines. Processes: Process 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 9

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling – Real time scheduling – Algorithm Evaluation. Case study: Process scheduling in Linux. Process Synchronization: The critical-section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors. Deadlock: System model – Deadlock 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

File-System Interface: File concept – Access methods – Directory structure – File -system mounting – 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 – performance. Mass-Storage Structure: Disk scheduling – Disk management – Swap-space management – RAID – disk attachment – stable storage – tertiary storage. Case study: I/O in Linux

TOTAL : 45 PERIODS

TEXT BOOKS

1. Silberschatz, Galvin, and Gagne, “Operating System Concepts”, Sixth Edition, Wiley India Pvt Ltd, 2003.
2. D. M. Dhamdhere, “Operating Systems: A concepts based approach”, Second Edition, Tata McGraw-Hill Publishing Company Ltd., 2006.

REFERENCES

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Pearson Education/PHI, 2001.
2. Harvey M. Deital, “Operating Systems”, Third Edition, Pearson Education, 2004.

PTCS2070 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

- 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 9

Messages - Windows programming - SDK style - Hungarian notation and windows data types - SDK programming in perspective.The benefits of C++ and MFC - MFC design philosophy - Document/View architecture - MFC class hierarchy - AFX functions. Application object - Frame window object - Message map.

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.

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 9

The inexistence function revisited – Document object – View object – Frame window object – Dynamic object creation. SDI document template - Command routing. Synchronizing multiple views of a document – Mid squares application – Supporting multiple document types – Alternatives to MDI. Splitter Windows: Dynamic splitter window – Static splitter windows.

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

Menu bar – Tool bar – Project explorer – Toolbox – Properties window – Form designer – Form layout – Intermediate window. Designing the user interface: Aligning the controls – Running the application – Visual development and event driven programming.

Variables: Declaration – Types – Converting variable types – User defined data types - Lifetime of a variable. Constants - Arrays – Types of arrays. Procedures: Subroutines – Functions – Calling procedures. Text box controls – List box & Combo box controls – Scroll bar and slider controls – File controls.

UNIT V DATABASE PROGRAMMING WITH VB 8

Record sets – Data control – Data control properties, methods. Visual data manager: Specifying indices with the visual data manager – Entering data with the visual data manager. Data bound list control – Data bound combo box – Data bound grid control. Mapping databases: Database object – Table def object, Query def object.

Programming the active database objects – ADO object model – Establishing a connection - Executing SQL statements – Cursor types and locking mechanism – Manipulating the record set object – Simple record editing and updating.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Jeff Prosise, 'Programming Windows With MFC', Second Edition, WP Publishers & Distributors [P] Ltd, Reprinted 2002.
2. Evangelos Petroutsos, 'Mastering Visual Basic 6.0', BPB Publications, 2002.

REFERENCES

1. Herbert Schildt, 'MFC Programming From the Ground Up', Second Edition, Tata McGraw Hill, reprinted 2002.
2. John Paul Muller, 'Visual C++ 6 From the Ground Up Second Edition', Tata McGraw Hill, Reprinted 2002.
3. Curtis Smith & Micheal Amundsen, 'Teach Yourself Database Programming with Visual Basic 6 in 21 days', Techmedia Pub, 1999.

PTEI2021 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

- 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 inpart 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 9

Brief survey of methods of power generation – hydro, thermal, nuclear, solar and wind power – importance of instrumentation in power generation – thermal power plants – building blocks – details of boiler processes UP&I diagram of boiler – cogeneration.

UNIT II MEASUREMENTS IN POWER PLANTS 9

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 9

Flue gas oxygen analyser – analysis of impurities in feed water and steam – dissolved oxygen analyser – chromatography – PH meter – fuel analyser – pollution monitoring instruments.

UNIT IV CONTROL LOOPS IN BOILER 9

Combustion control – air/fuel ratio control – furnace draft control – drum level control – main stem and reheat steam temperature control – superheater control – attemperator – deaerator control – distributed control system in power plants – interlocks in boiler operation.

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

1. Sam G. Dukelow, The control of Boilers, instrument Society of America, 1991.
2. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press, Oxford, 1971.

REFERENCES

1. Elonka,S.M.and Kohal A.L.Standard Boiler Operations, McGraw-Hill, New Delhi, 1994.
2. R.K.Jain, Mechanical and industrial Measurements, Khanna Publishers, New Delhi, 1995.

PTEI2022 INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES L T P C
3 0 0 3

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

1. A.L. Waddams, 'Chemicals from Petroleum', Butter and Janner Ltd., 1968.
2. J.G. Balchan. and K.I. Mumme, 'Process Control Structures and Applications', Van Nostrand Reinhold Company, New York, 1988.

REFERENCES

1. Austin G.T. Shreeves, 'Chemical Process Industries', McGraw Hill International Student edition, Singapore, 1985.
2. B.G Liptak, 'Instrumentation in Process Industries', Chilton Book Company, 1994.

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 9

MEMS and Microsystems, Miniaturization, Typical products, Micro Sensors,Micro actuation, MEMS with micro actuators, Microaccelorometers 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

1. Stephen Santeria, “Microsystems Design “, Kluwer publishers, 2000.

REFERENCES

1. Nadim Maluf, “ An introduction to Micro electro mechanical system design”, Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, “ The MEMS Handbook”, CRC press Baco Raton, 2000
3. Tai Ran Hsu, “MEMS & Micro systems Design and Manufacture” Tata McGraw Hill, New Delhi, 2002.
4. Julian w. Gardner, Vijay k. varadan, Osama O.Awadelkarim,micro sensors mems and smart devices, John Wiley & son LTD,2002
5. James J.Allen, micro electro mechanical system design, CRC Press published in 2005

PTGE2023 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

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 CHARECTERISATION TECHNIQUES 10

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

TOTAL : 45 PERIODS

TEXT BOOKS

1. A.S. Edelstein and R.C. Cammearata, eds., Nanomaterials: Synthesis, Properties and Applications, (Institute of Physics Publishing, Bristol and Philadelphia, 1996)
2. N John Dinardo, Nanoscale charecterisation of surfaces & Interfaces, Second edition, Weinheim Cambridge, Wiley-VCH, 2000

REFERENCES

1. G Timp (Editor), Nanotechnology, AIP press/Springer, 1999
2. Akhlesh Lakhtakia (Editor) The Hand Book of Nano Technology, “Nanometer Structure”, Theory, Modeling and Simulations. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

PTEC2055 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

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

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

1. William K.Pratt, ' Digital Image Processing', John Wiley, NewYork,2002.
2. Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice Hall of India, 2002.

REFERENCES

1. David Salomon : Data Compression – The Complete Reference, Springer Verlag New York Inc., 2nd Edition, 2001
2. Rafael C. Gonzalez, Richard E.Woods, Steven Eddins, ' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004
4. Milman Sonka, Vaclav Hlavac, Roger Boyle, 'Image Processing, Analysis, and Machine Vision', Brooks/Cole, Vikas Publishing House, II ed., 1999.
5. Sid Ahmed, M.A., 'Image Processing Theory, Algorithms and Architectures', McGraw-Hill, 1995.

PTEC2056 ADVANCED COMMUNICATION ENGINEERING L T P C
3 0 0 3

AIM

To understand the advanved 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 Navigationational 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 9

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 9

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 9

ISDN standards, ISDN interface and functions-UNI-ISDN proctol architecture, ISDN physical layer, ISDN dataline layer-Network interface

UNIT V RADAR AND NAVIGATIONAL AIDS 9

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

1. M.I. SKOLNIK, Introduction to Radar-Mc Graw Hill and Edition
2. William C.Y.Lee, Mobile Cellular Telecommunications system-Mc Graw Hill International Ed. 1990
3. Simon Haykin, 'Digital communications', John Wiley and Sons, 1988
4. William Stallings,'ISDN and BISDN' Macmillan Publishers, 1995

REFERENCES

1. Jennifer Bray and Charles F. Sturman, 'Bluetooth', Pearson Education Asia, 2001.

PTEC2057 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

- Detail study of time averaging , ensamble 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 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 Methods - AR, MA, ARMA model based spectral estimation. Parameter Estimation -Yule-Walker 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.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.
2. John G. Proakis, Dimitris G.Manolakis, Digital Signal Processing Pearson Education, 2002.

REFERENCES
1. John G. Proakis et.al.'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
2. Dimitris G.Manolakis et.al.' Statistical and adaptive signal Processing', McGraw Hill, New York, 2000.
3. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004.(For Wavelet Transform Topic)

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 9
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 9
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 – laser – acoustic – magnetic, fiber optic and tactile sensors.

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS 9
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 9
Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill climbing techniques – robot programming languages

UNIT V CASE STUDIES 9
Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-Hill Singapore, 1996.
2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

REFERENCES

1. Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA 1992.
2. Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.
3. Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering – An integrated approach, Prentice Hall of India, New Delhi, 1994.
4. Mc Kerrow P.J. Introduction to Robotics, Addison Wesley, USA, 1991.
5. Issac Asimov I Robot, Ballantine Books, New York, 1986.

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

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

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

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL : 45 PERIODS

TEXT BOOK

1. Dale H.Besterfiled, et at., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint (2006).

REFERENCES

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, Third Edition (2003).
3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd. (2006)
4. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd. (2006)

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

UNIT I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

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

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL : 45 PERIODS

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, (1999).
2. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, (2003)
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, (2001)
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective”, Biztantra, New Delhi, (2004)
5. David Ermann and Michele S Shauf, “Computers, Ethics and Society”, Oxford
6. University Press, (2003)

PTIC2401 DIGITAL CONTROL SYSTEM L T P C
3 0 0 3

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 9

Configuration of the basic digital control scheme – general sampled data system variables – signal classifications – why use digital control system – Advantages – disadvantages – examples of discrete data and digital control systems.

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

Determination of the $\mathcal{Z}$ transform – mapping between s and $\mathcal{Z}$ domains - $\mathcal{Z}$ transform of system equations – open loop Hybrid sampled Data Control Systems – open loop discrete Input Data Control System – closed loop sampled data control system – modified $\mathcal{Z}$ transform method – response between sampling instants – stability on the $\mathcal{Z}$ -plane and jury’s stability test – steady state error analysis for stable systems.

UNIT IV STATE VARIABLE ANALYSIS OF DIGITAL CONTROL SYSTEMS 9

State descriptions of digital processors – conversion of state variable models to transfer functions – conversion of transfer functions to canonical state variable models – first comparison form – second companion form – Jordon Canonical form – state description of sampled continuous time plants – solution of state difference equations – closed form solution – state transition matrix – Caley Hamilton Technique – concept of controllability and absorbability – loss of controllability and absorbability due to sampling.

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.

TOTAL : 45 PERIODS

TEXT BOOKS

1. C.M. Houpis, G.B. Lamount, 'Digital Control Systems-Theory, Hardware, Software', International Student Edition, McGraw Hill Book Co., 1985.
2. M.Gopal, 'Digital Control and State Variables Methods', Tata McGraw HILL, 2nd Edition, 2003.

REFERENCES

1. B.C. Kuo, "Digital control systems", Second Edition, Oxford University press, 1992.
2. P.B. Deshpande and R.H. Ash, 'Computer Process Control', ISA Publication, USA, 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 9

Gradient Search – Non-gradient search – Genetic Algorithms: Operators, search algorithm, penalty – Evolutionary Programming: Operators, Search Algorithms

TOTAL : 45 PERIODS

TEXT BOOKS

1. Laurance Fausett, 'Fundamentals of Neural Networks', Pearson Education, 2004.
2. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', McGraw Hill, 1997.
3. David Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning', Pearson Education, 2007.

REFERENCES

1. J.S.R.Jang, C.T.Sun and E.Mizutani, ' Neuro- Fuzzy and Soft Computing' Pearson Education, New Delhi, 2004
2. Jacek M. Zurada, 'Introduction to Artificial Neural Systems', Jaico Publishing home, 2002.
3. John Yen and Reza Langari, 'Fuzzy Logic – Intelligence, Control and Information', Pearson Education, New Delhi, 2003.
4. Robert J.Schalkoff, ' A rtifical Neural Networks', McGraw Hill, 1997.