3EI1 MATHEMATICS-III

UNIT 1 : LAPLACE TRANSFORM - Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant co-efficients with special reference to the wave and diffusion equations.
UNIT 2 : FOURIER SERIES & Z TRANSFORM – Expansion of simple functions in fourier series. Half range series, Change of intervals, Harmonic analysis. **Z TRANSFORM -** Introduction, Properties, Inverse Z Transform .
UNIT3 : FOURIER TRANSFORM - Complex form of Fourier Transform and its inverse, Fourier sine and cosine transform and their inversion. Applications of Fourier Transform to solution of partial differential equations having constant co-efficient with special reference to heat equation and wave equation.
UNIT 4 : COMPLEX VARIABLES - Analytic functions, Cauchy-Riemann equations, Elementary conformal mapping with simple applications, Line integral in complex domain, Cauchy;s theorem. Cauchy's integral formula.
UNIT 5 : COMPLEX VARIABLES -Taylor's series Laurent's series poles, Residues, Evaluation of simple definite real integrals using the theorem of residues. Simple contour integration.

3EI2 - ELECTRONIC DEVICES & CIRCUITS

UNIT 1 : SEMICONDUCTOR PHYSICS : Mobility and conductivity, charge densities in a semiconductor, Fermi Dirac distribution, carrier concentrations and fermi levels in semiconductor, Generation and recombination of charges, diffusion and continuity equation, Mass action Law, Hall effect.
UNIT 2 : Junction diodes, Diode as a ckt. element, load line concept, clipping and clamping circuits, Voltage multipliers. Construction, characteristics and working principles of UJT
UNIT 3 : Transistor characteristics, Current components, Current gains: alpha and beta. Operating point. Hybrid model, h-parameter equivalent circuits. CE, CB and CC configuration. DC and AC analysis of CE,CC and CB amplifiers. Ebers-Moll model. Biasing & stabilization techniques. Thermal runaway, Thermal stability.
UNIT 4 : JFET, MOSFET, Equivalent circuits and biasing of JFET's & MOSFET's. Low frequency CS and CD JFET amplifiers. FET as a voltage variable resistor.
UNIT 5 : SMALL SIGNAL AMPLIFIERS AT LOW FREQUENCY : Analysis of BJT and FET, DC and RC coupled amplifiers. Frequency response, midband gain, gains at low and high frequency. Analysis of DC and differential amplifiers, Miller's Theorem. Cascading Transistor amplifiers, Darlington pair. Emitter follower, source follower.

3EI3- CIRCUIT ANALYSIS & SYNTHESIS

UNIT 1 : NETWORK THEOREMS AND ELEMENTS :Thevenin's, Norton's, Reciprocity, Superposition, Compensation, Miller's, Tellegen's and maximum power transfer theorems. Networks with dependent sources. Inductively coupled circuits – mutual inductance, coefficient of coupling and mutual inductance between portions of same circuits and between parallel branches. Transformer equivalent, inductively and conductively coupled circuits.

UNIT 2 :TRANSIENTS ANALYSIS : Impulse, step, ramp and sinusoidal response Analysis of first order and second order circuits. Time domain & transform domain (frequency, Laplace) analysis. Initial and final value theorems. Complex periodic waves and their analysis by Fourier analysis. Different kind of symmetry. Power in a circuit.

UNIT 3 : NETWORK FUNCTIONS : Terminals and terminal pairs, driving point impedance transfer functions, poles and zeros. Procedure of finding network functions for general two terminal pair networks. Stability & causality. Hurwitz polynomial, positive real function

UNIT 4 : TWO PORT NETWORKS : Two port parameters and their interrelations – z-parameters, y-parameters, h-parameters, ABCD parameters. Equivalence of two ports, transformer equivalent, interconnection of two port networks. Image parameters. Attenuation & phase shift in symmetrical T and π networks.

UNIT 5 : NETWORK SYNTHESIS : RL & RC networks synthesis, Foster First & Second form, Cauer forms.

3EI 4 ELECTRICAL MEASUREMENTS

UNIT 1: MEASURING INSTRUMENTS: Principle of operation, constructional details, torque equation, scale shapes, uses and errors in moving coil, moving iron, electrodynamic, electrostatic, induction instruments for the measurement of voltage, current and power. Errors in wattmeters and their compensation. Single phase induction type energymeters.

UNIT 2: OSCILLOSCOPES : CRT Construction, Basic CRO circuits, CRO Probes, Techniques of Measurement of frequency, Phase Angle and Time Delay, Multibeam, and multi trace, storage Oscillocopes.

UNIT 3 :MEASUREMENT OF RESISTANCES: Classification of resistances, Methods for Measurement of low Resistance - Ammeter voltmeter method, Kelvin's double bridge method, potentiometer method.

Methods for Measurement of Medium Resistance : Ammeter - voltmeter method, substitution method, Wheat stone bridge method, ohmmeter method.

Methods for Measurement of High Resistance - Direct deflection method, loss of charge method, Meggar. Measurement of Earth Resistance and Soil resistivity.

UNIT 4 : A.C. BRIDGES: Generalized treatment of four arm a.c. bridges. Sources and detectors. Measurement of self inductance - Maxwell's inductance bridge, Maxwell's inductance capacitance bridge, Hay's bridge, Anderson's bridge.

Measurement of Capacitance - De Sauty's bridge, Schering bridge.

Measurement of Mutual Inductance - Heaviside bridge, Heaviside Campbell equal ratio bridge, carey foster bridge. Measurement of Frequency - Wein's bridge.

UNIT 5 : POTENTIOMETERS: Theory of operation and construction of d.c. and a.c. potentiometers (Polar and Coordinate type). Their standardization and applications.

3EI5 ELECTRICAL TECHNOLOGY

UNIT 1 : DC MACHINES

(I) **DC GENERATORS :** Generated voltage, Types of DC generators, No load and load characteristics Parallel operation.

(II) **DC MOTORS :** Production of torque, Back emf. Torque current and torque speed characteristics, Starting speed control of DC motors, Losses and efficiency.

UNIT 2 : INDUCTION MOTORS : Construction, Basic principles, Torque slip curves, Effect of rotor resistance cogging, Crawling, Starting, speed control and breaking of induction motors. Losses and efficiency, Single-phase induction motor: Starting methods.

UNIT 3 : SYNCHRONOUS MACHINES: Basic principles starting of synchronous motors, OC and SC and zero power factor characteristics. Single phase synchronous motor.

UNIT 4 : TRANSMISSION AND DISTRIBUTION SYSTEM : General idea of transmission and distribution system, electrical equipment of a sub station, Interface of power lines with telecommunication circuits. Conductors and insulators for transmission lines.

UNIT 5 : PROTECTION: Basic types of faults caused and consequences of faults in power system, over current relay and elementary idea of static relays and their advantages and limitations

3EI6 DATA STRUCTURES & ALGORITHMS

UNIT 1 : PERFORMANCE MEASUREMENT : Space complexity and Time complexity, big oh, omega and theta notations and their significance.

LINEAR LISTS : Array and linked representation, Singly & Doubly linked lists. Concept of circular and multiply linked lists.

UNIT 2 : ARRAY & MATRICES : Row and Column Major mapping & representation, irregular 2D array, Matrix operations, Special matrices: diagonal, tridiagonal, triangular, symmetric. Sparse matrices representation and its transpose.

UNIT 3 : STACKS : ADT, representation in array & linked lists, basic operation, Applications of stacks in parenthesis matching, towers of Hanoi etc.

Queues **-** ADT, representation in array & linked lists, applications, circular queues.

UNIT 4 : TREES : Binary Tree, representation in array & linked lists, basic operation on binary trees, binary tree traversal (preorder, postorder, in order). **SEARCH TREES :** Binary search tree, basic operation, Inroduction to AVL tree and B-tree.

UNIT 5 : GRAPHS : Representation of unweighted graphs, BFS, DFS Minimum Spanning Trees, Single Source Shortest Path.Sorting **-** Bubble sort, insertion sort, merge sort, selection sort, shell, quick sort, heap sort.

3EI7 HUMANITIES AND SOCIAL SCIENCES

UNIT 1 : INDIA- Brief History of Indian Constitution- framing, features, fundamental rights, duties, directive principles of state. History of Indian national movement, Socio economic growth after independence.

UNIT 2 : SOCIETY – Social Groups- Concepts and types, socialization- concept and theory, social control; concept, social problem in contemporary India, status and role.

UNIT 3 : THE FUNDAMENTALS OF ECONOMICS – Meaning, definition and importance of economics, Logic of choice, Central Economic Problems, Positive and Normative approaches, economic systems-socialism and capitalism.

UNIT 4 : MICROECONOMICS –Law of demand and supply, Utility approach, Indifference curves, Elasticity of demand & supply and applications, Consumer surplus, Law of returns to factors and returns to scale.

UNIT 5 : MACROECONOMICS –Concept relating to national product-National income and its measurement, Simple Keynesian theory, Simple multiplier, Money and banking,- Meaning, Concept of international trade, Determination of exchange rate, Balance of payments. Characteristics of Indian Economy.

3EI8 COMPUTER PROGRAMMING LAB-I

Programming in C

1. Simple array and simple sorting.
2. Addition, multiplication and transpose of sparse matrices represented in array form.
3. Addition, multiplication and transpose of sparse matrices represented in linked list form.
4. Polynomial addition, multiplication (8^{th} degree polynomials).
5. Implementation of stack and queue using array & linked lists.
6. Implementation of circular queue using linked list.
7. Infix to postfix/prefix conversion.
8. Quick sort, merge sort and searching algorithms (Fibanacci search)
9. Binary tree traversals.
10. Generation of spanning trees for a given graph using BFS & DFS algorithms.
11. AVL tree implementation (creation, insertion, deletion).
12. Symbol table organization (Hash Table).

3EI9 ELECTRONICS LAB-I

1. Study the following devices:
   (a) Analog & digital multimeters
   (b) Function/ Signal generators
   (c) Regulated d. c. power supplies (constant voltage and constant current operations)
2. Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.
3. Application of diode as clipper and clamper.
4. Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, Reverse Saturation current and static & dynamic resistances.
5. Plot V-I characteristic of zener diode and study zener diode as voltage regulator.
   Observe the effect of load changes and determine load limits of the voltage regulator.
6. Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.
7. Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of Idss & Vp
8. Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.
9. Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.
10. Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters.
11. Study half wave rectifier and effects of filters on wave. Also calculate ripple factor.
12. Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor.

3EI10 ELECTRICAL ENGINEERING LAB

1,2 Speed control of D.C. Shunt motor by
   (a) Field control method & plot the curve for speed vs field current.
   (b) Armature control mehtod & plot the curve for speed vs armature voltage.
3. Speed control of a D.C. Motor by Ward Leonard method and to plot the curve for speed vs applied armature voltage.
4. To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit.
5. To perform Star and delta connection on a three phase transformer and find the relation between line and phase voltage and line and phase current.
6. Assemble and disassemble a table fan and a ceiling fan. To learn about their nature of winding, no. of poles and starting capacitor. To draw winding diagram and phasor diagram.

7,8 To control the speed of single phase induction motor by
   (a) Variable voltage supply
   (b) Variable frequency

9,10 (a) Study different types of wires and assessment of size of conductor and levels and type of insulation.
   (b) Introduction of various types of wiring accessories. To make the house wiring diagram for a building.
   (c) To make circuit for staircase wiring.

11. To plot the hysterisis loop of a magnetic material.
12. To study the working of –
   (i) Starters for d.c. motors (ii) Star delta starter for a.c. motors

4EI1 CONTROL SYSTEM - I

UNIT 1 : INTRODUCTION : Concepts of open loop and closed loop control systems. Examples and applications of open loop and closed loop systems. Brief idea of multivariable control systems. Mathematical Modeling of Physical Systems **:** Representation of physical system (Electro-mechanical) by differential equations. Determination of transfer function by block diagram reduction techniques and signal flow method, Laplace transformation, Inverse Laplace transformation.
UNIT 2 : CONTROL SYSTEM COMPONENTS : Potentiometers, synchros, Armature & Field controlled DC servomotors, AC servomotors, stepper motor and ac tacho generator.
UNIT 3 : TIME RESPONSE ANALYSIS OF FIRST ORDER AND SECOND ORDER SYSTEM : Transient response analysis. Steady state error and error constants. Absolute stability and relative stability. Routh's stability criterion.
UNIT 4 : STABILITY OF THE SYSTEM : Root locus method of analysis. Polar plots. Nyquist stability criterion. concept of Gainmargin and phasemargin, M and N Locii. Nichols Chart.
UNIT5 : FREQUENCY DOMAIN METHODS: Bode plot, Design specification in frequency domain and their co-relation with time domain.
ELEMENTARY IDEAS OF COMPENSATING NETWORKS : Lag, Lead and Lag lead networks. Brief idea of proportional, derivative and integral controller.

4EI2 – ANALOG ELECTRONICS

UNIT 1 : FEEDBACK AMPLIFIERS : Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers. Analysis of voltage-series, voltage-shunt, current-series and current-shunt feedback amplifier. Stability criterion.
UNIT 2 : OSCILLATORS : Classification. Criterion for oscillation. Tuned collector, Hartley, Colpitts, RC-Phase shift, Wien bridge and crystal oscillators, Astable, monostable and bistable multivibrators. Schmitt trigger. Blocking oscillators.
UNIT 3 : HIGH FREQUENCY AMPLIFIERS : Hybrid Pi model, conductances and capacitances of hybrid-Pi model, high frequency analysis of CE amplifier, gain-bandwidth product. Emitter follower at high frequencies.
UNIT 4 : **TUNED AMPLIFIER -** Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit. Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET. Double Tuned Transformer Coupled Amplifier. Stagger Tuned Amplifier. Pulse Response of such Amplifier. Shunt Peaked Circuits for Increased Bandwidth.
UNIT 5 : POWER AMPLIFIERS : Power amplifier circuits, Class A output stage, class B output stage and class AB output stages, class C amplifiers, pushpull amplifiers with and without transformers. Complementary symmetry & quasi complementary symmetry amplifiers

4EI3 DIGITAL ELECTRONICS

UNIT 1 : NUMBER SYSTEMS, BASIC LOGIC GATES & BOOLEAN ALGEBRA: Binary Arithmetic & Radix representation of different numbers. Sign & magnitude representation, Fixed point representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function. Derived logic gates: Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and vica-versa. Converting logic diagrams to universal logic. Positive, negative and mixed logic. Logic gate conversion.

UNIT 2 : DIGITAL LOGIC GATE CHARACTERISTICS: TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET. Interfacing logic families to one another.

UNIT 3 : **MINIMIZATION TECHNIQUES:** Minterm, Maxterm, Karnaugh Map, K map upto 4 variables. Simplification of logic functions with K-map, conversion of truth tables in POS and SOP form. Incomplete specified functions. Variable mapping. Quinn-Mc Klusky minimization techniques.

UNIT 4 : **COMBINATIONAL SYSTEMS:** Combinational logic circuit design, half and full adder, subtractor. Binary serial and parallel adders. BCD adder. Binary multiplier. Decoder: Binary to Gray decoder, BCD to decimal, BCD to 7-segment decoder. Multiplexer, demultiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode switching matrix. Design of logic circuits by multiplexers,encoders, decoders and demultiplexers.

UNIT 5 : **SEQUENTIAL SYSTEMS:** Latches, flip-flops, R-S, D, J-K, Master Slave flip flops. Conversions of flip-flops. Counters : Asynchronous (ripple), synchronous and synchronous decade counter, Modulus counter, skipping state counter, counter design. Ring counter. Counter applications. Registers: buffer register, shift register.

4EI4 TRANSDUCERS IN INSTRUMENTATION

UNIT 1: Role of transducers in Instrumentation - Transducer construction, classification and characteristics, analogue and digital transducers, Principle of operation and characteristics of transducers for measurement of displacement, strain, velocity, acceleration, torque etc. Potentiometric, LVDT, strain gauge, capacitance gauge, piezoelectric transducers and accelerometers.

UNIT 2 : Principle of operation and characteristics of transducers for measurement of pressure and force, Pirani gauge, ionization gauge, LVDT, strain gauge as pressure sensing device, force summing devices like bourden tube, bellows, diaphragms etc.

UNIT 3 : Principle of operation and characteristics of tansducers for temperature transduction, bimetallic thermometer, resistance thermometer, Radiation and optical pyrometers. Transducers for Measurement of humidity and moisture. Sensors for measurement of pH, Thermal conductivity and Thickness.

UNIT 4 : Principle of operation and characteristics of tansducers for measurement of flow and level. Turbomagnetic, Electromagnetic and other flowmeters. Various methods of level measurements, ultrasonic level gauge.

UNIT 5: Electronic Display: principle of LED matrix and alpha numeric displays, gas discharged plasma panels, flat panel CRT, LCD, electro-luminiscent and electrophoretic displays.

4EI5 ANALOG COMMUNICATION

UNIT 1 : INTRODUCTION : Noise effects in Communication System, Resistance Noise, Noise in Reactive Circuits, Noise Figure & Noise Temperature in cascaded Circuits. Basic component of communication systems. Comparison of analog and digital communication.
UNIT 2 : AMPLITUDE MODULATION : Need of modulation, Frequency spectrum of AM wave. Power relations. Single side band and vestigal side band techniques.
ANGLE MODULATION - Mathematical representation and freq. spectrum of FM and PM, Comparison of AM, FM and PM, Pre-emphasis & D-emphasis.
UNIT 3 : DEMODULATION & RADIO RECEIVERS : Basic concepts of AM & FM demodulation, Sensitivity, Selectivity, Image Frequency, Double Spotting, AGC of Receiver, TRF & Superhetrodyne radio receivers, AM & FM Receivers..
UNIT 4 : TRANSMISSION LINE : Types of Transmission line equation, Equivalent circuit, Losses in TL. Reflection & SWR of line with different types of terminations. Distortion less line. Characteristic impedance. Line terminated with any impedance. Voltage and current at any point in a line. Coaxial cables.
Measurement of parameter**-**Attenuation, Reflection Co-efficient and SWR of line.
UNIT 5 : BROAD BAND COMMUNICATION & RADAR : Basic concepts & block diagram of satellite communication, fiber optical communication, mobile communication & Radar.

4EI6.1 OBJECT ORIENTED PROGRAMMING

UNIT 1 : OOP FUNDAMENTALS: Concept of class and object, attributes, Polymorphism, Message Passing, Encapsulation, Inheritance, public, private and protected members, Reference Variables.
UNIT 2 : PROGRAMMING IN C++: Enhancements in C++ over C in data types, operators and functions. Inline functions, constructors and destructors. Friend function, function and operator overloading. Working with class and derived classes. Single, multiple and multilevel inheritances and their combinations, virtual functions, pointers to objects. Input output flags and formatting operations. Working with text files.
UNIT 3 : JAVA: Variation from C++ to JAVA. Introduction to Java bytecode, virtual machine, application & applets of Java, integer, floating point, characters, boolean, literals, and array declarations.
UNIT 4 : OPERATORS AND CONTROL STATEMENTS: Arithmetic operators, bit wise operators, relational operators, boolean logic operators, the assignment operators * operator , operator precedence. Switch and loop statements, Break, Continue, Labelled loops.
UNIT 5 : PACKAGE AND INTERFACES: Exceptions, Packages, access protection, importing & defining packages. Defining and implementing interfaces, Exception and exception handling using try-catch.

4EI 6.2 ELECTROMAGNETIC FIELD THEORY

UNIT 1 : INTRODUCTION : Vector Relation in rectangular, cylindrical, spherical and general curvilinear coordinate system. Concept and physical interpretation of gradient, Divergence and curl, Green's & Stoke's theorems.

UNIT 2 : ELECTROSTATICS : Electric field intensity & flux density. Electric field due to various charge configurations. The potential functions and displacement vector. Gauss's law. Poisson's and Laplace's equation and their solution. Uniqueness theorem. Continuity equation. Capacitance and electrostatics energy. Field determination by method of images. Boundary conditions. Field maping and concept of field cells.

UNIT 3 : MAGNETOSTATICS : Magnetic field intensity, flux density & magnetization, Faraday's Law, Bio-Savart's law, Ampere's law, Magnetic scalar and vector potential, self & mutual inductance, Energy stored in magnetic field, Boundary conditions, Analogy between electric and magnetic field, Field mapping and concept of field cells.

UNIT 4 : TIME VARYING FIELDS : Displacement currents and equation of continuity. Maxwell's equations, Uniform plane wave in free space, dielectrics and conductors, skin effect sinusoidal time variations, reflection & refraction of UPW, standing wave ratio. Pointing vector and power considerations.

UNIT 5: RADIATION & EMI AND EMC : Retarted Potentials and concepts of radiation, Radiation from a small current element. Radiation resistance**:** Introduction to Electromagnetic Interference and Electromagnetic compatibility, EMI coupling modes, Methods of eliminating interference, shielding, grounding, conducted EMI, EMI testing: emission testing, susceptibility testing.

4EI6.3 MATHEMATICS - IV

UNIT 1 : N**UMERICAL ANALYSIS -** Finite differences – Forward, Backward and Central differences. Newton's forward and backward differences, interpolation formulae. Stirling's formula, Lagrange's interpolation formula.

UNIT 2 : NUMERICAL ANALYSIS- Integration-Trapezoidal rule, Simpson's one third and three-eighth rules. Numerical solution of ordinary differential equations of first order - Picard's mathod, Euler's and modified Euler's methods, Miline's method and Runga-Kutta fourth order method.,**Differentiation**

UNIT 3 : SPECIAL FUNCTIONS – Bessel's functions of first and second kind, simple recurrence relations, orthogonal property of Bessel's , Transformation, Generating functions, Legendre's function of first kind. Simple recurrence relations, Orthogonal property, Generating function.

UNIT 4 : STATISTICS AND PROBABILITY - Elementary theory of probability, Baye's theorem with simple applications, Expected value, theoretical probability distributions-Binomial, Poisson and Normal distributions. Lines of regression, co-relation and rank correlation.

UNIT 5 : CALCULUS OF VARIATIONS - Functional, strong and weak variations simple variation problems, the Euler's equation.

4EI7 INSTRUMENTATION WORKSHOP

1. Identification, Study & Testing of various electronic components :
   (a) Resistances-Various types, Color coding (b) Capacitors-Various types, Coding, (c) Inductors
   (d) Diodes (e) Transistors (f) SCRs (g) ICs (h) Photo diode (i) Photo transistor (j) LED (k) LDR (l) Potentiometers
2. Study of symbols for various Electrical & Electronic Components, Devices, Circuit functions etc.
3. To study and perform experiment on CRO demonstration kit.
4. Soldering & desoldering practice.
5. (a) To Design layout & fabricate PCB for a Regulated dc power supply.
   (b) Assemble the Regulated power supply using PCB and test it.
6. To study and plot the characteristics of following Opto-Electronic devices –
   (a) LED (b) LDR (C) Photovoltatic cell (d) Opto-coupler (e) Photo diode (f) Photo transistor
7. To study the specifications and working of a Transistor radio kit and perform measurements on it.
8. To study the specifications and working of a VCD Player.
9. To study the specifications and working of color TV.
10 To study the specifications and working of a Tape Recorder kit.
11. To prepare design layout of PCBs using software tools.
12. To fabricate PCB and testing of electronics circuit on PCB.

4EI8 ELECTRONICS LAB-II

1. Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.
2. Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor.
3. Plot and study the characteristics of small signal amplifier using FET.
4. Study of push pull amplifier. Measure variation of output power & distortion with load.
5. Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency
6. Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.

7,8 Study the following oscillators and observe the effect of variation of C on oscillator frequency:
(a) Hartley (b) Colpitts

9. Design Fabrication and Testing of k-derived filters (LP/HP).
10. To plot the characteristics of UJT and UJT as relaxation oscillator.
11. To plot the characteristics of MOSFET and CMOS.
12. Study of a Digital Storage CRO and store a transient on it.

4EI9 MEASUREMENT LAB

1. Measure the low resistance by Kelvin's double bridge.
2. Calibrate an ammeter using D.C. slide wire potentiometer.
3. Calibrate a wattmeter using Crompton's potentiometer.
4. Measure the power in 3-phase star connected load by two-wattmeter method at different values of load power factor.
5. Calibrate a single-phase energy meter(Analog and Digital) by phantom loading at different power factor by (i) Phase shifting transformer (ii) Auto transformer.
6. Measure earth resistance using fall of potential method.
7. Plot the V-I characteristics of a solar panel.
8. Measure low resistance using Crompton's potentiometer.
9. Measure unknown inductance using Anderson's bridge.
10. Measure unknown frequency using Wein's Bridge.
11. Measure unknown capacitance using DeSauty Bridge.
12. To see the burden effect on the performance of C.T.
13. To measure the phase angle and ratio error of CT.

4EI10 TRANSDUCER LAB

1. To draw the characteristics of following temperature transducers :-
   (a) PT 100 (b) Thermistor (c) Thermocouple
2. To perform experiment on ultrasonic depth meter.
3. To draw the characteristics of K type thermocouple.
4. Water level measurement kit.
   (a) To draw I/P vs O/P characteristics.
   (b) Study of water level indication.
   (c) To plot the curve between error and different measured water level.
5. Load Cell Kit.
   (a) To perform experiment and plot curve between load and strain.
   (b) To study about excitation.
   (c) To plot error curve at different loads.
6. To study Piezo electric vibration pickup.
7. LVDT kit.
   (a) To study excitation and balancing network.
   (b) To study phase difference.
   (c) To plot curve between displacement and output voltage.
8. Torque measurement kit.
   (a) To study about unbalanced strain.
   (b) To plot the curve between torque vs strain.
9. To draw characteristics of speed vs voltage on various transducers (For e.g. Magnetic pickup,Hall effect,Inductive pickup,).
10. To draw characteristics of LDR.
11. To Draw characteristics of variable capacitance type transducer.
12. To draw characteristics of variable Inductance type transducer.
13. To study various pressure sensors like Bourdon tube, Diaphragms, Pressure switches, bellows etc.

5EI1 SIGNALS AND SYSTEMS

UNIT 1 : **INTRODUCTION -** Continuous time and discrete time systems, Properties of systems. Linear time invariant systems - continuous time and discrete time. Properties of LTI systems and their block diagrams. Convolution, Discrete time systems described by difference equations.
UNIT 2 : FOURIER SERIES REPRESENTATION OF SIGNALS - Fourier series representation of continuous periodic signal & its properties, Fourier series representation of Discrete periodic signal & its properties, Continuous time filters & Discrete time filters described by Diff. equation.
UNIT 3 : **FOURIER TRANSFORM-** The continuous time Fourier transform for periodic and aperiodic signals, Properties of CTFT. Discrete time Fourier transform for periodic and aperiodic signals. Properties of DTFT. The convolution and modulation property.
UNIT 4 : **Z-TRANSFORM & LAPLACE TRANSFORM** - Introduction. The region of convergence for the Z-transform. The Inverse Z-transform. Two dimensional Z-transform. Properties of Z transform. Laplace transform, Properties of Laplace Transform, Application of Laplace transform to system analysis.
UNIT 5 : **SAMPLING** - Mathematical theory of sampling. Sampling theorem. Ideal & Real sampling. Interpolation technique for the reconstruction of a signal from its samples. Aliasing. Sampling in freq. domain. Sampling of discrete time signals.

5EI2 LINEAR INTEGRATED CIRCUITS

UNIT 1 : OPERATIONAL AMPLIFIERS: Basic differential amplifier analysis, Single ended and double ended configurations ,Op-amp configurations with feedback, Op-amp parameters, Inverting and Non-Inverting configuration, Comparators, Adder**.**
UNIT 2 : OPERATIONAL AMPLIFIER APPLICATIONS: Integrator, Differentiator, Voltage to frequency & Frequency to voltage converters.
Oscillators: Phase shift, Wien bridge, Quadrature, square wave, triangular wave, sawtooth oscillators. Voltage controlled oscillators.
UNIT 3 : ACTIVE FILTERS: Low pass, high pass, band pass and band reject filters,All pass filter, Switched capacitor filter, Butterworth filter design, Chebyshev Filter design.
UNIT 4 : PHASE-LOCKED LOOPS: Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM 565 PLL.
UNIT 5 : LINEAR IC's: Four quadrant multiplier & its applications, Basic blocks of linear IC voltage regulators, Three terminal voltage regulators, Positive and negative voltage regulators. The 555 timer as astable and monostable multivibrators. Zero crossing detector, Schmitt trigger.

5EI3 MODERN CONTROL SYSTEM

UNIT1:STATE SPACE APPROACH OF CONTROL SYSTEM AANALYSIS - Modern vs conventional control theory, Concept of state, State variables, State vector, State space,State-space equations. Writing state-space equations of mechanical, Electrical systems. Analogous systems.

UNIT2:STATE SPACE REPRESENTATION USING PHYSICAL AND PHASE VARIABLES- Companion form of system representation. Block diagram representation of state model. Signal flow graph representation. State space representation using Canonical variables. Diagonal matrix Jordan Canonical form. Derivation of transfer-function from state-model.

UNIT 3: SOLUTION OF STATE EQUATIONS- Diagonalization Eigenvalues and eigen vectors. Matrix exponential State transition matrix, Properties of state transition matrix. Computation of state transition matrix. Concepts of controllability & observability. Pole placement by state feedback, Ackerman's formula.

UNIT 4:DIGITAL CONTROL SYSTEMS- Introduction, Sampled data control systems, Signal reconstruction, difference equations, The Z-transform, Z-transfer Function. Block diagram analysis of sampled data systems, Z and S domain relationship, Stability analysis – by Routh Criterion.

UNIT 5:TRANSFORM DESIGN OF DIGITAL CONTROLS- Introduction, design example: position servo, design specifications, design on the ω-plane and ω' plane, digital PID controller and design on the Z-plane

5EI4 ELECTRONIC MEASUREMENT & INSTRUMENTATION

UNIT 1: THEORY OF ERRORS- Accuracy & precision, Repeatability, Limits of errors, Systematic & random errors Modeling of errors, Probable error & standard deviation, Gaussian error analysis, Combination of errors.

UNIT 2: ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS - Electronic Voltmeter, Electronic Multimeters, Digital Voltmeter, Component Measuring Instruments, Q meter, Vector Impedance meter, Vector Voltmeter, RF Power & Voltage Measurements.

UNIT 3: SIGNAL GENERATION - Sinewave generators, Frequency synthesized signal generators, Sweep frequency generators.

SIGNAL ANALYSIS : Measurement Technique, Wave Analyzers, Frequency - selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion analyzer, Spectrum analyzer.

UNIT 4 : FREQUENCY- Time & Interval measurements, Frequency counting, Time Interval measurement, , Frequency Counters, Gating error, Time base error, Trigger level error, High frequency measurements.

Unit 5 : RECORDER- Analog recorders, Operating mechanism, Chart drive mechanism, Strip chart recorders, Circular chart recorders, X-Y type recorders, Magnetic tape recorders.

5EI5 MICROPROCESSOR

UNIT 1 : INTRODUCTION - 8085 Microprocesor Architecture and Operations. Memory, Input/Output, Buffers, Encoders, Latches. Internal Data Operations, Registers, Pins and Signals, Memory Organisation. CISC and RISC architecture overview

UNIT 2 : **8085 MICROPROCESSOR INSTRUCTIONS** - Data Transfer, Arithmatic, Logic, Branch Instructions. Additional 16 Bit Arithmaic Instructions. Programming Techniques. Looping, Counting, Indexing.

UNIT 3 : 8085 MICROPROCESSOR INTERFACING - Basic Intefacing Concepts, Interfacing Output Displays, Input Keyboards, Interfacing Memory 8085 Interrupts.

UNIT 4 : INTERFACING PERIPHERALS – Interfacing Data Converters, 8155, 8355 Programmable Devices, 8279 Programmable Keyboard/Display Interface.

UNIT 5 : PROGRAMMABLE PERIPHERALS DEVICES - 8255 Programmable peripheral interface, 8253 Programmable interval timer, 8259 Programmable interrupt controller, 8257 DMA controllers, Basic concepts in serial I/O.

5EI6.1 OPTIMIZATION TECHNIQUES

1. **UNIT 1 : INTRODUCITON -** Introduction, Engineering applications of optimization, Statement and Classification of optimization problems, Single variable and multivariable optimization with and without constraints.
2. **UNIT 2 : LINEAR PROGRAMMING –** Formations of Linear Programming, Problem, Graphical approach, General Linear Programming Problem, Simplex Method, duality in Linear Programming and Transportation Problems.
3. **UNIT 3 : PROJECT SCHEDULING** – Project scheduling by PERT and CPM. Network Analysis.
4. **UNIT 4 : SEQUENCING THEORY –** General sequencing problems – N-Jobs through 2 machines and 3 machines & 2-Jobs through M-machines.
5. **UNIT 5 : DYNAMIC PROGRAMMING –** Introduction, Principles of optimality, Formulation and solution of Dynamic Programming problems, Traveling salesman's problems. Applications to Transportation problems and Linear programming problems.

5EI6.2 COMPUTER ORIENTED NUMERICAL & STATISTICAL METHODS

UNIT 1 : MATRIX COMPUTATION- Algebra of matrix, Inverse of a matrix, Rank of a matrix, Matrix inversion by Gauss elimination, Computer programs for matrix inversion.
UNIT 2 : SOLUTION OF LINEAR EQUATIONS- Cramer's rule, Gauss elimination, Gauss Jordan elimination and Gauss Seidal iterative method and their computer programming in C.
UNIT 3 : SOLUTION OF NON-LINEAR EQUATIONS- Interval bisection method, Secant method, Regula-Falsi method, Curve fitting, Method of least squares and their computer programming in C
UNIT 4 : SOLUTION OF DIFFERENTIAL EQUATIONS-Euler's method, Modified Euler's method, Runge Kutta method of fourth order, Solution of partial differential equation with special reference to heat equation, Laplace equation and wave equation Milne's and their computer programming in C.
UNIT 5 : STATISTICAL METHODS- Curve fitting methods – method of least squares, fitting a straight line, parabola. Correlation and Linear regression.

5EI6.3 DIGITAL COMMUNICATION

UNIT 1 : **PCM & DELTA MODULATION SYSTEMS** : Uniform and Non-uniform quantization. PCM and delta modulation, Signal to quantization noise ratio in PCM and delta modulation. DPCM, ADM, T1 Carrier System, Matched filter detection. Error probability in PCM system.
UNIT 2 : BASE BAND TRANSMISSION: Line coding(RZ,NRZ): Polar,Bipolar,Manchester,AMI. Inter symbol interference, Pulse shaping, Nyquist criterion, Raised cosine spectrum.
UNIT 2 : DIGITAL MODULATION TECHNIQUES : Geometric interpretation of signals,Orthogonalization.
ASK, BPSK, BFSK, QPSK, MSK modulation techniques and Coherent detection of these techniques.
Calculation of error probabilities.
UNIT 4 : INFORMATION THEORY : Amount of Information, Average Information, Entropy, Information rate, Increase in Average information per bit by coding, Shannon's Theorem and Shannon's bound, Capacity of a Gaussian Channel, BW-S/N trade off,
UNIT 5: CODING: Coding and decoding of Information, Hamming code, Single Parity-Bit Code, Linear Block code, cyclic code & convolutional code.

5EI7 COMPUTER PROGRAMMING LAB-II

Programs in C++

1. Write a program to perform the complex arithmetic.
2. Write a program to perform the rational number arithmetic.
3. Write a program to perform the matrix operations. (Transpose, addition, subtraction, multiplication, Test of symmetry)
4. Implement morse code to text conversion and vice-versa.
5. To calculate Greatest Common Divisor of given numbers.
6. To implement tower of Hanoi problem.

Program in Java

7. To implement spell checker using dictionary.
8. To implement a color selector from a given set of colors.
9. To implement a shape selector from a given set of shapes.
10. By mapping keys to pens of different colors, implement turtle graphics.
11. To implement a calculator with its functionality.
12. To implement a graph and display BFS/DFS order of nodes.

5EI8 CONTROL LAB

1. To design I order R-C circuits and observe its response with the following inputs and trace the curve.
   (a) Step (b) Ramp (c) Impulse
2. To design II order electrical network and study its transient response for step input and following cases.
   (a) Under damped System (b) Over damped System (c) Critically damped System
3. To Study the frequency response of following compensating networks, plot the graph and find out corner frequencies.
   (a) Lag Network (b) Lead Network (c) Lag-lead Network
4. To design ON-OFF Controller using a relay and Op-Amp.
5. To perform experiment on Potentiometer error detector.
6. To draw characteristics of a.c. servo motor.
7. (a)To draw the error vs angle characteristics of synchro transmitter.
   (b)To draw the characteristics of synchro transmitter and control transformer.
8. To perform experiments on relay control system.
9. (a). To find Transfer Function of field controlled d.c. servo motor.
   (b). To find Torque Speed Characteristics of field controlled d.c. servo motor.
10. (a). To find Transfer Function of armature controlled d.c. servo motor.
    (b). To find Torque Speed Characteristics of armature controlled d.c. servo motor.
11. To identify a system T.F. using its frequency response.
12. To perform experiments on digital control systems.

5EI9 MICROPROCESOR LAB-I

1. Study the hardware, functions, memory structure and operation of 8085 microprocessor kit.
2. Program to perform integer division: (i) 8-bit by 8-bit (ii) 16-bit by 8-bit.
3. Transfer of a block of data in memory to another place in memory in the direct and reverse order.
4. Searching a number in an array and finding its parity.
5. Sorting of array in: (i) Ascending (ii) Descending order
6. Programme to perform following conversion: (i) BCD to ASCII (ii) BCD to Hexadecimal
7. Programme to multiply two 8-bit numbers.
8. Programme to generate and sum 15 fabonicci numbers.
9. Programme for rolling display of message “INDIAN”.
10. To insert a number at correct place in a sorted array.
11. Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light, and sequential lights on off by above hardware.
12. Generation of different waveform on 8253/ 8254 programmable timer.

5EI10 DIGITAL ELECTORNICS LAB

To study and perform the following experiments.

1. (a) Operation of digital multiplexer and demultiplexer.
   (b) Binary to decimal encoder.
   (c) Characteristics of CMOS integrated circuits.

2,3 Compound logic functions and various combinational circuits based on AND/NAND and OR/NO Logic blocks.

4. Digital to analog and analog to digital converters.

5,6 Various types of counters and shift registers.

7. Interfacing of CMOS to TTL and TTL to CMOS ICs.
8. BCD to binary conversion on digital IC trainer.

9,10 Voltage waveforms at different points of (a) Astable (b) Monostable (c) Bistable Multivibrators and the frequency variation with different parameters.

11. Voltage comparator circuit using IC-710.
12. Schmitt transistor binary circuit.

6EI1 PROCESS CONTROL SYSTEMS

UNIT 1 : INTRODUCTION - General concepts and terminology. Laws, Languages and levels of process control.
OPEN LOOP RESPONSE OF SIMPLE SYSTEMS: Response of a thermometer bulb, Concentration response of a stirred tank. Temperature response of a stirred tank. Linearization and perturbation variables. Response of pressure systems. Response of non-interacting first order elements in series and response of interacting elements in series.
UNIT 2 : TRANSIENT RESPONSE OF CONTROL SYSTEM - General equations for transient response. Proportional control of single and two capacity process, Integral control, P-I control. Effect of measurement lag and time delay.
LEVEL CONTROL: Level as a major variable. Averaging control, Tank dynamics, Measurement lag, Performance of averaging controllers.
UNIT 3 : FLOW CONTROL- Process lag, Measurement lag, Effect of transmission lag on flow control, Control with noisy signal, Non linear ties in flow systems.
CONTROL OF HEAT EXCHANGERS: Dynamics of steam heated exchangers, Control schemes, Measurement lag, Response of filled bulbs, Bulbs in wells, Thermocouple response, Resistance thermometers. Reducing the measurement lag.
UNIT 4 : CONTROL OF DISTILLATION COLUMN- Basic features of composition control schemes. Control of overhead composition, Bottom composition and both product compositions, Location of sensing element, Control of columns with varying feed rates, Pressure control, Control of feed temperature and internal reflux control.
UNIT 5 : ADVANCED CONTROL SYSTEM - Cascade control, Feed forward control concept, Ratio control, Non linear and adaptive control, Value position control, Override control, Laplace domain analysis of cascade control, Feed forward control, Process with inverse response.
OPTIMUM CONTROLLER SETTINGS- Optimum settings from the plant response, Continuous cycling methods, Damped oscillation method, Reaction curve method.

6EI2 ANALYTICAL & ENVIRONMENTAL INSTRUMENTATION

UNIT 1: SPECTROSCOPIC ANALYSIS- Absorption and reflection techniques, Atomic techniques-emission, absorption and fluorescence, X-ray spectroscopy, Photo acoustic spectroscopy, Microwave spectroscopy, Mass spectrometers
.**UNIT 2: GAS ANALYSIS -** Infrared and ultraviolet absorption analyzers, Paramagnetic oxygen analyzers, Thermal conductivity analyzers and Chemiluminescence analyzers.
.**UNIT 3: CHROMATOGRAPHY-** Paper and thin layer chromatography. Basic parts of gas chromatography, Types of columns, Detection systems- thermal conductivity, Flame ionization, Electron capture detector.
Types of liquid chromatography, Liquid chromatography, Column and detection systems.
UNIT 4: ENVIRONMENTAL POLLUTION MONITORING- Air pollutants, Air pollution monitoring instruments-carbon mono oxide, sulpher dioxide, nitrogen oxide, hydro carbon & ozone. Smoke monitor, Dust monitor, Visible emission monitoring system.
UNIT 5: LIQUID ANALYSIS- PH meter, Conductivity meter, Analyzers for measurement of ammonia, silica, sodium and dissolved oxygen

6EI3 INDUSTRIAL ELECTRONICS

UNIT 1: SEMICONDUCTOR POWER DEVICES - Basic characteristics & working of Power Diodes, Diac, SCR, Triac, Power Transistor, MOSFETs, IGBT, and GTO**.**

UNIT 2: RECTIFIERS & INVERTERS - Working principles of single and three phase bridge rectifiers, Voltage and current source inverters.

UNIT 3: POWER SUPPLIES - Principle of operation of choppers. Step up, Step down and reversible choppers. High frequency electronic ballast, Switch Mode Power Supply: Fly back converter, forward/buck converter, Boost converter and buck-boost converter. Uninterruptible Power Supply.

UNIT 4: MOTOR CONTROL - Introduction to speed control of DC motors using phase controlled converters and choppers, Basic idea of speed control of three phase induction motors using voltage and frequency control methods.

UNIT 5: STEPPER MOTORS : Variable reluctance, Permanent magnet and hybrid stepper motors. Induction and dielectric heating control.

6EI4 BIOMEDICAL INSTRUMENTATION

UNIT 1 : HUMAN BODY SUBSYSTEMS- Brief description of neural, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities.
TRANSDUCERS AND ELECTRODES- Principles and classification of transducers for Bio-medical applications, Electrode theory, different types of electrodes, Selection criteria for transducers and electrodes.
UNIT 2: BIOPOTENTIALS- Electrical activity of excitable cells, ENG, EMG, ECG, ERG, ECG. Neuron potential.
CARDIOVASCULAR SYSTEM MEASUREMENTS- Measurement of blood pressure, blood flow, cardiac output, cardiac rate, heart sounds, Electrocardiograph, phonocardiograph, Plethysmograph, Echocardiograph.
UNIT 3 : INSTRUMENTATION FOR CLINICAL LABORATORY- Measurement of pH valve of blood, ESR measurement, hemoglobin measurement, O_2 and CO_2 concentration in blood, GSR measurement.
Instrumentation for clinical laboratory: Spectrophotomentry, chromatography, Hematology,
MEDICAL IMAGING: Diagnostic X-rays, CAT, MRI, thermography, ultrasonography, medical use of isotopes, endoscopy.
UNIT 4: PATIENT CARE, MONITORING AND SAFETY MEASURES Elements of Intensive care monitoring basic hospital systems and components, physiological effects of electric current shock hazards from electrical equipment, safety measures, Standards & practices.
COMPUTER APPLICATIONS AND BIOTELEMETRY: Real time computer applications, data acquisition and processing, remote data recording and management.
UNIT 5: THERAPEUTIC AND PROSTHETIC DEVICES - Introduction to cardiac pacemakers, defibrillators, ventilators, muscle stimulators, diathermy, heart lung machine, Hem dialysis, Applications of Laser.

6EI5 MICROCONTROLLER AND EMBEDED SYSTEM

UNIT 1 : THE 8051 MICROCONTROLLER: Introduction, The 8051 microcontroller hardware, I/O pins, Port, External memory, Counters and Timers, Serial data. Interrupts.
UNIT 2 : 8051 ASSEMBLY LANGUAGE PROGRAMMING: Addressing modes, External data moves, push and pop opcodes, Logical operations, Byte level and bit level logical operations. Arithmetic operations, Jump and call instructions, Interrupts & returns.
UNIT 3: REAL TIME CONTROL: Interrupts, Multiple sources of interrupts, Non maskable sources of interrupts, Interrupt structure in 8051,Timers,Free running counter & Real Time control .
UNIT 4: SYSTEM DESIGN: Serial I/O interface, Parallel I/O ports interface, Digital and Analog interfacing methods, LED array, keyboard, Printer, Flash memory interfacing.
UNIT 5: INTRODUCTION TO EMBEDED SYSTEM: Application of Microcontrollers in interfacing, Robotics, MCU based measuring instruments. Real Time Operating System for System Design, Multitasking System, Task Definition in a Multitasking System, Round Robin Scheduling, Full Pre-emptive Scheduling, Basic study and Features of Commercial RTOS : WINCE and Embedded Linux.

6EI6.1 COMPUTER ARCHITECTURE

UNIT 1 : REGISTER TRANSFER LANGUAGE – Data movement amount registers, Data movement from/to memory, Arithmetic and logic micro operations. Concept of bus and timings in register transfer.
UNIT 2 : CPU ORGANISATION – Addressing modes, Instruction format, CPU organization with large registers, Stacks and handling of interrupts & subroutines, Instruction pipelining.
UNIT 3 : ARITHMAIC ALGORITHMS – Array multiplier, Booth's algorithms, Addition/Subtraction for sign magnitude and 2's complement numbers.
UNIT 4 : MICROPROGRAMMED CONTROL UNIT – Basic organization of micro-programmed controller, Horizontal & Vertical formats, Address sequencer.
UNIT 5 : Concept of RAM/ROM, Basic cell of RAM, Associative memory, Cache memory organization, Vertical memory organization. Introduction to peripherals & their interfacing, Strobe based and handshake-based communication, DMA based data transfer, I/O processor.

6EI 6.2 ROBOTICS

UNIT 1 : INTRODUCTION- Introduction, Brief History, Types of Robots, Technology of Robots, Basic Principles in Robotics, Notation, Symbolic Computation and Numerical Analysis.
MATHEMATICAL REPRESENTATION OF ROBOTS- Introduction, Position and Orientation of a Rigid Body, Transformation Between Coordinate Systems and its properties, Representation of Joints, Representation of Link Using Denavit-Hartenberg, Link transformation Matrices, Homogeneous Coordinates, Lines, Screws, and Twists.
UNIT 2 : DYNAMICS OF MANIPULATORS- Introduction, Inertia of a Link, The Lagrangian Formulation, Dynamic Equations in Cartesian Space Inverse Dynamics of Manipulators, Simulation of Equations of Motion, Recursive Formulation of dynamics of Manipulators.
UNIT 3 : TRAJECTORY PLANNING AND GENERATION- Introduction, Joint Space Schemes, Joint Space Schemes With Via Points, Cartesiam Space Schemes, Some Additional Issues in Trajectory Planning.
UNIT 4 : POSITION AND FORCE CONTROL OF MANIPULATORS- introduction, Feedback Control of a Single-link Manipulator, PID Control of a Multi-link Manipulator, Non-linear Control of Manipulators, Simulation and Experimental Results, Non-linear control of constrained and Parallel Manipulators, Cartesian Control of Manipulators, Force Control of Manipulators, Hybrid Position/Force Controller, Stability Analysis of Non-linear Control Schemes, Advanced Topics in Non- linear Control of Manipulators.
UNIT 5: MODELLING AND CONTROL OF FLEXIBLE MANIPULATORS- Introduction, Modelling of a Flexible Joint, Euler--Bernoulli Beam Model, Kinematic Modelling of Multi- link Flexible Manipulators, Discretization Methods, Equations of Motion of Multi-link Flexible Manipulators Control of Flexible Link Manipulators, Other Topics in Flexible Manipulators.

6EI6.3 RANDOM VARIABLE & STOCHASTIC PROCESSES

UNIT 1 : **PROBABILITY** -Definitions, sample, space & events, joint & conditional probability, independent events.
UNIT 2 : **RANDOM VARIABLES -** Introduction, distribution & density functions, discrete & continuous random variables, special distributions : binominal, poisson, uniform, exponential, normal, ray leigh, conditional distribution & density functions
UNIT 3 : **MULTIPLE RANDOM VARIABLES** - Vector random variable, joint distribution functions, joint probability density function, conditional distribution & density functions. Statistical independence, distribution & density function of sum of random variable, one function of two R.V, two function of two R.V., linear transformation
UNIT 4 : **OPERATION ON SINGLE & MULTIPLE RANDOM VARIABLES** - Mean & variance, moments, chebyshev's inequality, Central limit theorem, characteristic functions & moment generating function, covariance & correlation coefficient of multiple R.V.
UNIT 5 : STOCHASTIC PROCESSES - Introduction, random process concept, stationarity & independence, ergodicity, correlation, functions. Gaussion Random Process, Transmission of Random process through linear systems.Power spectral density, cross Spectral density,

6EI7 ANALYSTICAL INSTRUMENTATION LAB

1. To measure pH value of given solution using pH meter.
2. To determine suspended particular matter using right volume air samples.
3. Find out concentration of (Na or K) by flame photo meter in the given sample.
4. To measure transmittance and absorption of a solution using Single beam spectro photo meter.
5. To study water analysis kit & measure pH, temperature, conductivity, dissolved O_2 of a given solution.
6. To measure the conductivity of solution indicator controller.
7. To study the analysis of flue gases.
8. To study ion selective electrode.
9. To study pH monitor and controller.
10. To study silica analyzer and zirconia based oxygen analyzer.
11. To study gas/ liquid chromatograph.

6EI8 ELECTRONIC INSTRUMENTATION LAB

1. Study of following parameters of op-amp –
   i) Input impedance.
   ii) Output impedance.
   iii) Input & Output offset voltage.
   iv) Input bias currents.
   v) Slew rate.
   vi) Supply voltage rejection ratio (SVRR).
   vii) Common mode rejection ratio (CMRR).
   viii) Gain Bandwidth product.
   ix) Power consumption.
   x) Transient response.

   Study & make the following circuits on breadboard using op-amplifiers.
2. Wein Bridge Oscillator.

3,4 Following filters for first order response.
   (a) High pass filter (b) Low pass filter (c) Notch filter

5,6 Wave generators –
   (a) Square wave generator (b) Saw tooth Generator (c) Triangular

7. Instrumentation amplifier.
8. A Comparator.
9. (a) Voltage to current converter.
   (b) Current to voltage converter.
10. Frequency divider

11,12 Study and make the following circuits on bread board using 555 timer & determine the o/p frequeny and Duty cycle
   (a) Astable multivibrator (b) Monostable multivibrator
   (a) Bistable multivibrator

6EI9 CONTROL SYSTEM SIMULATION LAB-I

1. Introduction to `Matlab'. Computing control software.
2. Defining systems in TF, ZPK form.
3. a. Plot step response a given TF and system in state-space. Take different valves of (damping ratio), Wn- natural undamped frequency.
   b. Plot ramp response.
   c, Plot impulse response
4. For a given 2nd order system plot step response and obtain time response specifications.
5. Use of for, while loops in Matlab programming.
6. Check for the stability of a given closed loop system
7 Plot bode plot for a 3rd order system and design a compensator to meet specifications.
8. Plot bode plot for a 2nd order system and find GM and PM.
9. Plot Nyquist plot for a given system and comment upon stability.
10. Plot Nichols plot for a given system.
11. Plot root locus for a given system and design a compensator.
12. For a given 2nd order system,to find the appropriate values of damping ratio and gain for the desired response.

6EI10 PROCESS CONTROL LAB

1. To perform experiments on Linear system simulator.
2. To draw characteristic curves for the response of temperature controlled process for On/Off, P, PI, PID Controller.
3. To perform experiments on stepper motor kit.
4. To study the design and application of lag compensator circuits.
5. To study the design and application of lead compensator circuit.
6. To study process simulator.
   (a) To perform experiments on P, PI, PD, PID controller with Process simulation.
   (b) To study the effect of loading the process.
7. To study the operation of linear & equal percentage type control valves and determine the following characteristics:
   (i) Valve flow coefficient
   (ii) Hysteresis of control valve
   (iii) Rangeability of equal percentage control valve.
8. To study Ratio Control Scheme and Cascade Control Scheme.
9. To plot and analyze step/impulse response of a first order system in
   (i) Non interacting mode (ii) Interacting mode.
10. To study the characteristics of air purge system and measure the level and liquid density.

7EI1 NEURAL NETWORKS AND FUZZY LOGIC CONTROL

UNIT 1 : NEURAL NETWORKS - Introduction Motivation, Biological neural networks and simple models, The artificial neuron model, Hopfield nets, Perceptrons & threshold logic devices, Single and multilayer networks, applications.
UNIT 2 : LEARNING ALGORITHMS- Supervised and unsupervised learning, Hebbian learning, delta learning, competitive learning. Back propagation and feedforward methods, Recent trends and future directions.
UNIT 3 : FUZZY LOGIC- Introduction -Uncertainty & precision, Statistics and random process, Uncertainty in information, Fuzzy sets and membership.
MEMBERSHIP FUNCTIONS: Features of membership function. Standard forms and boundaries, Fuzzification, Membership value assignment – Intuition, Inference, Neural networks.
FUZZY TO CRISP CONVERSIONS: Maximum membership principle.
UNIT 4 : DEFUZZIFICATION METHODS- Centroid method, Weighted average method, Meanmax membership.
FUZZY RULE BASED SYSTEMS: Natural language, linguistic hedges, Rule based system – Canonical rule forms, Decomposition of compound rules, Likelihood and truth qualification Aggregation of Fuzzy rules. Graphical techniques of reference.
UNIT 5 : FUZZY CONTROL SYSTEM- Simple Fuzzy Logic controller, General FLC, Special forms of FLC system models, Industrial application.

7EI2 DIGITAL SIGNAL PROCESSING

UNIT 1 : SAMPLING - Discrete time processing of Continuous-time signals, continuous-time processing of discrete-time signals, changing the sampling rate using discrete-time processing.
UNIT 2 : TRANSFORM ANALYSIS OF LTI SYSTEMS - Introduction, The frequency response of LTI systems, System functions for systems characterized by LCCD (Linear Constant Coefficient Difference) equations, All-pass system, Minimum-Phase systems, Linear systems with linear phase.
UNIT 3 : STRUCTURES FOR DISCRETE-TIME SYSTEMS- Block diagram and signal flow graph representation of LCCD (LCCD – Linear Constant Coefficient Difference) equations, Basic structures for IIR and FIR systems, Transposed forms.
UNIT 4 : FILTER DESIGN TECHNIQUES - Introduction, Analog filter Design: Butterworth & Chebyshev.IIR filter design by impulse invariance & Bilinear transformation. Design of FIR filters by Windowing: Rectangular, Hanning, Hamming & Kaiser.
UNIT 5 : The Discrete Fourier transform (DFT), Properties of the DFT, Linear Convolution using DFT. Efficient computation of the DFT: Decimation–in-Time and Decimation-in frequency FFT Algorithms. Processing of speech signals: Vocoders, linear predictive coders.

7EI3 COMPUTER NETWORKS

UNIT 1: QUEUING THEORY- Pure birth, Pure death & Birth-death processes, Mathematical models for M/M/1, M/M/∞, M/M/m, M/M/1/K and M/M/m/m queues. Little's formula. M/G/1 Queuing model basics.
UNIT 2: DATA LINK LAYER - Packet & Circuit switching, OSI & TCP/IP Reference Models, Framing, Simplex protocol, Simplex stop & wait protocol, Sliding window protocol, Go back N protocol, selective repeat, HDLC, Data link layer in internet.
UNIT 3: MEDIUM LAYER- Static & dynamic channel allocation, Multiple Access Protocols: ALOHA, slotted ALOHA, CSMA, Token Bus, Token Ring, FDDI, IEEE standards 802.2, 802.3 Hubs, Bridges, Routers & Gateways.
UNIT 4: NETWORK LAYER- Network layer Design issues.
Adaptive & Non-adaptive routing algorithms, Congestion control algorithms for TCP/IP networks, Internetworking, Network layer in the Internet: IPv4 & IPv6 Protocols, OSPF and BGP.
TCP Protocol architecture.
UNIT 5: ATM NETWORKS- Connection Oriented Networks: X.25, Frame Relay & ATM. ISDN system architecture. Broadband ISDN. ATM Protocol architecture, Recognition Algorithm in ATM Networks, Congestion control Algorithms.

7EI4 FIBER OPTIC INSTRUMENTATION

UNIT 1 : OPTICAL FIBERS- Introduction, Ray theory, Optical fibers: multimode, single mode, step index, graded index, plastic & glass fibers.
Transmission Characteristics of Optical Fibres **-** Introduction, Attenuation, Material absorption loss, Fibre bend loss, Dispersion (intermodal & intramodal)
UNIT 2: OPTICAL FIBER SOURCES & CONNECTION - Light Emitting Diode **-** Structure, Material, Characteristics, Power & Efficiency.
Fiber Alignment, Fiber splices, Fiber connectors, Expanded beam connectors,
UNIT 3 : OPTICAL DETECTORS - Optical detection principles, quantum efficiency, responsivity, PIN photo diode, Avalanche photo diodes, Noise in Detectors, Photo Diode Materials.
UNIT 4 : OPTICAL FIBER MEASUREMENTS - Measurements of Fiber Attenuation, Dispersion, Refractive Index Profile, Cut off Wave Length, Numerical Aperture & Diometer.
UNIT 5 : LASER - Emission and absorption of radiation, Einstein relation, Absorption of radiation, Population inversion, Optical feed back, Threshold condition. Population inversion and threshold Working of three level & four level laser. Basic idea of solid state, semiconductors, gas & liquid laser. Basic concept of Q**-**switching & mode locking.Laser applications for measurement of distance, Velocity, Holography.

7EI5 INDUSTRIAL MEASUREMENTS

UNIT 1: TEMPERATURE MEASUREMENTS - Bimetallic thermometers, Resistance thermometrs, Thermocouples, Thermistors. Radiation pyrometrs, Optical pyrometers

UNIT 2 :PRESSURE MEASUREMENTS - Manometers, bourden tubes , Diaphragms, Bellow's, Electrical pressure transducers - Strain gauge pressure transducer, Potentiometric pressure transducer, Capacitive pressure transducers, Piezo electric pressure transducers, Differential pressure transmitters.

UNIT 3 :FLOW MEASUREMENTS - Differential pressure flow meter, Orifice plates, Venturi tubes, Flow nozzels, Pitot tubes, Rotameters. Electromagnetic and ultrasonic flow meters, Vortex flow meters, Mass flow type meters. Shunt flow meters.

UNIT 4 :LEVEL MEASUREMENTS - Float type, Hydrostatic type, Differential pressure method, Electrical conductivity method, Capacitance level, Ultrasonic and nucleonic gauges. Capacitance probes. Density Measurements **-** Hydrometers, ultrasonic densitometer, radiation densitometer, Impulse wheel methods.

UNIT 5: STRAIN MEASUREMENTS - Electrical strain gauges Wire & foil type materials, Adhesives configuration, Protective coatings, Bonding, Temp. compensation, Calibration, Applications Rosette gauges.

7EI 6.1 MICROWAVE ENGINEERING

UNIT 1: **INTRODUCTION -** Introduction to Microwaves and their applications, Transit time effect. Rectangular Wave-guides: Solution of Wave equation modes in rectangular waveguides, Basic idea of TE and TM modes, TEM mode of propagation

UNIT 2 : MICROWAVE COMPONENTS - Theory and application of cavity resonators. Coupling to cavity, Q of Cavity resonators, Attenuators, Tees, Hybrid rings, Wave guide corners, Bends and twists, phase shifters, directional couplers, isolators, circulators.

UNIT 3 : MICROWAVE GENERATORS AND AMPLIFIERS - Theory of velocity modulation. Operation and characteristics of two-cavity klystron amplifier, Reflex Klystron, TWT, Magnetrons.

UNIT 4 :MICROWAVE SOLID STATE DEVICES - Principle of working and applications of IMPATT diode; hot Carrier Diode, PIN Diode, Tunnel diode, Gun Diode, MASER amplifiers, CCD.

UNIT 5 : MICROWAVE MEASUREMENTS - Detection of Microwaves, Basic methods of measurement of frequency, power, scattering parameters, VSWR, impedance.

7EI6.2 ADVANCED MICROPROCESSORS

UNIT 1 : 8086 ARCHITECTURE- Hardware specifications, Pins and signals, Internal data operations and Registers, Minimum and maximum mode, System Bus Timing, Linking and execution of Programs, Assembler Directives and operators.
UNIT 2: SOFTWARE & INSTRUCTION SET- Assembly language programming: addressing mode and instructions of 8086, MACRO programming, 8086 interrupts.
UNIT 3: ANALOG INTERFACING: A/D and D/A converter interfacing, keyboard and display interfacing, RS 232 & IEEE 488 communication standards**.**
UNIT 4 : DIGITAL INTERFACING: Programmable parallel ports**,** Interfacing microprocessor to keyboard and alphanumeric displays, Memory interfacing and Decoding , DMA controller.
UNIT 5 : MULTIPROCESSOR CONFIGURATIONS - Multiuser / Multitasking operating system concepts, 8086 based Multiprocessor systems. Introduction and basic features of 286, 386, 486 & Pentium processors.

7EI6.3 ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

UNIT 1 : INTRODUCTION TO AI KNOWLEDGE- Importance of AI, Knowledge Base System Knowledge organization & manipulation, Conceptual Introduction to LISP and other AI programming Languages.
UNIT 2 : KNOWLEDGE REPRESENTATION- Syntax Semantics, Inference Rules, Non-deductive Inference methods, and representations using rules, forward chaining and backward chaining. Fuzzy Logic & Natural languages computations. Probabilistic Reasoning. Object Oriented Representations.
UNIT 3 : KNOWLEDGE ORGANIZATION & MANIPULATION- Search & control strategies, matching techniques, knowledge organization & management, Genetic Algorithms based search techniques.
UNIT 4 : KNOWLEDGE SYSTEMS ARCHITECTURE- Rule based, non-production, uncertainty knowledge system building tools.
UNIT 5 : KNOWLEDGE ACQUISITION- General concepts, learning by induction.

7EI7 CONTROL SYSTEM SIMULATION LAB-II

1. Introduction to advanced facilities of Matlab, simulink, use of functions in Matlab.
2. Define the system in state-space.
3. Conversion of system in state-space to various forms.
4. Check for controllability, observability.
5. Eigen value analysis
6. Motion control : Design of motor control using power electronics tool box
7. Process control : Complete design of temp/level control problem.
8. Robotics : Design and simulation of cart pole problem using fuzzy logic control..
9. To design and simulate FIR digital filter (LP/HP).
10. To design and simulate IIR digital filter (LP/HP).

7EI8 Project (Stage I)

7EI9 MICROPROCESSOR & MICROCONTROLLER LAB

1. Using assembly programme check whether a given string is a palindrome or not.
2. Write a program to reverse a given string, the string is stores in the data segment.
3. Write a program to count 0 to 20H with a delay of 100 ms between each count.
4. Write a program to convert a 4 digit decimal number to its binary equivalent using a procedure for dividing a number by two.
5. Define a macro `SQUARE' that calculates square of a number.
6. Write a program to display message `Study of microprocessors is interesting,

   Programs based on 8051
   .
7. Implement given boolean function using 8051.
8. Interface 8 bit ADC with microcontroller.
9. Generate a square wave with 50% duty cycle by using data transfer and branching instructions.
10. Realise a full adder using microcontroller.
11. Configure timer of 8051 for preliminary studies of a timer.
12. To study internal and external interrupts used in 8051.

7EI10 PRACTICAL TRAINING AND SEMINAR

8EI1 INSTRUMENTATION IN INDUSTRIES

UNIT 1 : PROCESS INDUSTRIES INSTRUMENTATION – Organisation for Instrument Engineering, instrument department functions & responsibilities, Process industries instrumentation, Man power classifications, Power plant training in instrumentation, Standardisation of instrumentation, Specialised process plant instrumentation.

UNIT 2 : C&I IN CHEMICAL REACTORS – Classifications, Temperature Control Schemes, Reactor Temperature Control, Reactor Temperature Control with recirculation. Cascade Temperature Control with heating & cooling capability. Pressure Control Schemes – Reactor Pressure Control by modulating gas make up, Reactor Pressure Control by throttling flow of vent gas, Continuous Control of Reactor Pressure.

UNIT 3 : C& I IN HEAT EXCHANGERS - Classifications, Steam Heaters. Control Schemes – Feedback control of steam heated exchanger, Control valve in condensate line, Pumping traps, Steam trap replaced by level control, By pass control.

Condensers Control Schemes– Condenser on temperature control, Condenser on Pressure Control, Condenser control by changing the wetted surface area, Hot gas by-pass control.

Reboilers & Vaporizers Control Schemes – Temperature – Pressure cascade control loop on steam heater, Temperature- Flow cascade control loop on steam reboiler.

UNIT 4 : C&I IN EVAPORATORS AND DRYERS – Principles & Classifications, Control Schemes of Evaporators- Horizontal tube, Forced circulation, Short tube vertical, Falling film, Long tube vertical, Agitated film evaporators. Principles & classificaitons of dryers, Control of batch and continuous dryers, Classification & control schemes for pumps.

UNIT 5 : STEAM POWER PLANT INSTRUMENTATION – Selection of instrumentation, Power plant measurement (primary & secondary), Automatic control systems : Feed water control, Steam temperature control, Auxiliary control systems, Interlocks, Data logging & Computing equipments.

8EI 2 NON-LINEAR CONTROL SYSTEM

UNIT 1: INTRODUCTION - Non-linearities, Non-linear System behavior and analysis, Limit Cycles, Phase Plane Analysis. Construction of phase trajectories

UNIT 2: Fundamentals of Lyapunov Theory, Concept of Stability, Autonomous & Non-autonomous Systems, Local and Global Stability, Lyapunovs Direct Method

UNIT 3 : Describing Function Analysis, Fundamentals, Basic Assumptions, Definitions, Continuous and Discontinuous Non-linearities, Describing Functions of Common Non-linearities.

UNIT 4 : Non-linear Control System Design, Non-linear Control Problems, Stabilization, Tracking, Specifying Derived Behavior, Available Methods of Non-linear Control Design,

UNIT 5: ADAPTIVE CONROL - Basic Concepts Model-Reference Adaptive Control, Control of First Order Systems, Extension to Non-linear Plants, Choice of Control Law Adaptation Law, and Systems with output Feedback, Robustness of Adaptive Control Systems.

8EI3 DISTRIBUTED CONTROL SYSTEM & COMMUNICATION PROTOCOLS

UNIT 1. INTRODUCTION- Hierarchical organization for a process computer control and computer system structure for a manufacturing complex. Centralized and distributed control concept. Lower level and higher level computer tasks and duties. Functional requirement of DPCS.Aims of plant automation and distributed computer control systems and subsystems. DPCS system configuration and integration with PLCs and computers.

UNIT 2. ARCHITECTURE- Overviews of DPCS, systems architectures, data base organization. DPCS elements, comparison of different DPCS systems, state of the art in DPCS, configuration of control unit, different cards (I/O, O/P , Memory , PLC etc) system implementation concepts, work stations and its key – functions and function chart.

UNIT 3. DCS DISPLAYS- Standard and user defined displays, continuous process display, Ground display, overview display, detail display, graphic display, trend display, loop display, alarm summary display, annunciator display, batch/ sequence display, tuning display, tuning panel ,instrument faceplate ,etc

DATA COMMUNICATIONS LINKS AND PROTOCOL - Communication Hierarchy (point to point to field bus) Network requirements, ISO reference model,

UNIT 4. Transmission media ,network topologies, internetworking , data transmission , bus access methods ,error handling Field buses ,MAP and TOP Protocols. Features and capabilities of various field buses. FB standardization, comparison of MODBUS, PROFIBUS and FIPBUS, HART protocol and DEVICE NET CONTROL NET their functions, Network structure. DCS buses, LAN in DCS (including optical LAN) IEEE project 802 on LAN implementation

UNIT 5 DCS CONTROL FUNCTIONS- control unit, sequential control, system maintenances, utility, switch instrument, batch system builder, graphic builder, feedback control builder, security, and process reporting function etc

8EI4.1 WIRELESS COMMUNICATION

UNIT 1 : RADAR FUNDAMENTALS - Basic Radar System, Accuracy & Resolution, Radar Range Equavation, Radar Display, Radar Classificaiton, Basic Block Diagram of CW Radar, FM CW Radar, Moving Target Indicator Radar, Pulse Dopler Radar & Tracking Radar, Range & Velocity Resolution of Radar

UNIT 2 : SATTELITTE COMMUNICATION - Sattelite Frequency Band, Different types of Orbat, SAT Orbittle Requirements, Sattelite Stablisation, Orbittle Parameters, Eclipses, Various Sub-Systems of Satellite & Basic Block of Earth Station & Sattelite Communication System.

UNIT 3 : SATTELITE LINK DESIGN CALCULATION (UPLINK & DOWNLINK ANALYSIS)- Elementry Idea of Satellite Multiple Access,FDMA,TDMA,CDMA.

UNIT 4 : CELLELUR COMMUNICATION - Cellular Concepts, Cellular Network Structure, Cellular Components, Frequency Re-use, Hand Off Strategies, Interference & Coverage & Capacity in Cellular (Cell Splitting & Sectoring)

UNIT 5 : CELLELUR STANDARD - CT2, DECT Standard, Mobile Hand Set

Basic Concepts of GSM, Wireless, Personal Communication. Compare the frequency & bandwidth and channel capacity of PCs V/s Cellular Technology

8EI4.2 OPERATING SYSTEMS

UNIT 1 : INTRODUCTION – History, Operating system services, types, responsibilities, generations, LINUX, WINDOWS.
UNIT 2 : PROCESS MANAGEMENT- Operations on process, Process state, Scheduling, Criteria, scheduling algorithms, Evaluation, Synchronization, Semaphores, Monitors.
UNIT 3 : MEMORY MANAGEMENT- Swapping, Continuous memory allocation, Paging, Pure paging, Demand paging, Page-replacement algorithms, thrashing, Example-Pentium, Disk Scheduling.
UNIT 4 : INFORMATION MANAGEMENT- File and directory concept, Access methods, Protection, Free space management, Efficiency and performance, Access matrix, Capability-based systems, Program-threats, User authentication, Firewall.
UNIT 5 : DEAD LOCKS- System model, Dead lock characterization, Deadlock prevention, Avoidance, Detection, Recovery, Classic problems of synchronization.

8EI4. 3 IMAGE PROCESSING AND PATTERN RECOGNITION

UNIT 1: INTRODUCTION: Imaging in ultraviolet and visible band. Fundamental steps in image processing. Components in image processing. Image perception in eye, light and electromagnetic spectrum, Image sensing and acquisition using sensor array.

UNIT 2: DIGITAL IMAGE FUNDAMENTALS: Image sampling and quantization, Representing digital images, Spatial and gray-level resolution, Aliasing and Moiré patterns, Zooming and Shrinking digital images.

UNIT 3: IMAGE RESTORATION: Image restoration model, Noise Models, Spatial and frequency properties of noise, noise probability density functions, Noise - only spatial filter, Mean filter Statistic filter and adaptive filter, Frequency domain filters - Band reject filter, Band pass filter and Notch filter.

UNIT 4: IMAGE COMPRESSION: Compression Fundamentals - Coding Redundancy, Interpixel redundancy, Psycho visual redundancy and Fidelity criteria. Image Compression models, Source encoder and decoder, Channel encoder and decoder, Lossy compression and compression standards.
color space formats, scaling methodologies (like horizontal, vertical up/down scaling). Display format (VGA, NTSC, PAL).

UNIT 5: EXPERT SYSTEM AND PATTERN RECOGNITION: Use of computers in problem solving, information representation, searching, theorem proving, and pattern matching with substitution. Methods for knowledge representation, searching, spatial, temporal and common sense reasoning, and logic and probabilistic inferencing. Applications in expert systems and robotics

8EI5 INDUSTRIAL ELECTRONICS LAB

1 Study the characteristics of SCR.
  1.1 Observe the terminal configuration.
  1.2 Measure the breakdown voltage.
  1.3 Measure latching and holding current.
  1.4 V-I characteristics.
2 Perform experiment on triggering circuits for SCR.
  2.1 R-triggering circuit.
  2.2 2R-C triggering circuit.
  2.3 UJT triggering circuit.
3 Study and obtain the characteristics of Diac.
4 Study and obtain the waveforms for single-phase half-wave controlled converter.
5 Study and obtain the waveforms for single-phase half controlled symmetrical and asymmetrical bridge converters.
6 Study and obtain the waveforms for single-phase fully controlled bridge converter.
7 Study and obtain the waveforms for voltage-commutated chopper.
8 Study and obtain the waveforms for current-commutated chopper.
9 Perform experiment on single phase PWM inverter.
10 Perform experiment on buck, boost and buck-boost regulators.
11,12 Perform experiments on : Motor control – open loop and closed loop.

8EI6 REAL TIME CONTROL LAB

1. For PC based pressure control system
   a. Study of open loop response (manual mode).
   b. Study of close loop response using PI & PID controllers.
   c. Optimize the system performance by tuning P & PI controller using SCADA software.
2. For PC based temperature controlled system
   a. Study of open loop response (manual mode).
   b. Study of close loop response using PI & PID controllers.
   c. Tuning techniques of PID controller (open loop method & closed loop method).
3. To configure and study the following advanced control schemes for a PC based multi parameter process:
   a. Cascade control
   b. Feed forward control
   c. Ratio control
4. a. To study working of a PLC controlled process.
   b. Study of ladder logic for the above process.
5. Speed control of induction motor using digital signal controller MCK 2812 using MCW in 2812.

Virtual instrumentation lab using any virtual instrumentation software

6. Study of data acquisition system and test all the signal points.
7. Development of flexible SCADA system.
8. Tuning of PID controllers

8EI7 APPLIED INSTRUMENTATION LAB

1. Setting Analog & digital link.
2. Study & measurement of losses in optical fiber.
3. Measurement of Numerical aperture of fiber.
4. Plot V-I & PI characteristics of LED.
5. Plot V-I & P-I characteristics of Laser
6. To study the indirect BP measuring method and to measure BP using sphygmomanometer and electronic BP instrument.
7. To obtain ECG of a resting human subject and verify the algebraic relationship amongst units leads.
8. To find out various ling capacity measurements using pnemotachgraph.
9. To obtain EEG signal of a normal subject with the following conditions :
   a. Eyes open
   b. Eyes closed
   c. Thinking
   d. Writing
   e. Reading
10. For the above conditions energy levels of a different areas of brain should be plotted.
11. To study the effect of exercise on HR and BP.

8EI8 SEMINAR

8EI9 PROJECT (STAGE-II)