APPLIED ELECTRONICS & INSTRUMENTATION ENGINEERING

5th Semester				6th Semester			
Subject Code	***Theory***	***Contact Hrs L-T-P***	***Credit C***	***Subject Code***	***Theory***	***Contact Hrs L-T-P***	***Credit C***
MA-301 CY-301	Optimization in Engg OR Bio-Environmental Engg	3-0-0	3	CY-301 MA-301	Bio-Environmental Engg OR Optimization in Engineering	3-0-0	3
EC-321 EE-321	Digital Signal Processing OR Power Electronics	3-0-0	3	EE-321 EC-321	Power Electronics OR Digital Signal Processing	3-0-0	3
IC-323 EC-333	Control System Engg OR Microprocessors & Microcontrollers	3-1-0 3-0-0	4 3	EC-333 IC-323	Microprocessors & Microcontrollers OR Control System Engg	3-0-0 3-1-0	3 4
EI-301	Instrumentation & Measurements	3-1-0	4	EC-361	Electromagnetic Theory	3-1-0	4
EI-313	Sensors & Signals	3-1-0	4	EL- 1	Elective-I	3-0-0	3
		18/17	**18/17**			**16/17**	**16/17**
Subject Code	**Practicals / Sessional**	**Contact Hrs L-T-P**	**Credit** C	**Subject Code**	**Practicals / Sessional**	**Contact Hrs L-T-P**	**Credit** C
EC-371 EE-371	Digital Signal Processing Lab OR Power Electronics Lab	0-0-3	2	EE-371 EC-371	Power Electronics Lab OR Digital Signal Processing Lab	0-0-3	2
EI-373 EC-373	Instrumentation & Measurement Lab OR Microprocessors & Microcontrollers Lab	0-0-3	2	EC-373 EI-373	Microprocessors & Microcontrollers Lab OR Instrumentation & Measurement Lab	0-0-3	2
EI-371	Sensor & Signal Lab.	0-0-3	2	EC-372	Electronic Design Lab	0-0-3	2
	Total	**9**	**6**		**Total**	**9**	**6**
	Grand Total	**27/26**	**24/23**		**Grand Total**	**25/26**	**22/23**

MA-301 OPTIMIZATION IN ENGINEERING (3-0-0)

MODULE-I (15 Hours)

Two variable LP model, Graphical sensitivity analysis, The Simplex method, Computational details, Simplex algorithm, Artificial Starting solution, Degeneracy, Alternative optima , unbounded solution. Duality and Sensitivity analysis, primal Dual relation, Transportation Model, Non-traditional transportation model, Assignment model, Humgarian method, Networks, Shortest route problem, Maximal flow method.

MODULE-II (13 Hours)

Integer linear programming, Illustration Branch & Bound Algorithm, Cutting-plane algorithm, Dynamics programming, Knapsack model, Decision analysis & Game Theory, Simulation modelling, Monte-Carlo simulation for discrete events.

MODULE-III (12 Hours)

Nonlinear programming, Unconstrained optimizations, unimodal function, Necessary & sufficient conditions, Newton Raphson method, constrained algorithm, Direct search method, gradient method.

TEXT BOOKS

1. H. A Taha, Operations Research: An Introduction, Pearson Education, (7^{th} Edition); Ch-2[2.1,2.2 (2.2.1, 2.2.2), 2.3], Ch-3[3.1, 3.3, (3.3.1, 3.3.2) 3.4, 3.5], Ch-4[4.1, 4.2, 4.4 (4.4.1), 4.5 (4.5.1, 4.5.2)], Ch-5[5.1, 5.3(5.3.1, 5.3.2), 5.4(5.4.1)], Ch-6[6.1, 6.3 (6.3.1, 6.3.2), 6.4 (6.4.1, 6.4.2)], Ch-9 [9.1, 9.2(9.2.1, 9.2.3)], Ch-10 [10.3.1 Ch-14 **:**14.3, 14.4], Ch-18 [18.1**,** 18.4], Ch-20[20.1(20.1.1), 20.2 (20.2.1, 20.2.2)], Ch-21[21.1]

REFERENCE BOOKS

1. F.S Hiller, G. J. Libermen, An Introduction to Operations Research: Concepts & Cases, (8^{th} Edition), TMH Publication.
2. Kalyanmayee Dev, Optimization for Engineering Design, PHI Publications

CY-301 BIO-ENVIRONMENTAL ENGINEERING (3-0-0)

MODULE –I (22 hours)

Fundamentals of Ecology: Components and structures of Eco-system. Levels of organization in the biotic components of the Eco-system. Eco-system processes- Energy flow-primary and secondary production, tropic level, food chain & food web and Bio-magnification. Decomposition and Nutrient Cycling- Biogeochemical cycles of nature- Carbon cycle, Nitrogen cycle and Hydrological cycle.

Fundamentals of Chemistry and Microbiology

Water chemistry : Concentration expressions, mole concept and Stoichiometry. Physical & chemical properties of water. Organic chemical properties and their measurement, parameters like BOD, COD, and TOC & TOD Inorganic properties like pH, Alkalinity, Hardness, conductivity and Solubility.

Atmospheric chemistry – structure of atmosphere, chemistry of primary and secondary air pollutants.

Chemical Reaction- Chemical & Bio-chemical Reactions fundamentals of reaction kinetics, Reactor configurations and material balances.

Microbiology – Important microbes in Environmental Engineering, Microbial growth and decay rates, Aerobic & Anaerobic group of bacteria.

ENVIRONMENTAL POLLUTION

Water Pollution:- Water quality standard and parameter (Indian Standard Drinking Water Specifications, IS 10500, 1991), Physical, Chemical and Biological methods of assessment of water quality, Aquatic Pollution, Fresh Water Pollution:- Organic Pollution, Oxygen Sag Curve, Eutrophication and Acidification, Estuarine water quality, Marine Pollution and Ground water pollution. Parameters of organic content of water quality, DO and BOD in streams, Deaeration and Reaeration kinetics in streams (Streeter – Phelps oxygen sag formula)

Air Pollution:- Primary and Secondary pollutants, units of concentration, Global air pollution-Acid rain , Global warming and ozone layer depletion. Air pollution meteorology – Ambient and Adiabatic lapse rate, Atmospheric stability Lapse rates and Dispersion, Atmospheric Dispersion.

Noise Pollution: Sources of noise, Physical properties of sound, resultant and equivalent sound levels, Noise control measures and impact of noise on human health.

MODULE-II (14 Hours)

ENVIRONMENTAL POLLUTION CONTROL

Water Treatment:- Conventional water treatment comprising of Pre-treatment – Screenings, Aeration and Equalisation Primary Treatment – Sedimentation, Coagulation, Filtration Disinferction – Chlorination, Breakpoint chlorinatioin Advanced water treatment – Fluoridation, Deflouridation, Ion-Exchange and Reverse Osmosis.

Wastewater Treatment (Domestic waste water) : Wastewater flow and characteristics Pretreatment-Screenings, Grit chamber, Equalisation and storage. Primary treatment – Sedimentation and coagulation Biological treatment (Aerobic) Activated Sludge Process (ASP) with complete mix reactor and design parameters. Biological treatment (Anaerobic)

Municipal Solid Waste (MSW) : Physical, Chemical and Energy properties of MSW, MSW Management – Composting, MSW Management – Landfill Operations

Hazardous Waste Management: Characterization, Hazardous Waste Treatment – Incineration

Industrial Air Emission Control : Gaseous Emission Control – Absorption, Adsorption and Condensation, Particulate Emission Control – Gravity Settling Chamber, Cyclone Separator, Bag Filter and Electrostatic Precipitator, Flue gas desulpherisation, NO_x Emission Control and Fugitive Emission

MODULE-III (6 Hours)

ENVIRONMENTAL MANAGEMENT

Evolution of environmental legislation in India, Environment, Development and Sustainable Development, ISO 14,000- Environmental Management Systems – Life Cycle Assessment

Elements of waste minimization- strategy-Reduction at source, Recycling/Reuse/ Recovery, Waste treatment and Disposal, Waste minimization program, Cost benefit analysis and advantage of clean technology Environmental Impact Assessment

Stages of EIA procedure – Screening, Scoping, Environmental Impact Statement (EIS), Public Participation and Review, Generic Structure of EIA report:- Project Profile, Baseline Data Collection, Impact Prediction and Assessment, Environmental Management Plan (EMP) and Post EMP Monitoring.

TEXT BOOKS

1. Gerard Kiely, Environmental Engineering, Tata McGraw Hill Publishing Company Limited
2. Peavy, Rowe and Tchobanoglous, Environmental Engineering, Tata McGraw Hill Company Ltd.1981,(International Edition).
3. C.S.Rao, Environmental Pollution Control Engg., Wiely Eastern Ltd, New Delhi,1999.

EC-321 DIGITAL SIGNAL PROCESSING (3-0-0)

MODULE-I (12 Hours)

Introduction to Discrete Time Signals & Systems: Discrete time signals, Elementary examples , Classification, Discrete Time Systems, Block diagram representation , Classification, **Analysis of discrete time LTI System:** Response of LTI systems to arbitrary inputs (convolution sum), properties of convolution and the interconnection of LTI systems, causal LTI systems, stability of LTI systems, systems with finite- duration and infinite-duration Impulse response, Recursive and non-recursive discrete time systems, LTI systems characterized by constant coefficient Difference Equations, Solution of linear constant coefficient Difference equations, **Implementation of Discrete time systems:** Structures for the realization of LTI systems (Form I, Form II, Cascade, Parallel, Lattice), Recursive and Non-recursive realizations for FIR systems. **Correlation of Discrete time signals:** Cross correlation and auto correlation sequence, Properties of the autocorrelation and cross correlation sequence. **Z transform:** The Z-transform and one sided Z-transform properties of Z transform, Inversion of the Z-transform, solution of difference equations, causality and stability of LTI systems in the Z-domain.

MODULE-II (12 Hours)

Frequency analysis of Discrete time Signals: Energy density spectrum of aperiodic signals, Relationship of the Fourier Transform to the Z-transform, The spectrum, Fourier Transform of Signals with poles on the unit circle.

LTI Systems as Frequency-selective filters:- Lowpass, highpass, bandpass filters, Digital resonators, Notch filters, Comb filters, Allpass filters

Inverse systems and Deconvolution: Minimum phase, maximum phase and mixed phase systems, system identification and deconvolution, Homomorphic deconvolution.

The Discrete Fourier Transform: DFT and IDFT, DFT as a linear transformation, relationship of DFT with Z-transform, properties of the DFT, Circular convolution, circular correlation, filtering of long data sequences: overlap-add and overlap-save method.

MODULE-II (12 Hours)

Fast Fourier Transform: Direct computation of DFT, Radix-2 FFT algorithm, DIT and DIF FFT, Applications of FFT: efficient computation of DFT of two real sequences, efficient computation of DFT of a 2 N point real sequence.

Power Spectrum Estimation: computation of the Energy Density Spectrum, the Periodogram, DFT in power spectrum estimation, Bartlett method, Welch Method, Blackmann & Tookey method

Digital Filter: Causality and its implications, characteristics of practical frequency selective filter, FIR filter design using different windows (Rectangular, Hann, Hamming, Bartlet, Kaiser), FIR filter design using frequency sampling method, Design of IIR filters: Impulse invariant method, Bilinear transformation method.

TEXT BOOKS

1. J.G. Proakis & D.G. Manolakis, Digital Signal Processing- Principles, Algorithms and Applications, Pearson.
2. Schilling & Harris, Fundamentals of Digital Signal Processing, Thomson Learning

REFERENCE BOOKS

1. J.R. Johnson, Introduction to Digital Signal Processing, PHI
2. Sanjit K. Mitra, Digital Signal Processing : A Computer Based Approach, Tata McGraw Hill

EE-321 POWER ELECTRONICS (3-0-0)

MODULE-I (16 Hours)

Power Semiconductor Devices :

Power Diodes : Types, characteristics

Thyristors : SCR, Static V-I characteristics of SCR, two transistor analogy of SCR, dynamic characteristics of SCR, Gate characteristics of SCR, Thyristor ratings, DIAC, TRIAC, GRO, UJT.

Power Transistors : Power BJT, Power MOSFETS, IGBT.

Triggering Circuits : R- Triggering, R-C Triggering, UJT triggering, Design of UJT triggering circuit, Cosine law triggering, triggering circuit using pulse train.

Thyristor commutation circuits : Class-A, Class-B, Class-C, Class-D, Calss-E, Class-F commutation circuits. Series and parallel operation of thyristors, protection of thyristors : di/dt protection, dv/dt protection, design of snubber circuit, overvoltage protection, over current protection.

MODULE-II (14 Hours)

Control rectifiers (AC to Dc converter) : Single phase converters : Principle of phase control, half wave controlled rectifier with R, R-L and R-L-E load, fully controlled bridge converter with R, R-L, R-L-E load. Effect of freewheeling diode, performance measures of two pulse converters. Half controlled (semi) converter. Effect of single phase full converter with source inductance. Dual converter. **Three phase converter :** 3-phase half wave controlled rectifier with R, and R-L load, 3-phase fully controlled bridge converter with R-L load (6-puse converter), 3-phase semi converter.

MODULE-III (10 Hours)

Inverter : Series inverter, parallel inverter, single phase bridge inverter. Mc-Murray inverter, Mc-Murray bed ford inverter, concept of VSI and CSI,3-phase bridge inverter (120^0 and 180^0 conduction mode), concept of PWM inverter.

D.C. Choppers : Principle of operation, control techniques, analysis of step down chopper with R-L-E load. Step up chopper, classification of choppers (Type A,B,C,D,E,) voltage commutated chopper, current commutated chopper, load commutated chopper.

Cyclo converters : Mid point-type and bridge type cyclo converter with R and R-L load.

Applications : HVDC transmission, UPS, Arc welding,. Zero voltage switch.

TEXT BOOKS :

1. Singh & Khanchandani, Power Electronics, TMH
2. P.S. Bhimbra,Power Electronics, Khanna Publication
3. M.H. Rashid,Power Electronics, Pearson Publication

REFERENCE BOOKS :

1. P.C. Sen , Power Electronics, TMH.
2. V.R. Murty, Power Electronics, Oxford Publication

IC-323 CONTROL SYSTEM ENGINEERING (3-1-0)

MODULE-I (10 Hours)

Introduction : Basic concepts of control systems, open loop and closed loop systems, difference between open loop and closed loop systems, classifications.

Mathematical model of physical systems, transfer function, block diagram algebra, signal flow graph (SFG), Masoin's gain formula, application of SFG to control systems.

Feed back theory : Types of feedbacks, effect of degenerative feedback on control systems, regenerative feedback. Components : A.C. Servo Motor, DC servo motor, synchros,

MODULE-II (10 Hours)

Time domain analysis : Standard test signals : Step, ramp, parabolic and impulse signals. Time response of 1st order systems to unit step and unit ramp inputs. Time response of 2^{nd} order to unit step input. Time response specifications. Steady state errors and error constants of different types of control systems Generalized error series method

Concepts of stability : Necessary conditions of stability, Hurwitz stability criterion, routh stability criterion, application of routh stability criterion to linear feed back systems, relative stability.

MODULE-III (15 Hours)

Root locus techniques : Root locus concepts, rules for construction of root loci, determination of root locus, root contours. Frequency domain analysis: Introduction, bode plots, determination of stability from Bode plots, polar plots Nyquist stability criterion, Applications of nyquist to the liner feed back system. Closed loop frequency response: Constant M circles, constant N circles, use of Nicolas chart Controllers: Introduction proportional, derivative and integral control actions, P, PI and PID controllers.

TEXT BOOKS

1. D.Roy Choudhury, Modern Control Engineering, PHI
2. K. Ogata, Modem Control Engineering, PHI
3. L.J. Nagrath, M. Gopal, Control Systems Engineering, Third Edition, New Age International Publishers. Reference Book

REFERNCE BOOKS

1. Samarjit Ghosh, Control System, Theory & Applications, Pearson Education
2. Eroni Umez Erani. System Dynamic and Control, PWS Publishing, International
3. Thompson Publishing Company

EC- 333 MICROPROCESSORS & MICROCONTROLLERS (3-0-0)

MODULE-I (12 Hours)

Microprocessor Architecture:- Introduction to Microprocessor and Microcomputer Architecture, Pins & Signals, Register Organization, Timing & Control MODULE, 8085 Instruction Timing & Execution. Instruction Set and Assembly Language Programming of 8085:- Instruction set of 8085, Memory & I/O Addressing, Assembly language programming using 8085 Instruction Set, use of Stack & Subroutines. Memory Interfacing:- Interfacing EPROM & RAM Memories Interrupts:-8085 Interrupts

MODULE-II (12 Hours)

Microprocessor Based System Development Aids:- Programmable Peripheral Interface: 8255, Programmable DMA Controller: 8257, Programmable Interrupt Controller: 8259, Microcontroller (Architecture and Programming):- Introduction to 8051 Microcontrollers (Architecture, Pin description), 8051 Assembly Language Programming (JUMP, LOOP, CALL Instructions), I/O Port Programming, 8051 Addressing Modes, Arithmetic & Logic Instructions, Microcontroller Interrupts and Interfacing to 8255:- 8051 Interrupts, Interfacing to 8255

MODULE-III (12 Hours)

Intel 8086 (16 bit processors):-8086 Architecture, Addressing Modes, Instruction Format, Pins & Signals, 8086 Basic System Concept, Interfacing with Memories, 8086 Interrupts.

Intel 80386 :- Introduction to 80386 Microprocessor, Architecture, Pins & Signals, Memory System, Registers, 80386 Memory Management, Paging Technique, Protected Mode Operation, brief introduction to 80387 Math Coprocessor. Pentium Processors (Only features):- Introduction to Pentium Processors, Memory System, Input/Output System, Branch Prediction Logic, Floating Point MODULE, Cache Structure, Superscalar Architecture.

(only the features of Pentium Processor mentioned above are to be discussed)

TEXT BOOKS

1. Ghosh & Sridhar, 0000 to 8085 -Introduction to Microprocessor for Scientists & Engineers, PHI publication
2. A.K. Roy & K.M. Bhurchandi, Advanced Microprocessor and Peripherals (Architecture, Programming & Interfacing), TMH Publication
3. Mazidi & Mazidi, The 8051 Microcontroller & Embedded Systems, Pearson / PHI

EI-301 INSTRUMENTATION & MEASUREMENT (3-0-0)

MODULE-I (10 Hours)

Classification, Absolute and Secondary instruments, indicating instruments, control, balancing and damping, construction details, characteristics, errors in measurement. Wattmeters : **Induction type, single phase and three phase wattmeter's, compensations.** Energy meters : **AC Induction type single phase and three phase energy meter compensation, creep, error, testing. Frequency meters :** Vibrating reed type, electrical resonance type

MODULE-II (15 Hours)

Instrument Transformers : Potential and current transformers, ratio and phase angle errors, phasor diagram, methods of minizing errors, testing and applications. Galvanometers : **General principle and performance equations of D'Arsonval Galvanometers Ballistic Galvanometer, undamped, underdamped and overdamped motion of galvanometer.**

Potentiometers : D.C. Potentiometer-Crompton potentiometer, construction, standardization, application, AC. Potentiometer-Drysdale polar potentiometer; Gall Tinsley coordinate type potentiometer, standardization, application.

MODULE-III (10 Hours)

DC & AC Bridges : General equations for bridge balance, measurement of self inductance by Maxwell's bridge (with variable inductance variable capacitance), measurement of capacitance by Schering bridge, errors, Kelvin's double bridge.

Transducer : Strain Gauges, Thermistors, Thermocouples. Linear Variable Differential Transformer (LVDT) Capacitive Transducers, Peizo-Electric transducers. Optical Transducer, Torque meters, inductive torque transducers, electric tachometers, photo electric tachometers.

Electronic Instruments : CRO : Block Diagram, sweep generation, vertial amplifiers, use of CRO in measurement of frequency, phase, Amplitude and rise time of a pulse.

Digital Multimeter : Block diagram, principle of operation, Accuracy of measurement

Electronic Voltmeter : Transistor Voltmeter, Block diagram, principle of operation, accuracy of measurement : metering amplifier.

TEXT BOOKS

1. A.K. Sawhney, A Course in Elec. & Electronic Measurement and Instrumentation:

REFERENCE BOOKS

2. W.O. Cooper, Electronic Instrumentation and measurement techniques
3. Larry Jones & A foster , Chin Electronic measurement & Instrumentation systems
4. Golding & Waddis, Electronic measurement & measuring Instruments

EI-313 SENSORS & SIGNALS (3-1-0)

MODULE-I (14 Hours)

Basic concepts and Classification :- Introduction, System Configuration, Problem Analysis, Basic Characteristics of Measuring Devices, Calibration

Transducer classification :- Introduction, Electrical Transducer, Classification, Basic Requirements of a Transducer. Introduction, Principles of Transduction, Digital Transducers, Level Measurements

Strain Measurement :- Introduction, Factors affecting Strain Measurements, Types of Strain Gauges, Theory of Operation of Resistance Strain Gauges, Types of Electrical Strain Gauges, Materials for Strain Gauges, Gauging Techniques and Other Factors, Strain Gauge Circuits, Temperature Compensation, Applications.

MODULE-II (14 Hours)

Pressure Transducer :- Introduction, Diaphragms, Other Elastic Elements, Transduction Methods, Force- Balance Transducer, Solid State Devices, Thin Film Pressure Transducers, Piezoelectric Pressure Transducer, Vibrating Element Pressure Sensors, Pressure Multiplexer, Pressure Calibration

Temperature Transducer :- Introduction, Temperature Scales, Mechanical Temperature Sensors, Resistance- Type Temperature Sensors, Platinum Resistance Thermometer, Thermistors, Thermocouples, Solid-State Sensors, Quartz Thermometer, Temperature Measurement by Radiation Methods, Optical Pyrometer, Calibration of Thermometers.

MODULE-III (14 Hours)

Force and Torque transducer :- Introduction, Force-Measuring Sensor- Load Cell, Effect of Temperature Variations, Dynamic Response of Elastic Transducers, Digital Force Transducers, Force-Balance Device, Hydraulic Load Cell, Electronic Weighing System, Torque Measurement.

Vibration Transducers :- Introduction, Characteristic of Vibration, Analysis of Vibration-Sensing Devices, Vibration-Sensing Devices, Signal Conditioners, Shock Measurements, System Characteristics, Vibration Exciters, Calibration.

TEXT BOOKS

1. C.S. Rangan, G.R. Sarma, V.S.V. Mani, Instrumentation Devices & Systems, 2nd Edition, Tata McGraw Hill publishers.
2. D.V.S. Murty, Instruments and Transducers,PHI

REFERENCE BOOKS:

1. B.G. Liptak, Process Measurement and Analysis, 4th Edition, CRC Press

EC- 361 ELECTROMAGNETIC THEORY (3-1-0)

MODULE – I (16 Hours)

Review of the Co-ordinate Systems: Rectangular, Cylindrical, and Spherical Co-ordinate System. Co-ordinate transformation. Gradient of a Scalar field, Divergence of a Vector field and Curl of a Vector field. Their Physical interpretation. The Laplacian. Divergence Theorem, Stokes'Theorem. Useful Vector identities.

Electrostatics: The experimental laws of Coulomb, Electric field intensity. Field due to a line charge, Sheet Charge and Continuous Volume Charge distribution. Electric Flux and Flux Density; Gauss's law. Application of Gauss's law. Energy and Potential. The Potential Gradient. The Electric dipole. The Equipotential surfaces. Energy stored in an electrostatic field. Boundary Conditions. Capacitors and Capacitances. Poisson's and Laplace's equations. Solutions of Simple Boundary value problems. Method of Images.

Steady Electric Currents: Current densities, Resistance of a Conductor; The Equation of Continuity. Joules law. Boundary Conditions for Current densities. The EMF.

MODULE – II (16 Hours)

Magnetostatics: The Biot-Savart law. Amperes' Force Law. Torque exerted on a current carrying loop by a magnetic field. Gauss's law for magnetic fields. Magnetic Vector Potential. Magnetic Field Intensity and Ampere's Circuital law. Boundary conditions. Magnetic Materials . Energy in magnetic field . Magnetic circuits.

Faraday's Law of Induction: Self and Mutual inductance. Maxwell's Equations from Ampere's and Gauss's Laws. Maxwell's Equations in Differential and Integral forms; Equation of Continuity. Concept of Displacement Current. Electromagnetic Boundary Conditions. Poynting's Theorem , Time - Harmonic EM Fields . Application to Transformer.

Plane wave Propagation : Helmholtz wave Equation. Plane wave solution. Plane wave propagation in lossless and lossy dielectric medium and conducting medium. Plane wave in good conductor, surface resistance, depth of penetration. Polarization of EM wave - Linear, Circular and Elliptical polarization. Normal and Oblique incidence of linearly Polarized wave at the plane boundary of a perfect conductor, Dielectric - Dielectric Interface. Reflection and Transmission Co-efficient for parallel and perpendicular polarizations, Brewster angle.

MODULE – III (10 Hours)

Transmission lines: Lumped-Element Circuit model of a uniform transmission line. Wave solution. Propagation constant γ and characteristic impedance Z0. Losslas line. Sending end impedance. Reflection Co-efficient & VSWR for various terminating conditions. Length of transmission line as circuit elements. Field analysis of co-ax and two-wire transmission lines. R,L,C&G parameters.

Note to Instructor: The subject can be better mastered by solving problem. Please workout as many problems as possible in the class and through assignments.

TEXT BOOKS

1. E. C. Jordan & K. G. Balmin, Electromagnetic waves and Radiating Systems, 2nd Edition. PHI Pvt. Ltd.
2. B. S. Guru & Huseyn R. Hiziroglu. Electromagnetic Field Theory, Fundamental, Publication : Thomson Asia Pte. Ltd. Singapore. Vikas Publishing Home Pvt. Ltd. New Delhi.

REFERENCES

1. Mathew N. O. Sadiku, Elements of Electromagnetic, Publisher Oxford University Press.
2. Hayt & Buck, Engineering Electromagnetics , 7th Edition Tata McGraw Hill.
3. N. Narayan Rao, Elements of Engineering Electromagnetics – 6th Edition, Pearson Education.

ELECTIVE - I

EC-314	**PCB DESIGN AND ELECTRONIC PACKAGING**
IC-324	**ADVANCED CONTROL SYSTEM ENGG.**
CS – 428	**COMPUTER SYSTEM ARCHITECTURE & ORGANISATION**
EC - 443	**COMMUNICATION ENGINEERING**
CY – 201	**ENGINEERING MATERIALS**

EC-314 PCB DESIGN AND ELECTRONIC PACKAGING (3-0-0)

MODULE – I (15 Hours)

Introduction:

Basics of Electronic Packaging, Packaging Hierarchy in Electronic Systems, Functions of Packaging, **Electric & Thermal Considerations for Electronic Packaging:** Electric Field Interference, Magnetic Field Interference, Noise performance due to passive components - Cabling, Shielding and Grounding/filtering/shielding/screening and surge protection/suppression, noise suppression, Heat generation and modes of heat transfer in electronic components and packages, Selection/Design of Heat Sinks, Ventilation, Forced cooling, Heat pipes for electronic cooling applications, Cooling of power intensive components

MODULE – II (15 Hours)

PCB fabrication process: PCB technology trends, multi-layer boards, Materials used in Printed Circuit Board, Lamination process, PCB soldering and assembly techniques, Surface mount Technology, **PCB Design:** Design CAD tool for PCB design, artwork and layout, general rules, design rules for PCB's for digital circuits, high frequency, analog and mixed signal circuits, power and microwave applications, EDA Tools for Schematic Capture, Circuit Simulation, Layout Design

MODULE – III (10 Hours)

Hybrid Electronic Packaging: Advantages of Hybrid packaging, Hybrid Fabrication Technology: Screen printing, conducting, resistive, dielectric and solder pastes, drying and firing, Hybrid Assemblies, **Testing and Reliability of Electronic Packages:** Design for Test, Adhesive and Its Application, Thermal Management, Testing and Inspection, Package/Enclosure, Electronics Package Reliability and Failure Analysis, Product Safety and Third-Party Certification

TEXT BOOKS :

1. Waller C. Bosshart, PCB Design & Technology, Tata McGraw-Hill
2. Glenn R. Blackwell The Electronic Packaging Handbook, CRC Press, 2000.

REFERENCE BOOKS:

1. Clyde F. Coombs , Printed Circuits Handbook, McGraw-Hill, ISBN 0071350160, 2001
2. John H. Lau, Electronic Packaging: Design, Materials, Process, and Reliability,1998, McGraw-Hill, ISBN 0070371350
3. Microelectronics Packaging Handbook: Technology Drivers Part 1, Rao R. Tummala (Editor), Eugene J. Rymaszewski (Editor), Alan G. Klopfenstein (Editor), Kluwer Academic Publishers, Second Edition, January 1997, ISBN: 0412084317
4. Microelectronics Packaging Handbook: Semiconductor Packaging, Vol. 2, Rao R. Tummala (Editor), Eugene J. Rymaszewski, Kluwer Academic Publishers, Second Edition, January 1997, ISBN: 0412084414
5. Microelectronics Packaging Handbook: Technology, Vol. 3, Rao R. Tummala, Eugene J. Rymaszewski, Alan G. Klopfenstein, Kluwer Academic Publishers, Second Edition, January 1997, IS

IC-324 ADVANCED CONTROL SYSTEM ENGG. (3-1-0)

Module-1 (12 hours)

Mathematical modeling of dynamic systems in state space, state space representation of Mechanical and Electric systems, State equations and transfer functions, Characteristics equation, Eigenvalues and Eigenvector of state Matrix Solution of time-invariant state equation, determination of State Transition Matrix, use of Carley –Hamilton Theorem Controllability, Observability,.

Module-II (12 hours)

Introduction to design of control systems in state space, design of phase lead qnd phase lag controllers in time and frequency domain, pole placement design. State observers. **Sampling and Signal reconstruction:** definition of Z-Transform, properties of Z-Transform, Inverse Transform, Mapping between S-plane and Z-plane, system descriptions by difference equations and solutions.

Sample data control systems: Transfer function of discrete data systems, Pulse and Z-Transform functions, transfer functions of discrete data system with cascade element, transfer function of Zero order and 1st order holds, transfer function of closed loop discrete data systems.

Module –III (12 hours)

Non linear systems: Common physical nonlinearities, the phase plane methods, Basic concepts, Singular points, stability of nonlinear systems, Construction of phase trajectories, Construction by analytical and graphical methods. System analysis by phase plane method,

The describing function methods: Basic concepts, derivation of describing functions for common non linearities, stability analysis by Describing function approach, Jump resonance, Lyapunov stability criterion, Popov's stability criterion.

TEXT BOOKS

1. Modern Control Engineering, K. Ogata, PHI
2. Automatic Control System, B.C. Kuo, PHI
3. Digital Control and State Variable Methods, Gopal M., " Tata McGraw Hill, New Delhi, 1997.

CS 428 COMPUTER ARCHITECTURE AND ORGANIZATION (3-0-0)

MODULE –I

Basic structures of Computers: Functional units, operational concepts, Bus structures, Software, Performance, Multiprocessors and multicomputers. **Machine Instruction and Programms**: Memory location and addresses, Memory Operations, Instructions and instruction Sequencing, Addressing modes, Assembly Language, Basic Input/Output operations, subroutine, additional Instructions.

MODULE – II

Arithmetic : Addition and subtraction of signed Numbers, Design of Fast Adders, Multiplication of positive Numbers, Signed-operand multiplication , Fast multiplication, Integer Division, Floating-point Numbers, (IEEE754 s…) and operations.

MODULE – III

Basic Processing units: Fundamental concepts, execution of complete Instructions, Multibus organization, Hardwired control, Micro programmed control **Memory System**: Basic Concepts, cache Memory, performance consideration, Virtual memories, Memory Management requirement, secondary storage.

TEXT BOOKS

1. Carl Hamacher, Zvonkovranesic, Safwat Zaky, Computer Organization, Mc Graw Hill.
2. Morris M. Mano , Computer system Architecture, PHI NewDelhi

REFERENCE BOOKS

1. David A. Patterson, John L. Computer Organization and Design Hardware/ Software Interface, Hennessy ELSEVIER.
2. B. Govinda Rajalu, Computer Architecture and Organisations, Design principles and Application. Tata McGraw-Hill Publishing company Ltd
3. John P. Hayes , Computer Architecture and Organization. Mc Graw Hill introduction.

EC - 443 COMMUNICATION ENGINEERING (3-0-0)

MODULE-I (14 Hours)

Elements of Communication System- Analogue System, Digital System, Distinguishing features. Electromagnetic Spectrum. Bandwidth.

Transformation of Base band signal from Time domain to Frequency domain and Vice-versa using Fourier Transform FT of few simple baseband signals.

Source of noise- External noise, Internal noise, white noise, Noise Calculation.

Need for Modulation, Analogue Modulation Techniques: Amplitude Modulation (AM), Depth of Modulation, Modulated Waveform, Powers in Carrier, and Sidebands. Generation of DSBSC and SSB, Balanced Modulator, AM Demodulators. Frequency Modulation (FM)- Frequency Deviation, Frequency Modulated Waveform, Spectrum. Narrow Band FM and Wideband FM. Generation of FM; Narrow Band FM Modulator, Wideband FM Modulator, FM Discriminator. Frequency Division Multiplexing.

MODULE-II (14 Hours)

Converting an analogue signal to Digital Signal: Sampling, Nyquist Criteria. Quantization and Binary Coding of sampled values. Pulse Code Modulation. Quantization error. Companding. Line Coding: RZ, NRZ, Manchester Coding.

Digital Baseband Signal Formats – T-I Carrier system. TDM. TDM of 8-bit PCM Signal.

Digital Modulation Technique: Phase Shift Keying (PSK), Frequency Shift Keying (FSK) - their Basic principle, Waveform, Generation and Detection. Coding for error detection and correction. Sharon's Capacity theorem. Advantages of Digital Communication System.

MODULE-III (08 Hours)

Optical Communication System: Brief description of fiber optic communication System: Block Diagram, Range of operating wavelength, Optical Fiber, Optical Sources- LED and LASER, Optical detectors. Advantages of fiber optic system. Brief description of Satellite Communication System: Block diagram. Frequency bands of operation, uplink and downlink frequencies, Transponder, earth stations, Types of Antenna mounted on satellites. Services available through satellite.

TEXT BOOKS

1. H. Taub and D.L. Shilling, Principle of Communication System, TMH
2. Leon W. Couch, II, Digital and Analogue Communication Systems – 6th Edition, Pearson Publication.

REFERENCE BOOKS

1. Louis E. Frenzel., Communication Electronics – Principles and Applications, 3rd Edition.

CY – 201 ENGINEERING MATERIALS (3-0-0)

MODULE – I (16 Hours)

Fuel and combustion: Classification, calorific value, Solid fuels (Analysis of coal, manufacture of metallurgical coke),Liquid fuels (Refining of crude oil: fractional distillation, cracking, reforming, knocking, octane number and cetane number), Gaseous fuel (Producer gas, water gas, Biogas, LPG), Combustion calculations.

Water treatment : Hardness of water & its determination (EDTA method), Types of hardness, Disadvantages of hard water in boiler, Softening techniques (Soda lime, Zeolite and ion-exchange processes), Purification of Drinking water.

MODULE –II (12 Hours)

Inorganic Engineering Materials:

1. Glass: Manufacture of glass, Types.
2. Ceramics: White wares, glazing, optical fibres.
3. Refractories: Classification, manufacture of silica, fire clay and carborundum bricks.
4. Abrasives: Natural and artificial (carborundum, Alundum, Norbide).

Bio &Conducting polymers:

Bio-polymers (Starch, Cellulose)**,** Conducting polymers (Polyacetylene, Polyaniline) Properties and application.

MODULE – III (14 Hours)

1. **Composites :** Constituents of Composites, Types of composites fibre - Reinforced composites, (Fiberglass, Advanced composites, wood) , Aggregate composites , mechanical properties of composites. Processing of composites.
2. **Chromatography :** Thin layer chromatography, Gas-liquid chromatography, Column chromatography, High Performance Liquid Chromatography (HPLC).

TEXT BOOKS

1. Jain & Jain, Engineering chemistry, 15th Edition, Dhanpat Rai Publishing Co., 2007.
2. Shackelford & Muralidhara:Introduction to Materials Science for Engineers, Sixth Edition 2007, Pearson Education.

5th & 6th SESSIONALS

EC -371 DIGITAL SIGNAL PROCESSING LAB (0-0-3)

(Any 8 experiments should be completed)

1. Different types of Signal generation using MATLAB. (both continuous and discrete.)
2. Linear Convolution of sequences. (Without using the inbuilt function conv() available in MATLAB.)
3. Circular Convolution of two Sequences
   i) Computation of circular convolution
   ii) Computation of linear convolution using circular convolution & comparison of result with the result obtained from linear convolution.
4. Correlation between sequences
   i) Finding auto correlation of a sequence
   ii) Finding cross correlation of 2 sequences.
   iii) Finding power spectral density of a sequence.
   iv) Finding correlation using convolution
   v) Finding circular correlation between sequences
5. Finding the convolution (linear and circular) and correlation (linear & circular) of periodic sequences using DFT and IDFT.

6. Implementation of DFT (Fast Fourier Transform) and IFFT algorithms using
   i) Decimation in Time (DIT)
   ii) Decimation in Frequency (DIF)
7. Design of FIR filters (lowpass, highpass, bandpass) Using windowing technique (hamming window, hanning, window rectangular window, Kaiser window) and comparison of their frequency responses.
8. Design of IIR filter.
   i. Design of Butterworth Filter
   ii. Design of Chebyshev filter
9. Convolution of long duration sequences using overlap add & overlap save methods using DFT and IDFT
10. Working with a DSP processor. (fixed point -TMS320C-5X / Floating point) series.
    i) Implement convolution (Linear & circular convolution)
    ii) FIR & IIR filtering implementation .

EE-371 POWER ELECTRONICS LAB (0-0-3)

1) Study of V-I characteristics of SCR.
2) Study of different methods of triggering of SCR.
   a) R-Triggering Method
   b) RC-Triggering Method
3) Study of different methods of triggering of SCR.
   a) UJT-Triggering method
   b) Cosine-Triggering method
4) Study of SCR Commutation Techniques
   Self Commutation (Class-A, Class-B)
5) Study of SCR Commutation Techniques
   Forced Commutation (Class-C, Class-D, Class-E)
6) Study of Single phase full wave fully controlled and semi controlled converter with R, R-L load with / without freewheeling diode.
7) Study of Three phase full wave fully controlled and semi controlled converter with R, R-L load with / without freewheeling diode.
8) Study of Single Phase AC voltage Controller Using Triac.
9) Study of DC Jones chopper with PWM controller.
10) Study of IGBT based 3-phase Voltage Source Inverter.
11) Study of Single phase Cyclo Converter.
12) Study of single phase Series Inverter.
13) Study of single phase Parallel Inverter.
14) Study of single phase Current Source Inverter.

EI 373 INSTRUMENTATION & MEASUREMENT LAB (0-0-3)

(1-8 experiments are compulsory and any 2 from the rest)

List of Experiments

1. Sine wave square wave and pulse measurement.
2. Phase and frequencies Measurement by Time base and Lissagous Figure method.
3. Linearity Measurement of an Amplifier.
4. Design and Simulation of Different types of multi-vibrators
5. Spectrum analysis by Bank of filters.
6. Time domain Reflectometry.
7. Design a circuit to generate Ramp and Square wave by using 555 Timer
8. Temperature Measurement using RTD & Thermister.
9. Design and Simulation of a Function generator, fixed and variable D.C. power supply.
10. Design and simulation of a Digital Multimeter.
11. Design and Simulation of PLL Circuit.
12. Measurement of Q factor, resonance frequency and bandwidth of series and parallel R-L-C circuit.
13. Measurement of unknown passive components by the help of different bridge.

EC-373 MICROPROCESSOR & MICROCONTROLLER LAB. (0-0-3)

(AEI, ECE,EE, EEE & ICE)(5^{TH} & 6^{TH})

NOTE : Total 10 (Ten) experiments have to be completed.

(2 from Gr – A , 4 from Gr – B , 2 from Gr – C, 2 from Gr – D)

A) 8085

1. Addition, Subtraction, Multiplication, Division of two 8 bit numbers resulting 8/16 bit numbers.
2. Smallest /Largest number among n numbers in a given data array
3. Binary to Gray Code / Hexadecimal to decimal conversion.

B) 8051MICROCONTROLLER

COMPULSORY

4. Initialize data to registers and memory using immediate, register , direct and indirect addressing mode

OPTIONAL (any one)

5. Addition, subtraction of 16 bit numbers.
6. Multiplication, Division of 16 bit numbers
7. Transfer a block of data to another memory location using indexing.

C) INTERFACING

COMPULSORY

8. Operation of 8255 using 8085 & 8051 microcontroller
9. Generate square waves on all lines of 8255 with different frequencies (concept of delay program)

OPTIONAL (Any Two)

10. Study of stepper Motor and its operations (Clockwise, anticlockwise, angular movement, rotate in various speeds)
11. Study of Elevator Simulator
12. Generation of Square, triangular and saw tooth wave using Digital to Analog Converter
13. Study of 8253 and its operation (Mode 0, Mode 2, Mode 3)
14. Study of Mode 0, Mode 1, BSR Mode operation of 8255.
15. Study of 8279 (keyboard & Display interface)
16. Study of 8259 Programmable Interrupt controller.
17. Study of Traffic Light controller

D) 8086

COMPULSORY

18. Addition, subtraction, Multiplication , Division of 16 bit nos + 2's complement of a 16 bit no.

OPTIONAL (Any One)

19. Marking of specific bit of a number using look-up table.
20. Largest /Smallest number of a given data array.
21. To separate the Odd and Even numbers from a given data array.
22. Sorting an array of numbers in ascending/descending order
23. Finding a particular data element in a given data array.

EI-371 SENSOR & SIGNAL LAB (0-0-3)

(1-8 is compulsory and any two from remaining)

List of Experiments

1. Design and Simulation of 2nd order Active filters (Low-pass, high, band pass and all pass).
2. Design and Simulation of Instrumentation amplifier.
3. The study and simulation of Analog to Digital Converter (ADC).
4. Study and Simulation of Digital to Analog Converter (DAC).
5. Design and Simulation of the Reactive - Deflection bridge with two resistive sensors.
6. Study of the characteristics of optical sensors:- LDR, Photodiode, Phototransistor, Opto-coupler and photo multiplier.
7. Study of the characteristics of Linear Variable Differential Transformer (LVDT).
8. Study the characteristics of thermocouples with and without cold Jn. Temp. Compensation.
9. Study of capacitive transducer and measurement of capacitance by the principle of variable dielectric method.
10. Study of the characteristic between strain applied to the contilever strain sensor and signal conditioned output of the strain gauge.
11. Study the characteristics of pillar load cell
12. Study of piezo-electric transducer and its characteristics.
13. Study of electrochemical transducer- measurement of Bioelectric signal (PH)
14. Design and simulation of Balance modulator.

EC – 372 ELECTRONIC DESIGN LAB (0-0-3)

(Experiments under sl no. 1-8 are mandatory ; 9 and 10 should be attempted)

1. AD and DA converters - Linearity.
2. 2 Level to N- level converter.
3. Delta Modulator and Adaptive Delta Modulator.
4. Generation of PSK, DPSK and QPSK Signal.
5. Generation of FSK and MSK Signal.
6. Generation of ASK and QAM Signals.
7. QPSK Demodulators.
8. Design of a PN sequence generator.
9. PCM – TDM (MATLAB/Simulink Simulation)
10. Performance of any digital modulation/demodulation Scheme in the presence of noise (MATLAB Simulation)

7th Semester				8th Semester			
Subject Code	***Theory***	***Contact Hrs L-T-P***	***Credit C***	***Subject Code***	***Theory***	***Contact Hrs L-T-P***	***Credit C***
EI-401	Process Control & instrumentation	3-1-0	4	EI-402	Bio Medical Engg.	3-0-0	3
EI-423	VLSI Design	3-0-0	3	EI-404	Fibre Optic Instrumentation	3-1-0	4
HS-401	Principles of Management	3-0-0	3	EL-IV	Elective – IV	3-0-0	3
EL-II	Elective-II	3-0-0	3	EL-V	Elective – V	3-0-0	3
EL-III	Elective-III	3-0-0	3				
		16	**16**			**13**	**13**
Subject Code	***Practicals / Sessional***	***Contact Hrs L-T-P***	***Credit C***	***Subject Code***	***Practicals / Sessional***	***Contact Hrs L-T-P***	***Credit C***
EI-471	VLSI Lab	0-0-3	2	EI-492	Seminar	0-0-2	1
EI-473	Process Control Lab.	0-0-3	2	EI-494	Major Project	0-0-10	7
EI-491	Seminar	0-0-2	1	EI-496	Comprehensive Viva – Voce	0-0-3	2
EI-493	Minor Project	0-0-5	3				
EI-495	Summer Training		2				
	Total	**13**	**10**		**Total**	**15**	**10**
	Grand Total	**29**	**26**		**Grand Total**	**28**	**23**

EI-401 PROCESS CONTROL & INSTRUMENTATION (3-1-0)

MODULE -I (14 Hours)

Introduction: Review of control theory concept, instrumentation Symbols and control room layout.

Introduction to process control: Definition, Dynamic variable, Regulations, elements of process control servomechanism.

Elements and characteristics of process control: Dynamic elements in control loop. Negative feedbadk, dead time and capacity characteristic of real processes.

Actuators : Pneumatic Actuator: Introduction , Actuator features and selection , Diaphragm actuators, piston actuators , High speed actuator , rotary valve actuator. Electrical Actuators: D C motor , A C motor and stepper motors.

MODULE -II (14 Hours)

Controllers: Linear controllers, disturbances, P, I, PI, PID controllers, model based controller interrupting control loop, Non linear elements in closed loop, non liner phase shifting elements, variation of ON- OFF controller dual mode concept, non-linear PID controllers and problems, Transient response of control systems: Servo operation and regular operation, Type of inputs, general equation for transient operation, proportional control of single capacity, two capacity and three capacity process. PI control of single capacity and two capacity process and problems.

Frequency response of controls: PI, PD, PID. Interaction between derivative and integral elements, frequency response of closed loop system, changes in set point, changes in load, effect of measurement log.

MODULE- III (12 Hours)

PLCs and Other Logic Devices:- Binary Logic Diagrams for Process Operations, Ladder Diagrams, Optimization of Logic Circuits, PLCs : Programmable Logic Controllers, PLC Programming, Relays, System Integration: Computers with PLCs, Time Delay Relays, Timers and Programming Timers

TEXT BOOKS

1. Peter Horriot, Process control, TMH Publications.
2. D. Patranabis, Principles of process control, TMH Publications.
3. B.G. Liptak, Process Control and Optimization, CRC press

REFERENCE BOOKS

1. F.G. Shinskey, Process Control System, TMH Publications.
2. C.B. Johnson., Process Control Instrumentation , PHI publications
3. Smith C.L and Corripio.A..B, John Wiley and Sons, Principles and Practice of Automatic Process Control, 2nd Edition, New York, 1998.
4. Shinskey, Process Control Systems, 4th Edition, McGraw Hill, Singapore, 1996.
5. Paul W.Murril, "Fundamentals of Process Control Theory", 3rd Edition, ISA press, New York

EI-423 VLSI DESIGN (3-0-0)

MODULE – I (10 Hours)

Introduction: Historical evolution of VLSI, Moore's Law, VLSI Design Methodologies, Front end design and Back end design

VLSI Fabrication: Fabrication processes, NMOS Fabrication, CMOS Fabrication, CMOS N-well process, Layout Design Rules, Stick Diagrams, Mask Layout Design

MOS Transistor: Review of structure and operation of MOSFET, NMOS, CMOS, MOSFET V-I characteristics, MOSFET capacitances, Short channel effects, MOSFET scaling, Modeling of MOSFET Transistors – Basic concept of SPICE level-1, level-2 and level-3 model equations.

MODULE – II (12 hours)

MOS Inverters: Basic MOS inverters and their characteristics, inverters with resistive load and with n-type MOSFET load, CMOS inverter Switching characteristics and interconnect effects, Delay time definition and calculations, inverter design with delay constraints, estimation of parasitics, switching power dissipation of CMOS inverters

Combinational MOS Logic Circuits: CMOS logic, complex logic circuits, pass transistor and transmission gate logic, sequential logic circuit: SR latch, clocked & flip-flop circuits, CMOS D latch and edge triggered flip-flop.

MODULE – III (12 hours)

Dynamic Logic Circuits: Dynamic logic, basic principles, high performance dynamic logic circuits, Memories: ROM, Dynamic RAM, SRAM, flash memory

VHDL: Introduction, Behavioral Modeling, Sequential processing, Data Types, Sub program & Packages, Attributes, Configurations, VHDL design of adders, Multiplexer, Decoder, Latch, S-R flip flop, D flip flop, Memory circuits, Front end e-CAD tools

VLSI eCAD: VLSI Design methodology, Full custom, Semi-custom and Programmable designs, VLSI Design Flow, FPGA based designs, standard cell based designs, floor planning and place and route, Back end e-CAD tools

Design Verification and Testing: simulation at various levels including timing verification, fault models, Design strategies for testing chip level and system level test techniques.

TEXT BOOKS:

1. Kang and Yussuf Leblebici, CMOS Digital Integrated Circuits – Analysis & Design, Sung Mo, Tata McGraw Hill.
2. D.L.Perry, VHDL Programming by examples, Tata McGraw Hill

REFERENCE BOOKS:

1. J.M.Rabey, Anantha Chandrakasan and Borivoje Nikolic, Digital Integrated Circuits: A Design Perspective , Pearson Education.
2. Geiger et al., VLSI Design Techniques for Analog and Digital Circuits, McGraw Hill

HS 402 PRINCIPLES OF MANAGEMENT (3-0-0)

MODULE-I [12 hours]

Introduction to Management: Science, Theory and Practice; Importance and Scope of Management; Evolution of Management Thought; Management and Environment- Environmental Impact on the Management Process; Globalisation and Business Environment; Social Responsibilities and Obligations of Business Management.

Importance of Management in Engineering and Technology - Critical Factors in Managing Technology, Management of Technology and Global Competitiveness, Formulation of a Technology Strategy; Creating the Product-Technology-Business Connection, Technology Planning, Technology as an Instrument of Competition.

MODULE-II [12 hours]

The Process of Management; Planning – Essentials of Planning and Managing by Objectives, Strategies, Policies, Planning Perishes, and Decision Making; Organising – Principles of Organization, Organization Structure, Effective Organizing and Organization Culture; Directing – Crisis Management and Corporate Governance; Staffing – Selection, Training, Development, Appraisal,

Knowledge Management; Controlling – The System and Process of Controlling, Control Techniques and Information Technology.

MODULE-III [12 hours]

Functions of Management – Marketing Function of Management, Morden Concept of Marketing, Functional Classification of Marketing, Marketing Mix, Fundamental Needs of Customers, Role of Distribution Channels and Advertising; Financial Functions of Management – Concept of Financial Management, Project Appraisal, Tools of Financial Decision Making, Introduction to Short-Term and Long-Term Sources of Financing.

TEXT BOOKS

1. Essentials of Management, Harold Koontz and Heinz Weihrich, Tata McGraw Hill, 8th Edition, 2010.
2. Business Organisation and Managemnt, C. R. Basu, Tata McGraw Hill, 3rd Reprint, 2008.
3. Management of Technology, Tarek Khalil, Tata McGraw-Hill Edition, 2009.

REFERENCE BOOKS

1. Management – Theory and Practice, C. B. Gupta, 14th Edition, S. Chand & Sons, 2009.
2. Financial Management, I. M. Pandey, Vikas Publications, 9th Edition, 2009.

ELECTIVE – II & III

EI - 415	**ADVANCED TRANSDUCER TECHNOLOGY**
EC - 413	**OPTO ELECTRONICS AND PHOTONICS**
EI - 417	**SCIENTIFIC & ANALYTICAL INSTRUMENTATION**
EC - 421	**DIGITAL IMAGE PROCESSING**
EC - 423	**DIGITAL SPECH PROCESSING**
CS - 301	**OPERATING SYSTEMS**
EI - 425	**EMBEDDED SYSTEMS DESIGN**
MA - 401	**SIMULATION MODELLING**
EC - 445	**COMPUTER COMMUNICATION NETWORKS**
EI - 427	**ANALOG VLSI**
IT - 401	**ESSENTIALS OF IT**
EC – 424	**ADAPTIVE SIGNAL PROCESSING**
EC- 452	**SOFT COMPUTING**
EC - 302	**ADVANCED ELECTRONICS CIRCUITS**
IT - 417	**MANAGEMENT INFORMATION SYSTEM**

EI-415 ADVANCED TRANSDUCER TECHNOLOGY (3-0-0)

MODULE-I (10 Hours)

Flow:-Introduction, Classification of Flow Meters, Head-Type of Flow Meters, Rota meter, Electromagnetic Flow meter, Mechanical Flow Meters, Anemometers, Ultrasonic Flow Meter, Vortex Flow Meter.

Ionization Transducer: Ionization vacuum gauges, ionization displacement transducer, nuclear radiation transducer, radioactive vacuum gauge, radioactive thickness gauge, radioactive level gauge

MODULE-II (11 Hours)

Sensors signal Conditioning: Deflection Bridges, Tthevenin's equivalent circuits, design of resistive deflection bridges, two-element resistance thermometer bridge, design of reactive deflection bridges, Amplifiers: limitations of practical op-amp IC. Instrumentation amplifier, isolation amplifier, AC Carrier system, Current transmitters, Closed loop differential pressure transmitter, open loop differential pressure and temperature Transmitter, intelligent Transmitters, Oscillators and Resonators.

Sensor Signal Processing Circuits: Analog to digital conversion; Frequency to digital conversion, DA Converters, Voltage to frequency converter, Analog modulators; Amplitude modulators, frequency modulators, Analog Demodulators: amplitude and frequency demodulators.

MODULE-III (14 Hours)

Feedback Transducers system : Introduction, feedback fundamentals, Inverse transducers, Temperature balance system, self balancing potentiometer, self balancing bridges, Heat flow balance system, Beam balance system, server operated manometer, feedback pneumatic load cell, servo operated electromagnetic flow meter, feedback accelerometer system, Integrating servo, automatic measurement of dew point , Non contact position measurement, Bimorph position control system , Other application of feedback.

Data display and Recording systems: Review and choice of data presentation elements, pointer scale indicators, Analog chart Recorders, small scale alphanumeric display, Liquid crystal display, Magnetic tape recorder, Data loggers.

Data Transmission & Telemetry : Introduction, Data logger, analog Indicators, Digital readout systems, Analog recorders magnetic tape recorders, Digital input & output devices

TEXT BOOKS

1. Instruments and Transducers, by D.V.S. Murty , PHI
2. Principle of measurement system, 3rd Edition by Joseph P.Bentley

REFERENCE BOOKS

1. B.G. Liptak, Process Measurement and Analysis, 4th Edition, CRC Press.
2. C.S. Rangan, G.R. Sharma, V.S.V. Mani, Instrumentation Devices & Systems, 2nd Edition,Tata McGraw Hill publishers.

EC 413 OPTO ELECTRONICS AND PHOTONICS (3-0-0)

MODULE-I (12 Hours)

Optical Processes in Semiconductors, Electron-hole pair formation and Recombination. Absorption in semiconductors. Effect of Electric field on absorption. The Kramer – Kronig Relation. Radiation in Semiconductors. Luminescence from Quantum wells. Time-Resolved Photoluminescence.

P-N Junction; Semiconductor Hetero Junctions; Light Emitting Diodes: The Electroluminescence process. Choice of LED Materials. Device Configuration and efficiency, Light output from LED. Device Performance, Frequency response and Modulation bandwidth.

MODULE-II (12 Hours)

Lasers: Operating Principles, Emission, absorption and radiation in 2-level systems. The Einstein Relations and Population inversion. Lasing conditions and gain in a semiconductor. Selective Amplification and coherence – need for Laser Cavity. Lasing Threshold condition

Distributed feedback laser. Quantum well lasers. Measurement of Laser Characteristics.

Photo detectors: Gain & Bandwidth. Junction Photo detectors. PIN and APD Photo detectors. Noise performance.

MODULE-III (12 Hours)

Optical Amplifiers: Solid State Optical Amplifiers, Erbium doped Fiber Amplifier

Solar Cells Basic Principles: Current – Voltage Character Spectral Response. Hetero junction and cascaded solar cells. Schottkey Barrier cells. Materials and design considerations: Materials requirements.

Solar Cell Design. P^t–n–n^+ Vrs n^+–p–p^+ cells.

Dependence of Cell performance on External Factors.

TEXT BOOKS

1. Pallab Bhattacharya, Semiconductor Optoelectronic Devices, PHI
2. D.K. Mynbaev and L.L. Scheiner, Fiber-optic Communication Technology, Pearson Publication. Selected Portions.

REFERENCE BOOKS

1. A. Yariv and Pochi Yeh, Photonics – 6^{th} Edition, Oxford Publication
2. Gerd Keiser, Optical Fiber Communication, 3^{rd} Edition, McGraw Hill International Edition.

EI-417 SCIENTIFIC & ANALYTICAL INSTRUMENTATION (3-1-0)

MODULE I (14 Hours)

Introduction to Scientific and Analytical Instruments

Spectrophotometers: Electromagnetic Radiations, Laws relating to absorption of radiation, Absorption of radiation, Absorption instruments, single beam Null type spectrophotometer, Direct reading, Double beam ratio recording, Dual wavelength spectrophotometer, the derivative technique, sources of errors in spectrophotometric measurements.

IR spectrophotometer: Infrared spectroscopy, Basic components, types, sample handling techniques, FIR, calibration, ATR technique

MODULE II (14 Hours)

Atomic Absorption spectrophotometer: Atomic absorption spectroscopy, Atomic absorption instrumentation, sources of interference.

Mass spectrometer: Basic mass spectrometer, principle of operation types, components, ICR mass spectrometer, Gas chromatograph- mass spectrometer, liquid chromatographic mass spectrometer.

Nuclear magnetic Resonance spectrometer: NMR spectroscopy, Principles, types, constructional details, sensitivity enhancement for analytical NMR spectroscopy.

MODULE III (12 Hours)

X-ray spectrum, Instrumentation for x-ray spectrometry, x-ray defractometer, x-ray absorption meter, x-ray house scence spectrometry, electroprobe micro analyzer.

Blood gas analyzer: Acid Base balance, Blood PH measurement, measurement of Blood PCO2 Blood PO2 measurement, a complete blood gas analyzer.

Industrial gas analyzer: Types, paramagnetic oxygen analyzer, magnetic wind instruments, the electrochemical methods, IR gas analyzers, Thermal conductivity analyzers, Analyzers based on gas density method based on ionisation of gases.

TEXT BOOKS:

1. R.S. Khandpur Analytical Instruments, TMH Publications

REFERENCE BOOKS

1. D. Patranabis, Principles of Industrial Instrumentation, TMH Publications.
2. B.G. Liptak, Process Measurement and Analysis, 4th Edition, CRC Press

EC 421 DIGITAL IMAGE PROCESSING (3-0-0)

INTRODUCTION: Fundamental steps in Digital Image Processing, Components of an image processing system, DIGITAL IMAGE FUNDAMENTALS: Image sampling and quantization, Some basic relationships between pixels, Linear and nonlinear operations, IMAGE ENHANCEMENT IN SPATIAL DOMAIN: Some basic gray level transformations, Histogram processing, Smoothing and Sharpening spatial filters, IMAGE ENHANCEMENT IN FREQUENCY DOMAIN: Smoothing and Sharpening frequency domain filters, Homomorphic filtering, IMAGE RESTORATION: Noise models, Restoration in the presence of noise only-spatial filtering, Estimating the degradation functions, Inverse filtering, COLOR IMAGE PROCESSING: Color models, Pseudo-color processing, IMAGE COMPRESSION: Image compression models, Loss-less and Lossy compression, MORPHOLOGICAL IMAGE PROCESSING: Dilation and erosion, Opening and closing, Some basic morphological algorithms, IMAGE SEGMENTATION: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region based segmentation, RECENT DEVELOPMENTS**.**

TEXT BOOKS

1. R. C. Gonzalez and R.E. Woods, Digital Image Processing, Pearson Education, 2006
2. R. C. Gonzalez , R.E. Woods and Eddins, Digital Image Processing using MATLAB, Pearson Education

REFERENCE BOOKS

1. A. K. Jain, Fundamentals of Digital Image Processing, Pearson Education, 2007
2. B.Chanda & D. Dutta Majumdar , Digital Image Processing and Analysis, PHI, 2001.
3. Alasdair McAndrew , Introduction to Digital Image Processing with MATLAB, Cengage Learning, 2004

EC 423 DIGITAL SPEECH PROCESSING (3-0-0)

Background: Pattern Classification, Statistical Pattern Classification. Introduction to Digital Speech Processing. **Digital Models:** Process of Speech Production, Acoustic Theory of Speech Production, Digital Models for Speech Signals.

Digital Representation: Speech Signals and Representations or Feature Extraction, Digital Representation of speech Waveform. Sampling speech signals, Statistical Model, Instantaneous quantization, Instantaneous companding, Quantization for optimum SNR, Adaptive Quantization, Feed-Forward and Feedback adaptations, Speech production model, Linear Predictive Coding (LPC) Analysis, Block diagram of Simplified Model for Speech production. Basic Principles of Linear predictive Analysis- The Auto Correlation Method. Computation of the Gain for the Model, The Prediction Error Signal.

Speech Recognition: Speech Recognition and Understanding, Automatic Speech Recognition(ASR): Feature extraction, Hidden Markov Model (HMM),

Digital Speech Processing for Man-machine Communication by voice, Speaker Recognition Systems – Speaker Verification and speaker Identification Systems.

TEXT BOOKS

1. L.R. Rabiner, R.W. Schafer, Digital Processing of Speech Signals, Pearson Education.
2. B. Gold, N. Morgan, Speech and Audio Signal Processing, John Wiley & Sons.

REFERENCE BOOKS

1. Quatieri, Discrete-Time Speech Signal Processing, Pearson Education.
2. Kondoz, Digital Speech, John Wiley & Sons.
3. Rabiner & Juang, Fundamental of Speech Recognition, Pearson Education.

CS-301 OPERATING SYSTEMS (3-0-0)

MODULE-I (15 Hours)

Introduction: What is an Operating System, Evolution of operating system, Simple Batch Systems, Multiprogramming and Time Sharing systems. Personal Computer Systems, Parallel Systems, Distributed Systems and Real time Systems. **Operating system structures**: O.S. Services, system calls, operating system structure. **Process Management:** Process concept, Process Scheduling, Operation on Processes, Cooperating Processes. Inter-process communication. Threads: User and Kernel level threads. **CPU Scheduling:** Basic concepts, scheduling criteria, scheduling algorithms. **Process synchronization:** Background , Critical section problem, Hardware Primitives Semaphore, Overview of classical synchronization problems, Monitors

MODULE-II (15 Hours)

Deadlocks: System model, Deadlock Characterization Methods for Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection, Recovery from Deadlock. **Memory management:** Background, address Binding, Logical versus Physical Address space, Overlays, contiguous Allocation. Paging, Segmentation. Segmentation with paging. **Virtual Memory:** Background, Demand paging, performance of Demand paging, Page Replacement Algorithms. Allocation of frames, Thrashing,

MODULE – III (10 Hours)

File-system: File concept, Access Methods, Directory structure & implementation, Allocation Method, Free space management. **I/O systems:** Overview, I/O Hardware, Application of I/O interface, Kernel I/O - subsystem Transforming I/O requests to Hardware Operations. Secondary

storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap space Management, Disk Reliability. UNIX Operating System calls and interprocess communication, Case study.

TEXT BOOK

1. Abraham Silberschatz and Peter Bear Galvin, Operating System Concepts, Addison Wesley.

REFERENCE BOOKS

1. H.M Deitel, Operating System, Addison Wesley
2. Milenkovic, M , Operating Systems – concepts and Design, McGraw Hill International.
   Andrew, S Tannenbaum, Operating System, PHI

EI-425 EMBEDDED SYSTEM DESIGN (3-0-0)

MODULE-I (14 Hours)

Introduction: An Embedded System, Processor in the System, Other hardware units, Software embedded into a system, Exemplary Embedded System-on-Chip (SOC) and VLSI circuit.

Devices and Device Drivers: I/O Devices, Timer and counting Devices, Serial communication using IC, CAN and advanced I/O buses between the networked multiple devices, Host system or computer parallel communication between networked I/O multiple devices using ISA,PCI, PCI-X and advanced buses, Device Drivers, Parallel Port Device Drivers in a System. Serial Port Device in a system, Interrupt servicing (Handling) mechanism.

MODULE-II (14 hours)

Software and Programming Concepts: Processor selection for an embedded system, memory selection for an embedded system, Embedded programming in C++, Embedded Programming in JAVA, Unified modeling language (UML), Multiple Processes and Application, Problem of sharing data by multiple tasks and routines, Inter Process Communication.

Real Time Operating System: Operating system services, I/O subsystem, Network Operating System, Real time and Embedded System, Need of well tested and debugged Real time Operating System (RTOS), Introduction to C/OS-II.

MODULE-III (12 hours)

Case Studies of Programming with RTOS: Automatic vending machine, Adaptive Cruise Control System for a Car, Smart Card.

Hardware and Software Co-design: Embedded system project management, embedded system design and co-design issues in system development process, Design cycle in development phase for an embedded system, Use of software tools for development of an embedded system, Issues in embedded system design.

TEXT BOOKS:

1. Embedded systems-Architecture, Programming and Design.
   By: Raj Kamal, Tata McGraw Hill, ISBN: 0070494703
2. Languages for Digital Embedded Systems. By: Stephen A. Edwards, Kluwer, 2000, ISBN:

REFERENCE BOOKS:

1. Stuart R. Ball, Embedded Microprocessor Systems: Real World Design.Butterworth-Heinemann Publishers, 3rd edition, 2002, ISBN: 0750675349
2. Jack G. Ganssle, The Art of Programming Embedded systems. academic Press,1992, ISBN:0122748808.

MA-401 SIMULATION MODELLING (3-0-0)

MODULE-I (14 Hours)

Introduction to Systems, Models and simulations, Discrete-event simulation, simulation of a single server queuing system, Steps in a sound simulation study, Continuous, Discrete-continuous and Monte Carlo Simulation, Advantages, Disadvantages and pitfall of simulation. List processing in simulation, Single-Server queuing simulation with Simlib. Simulation Software (classification and desirable features)

MODULE-II (14 Hours)

Review of Statistics, Random variables, Simulation output data and stochastic processes, Estimation of means, variances and correlations, Confidence intervals and Hypothesis testing, strong law of large numbers, Building valid, credible and appropriately detailed simulation model , Instruction, level of model detail, verification of simulation computer programs Techniques for increasing model validity and credibility. Selection of input probability distributions, Hypothesizing, families of distributions, estimation of parameters, Determining how representative the fitted distributions are.

MODULE-III (14 Hours)

Random-number generators (Linear congruential generators, composite generators, Testing random-number generators) Generating random variates (Inverse transform, composition, convolution, acceptance-rejection of methods), Output data analysis for a single system (Transient and steady) State behavior of stochastic process, Types of simulations with regard to output analysis, statistical analysis for terminating simulations.

TEXT BOOKS

1. A.M. Law, Simulation Modeling and Analysis, 4th Edition, TMH , 2008.
2. N.Deo- Simulation and Modeling (PE)
3. Banks, Earson, Nelson & Nicol : Discrete Event system simulation

EC 445 COMPUTER COMMUNICATION NETWORKS (3-0-0)

MODULE-I (11 Hours)

Approach to Network Design. Key factors in Communication Network Evolution. Applications and layered Architecture. The OSI Reference Model. Overview of TCP/IP Architecture. Complete Block diagram of a Digital Communication System including coding, decoding, Equalizer, diversity facilities – one for wired – and other for wireless connection emphasing the basic principle of operation. Concept of Bandwidth, data rate, capacity, error ditection and correction capabilities of the system. A brief introduction to co-ax cable and optical fiber and especially the latters serving as backbone of modern Internet System. Wireless Channels and their associated problems.

Introducing the concepts of Frequency Division Multiplexing, Time Division Multiplexing and Wavelength Division Multiplexing.

MODULE-II (15 Hours)

SONET Multiplexing and Sonet frame structure. Circuit Switching and Packet Switching, Signaling system Architecture. Cellular Telephone Network. Satellite Cellular Network.

Peer-to-Pear protocols & service models. ARQ protocol. Other Adaptation Functions. Data line Controls.

Local Area Network and Medium Access Control Protocols: LAN structure; the medium Access Control sub layer, the logical link control layer. Random Access – Aloha, slotted Aloha, CSMA, CSMA-CD. Scheduling approaches to Medium Access Control. LAN Standards.

MODULE-III (15 Hours)

Packet Switching Networks:

Routing in Packet Networks. Shortest Path Algorithms. ATM Networks. Traffic Management and QOS. Congestion Control.

TCP/IP: The TCP/IP Architecture. The Internet Protocols, IPV6. User Datagram Protocol. Transmission Control Protocol. Dynamic Host Configuration Protocol, Mobile IP. Internet Routing Protocol. Multicast Routing.

TEXT BOOKS

1. Alberto Leon-Garcia and Indra Widjaja, Communication Networks, Tata McGraw Hill Publishing Co., New Delhi, Selection Portion from Ch. 1,2,3,4,5,6,7 and 8.

REFERENCE BOOKS

1. William Stallings, Data & Computer Communication, Pearson Education

EI-427 ANALOG VLSI (3-1-0)

Introduction: Need for Analog IC's, CMOS based Analog IC's, Their applications, General concepts of Analog Design

Resistor, Capacitors and Switches: Integrated Resistors, Integrated Capacitors, Analog Switches, Layout of Switches

MOS Transistor : The MOS structure: Energy band diagrams, Depletion layer thickness, work function difference, Flat band voltage, threshold voltage, charge distribution, Capacitance – voltage characteristics, The basic MOSFET operation, current – voltage relation, Frequency limitation: small signal equivalent circuit, MOS device models, SPICE models

Single Stage Amplifiers : Current Sink and Current Source, Basic MOS amplifiers, Common Source Amplifiers with various loads and their small signal models and analysis, Source Follower, Common Gate Amplifier

Differential Amplifier : Basic Differential amplifier, Its input – output characteristics, Differential and Common mode operation, Half circuit concept, Small signal analysis

Current Mirrors : Current Mirror, Cascode Stage, Folded Cascode stage, Cascode Current Mirror, Active Current Mirror – Its small and large signal analysis and common mode properties

Properties of Amplifiers : Frequency response and noise of Common Source, Source Follower, Common Gate and Cascode and Differential Amplifiers, Feedback circuits, types of feedback, effect of loading on feedback and noise

Operational Amplifiers : Single stage and two stage Operational Amplifiers, Gain boosting, Common mode feedback, slew rate and noise, Stability and frequency compensation, Non-linearity and mismatch

Oscillators and Phase Locked Loop : Ring Oscillator, LC Oscillator, Voltage Controlled Oscillator, Simple PLL, Charge pump PLLs, Non-ideal effects in PLL, Applications of PLL

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits – Behzad Razavi, Tata McGraw Hill, 2002, ISBN:0072380322
2. Analysis and Design of Analog Integrated Circuits – by Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, 4th Edition, John Wiley and Sons, 2001, ISBN: 9780471321682.

IT 401 ESSENTIALS OF IT (3-0-0)

MODULE-I (10 Hours)

Fundamentals of Computer Architecture-Introduction-Organization of computer, Central Processing Unit-Execution Cycle- Instruction categories- measure of CPU performance, Memory-Input/Output devices-BUS- addressing modes, System software-Assemblers-Loaders and Linkers-Compilers and Interpreters, Operating system-Introduction- Process management scheduling-Memory management-Threads. Problem Solving with Algorithms, analysis of algorithms-Asymptotic notations

MODULE-II (12 Hours)

RDBMS-data processing-the database technology-data models, ER-modelling concepts-notations-Extended ER features, Logical database design-Normalization, SQL-DDL statements-DML statements-DCL statements, SQL tuning techniques. Objects oriented concepts-object oriented programming, UML class Diagrams-relationships-Inheritance-Abstract classes-Polymorphism, and Object Oriented Design methodology.

MODULE-III (08 Hours)

System Development Methodologies-Software Development Models, Components of Web Application-Browsers and Web servers, World Wide Web, URL-HTML-HTTP protocol-Web Applications-Application Servers-Web Security.

1. Table Creation and Queries using SQL
2. A Simple project on Database Design
3. Design the Bio- Data From using HTML
4. All the assignments will be done in the Computer lab.

TEXT BOOKS

1. Abraham Silberschatz and Peter Bear Galvin, Operating system concepts, Addison welsley.
2. David A. Patterson, John L. Hennessy, Computer Organisation & Design , Elsevier.
3. R. Elmasri, S. Navatne : 4th Edition, Fundamental of Database Systems, Pearson Education.
4. Blaha, Rumbaugh, Object-oriented Modelling & Design with UML,: PHI

REFERENCES

1. Infosys course materials.

EC 424 ADAPTIVE SIGNAL PROCESSING (3-0-0)

Adaptive systems: Examples and applications. Adaptive linear combiner : the performance function, gradient and minimum mean square error, alternative expression of gradient, LMS, NLMS, transform domain LMS, Recursive least square algorithm, windowed RLS , Block adaptive filter(time and DFT domains. IIR adaptive filter: equation error form. Adaptive filtering, adaptive channel equalization, Adaptive line enhancement and adaptive system identification. Applications of adaptive filter : 50hz Interference In Electrocardiography, Cancellation Of Donor-Heart Interference, Cancellation Of Maternal Ecg In Electrocardiography, Cancellation Noise In Speech Signals, Adaptive Echo Cancellation. Adaptive control systems: Model Inverse and Model Reference Controls. Introduction of Adaptive Array and Adaptive Beam Forming.

TEXT BOOKS

1. Simon Haykin and Thomas Kailath, Adaptive Filter Theory, Pearson Education, 4th Edition, 2005.
2. Bernard Widrow and Samuel D. Sterns, Adaptive Signal Processing, Pearson Education, 2nd Indian reprint, 2002.

EC- 452 SOFT COMPUTING (3-0-0)

Neural networks, Introduction, Neuron Models, Supervised and Unsupervised Learning Methods, Single Neuron/ Perceptron Networks, Training Methods, Applications to Linearly separable problems, Multi layered perceptrons, Back-propagation algorithm, Introduction to Fuzzy systems, Membership function, Fuzzy relational operation, fuzzy IF THEN rules, Defuzzyffication – Sugeno and Mamdani type systems, Adaptive Neuro-Fuzzy Sytems, Training Methods, Genetic Algorithm: Basic Concepts, Search Space, Working Principle. Encoding: Binary, Octal, Hexadecimal, Permutation, Value and Tree. Decoding, Fitness Function, Selection: Roulette-wheel, Tournament, Rank and Steady-state. Elitism, Crossover: Single-Point, Two-Point, Multi-Point, Uniform, Matrix And Cross Over Rate, Mutation: Mutation, Mutation Rate.

Ant Colony Optimization: Ant Foraging Behavior, Combinatorial Optimization, Routing In Communication Network, Application : Control; Communication Engineering; System Identification And Pattern Classification, Function Optimization, Adaptive System Identification, Channel Equalization.

TEXT BOOKS

1. S. Haykin, Neural Networks, A Comprehensive Foundation, Pearson Education, India
2. Martin T. Hagan, Howard B. Demuth, Mark H. Beale; Neural Network Design; (ISBN: 0-9717321-0-8); Thomson 2002
3. Jang, Sun and Mizutani; Neuro-Fuzzy and Soft-Computing – A computational approach to learning and machine intelligence, Prentice Hall of India David E. Goldberg, Genetic Algorithms in search, Optimization and machine learning, 1989.

REFERENCE BOOKS

1. Satish Kumar, A Classroom approach, Neural Networks: Tata McGraw Hill, 2004,

EC - 302 ADVANCED ELECTRONICS CIRCUITS (3-0-0)

MODULE-I (15 Hours)

Linear wave shaping:- The High pass and Low pass RC circuit- Exponential & Ramp input, Integrator, Differentiator, Attenuator

Bistable MV :- Stable states, fixed and self biasing transistor Binary, commutating capacitors, Triggering, Emitter coupled Binary- Schmit Trigger Circuit

Monostable MV:- Gate width of collector coupled mv, its waveform, effect of reverse saturation current on gate width, Analysis and waveform of emitter coupled monostable MV.

Astable MV:- Time period and waveforms of collector coupled multi, analysis of emitter coupled multi & its time period.

MODULE-II (10 Hours)

Negative Resistance Devices:- The behaviour and V~I characteristic of Tunnel Diode, UJT

Negative Resistance Switching Circuit:- Basic circuit principle for operation of voltage controllable and current controllable NR devices in Bistable, Monostable and Astable mode

Application of Tunnel diode as Bistable, Monostable and Astable circuit

555 timer wave generator Analysis, Application as Astable and monostable MV, sawtooth wave generator - using OP-AMP, using UJT

MODULE-III (10 Hours)

Voltage Time Base generator:- Method of generation-Exponential sweep circuit, NR switches, Miller and Bootstrap, Transistor Miller time base generator, Transistor Bootstrap time base generator.

Current time base generator:- A current sweep, linearity correction, Transistor current time base generator, methods of linearity improvement.

Sampling gate: Basic operating principle, unidirectional and Bidirectional diode gates. The transistor as a chopper.

TEXT BOOKS

1. J. Millman, C. Halkias and S. Jit, , Electronics Devices and Circuits (2nd Edition) Tata Mc Graw Hill.
2. J. Milliman, H. Taub and P.Rao, Pulse, Digital and switching waveform, Tata Mc Graw Hill.

REFERENCE BOOKS

1. Pulse and Digital Circuit, A, Ananda Kumar, PHI
2. OP-Amp and linear Integrated circuit, R.F. Coughlin and F. Driscoll, Pearson Education.

IT-417 MANAGEMENT INFORMATION SYSTEM (3-0-0)

MODULE-I (12 Hours)

Fundamentals of Information Systems, Systems approach to problem solving, Developing information system solutions. Information system components, Information quality, Data resource management, Database, Data models, Information Systems in marketing, manufacturing, HRM, Accounting and Finance.

MODULE-II (12 Hours)

Information analysis and design tools : Decision tools, Decision Table, Structured Analysis, Dataflow Analysis, Tools for dataflow strategy, Developing dataflow diagrams, Leveling, Data dictionary, Structured flow chart, HIPO, Warnier/ORR diagram.

MODULE-III (12 Hours)

Planning & implementation of Information Systems, Transaction Processing Systems, Executive information Systems, Decision Support Systems, Expert Systems, Knowledge Management. Computer crime, Security (Goals, risks, controls, security & recovery measures of IS, economics of information security) & ethical challenges.

TEXT BOOKS

1. James A. O'Brien, George M. Marakas, Management Information Systems, Eighth Edition, 2008, McGraw-Hill Education
2. Kenneth C. Laudon, Jane P. Laudon, Management Information Systems, Tenth Edition, Pearson Education

REFERENCE BOOKS

1. Kenneth E. Kendall, Julie E. Kendall , System Analysis and design, PHI Learning Pvt. Ltd
2. James A. Senn ,Analysis & Design of Information Systems, McGraw-Hill Education
3. Effy Oz, Management Information Systems, Sixth Edition, 2009, CENGAGE Learning India Pvt. Ltd., New Delhi.
4. Robert G. Murdick, Joel E. Ross, James R. Claggett, Information Systems for Modern Management, Third Edition, PHI Learning Pvt. Ltd., New Delhi.
5. Stephen Haag, Maeve Cummings, Amy Philips, Management Information Systems, Sixth Edition, 2007, McGraw-Hill Education (India), New Delhi.
6. Gordon B. Davis, Margarethe H. Olson, Management Information Systems, Second Edition, 1985, McGraw-Hill Education (India), New Delhi.
7. Mahadeo Jaiswal, Monika Mital, Management Information Systems, First Edition, 2004, Oxford University Press, New Delhi.

EI-402 BIOMEDICAL ENGINEERING (3-1-0)

MODULE – I (16 Hours)

Measuring, recording and monitoring instruments: Fundamentals of medical instrumentation, Bioelectric signals and electrodes, physiological transducers, Biomedical recorders, patient monitoring system,

Modern imaging system: x-ray m/c & Digital Radiography, computed tomography, pulse height analyzer, Gamma camera, ECT, SPECT, PET scanner, Echocardiograph, RT ultrasonic imaging system, Thermographic equipment, Pyroelectric vidicon camera,Thermal camera based on IR sensor with digital focal plane array

MODULE II (12 Hours)

Therapeutic Equipments: External cardiac pacemaker, Implantable pacemaker, Bladder stimulator, cerebellar stimulator, artificial kidney, Haemodealysis, machine, ventilators, modern ventilators, Humidefiors, Nebulizers, aspirators, Development of betatron, cobalt co machine.

MODULE III (12 Hours)

Clinical laboratory instruments: Medical diagnosis with chemical tests, spectrophotometer type instruments, colorimeter, spectrophotometer, automated biochemical analyses system, clinical flame photometer, selective ion electrodes based electrolytes.

Patient safety: Electric shack hazard, leakage current, safety codes for electromedical equipments, electrical safety analyzer, testing of biomedical equipment.

TEXT BOOKS

1. Handbook of Biomedical Instrumentation by R.S. Khandpur, TMH Publications (2nd Edition)

REFERENCE BOOKS

2. Biomedical Instrumentation and Measurements (2nd edition) by Leslie Cromwell, Fred J. Wlibell, Enrich A. Pleiffer.

EI-404 FIBER OPTIC INSTRUMENTATION (3-0-0)

MODULE-I (14 Hours)

Optical sources: Light Emitting Diodes (LEDs). LED Structures, Light Source Materials Quantum Efficiency and LED Power, Modulation of an LED.

LASER diodes: Principle of Operation, Modes and Threshold Conditions, Structure Optical output power and drive current-Quantum efficiency, Resonant frequencies, Radiation pattern, Single Mode Lasers, Modulation of Laser diode.

Optical Detectors: P-n junction Photo diode-how they work, Power relationship, Responsivity Vrs wavelength Equivalent Circuit of a p-n photo detector, Bandwidth, p-i-n photo diode and APD photodiode, Principle of operation, Sources of noise, Noise Equivalent Circuits, Signal to noise ratio for p-i-n and APD Photodiodes, Photodiode Sensitivity.

MODULE -II (12 Hours)

Optical Fiber, Fiber Materials: Ray Propagation in Step-Index Fibers, Total Internal reflection, Ray Propagation in Graded Index Fibers, Mode Theory, Monomode Fibers, Attenuation in Optical Fibers-Absorption, scattering and bending losses

Power launching and Coupling, Source-to-Fiber Power Launching. Power launching calculation, Equilibrium Numerical Aperture, Lensing Schemes for coupling improvement.

MODULE -III (14 Hours)

Fiber Optic Sensors. Intensity Modulated Sensors, Phase Modulated Sensors. Fiber-optic Mech-Zehnder Interferomatric sensors, Fiber-Optic Gyroscope Spectrally Modulated Sensors. Distributed Fiber Optic Sensors.

Optical Amplifiers: Semiconductor Optical amplifiers (SOA). Fabry- Perot type Erbium Dioped Fiber amplifiers. Fibre-optic Measurements:Modulation of intensity by sources. Modulation of Intensity by Transmission medium. Two Wave Noveleyth Systems interferometers

TEXT BOOKS

1. Gerd Keiser, Optical Fiber Communication, 3rd Edition, TMH
2. R.P. Khare, Fibre Optics &Opto electronics, Oxford University Press.

REFERENCES

1. Harold Kolimbins, Fiber Optic Communication, 3rd Edition, Pearson Education
2. Optical Fiber Communication – Senior (3rd Edition) PHI

ELECTIVE – IV & V

IC - 422	**VIRTUAL INSTRUMENTATION**
EI - 406	**INTELLIGENT INSTRUMENTATION**
CS - 416	**BIOINFORMATICS**
EI - 408	**LASER AND RADAR INSTRUMENTATION**
CS - 421	**SOFTWARE ENGINEERING**
IT - 411	**INTERNET AND WEB TECHNOLOGY**
IT - 314	**PROGRAMMING WITH JAVA**
EC- 442	**MOBILE COMMUNICATION ENGINEERING**

IC 422 VIRTUAL INSTRUMENTATION (3-1-0)

MODULE - I (14 Hours)

Introduction to Virtual Instrumentation: Introduction, Computers in Instrumentation, What is Virtual Instrumentation (VI)?, History of VI, Lab View and VI, Conventional and Graphical Programming, Future Perspectives, **Basic of Lab View:-** Introduction, Components of Lab View, Owned and Free Labels, Tools and other Pallettes, Arranging Objects, Pop-up Menus, Colour Coding, Code Debugging, Context Sensitive Help Creating Sub- Vis, **FOR and WHILE Loops:-** Introduction, The For Loop, The WHILE Loop, Additional Loop Problem, Loop Behaviour and Interloop Communication, Local Variable, Global Variables, Shift Registers, Feedback, Autoindexing, Loop Timing., **The Structures:-** Introduction, Sequence Structures, Case Structures, Case Structure, Formula Node.

MODULE -II (12 Hours)

Arrays and Clusters:- Introduction, Arrays, Clusters, Inter-conversion of Arrays and Clusters, **Graphs and Charts:-** Introduction, Waveforms Chart, Resetting Plots, Waveform Graph, Use of Cursors, X-Y Graph, **State Machines:-** Introduction, What is a State Machine?, A Simple State Machine, Event Structures, The Full State Machine, Notes and Comments.

File Input / Output:- Introduction, File Formats, File I/O Functions, Path Functions, Path Functions, Sample VIs to Demonstrate File WRITE and READ, Generating Filenames Automatically.

MODULE - III (14 Hours)

String Handling:- Introduction, String Functions, Lab VIEW String Formats, Examples, Some More Functions, Parsing of Strings, **Basics of Data Acquisition:-** Introduction, Classification of Signals, Real World Signals, Analog Interfacing , Connecting the Signal to the Board, Guidelines, Practical vs. Ideal Interfacing, Bridge Signal Sources., **Data Acquisition with Lab VIEW DAQ VIs:-** Introduction, Measurement and Automation Explorer, The Waveform Data Type, use of Simple VIs, Intermediate VIs, Use of DAQmx

Interfacing Instruments: GPIB and RS 232:- Introduction, RS232C vs. GPIB, Handshaking, GPIB Interfacing, RS232C/ RS485 Interfacing, Standard Commands for Programmable Instruments, VISA, Instrument Interfacing and Lab VIEW.

TEXT BOOKS

1. Sanjay Gupta and Joseph John "Virtual Instrumentation Using Lab VIEW, TMH Publications.
2. Gary Johnson, LabVIEW Graphical Programming, 2nd Edition, McGraw Hill, New York, 1997.

REFERENCE BOOKS

1. Lisa K. wells & Jeffrey Travis, "LabVIEW for everyone", Prentice Hall, New Jersey, 1997.
2. Jane W. S. Liu, "Real-time Systems", Pearson Education India, 2001.

EI-406 INTELLIGENT INSTRUMENTATION (3-0-0)

Module-1 (12 Hours)

Introduction: Introduction to intelligent instrumentation, Historical Perspective, Current status, software based instruments. Intelligent versus Dumb instruments.

Virtual Instrumentation: Introduction to graphical programming, data flow & graphical programming techniques, advantage of VI techniques, VIs and sub Vis loops and charts, arrays, clusters and graphs, case and sequence structure, formula nodes, string and file I/O, Code Interface Nodes and DLL links.

MODULE-II (13 Hours)

Data Acquisition Methods: Analog and Digital IO, Counters, Timers, Basic ADC designs, interfacing methods of DAQ hardware, software structure, use of simple and intermediate Vis. Use of Data Sockets for Networked communication and controls.

Interfacing: RS 232C, RS422, RS423, RS485, USB, VXI, SCXI, PXI.

Communication: Basic networking methods and their applications in instrumentation, use of Data sockets for distributed control.

MODULE-III (10 Hours)

Analysis Techniques: DSP software, Measurement, filters and wavelets, windows, curve fitting probability & statistics.

Intelligent sensors: Intelligent pressure, Flow, level, Temperature sensor. Intelligent sensor application in process control. Intelligent analytical instruments. Application of intelligent sensor in biomedical engineering. Future scope of intelligent instrument.

TEXT BOOKS:

1. G.C. Barney / Intelligent Instrumentation / Prentice Hall, 1995.

2. Lisa, K.Wells &Jeffery Travis / Lab VIEW For every one Prentice Hall, 1997

REFERENCE BOOKS:

1. A.S. Morris / Principles of measurement and Instrumentation / Prentice Hall, 1993.
2. S. Gupta / P.C Interfacing for data Acquisition & Process Control, 2nd Edition / Instrument Society of America, 1994.
3. Gray Johnson / Lab VIEW Graphical Programming 2nd Edition / Tata McGraw Hill, 1997.
4. Bitter, Mohiuddin, Nawrocki / Advanced Cal VIEW Programming Techniques.
5. Sokoloft, Basic concepts of Lab VIEW, Prentice Hall

CS-416 BIOINFORMATICS (3-0-0)

MODULE-I (12 Hours)

Basic Concepts of Molecular Biology: Cellular Architecture, Nucleic Acids (RNA & DNA) Transcription and Translations, Open reading frame, Genetic code, Protein structure and function, Molecular biology tools. Suffix Trees: Definition and examples Ukkonen's linear-time suffix tree algorithm, Applications longest common sub strings of two strings, Recognizing DNA contamination. Pair wise Sequence Alignment (Edit distance, Dynamic Programming Calculation of edit distance, string similarity, gaps).

MODULE-III (14 Hours)

Pair wise sequence alignment local, Multiple String Alignment, Need of MSA, Family & Super Family representation, multiple sequence comparison for structural inferences, Multiple alignments with sum-of- pairs, consensus objective functions. Database searching for similar sequence (FASTA, BLAST), PAM, BLOSOM SUBSTITUTION MATRICES.

MODULE-III (14 Hours)

Sequencing (DNA sequencing, shortest superstring problem, DNA Arrays, sequencing by Hybridization)

Phylogenetic analysis (Evolutionary Trees, Distance and character based true reconstruction, Reconstructing trees from additive matrices, Evlutionary trees and hierarchical clustering –VPGMA Neighbors Joining,) small and large parsivrony problem.

TEXT BOOKS

1. Dan Gusfield, Algorithm on strings, Trees and Sequences: Computer Science & Computational Biology, Cambridge University Press, 1997 (Chapters: 5, 6, 7, 10, 11, 14 & 15 relevant portions)
2. N. C. Jones and P. A PEVZNER- An Introduction to Bioinformatics Algorithms- MIT press, 2009 (chapters 3, 8 7 10 – relevant portions)
3. D. E. Krane & M. L. Raymer- Fundamental concepts of Bioinformatics – Pearson Education, 2003 (Chapter-1)

REFERENCE BOOK

1. D. Baxevanis, B. F. Francis one llitte Bioinformatics, Wiley- Interscience

EI-408 LASER AND RADAR INSTRUMENTATION (3-0-0)

MODULE – I (12 Hours)

Laser-Theory and Technology: Principles of emission, modes of resonant cavity, CW and pulse operations, Mode locking Gas, Solid state, Semiconductor and liquid lasers, application of lasers.

Optical Fiber and its Applications: Joints, Connectors and couplers, sources-laser, LEDs.

MODULE – II (12 Hours)

Detector- PIN Diodes, APD, Application to Communication and Instrumentation.

Pulsed Radar: Basic Principle, Block diagram, Operation of Pulse, Range, Radar equation and minimum detection signal, Limitation of Radar, PFR and Range ambiguities, Brief idea of pulser circuits and indicators.

MODULE – III (11 Hours)

CW and FW Radar: Doppler effect, CW Radar, Range Measuring Doppler system, FM CW Radar, Airoborne Doppler navigation, Multiple Frequency CW Radar MTI Radar, Pulse Doppler Radar.

REFERENCE BOOKS:

1. Young M. Optics and Laster: An Engineering Physics Approach,1977.
2. Cheo,Peter K., Fiber Optics: Devices and Systems,Prentice Hall Series on Solid State Physical Electronics, 1985.
3. Skolnock, Introduction to Radar System
4. E.E. Terman, Electronic and Radio Engineering
5. Reidnour, Radar System Engineering

CS-421 SOFTWARE ENGINEERING (3-0-0)

MODULE-I (15 Hours)

Introduction to Information System Development: Overview of System Analysis and Design, Categories of Information Systems, System development Strategies, Implementation and Evaluation, Tools for System development, **Introduction to software Engineering:** Basic concepts about software and program and Evolution of Software Engineering, Basic concepts on process and life cycle models. **Models:** Waterfall, Prototype, Evolutionary, Incremental, spiral, V, RADM etc. Requirement Analysis: Introduction to software specification, its needs and importance, formal specification methods. SRS: Attributes of good SRS and organization of SRS document.

MODULE-II (15 Hours)

Software design: Methods and strategies, desirable design attributes, Concept of good design, Cohesion and coupling. Function-Oriented Software Design: structured system analysis and structured design, formal approach design, data flow oriented design. Software coding and testing: coding standard and guidelines, code review, software inspection, **Testing:** Unit, Integration, System testing, black box and white box testing Incremental testing, formal proof of correctness, software matrix. Introduction to software verifications.

MODULE-III (10 Hours)

Software Reliability and Quality Management: S/W and H/W reliability, Reliability Matrices, S/W quality, ISO 9000 , Software engineering management: introduction to capability maturity model, quality assurance and software cost estimation (Delphi, COCOMO). Introduction to Computer-aided Software Engineering, Software reuse and maintenance.

TEXT BOOKS

1. Rajib Mall : Fundamentals of Software Engineering , PHI.
2. R.S. Pressman: Software Engineering, A practitioner's approach, McGraw Hill.

REFERENCE BOOKS

1. P. Jalote: An integrated approach to software engineering. Narosa, New Delhi.
2. G. Booch : Object-Oriented analysis and design, Benjamin / Cumming Publishing Co. New York.
3. James A. Senn: Analysis and Design of Information Systems, McGraw Hill
4. Hong Zhu : Software Design Methodology, Elsevier

IT 411 INTERNET AND WEB TECHNOLOGY (3-0-0)

MODULE-I (17 Hours)

Internet Basics: Basic Concepts, Communication on the Internet, Internet Domains, TCP/IP and Internet, Application Protocols, Idea of Web Server, Web Browser. **Web Design:** HTML Tags, Color and Background, text formatting tags, creating hyperlinks and anchors, Image, Image map, table, frame, Designing Forms and controls, Multimedia in Web DHTML, Style sheet. **Client Side Scripting:** Introduction to Client side Scripting, Programming Fundamentals, Java Script Document Object Model, built in object, form object and element, working with data, flow control structures, operator, custom function and object, data entry and validation using tables and forms using JavaScript, VBScript functionalities, VBScript controls. **Server Side Scripting:** Introduction to Server side Scripting, ASP Objects and Components, Working of .asp files, CGI Basics, Why CGI is used? How it Works? Get and Post methods.

MODULE-II (15 Hours)

Introduction to Java Enterprise Edition 5: Programming for the Enterprise, Enterprise Architecture (Single tier, two tier, three tier, N tier, Enterprise) and Technologies, Introduction to Web Application. **Java Servlets:** Introduction to Web Containers, Servlet Programming, Servlet vs. Applet, Servlet API, GenericServlet Class, HttpServlet Class, Servlet Architecture, Servlet life Cycle, Working with Servlet, Working with Databases, Servlet Sessions, Cookies, Context and Collaboration. **Java Server Pages:** Basics and Architecture, Life Cycle of JSP Page, JSP Directives, Scripting Elements, Standard Action Elements of JSP, Implicit Objects and scope, Writing JSP application with standard Tag Libraries, Connecting to Databases. **XML:** Introduction, XML Document Syntax, Document Type Definition, Parsing valid XML, SAX, DOM.

MODULE-III (8 Hours)

Distributed Computing Using RMI: Basics, RMI Architecture, Locating Remote Objects, RMI Exceptions, and Developing Applications with RMI, Understanding Directory Services and JNDI. **Enterprise Java Beans:** Introduction, EJB vs. Java Beans, EJB Architecture, Features/ Benefits of EJB, Types of EJB, Working with Session Beans, Entity Beans.

TEXT BOOKS

1. Ivan Bayross, Web Technologies, Vol-I and Vol-II , BPB Publications.
2. Subrajmanyam Allamaraju and others, Professional Java Server Programming J2EE 1.3 Edn., Apress, SPD.

REFERENCE BOOKS

1. Ivan Bayross and Others, Java Server Programming for Professional covers JAVA EE 5, SPD.
2. Danny Ayers and others, Professional Java Server Programming, Wrox Press ltd, SPD.
3. Dream Tech Press , Java Server Programming (J2EE 1.4) Black Book" Bruce W. Perry, "Java Servlet & JSP", Cookbook SPD-O'Reilly
4. SL-134 Web Component with Servlets & JSP Technologies, Sun Solaris.
5. FJ-310-EE5 Developing Applications for the Java EE Platform, Sun Solaris.
6. SL-285-SE6 Developing Applications with the Java SE Platform, Sun Solaris.

IT - 314 PROGRAMMING WITH JAVA (3-0-0)

MODULE –I (12 Hours)

Introduction to Java and Java programming Environment: History and Features of Java, Java Development Kit, JRE.

Fundamental programming structures in Java: Data Types, Variables, Assignments and initializations, Type Conversion and Casting, Arrays, Operators and their precedence, Control Flow, Strings, Comments.

Concepts of Objects and Classes: Introduction to Object oriented programming, Using Existing classes, Building your own classes, constructor overloading, Garbage Collection, Overloading Method, static Fields and Method, Understanding final and this keyword.

Inheritance Basics: Extending Classes, Using super to call super class Constructors, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, using final with Inheritance, Final Class and Method, Inner classes, The Object Class, The Class Class, Reflection.

Packages and Interfaces: Packages, Access Protection, importing packages, Interfaces, variables in interfaces, Interfaces can be extended, Interfaces vs. Abstract Class.

Exception Handling: Fundamentals, Dealing with Errors, Exception Types, Using try & catch, Multiple catch, thro, throws, finally, Java's Built-in exceptions, user defined exceptions, Assertions, Debugging Techniques.

MODULE –II (18 Hours)

Multi-Threading: Java Thread Model, Creating a thread, Creating multiple threads, Thread priorities, Thread Synchronization, Using isAlive() and join(), using wait() and notify().

String Handling: String constructors, String length; Character Extraction, String Comparison, Modifying a String.

Exploring java.Lang: Simple type wrappers, Runtime memory management, Object Cloning.

Java.util: The Collection interface, Collection classes, Use of Iterator, The Collection Algorithm, The legacy Classes and interface, String Tokenizer, Random

Java.io: The java I/O Classes and Interfaces, Stream classes Byte Stream, Character Stream, serialization, File Management in Java.

Applet: Basics, Architecture, Skeleton, The HTML Applet tag, Passing parameter to Applets, AppletContext and showDocument().

AWT: AWT Classes, Window fundamentals, Components, Container, Panel, Window, Frame, Canvas, Creating a Frame window in an Applet, Working with Graphics, AWT

Control Fundamentals, Layout management, Dialog Boxes.

MODULE –III (10 Hours)

Event Handling: Basics of Event Handling, Delegation Event model, Event Class, Event Listener interfaces, Adapter Classes, Handling Events by extending AWT components.

Swing: An Introduction, Features, JApplet, Icons and Labels, Text Fields, Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, Tables.

JDBC: Fundamentals, Type-I, Type-II, Type-III, Type-IV Drivers, Database connectivity programs.

Networking: Basics, Socket overview, Networking classes and interfaces, TCP/IP client sockets, URL connection, TCP/IP Server Sockets.

TEXT BOOKS

1. Herbert Schildt, "The Complete Reference Java 2, TMH
2. Balguruswamy, "Programming with Java", TMH.

REFERENCE BOOKS

1. Shirish Chavan, Java for Biginners, SPD.
2. Kathy Sierra and Bert Bates, Head First Java, O' Reilly, SPD.
3. Cay S. Horstmann & Gary Cornell, Core Java Vol-I & Vol-II, Sun MicroSystem Press.
4. SL-275-SE6 Java Programming Language, Sun Solaris.

EC 442 MOBILE COMMUNICATION ENGINEERING (3-1-0)

MODULE-I (15 Hours)

Cellular Concept & System Design: Fundamentals Hexagonal Cell, Frequency reuse, Handoff, Interferences and System Capacity, Adjacent Channel interference. Improving coverage and capacity in Cellular Systems – Cell Splitting, Sectoring, Microcell Zone Concept.

Mobile Radio Propagation : Large –Scale path loss Free space propagation model, Reflection, Ground Reflection (2-ray) Model, Diffraction, Scattering. Practical link budget design using path loss model. Determination of percentage of coverage area. Outdoor propagation Model – Okumura Model; Small scale fading & multipath - Factors influence small scale fading. Parameters of Mobile Multipath Channels, Time dispersion parameters, Coherence Bandwidth and Coherence time of a Channel, Flat Channel, Frequency Selective Channel.

Modulation Techniques for mobile radio : $\pi/4$ QPSK, Minimum shift keying MSK Gaussian minimum shift keying GMSK, OFDM and their performance analysis.

MODULE-II (15 Hours)

Spread Spectrum Techniques : PN Sequence, DS-SS, PH-Ss and their performances, in fading and Multipath channels.

Equalization and Diversity: Fundamental of equalization, Linear Equalizers, Maximum Likelihood Sequence Estimation Equalizer (MLSE). Least Mean Square algorithm. Diversity Techniques : Space diversity, frequency diversity, Polarization diversity & Time diversity. Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Sense CDMA.

MODULE-III (10 Hours)

Wireless Network, Circuit switching & Packet Switching, Traffic Routing; The OSI Model GSM; System Architecture, Protocols; Localization and calling. Handover, Security. Introduction to SS7 signaling, Wireless Application Protocol (WAP), Mobile IP, and Mobile TCP.

TEXT BOOKS

1. Wireless Communication, 2nd Edition by Theodore S. Rappaport , Pearson Publication. Selected portions from Chapter 3, 4, 5, 6, 7, 9, 10 and 11.
2. Mobile Communication, 2nd Edition by Jocken Schiller, Pearson Education.

REFERENCE BOOKS

1. Modern Wireless Communication by Simon Haykin and Michael Moher, Pearson Education.

7th SESSIONALS

EI-471 VLSI LAB (0-0-3)

Lab '1' through '4' can be done using Tanner Spice/Magic tools

Lab '5' through '10' should be done using Xilinx or IRSIM or any other open source tools (GPSL)

List of experiments:

1. Characteristics of NMOS
2. Characteristics of CMOS
3. Stick Diagram: Introduction to λ rules
4. Implementation of inverter, NAND and NOR gates
5. Design of Half Adder
6. Design of Full Adder
7. Design of Multiplexer
8. Design of Decoder circuits
9. Design of Latch, S-R flip flop, D flip flop
10. Design of Memory circuits

EI-473 PROCESS CONTROL LAB (0-0-3)

1. To study the characteristics and working principle of current to pressure converter and control valve.
2. To study the characteristics and working principle of Differential pressure transmitter.
3. To study the performance of ON/OFF, P, PI Controllers on Flow process.
4. to study the performance to PID controller on flow process.
5. To study the performance of Analog PID controller on Flow process.
6. To study the performance of PI, PID controller on pressure station.
7. SCADA (Flow station, level station).
8. Study of two positions and three positions analog/ Digital Controller using comparator and Flip-Flops.
9. Implementation of And / OR/ NOT/ NAND/ EXOR/ EXNOR using ladder logic diagram.
10. Designing of comparator, timer, counter using PLC.
11. To implement ON/OFF controller for water tank in PLC.
12. Stepper Motor control by using PLC.