3AI1 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.

3AI2 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.

3AI3 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.

3AI4 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.

3AI5 BASIC ELECTRICAL & ELECTRONICS MEASUREMENTS

UNIT 1 : INTRODUCTION - Difference in measurement at low and high frequencies, Types of indicating instruments, Balance detectors and other auxiliary apparatus used, Shielding and grounding considerations, Noise problem, Effects of physical size of components.

UNIT 2 : PMMC INSTRUMENTS - Moving Iron Instruments; Electrodynamic Instruments: Construction, Torque equation, Shape of scale

Potentiometers: DC Potentiometers: Crompton, Vernier, Brooks deflection and Self-balancing potentiometer. AC potentiometers: Co-ordinate and Polar type potentiometers. Calibration of both AC and DC potentiometer.

UNIT 3 : MEASUREMENT OF LUMPED PASSIVE COMPONENTS - Measurement of resistance, capacitance, self inductance, mutual inductance and incremental inductance at audio and radio frequencies, Price's guard wire and loss of charge methods for high resistance measurements, Introduction to inductively coupled ratio arm bridge, Special consideration for radio frequency bridges, High frequency measurement: Resonance methods of parameters measurements, Twin-T and bridge-T networks, Q-measurements and Q-Meter.

UNIT 4 : ELECTRONIC VOLTMETERS - Characteristics and specification of Analog electronic voltmeters of different kinds, Circuits of DC voltmeters using tubes, FET's, BJTs, and IC's, Analysis of circuit with various configurations to compare sensitivity, stability, linearity and impedance characteristic, Theory of operation and circuits for average, peak, peak to peak and RMS responding-A.C. Voltmeters, Use of compensated multipliers, CMRR and NMRR, RF Voltmeter, Electronic VOM.

UNIT 5 : CATHODE RAY OSCILLOSCOPE - Internal structure, Basic CRO circuits, CRT Connections, Measurement of Time period, Frequency, Current and voltage. High frequency Working of CRO, Free running and triggered mode CRO, Dual-Beam and dual trace CROs, CRO probes.

3AI6 DATA STRUCTURES & ALGORITHMS

UNIT 1 : PERFORMANCE MEASUREMENT - Space complexity and Time complexity, Big oh, Omega and theta notations and their significance.

UNIT 2 : LINEAR LISTS - Array and linked representation, Singly and linked list, Concept of circular and multiple linked list.

UNIT 3 : ARRAY AND MATRICES - Row and Column Major mapping & representation, Irregular 2D array, Matrix operations, Special Matrices: Diagonal, Tridiagonal, Triangular, Symmetric, Spares matrices representation and its transpose.

Stacks: ADT, Representation in array & linked linked lists, Basic operation, Applications of stacks in parenthesis matching, Towers of Hanoi etc.

Queues: ADT, Representation in array & linked lists, Application, circular queues.

UNIT 4 : TREES- Binary Tree, Representation in array & linked lists, Basis operation on binary trees, Binary tree traversal (preorder, postorder inorder), Single source shortest path algorithm, Minimum cost spanning tree.

Search Trees: Binary search tree, Indexed binary search tree, Basic operation, AVL tree, B-tree

UNIT 5 : GRAPH - Representation of unweighted graphs BFS, DFS, Files.

Sorting: Bubble sort, Insertion, Merge sort, Selection sort, Shell sort, Quick sort, Heap sort.

3AI7 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)
   d. Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.
2. Plot V-I characteristic of P-N junction diode & calculate cut-in-voltage, peak reverse voltage, Saturation current and static & dynamic resistances.
3. 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.
4. Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.
5. Plot drain current-drain voltage and drain current-gate bias character-istics of field effect transistor and measure of Idss & Vp
6. Application of diode as clipper & clamper.
7. Plot gain-frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.
8. Plot gain-frequency characteristic of emitter follower & find out its input and output resistances.
9. Characterising a given passive network using Y & Z parameters.
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 DC voltage output & ripple factor.

3AI8 DIGITAL ELECTRONICS LAB

1. To study and perform the following experiments.
   (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/NOR 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. Voltage comparator circuit using IC-710
   10. Schmitt transistor binary circuit
   11,12. Voltage waveforms of different points of transistor (a)Astable (b)Monostable (c) Bistable Multivibrators and the frequency variation with different parameters.

3AI9 ELECTRICAL & ELECTRONICS MEASUREMENTS LAB

1. Calibrate an ammeter using D.C. potentiometer.
2. Measurement of logarithmic decrement of a ballistic galvanometer.
3. Measurement of high resistance by loss of charge method.
4. Measurement of low resistance by Kelvin's double bridge.
5. Measurement of inductance by Anderson's bridge.
6. Measurement of capacitance by Desauty's bridge.
7. Study the performance and applications of Q meter.
8. Assembly and testing of electronic voltmeter circuit based on:-
   a. Average rectifier principle,
   b. Peak reading principle.
   c. Peak to peak reading principle.
   d. R.M.S. reading principle.
9. Study of a triggered, dual trace with and without storage facility CRO.

3AI10 DATA STRUCTURE AND ALGORITHM LAB

COMPUTER PROGRAMMING IN C

1. Write a program to find the greatest between four numbers.
2. Write a program to prepare mark sheet of students using structures.
   Write a C program to read several different names and addresses, rearrange the names in alphabetical order and print name in alphabetical order using structures.
3. Write a program to implement concatenation of two strings using pointers.
4. Write a program to create a singly link list of ten students names and implement add node, delete node, and is empty list operations.
5. Write a program to search a pattern in a given string.
6. Write a program to print the following output using FOR loop.

```
1                   1
22                2     2
333             3   3   3
4444          4   4   4   4
55555       5   5   5   5   5
```

7. Write a Program to read add, subtract and multiply integer matrices.
8. Factorial computation and sine function computation.
9. Reversing the digits of an integer.
10. Character to number conversion.
11. Smallest divisor of an integer.

4AI1 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.

4AI2 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 complimentary symmetry amplifiers

4AI3 MICROPROESSORS

UNIT 1 : INTRODUCTION TO MICROPROCESSOR- CPU, Address bus, data bus and control bus, Input/Output devices, buffers, encoders, latches and memories.
UNIT 2 : 8085 MICROPROCESSOR ARCHITECTURE- Internal data operations and registers, pins and signals, peripheral devices and memory organization, interrupts CISC and RISC architecture overview.
UNIT 3 : 8085 MICROPROCESSOR INSTRUCTIONS- Classification, format and timing Instruction set, Programming and debugging, 8 bit and 16 bit instruction.
UNIT 4 : 8085 MICROPROCESSOR INTERFACING- 8259, 8357, 8255, 8253, 8251 chips and their applications. A/D conversion, memory, keyboard and display interface.I/O programming Fundamental of I/O, Programmed I/O, Interrupt I/O, and memory configuration
UNIT 5 : INTRODUCTION TO 16 BIT MICROPROCESSORS- Architecture of 8086 CPU, Memory Management of 8086, Minimum & maximum modes of 8086, Internal operations, Instruction set of 8086, Addressing mode, Instruction Format, Instruction execution timing, comparison of 8086 with 8088.

4AI4 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.

4AI5 ELECTRONIC INSTRUMENTATION

UNIT 1: Theory of Errors**:** Accuracy and precision, Methods of reducing systematic errors in measurements, Statistical analysis of random errors, Normal error curve, Estimation of error in computed result.

UNIT 2 : INSTRUMENTATION AMPLIFIERS - Operation, performance and characteristics of single ended, differential amplifier, chopper stabilized amplifiers used in Instrumentation, Different types of choppers and their characteristics.

Electronic Analog Ammeters**:** Performance, specifications of instruments for audio and radio frequency current measurements, Rectifier and thermocouple ammeters, Principle of Hall effect ammeters, Use of amplifier type DC Voltmeter as ammeter.

UNIT 3: Power measurements at audio radio frequencies, Absorption, calorimetric and transmission power meters, Electronic wattmeter.

UNIT 4: **WAVE MEASUREMENTS -** Various types of wave and spectrum analyzer for audio, Radio and microwave frequencies, Field strength measurements of radio waves.

Vector and differential Voltmeter, Vector impedance meter, Function generators, RF Signal generators and pulse generators, Introduction to frequency synthesizers.

UNIT 5: DIGITAL INSTRUMENTS - Principle of operation of probes, Digital pulsar and logic analyzer, Components of a digital universal counter: Digital period, frequency and time interval measurement, Errors in digital counter, High frequency measurement with digital counters, Different types of integrating and non-integrating digital voltmeters, Digital oscilloscopes.

4AI 6.1 OBJECT ORIENTED PROGRAMMING

UNIT 1 : OOP FUNDAMENTALS: Concept of class and object, attributes, public, private and protected members, derived classes, single & multiple inheritance.

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: operators, operator procedence. Switch and loop statements.

UNIT 5 : PACKAGE AND INTERFACES: Packages, access protection, Importing & defining packages. Defining and implementing interfaces.

4AI 6.2 COMPUTER ORIENTED NUMERICAL 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.

4AI 6.3 DATA BASE MANAGEMENT SYSTEM

UNIT 1: Need, purpose and goals of DBMS. DBMS Architecture, Concept of keys, Generalisation and specialization, Introduction to Relational data model, ER Modeling, Relational algebra.
UNIT 2 : DATABASE DESIGN - Conceptual Data Base design. Theory of normalization, Primitive and composite data types, concept of physical and logical databases, data abstraction and data independence,. Relational calculus.
UNIT 3 : SQL : DDL and DML. Constraints assertions, views, data base security.
Application Development using SQL : Host language interface, embedded SQL programming.
GL's, Forms management and report writers. Stored procedures and triggers.
UNIT 4 : INTERNAL OF RDBMS - Physical data organization in sequential, indexed, random and hashed files. Inverted and multilist structures.
UNIT 5: Transaction processing, concurrency control, Transaction model properties and state serialisability. Lock base protocols, two phase locking, Log based recovery Management.

4AI 7 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 l KHz 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 and observe the high frequency performance.
4. Study wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency.
5. Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
6. Study the following oscillators and observe the effect of variation of C on oscillator frequency:
7. (a) Hartley (b) Colpitts
8. To design and study voltage waveforms at different points of transistor. (a) Astable (b) Monostable (c) Bistable Multivibrators and frequency variation with different parameters.
9. Design and testing of pushpull class A/B power amplifier and calculate distortion.
10. Assembling complementary pushpull power amplifier and its testing.

4AI 8 MICROPROCESSOR LAB

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.
3. Transfer of a block data in memory to another place in memory in the forward 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 fibonacci number.
9. Programme for rolling display of message "INDIAN"
11. To insert a number of correct place in a sorted array.
12. Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light and sequential lights on off by above hardware.
13. Generation of different waveform on 8253/8254 programmable timer.

4AI 9 TRANSDUCER & MEASUREMENT LAB

1. Study the performance of piezo electric transducer for measuring acceleration.
2. Plot the characteristic of potentiometric transducer.
3. To draw the V-I characteristics of Solar panel.
4. To study the operation of Hall effect transducers.
5. Study the performance for measuring distance using ultrasonic transmitter and receiver.
6. Study the performance for measuring displacement using LVDT.
7. Draw the characteristics for the following temperature transducers:
   (a) RTD (Pt-100) (b) Thermistors (c) Thermocouple
8. To study and draw the characteristics of LDR.
9. Measure the speed of table fan by using stroboscope.
10. Measurement of strain/force with the help of strain gauge load cell.
11. Study the various pressure and force sensors.
12. Study the Flapper Nozzle mechanism.

4AI 10 ELECTRONICS WORKSHOP

1. Identification, Study & testing of various electronic components;
   a. Resistances-Various types Color coding
   b. Capacitors-Various types, Coding
   c. Conductors
   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 & fabricate a PCB for a Regulated 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 B
   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 Tape Recorder kit.
9. Coil winding and testing.

5AI 1 FIELD THEORY

UNIT 1 : ELECTROSTATICS - Introduction to Vector Analysis. Gradient. Divergence and Curl, Divergence & Stoke theorems. Electric field intensity & flux density. Electric field due to various charge configurations, Gauss's law. Poisson's and Laplace's equation and their solution. Uniqueness theorem
UNIT 2 : MAGNETOSTATICS - Magnetic flux, Magnetic field intensity, flux density & magnetization, Current element, Faraday's Law of Induction. Bio-Savart's law, Ampere's circuit law, differential form, application of EM waves, continuity equation.
UNIT 3 : TIME VARYING FIELDS - Maxwell's equations. Uniform plane wave in free space, dielectrics and conductors, skin effect, Pointing vector, General solution of uniform plane wave equation.
UNIT 4 : TRANSMISSION LINES - Types of transmission lines, general transmission line equation, line constant, equivalent circuits, infinite line, and reflection on a line, Input impedance, SWR of line with different type of terminations. Distortion less and dissipation less lines, Transmission lines at audio and radio frequencies, Losses in transmission line, characteristics of quarter wave, half wave and other lengths.
UNIT 5 : TRANSMISSION LINE APPLICATIONS - Smith chart and its application., Impedance matching network. Single & double Stub matching. Measurement of parameters of transmission line, measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio.

5AI2 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.

5AI3 CONTROL SYSTEMS

UNIT 1 : INTRODUCTION - Types of Control systems, The basic elements of a Closed Loop and Open Loop Control Systems, Basic idea of servomechanism, Multivariable Control System, Sampled data Control System.

Mathematical Modeling of System : Mathematical representation of Physical system, Electrical-Mechanical systems, Transfer function of linear systems, Evaluation of Transfer Function by using Block Diagram reduction Techniques and Signal flow graphs, Conversion of block diagram to signal flow Graph and vice versa.

UNIT 2 : CONTROL SYSTEM COMPONENTS - Potentiometer, Synchros, L.V.D.T., A.C. Servomotors, D.C. & A.C. Tacho-generator, Mathematical modeling of D.C. Motors, Example of closed loop Systems using D.C. & A.C. servomotors, Synchros, Tacho-generators, etc.

UNIT 3 : **TIME RESPONSE OF FEEDBACK CONTROL SYSTEM -** Time response, Typical standard test signal for the time response analysis, Transient and steady state response of 1st and 2nd order systems for various standard test signals, Performance Specification of 2nd Order System, Steady state error, Effects of derivative and integral controls on the transient performance, P.I., P.D. Controllers, Stability of linear control system, The Routh-Hurwitz criterion.

UNIT 4 : THE FREQUENCY RESPONSE METHOD - Frequency response of feedback control system, Frequency domain specifications, MP and WP for a second order system., Bode's Plot, Magnitude versus phase plot

The Nyquist Criterion and Stability **:** Introduction, The Principle of argument, the Nyquist Path, Nyquist criterion and the G(s)H(s) Plot, Effects of additional poles and zeros of G(s)H(s) on Nyquist plot, Relative stability, gain margin, conditionally stable systems.

UNIT 5: THE ROOT LOCUS TECHNIQUE- Introduction, Root Locii, construction of the Root Locus plot. Introduction to compensating networks: Lag, Lead and Lag-Lead networks. Elementary concept of design using compensators.

5AI4 ANALOG COMMUNICATION

UNIT 1: **NOISE EFFECTS IN COMMUNICATION SYSTEMS:** Resistor noise, Networks with reactive elements, Noise temperature, Noise bandwidth, effective input noise temperature, Noise figure. Noise figure & equivalent noise temperature in cascaded circuits.

UNIT 2 : **AMPLITUDE MODULATION** : Frequency translation, Recovery of base band signal, Spectrum & power relations in AM systems. Methods of generation & demodulation of AM-DSB, AM-DSB/SC and AM-SSB signals. Modulation & detector circuits for AM systems. AM transmitters & receivers.

UNIT 3: **FREQUENCY MODULATION** : Phase & freq. modulation & their relationship, Spectrum & band width of a sinusoidally modulated FM signal, phasor diagram, Narrow band & wide band FM. Generation & demodulation of FM signals. FM transmitters & receivers.. Comparison of AM, FM & PM. Pre emphasis & deemphasis. Threshold in FM, PLL demodulator.

UNIT 4: NOISE IN AM AND FM: Calculation of signal-to-noise ratio in SSB-SC, DSB-SC, DSB with carrier, Noise calculation of square law demodulator & envelope detector. Calculation of S/N ratio in FM demodulators, Super heterodyne receivers.

UNIT 5: **PULSE ANALOG MODULATION :** Practical aspects of sampling: Natural and flat top sampling. PAM, PWM, PPM modulation and demodulation methods, PAM-TDM.

5AI 5 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, EEG. 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: Spectrophotometry, chromatography, Hematology, Measurement of pH value, concentration in blood.
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 effect 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, Hemodialysis, Applications of Laser.

5AI 6.1 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.

5AI6.2 ANALYTICAL & ENVIRONMENTAL INSTRUMENTATION

UNIT 1 : SPECTROSCOPIC ANALYSIS- Absorption and reflection techniques, Atomic techniques- emission, absorption and flourescence, 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, sulphur 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. Applications in industries.

5AI6.3 INFORMATION THEORY & CODING

UNIT 1 : ELEMENTS OF INFORMATION THEORY - Measure of Information. Average Information. Entropy, Information Rate. Communication Channel. Discrete and Continuous channel, Shannon – Hartley Theorem and its Implications, Channel capacity, Gaussian channel, Bandwidth – S/N tradeoff.

UNIT 2 : INTRODUCTION OF CODING - Type of Errors. Types of codes, Error control coding. Methods of controlling errors.

UNIT 3 : LINEAR BLOCK AND BINARY CYCLIC CODES - Matrix decryption of linear block codes, Error detection and error correction capabilities of linear block codes. Hamming codes.

UNIT 4 : Structure of cyclic codes, encoding using an (n-k) bit shift register, syndrome calculation, its error detection & correction, Special classes of cyclic codes: BCH.

UNIT 5: BURST AND CONVOLUTIONAL CODES- Burst and random error correcting codes, Encoders for convolutional codes, Decoders for convolutional codes, performance of convolutional codes, performance of block codes in error correction & detection. Comparison of error rates in coded and uncoded transmission.

5AI7 INTEGRATED CIRCUITS LAB

1. Study of OP-AMP (741 IC) characteristics/parameters:
   (a) Input Impedance
   (b) Out put impedance
   (c) Offset voltage
   (d) Bias current
   (e) Slew rate
   (f) CMRR
   (g) SVRR
   (h) Gain band with product
   (i) Power consumption
   (j) Transient/frequency response
   (k) Stability
2. To Design, Assemble & Test Inverting & non-inverting Amplifier.
3. To Design, Assemble & Test Differentiator & integrator Circuit.
4. To Design, Assemble & Test summer, difference& Averaging Amplifiers.
5. To Design, Assemble & Test Wein Bridge& phase shift Oscillators.
6. To Design, Assemble & Test following Active filters
   (a) High pass (b) Low pass (c) Notch filter
7. To Design, Assemble & Test wave form generators
   (a) Square wave (b) saw tooth
8. To Design, Assemble & Test Timer circuit using 555 IC.
9. To Study & Measurement of Liner PLL parameters.
10. To Study & Measurement of parameters for digital PLL
11. To Design of FM demodulator using PLL (565).
12. Designing of RPS using OP-AMP &testing of
    (a) Load regulation (b) Line regulation

5AI8 COMMUNICATION SYSTEMS LAB

1. Harmonic analysis of a square wave of a modulated wave form.
2. Observe the Amplitude modulated wave form & measure modulation index and observe demodulation of AM signal.
3. Generation of DSB – SC signal and demodulation of the signal.
4. To modulate a sinusoidal signal with high frequency carrier to obtain FM signal and demodulate the FM signal.
5. To observe the following in a transmission line demonstrator kit :
   (a) The propagation of pulse in non reflecting transmission line.
   (b) The effect of losses in transmission line.
   (c) Transmission with standing waves on a Transmission line.
   (d) The resonance characteristics of a half-wave length long X-mission line.
6. (a) To observe the operation of sampling and sample & hold circuits.
   (b) To study the effect of sampling time (sampling pulse width).
   (c) To study the effects of changing the sampling frequency.
7. To study & observe the operation of a super heterodyne receiver.
8. To study & observe the amplitude response of automatic gain controller (AGC action).
   (a) Modulate a pulse carrier with sinusoidal signal to obtain PAM, PWM & PPM signal & demodulate it.
   (b) To design assemble & test an Envelope Demodulator.

5AI9 ELECTRONIC INSTRUMENTATION LAB

1. Study of instrumentation symbols as per Beauro of Indian standards.
2. Study of various recorders:
   (a) Strip-chart Recorder (b) X-Y Recorder
3. To design, Assemble& test Instrumentation Amplifier.
4. To design, Assemble & Test Logarithmic Amplifier.
5. To design, Assemble & test seven segment display unit.
6. To design, Assemble & Test sample & Hold circuit.
7. To design, Assemble & test charge amplifier & Signal conditioning circuit for piezoelectric transducers.
8. To study and test the performance of different choppers.
9. To design, Assemble & Test chopper Stabilized Amplifier
10. To Measure Period Frequency & time interval using Universal digital Counter.
11. To study and test the characteristics of a phase sensitive detector.
12. To study and test voltage to frequency and frequency to voltage converters.

5AI10 HUMANITIES

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 : MACRO ECONOMICS –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.

6AI 1 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.

6AI2 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 non-periodic signals, Properties of CTFT. Discrete time Fourier transform for periodic and non-periodic 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, 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.

6AI 3 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.

6AI4 DIGITAL COMMUNICATION

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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.

6AI 5 MICROCONTROLLER & EMBEDDED 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.

6AI6.1 IC TECHNOLOGY

UNIT 1. INTRODUCTION TO TECHNOLOGIES: Semiconductor Substrate-Crystal defects, Electronic Grade Silicon, Czochralski Growth, Float Zone Growth, Characterization & evaluation of Crystals; Wafer Preparation – Silicon Shaping, Etching and Polishing, Chemical Cleaning.
UNIT 2. DIFFUSION & ION IMPLANTATION: Ficks diffusion equation in One Dimension, Atomic Model, Analytic Solution of Ficks Law, correction to simple theory, Diffusion in SiO_2 Ion Implantation and Ion Implantation System oxidation. Growth mechanism and Deal-Grove model of Oxidation, Linear and parabolic Rate Co-efficient, the structure of SiO_2, Oxidation techniques and system, Oxide properties.
UNIT 3. CHEMICAL VAPOUR DEPOSITION AND LAYER GROWTH: CVD for deposition of dielectric and polysilicon – a simple CVD system, Chemical equilibrium, and the law of mass action, Introduction to atmospheric CVD of dielectric, low pressure CVD of dielectric and semiconductor. Epitaxy-Vapour Phase Epitaxy, Defects in Epitaxial growth, Metal Organic Chemical Vapour and a Deposition, Molecular beam epitaxy.
UNIT 4. PATTERN TRANSFER: Introduction to Photo/Optical lithography, Contact/Proximity Printers, Projection Printers, Mask generation, Photoresists. Wet etching, Plasma etching, Reaction ion etching.
UNIT 5. VLSI PROCESS INTEGRATION: Junction and Oxide isolation, LOCOS methods, Trench Isolation, SOI; Metallization, Planarization. Fundamental consideration for IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology.

6AI 6.2 WIRELESS COMMUNICATION

UNIT 1. INTRODUCTION: Cellular revolution, Global Cellular Network, Broad band and troubles with wireless. Cellular Wireless Networks: Principles of Cellular Networks, First generation analog, Second generation TDMA, CDMA & FDMA and Third generation systems.
UNIT 2. CORDLESS SYSTEMS AND WIRELESS LOCAL LOOPS: Cordless systems, Digital Enhanced Cordless Telecommunications, Wireless local loop and IEEE 802.16 Fixed Broadband Wireless Access standard.
Mobile Communication- Essential aspects of working, of radio paging, cellular radio telephone and cordless telephone.
UNIT 3. WIRELESS LAN: Infrared v/s radio transmission, Infrastructure and adhoc networks. IEEE 802.11-System architecture, Protocol architecture, Physical layer, Medium access control layer and MAC management HIPER LAN-protocol architecture, physical layer, channel access control sub layer information base and networking Bluetooth-User scenarios, Physical layer, MAC Layer. Networking Security and Link Management.
UNIT 4. MOBILE IP AND WIRELESS ACCESS PROTOCOL: Mobile IP, Wireless Application Protocol, Internet Control Message Protocol and Message Authentication. Broadcast Systems: Overview, Cyclic repetition of data, Digital audio broadcasting-mobile object transfer protocol. Digital video broadcasting.
UNIT 5. SATELLITE SYSTEMS: Application Basics-GEO, LEO and MEO Introduction to Mobile Satcom. Routing, Localization and Handover.

6AI 6.3 FIBER OPTICS 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.

6AI7 CONTROL SYSTEMS LAB

1. To design and testing of first order RC network with the following inputs:
   (a) Step (b) Ramp (c) Impulse
2. To design and testing of second order RLC network and study the transient response step input with following conditions:
   (a) Under damped (b) Critically damped (c) Over damped
3. To plot the frequency response curve and calculate cut off frequency for the following networks:
   (a) Lag network (b) Lead network (c) Lag-Lead network
4. To design an ON-OFF controller using relays and OP-Amp.
5. To design and performance evaluation of a suitable compensating network for a given system.
6. To study the characteristics of synchro transmitter- Receiver and draw Error v/s angle characteristics.
7. To study the operation and characteristics of Stepper motor.
8. To design P, PI, PD & PID controllers using process simulator.
9. To test & determine time domain specifications of a control system.
10. To test & determine frequency domain specifications of a control system.
11. To study the performance of potentiometer error detector in position control system.
12. To study the characteristics of control valves and actuators.

6AI8 DIGITAL COMMUNICATION LAB

1. (a) To identify & solve the aliasing problem.
   (b) To observe the transmission of two signals over a single channel using sampling methods.
2. To observe the operation of a PCM encoder & decoder. To consider reason for using digital signal x-
3. missions of analog signals.
4. To investigate the characteristics of quantization noise & the effect of injected noise on the performance of a PCM system.
5. To observe the performance of a delta modulation system & to derive from it a delta sigma modulation system.
6. To generate ASK signals, with and without carrier suppression. Examine the different processes required for demodulation in the two cases.
7. To generate the FSK wave forms & demodulate the FSK signals based on the properties of
   (a) A tuned circuits (b) on a PLL
8. To generate the PSK signals and demodulate it.
9. Study of data formatting techniques.
10. Study of data reformatting techniques.
11. To calculate the noise-figure & S/N ratio of an analog communication system using ACL-05(Falcon).

6AI9 INDUSTRIAL ELECTRONICS LAB

1. To plot static V/I characteristics of SCR and determine
   (a) Latching & Holding current (b) Breakdown voltage
2. To determine the firing angle by observing the waveform for the following triggering ckts of SCR,
   (a) R-triggering ckt
   (b) RC- triggering ckt
   (c) UJT-triggering ckt
   Also find limitation of firing angle.
3. To plot the V-I characteristics of DIAC and determine break-over voltage.
4. To obtain the waveforms for single phase half wave controlled converter and determine its firing angle, V_o (dc) & compare it with theoretical value.
5. To obtain the waveforms for single phase half wave controlled symmetrical & asymmetrical bridge converter and determine its firing angle, V_o (dc) & compare it with theoretical value.
6. To obtain the waveforms for single phase fully controlled bridge converter and determine its firing angle, V_o (dc) & compare it with theoretical value.
7. To obtain the waveforms for voltage commutated chopper and determine its firing angle, V_o (dc) & compare it with theoretical value.
8. Study and obtain the waveforms for current-commutated chopper and determine its firing angle, and make a comparison between practical & theoretical values.
9. To study the operation and characteristics of single phase PWM inverter.
10. To determine Line regulation and Load regulation of buck, boost & buck-boost regulators.
11. To measure the speed of motor in open loop control for different firing angles and also determine regulation.
12. To measure the speed of motor in closed loop control for different firing angles and also determine regulation.

6AI10 MICRO-CONTROLLER LAB

1. Study Analog & Digital conversion using 8051.
2. To perform addition of two 8-bit numbers using 8051.
3. To perform subtraction of two 16-bit numbers using 8051.
4. To generate fibonacci series using 8051.
5. To perform multiplication of two 8-bit numbers using 8051.
6. To perform Division of two 16-bit number using 8051.
7. To study Traffic light control system using micro controller 8051.
8. To study the stepper motor control system using micro controller 8051.
9. To study the temperature control system (Pt-100) using micro-controller 8051.
10. To study Relay light control system using micro controller 8051.
11. Interface 8253 peripheral devices with micro-controller 8051 & generate the square wave with duty cycle (1) 40%(2) 75%using 8253
12. Interface 8255 peripheral devices with micro-controller. 8051 & multiply two 8-bit number & display the product on port A, carry (if generated) on port B of 8255.

7AI 1NEURAL 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

7AI 2 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.

7AI 3 INDUSTRIAL AUTOMATION

UNIT 1 : DATA ACQUISITION SYSTEM - Block diagram of analog and digital data acquisition system, Single and multi-channel data acquisition system, computer based data acquisition system.
UNIT 2 : TELEMETRY AND DATA TRANSMISSION - Methods of data transmission-Hydraulic, Pneumatic, Electrical & Electronic transmission, general telemetry system, types of telemetry system – landline telemetry (Voltage, current, position telemetry system), RF telemetry, Modulation methods (AM, FM,PAM,PCM telemetry), Multiplexing in telemetry system.
UNIT 3 : DATA LOGGERS - Programmable Data logger configuration, operation of data loggers, application of data logging system.
UNIT 4 : DISCRETE CONTROL USING PLC - Introduction to microcomputer, programmable controller (PLC)-Evolution, Architecture, Basic structures, programming, ladder diagram, symbol, circuit, PLC communication and networking, PLC selection, Installation and advantages of PLC. Brief introduction of SCADA .
UNIT 5 : DCS-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.

7AI 4 TELECOM SYSTEMS

UNIT 1 : DIGITAL TELEPHONY - Concepts of Circuit and Packet switching, Space Division, Time division switching, Combination switching: TS, ST, STS, and TST switch blocks, Principle of SPC digital telephone exchanges. T1 Carrier System.
unit 2 : TELEPHONE SYSTEM- The Telephone Set, Pulse & Tone Dialing, Hierarchy of switching office, Common control, Two wire and four wire connections, echo suppressor, Numbering plan, EPABX, FAX, Traffic Engineering: Unit of traffic, Congestion, Grade of Service.
UNIT 3 : INTEGRATED DIGITAL NETWORKS - Basic aspects of multiplexing, ISDN architecture, interfaces, devices, protocol layers and BISDN, Frame relay, ATM and SONET.
UNIT 4 : SATELLITE COMMUNICATIONS - Frequency bands, Types of orbits, Brief description of satellite subsystems & earth station, Satellite Link design with respect to received power & C/N ratio. Elements of Multiple access techniques.
UNIT 5 : CELLULAR COMMUNICATION- Principle & operation of cellular networks, Handoff, power control, Overview of GSM & Second generation CDMA system.

7AI 5 MODERN CONTROL SYSTEM

UNIT 1 : STATE SPACE APPROACH OF CONTROL SYSTEM AANALYSIS - Modern v/s 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.

UNIT 2 : 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.

7AI 6.1 ANTENNA & WAVE PROPAGATION

UNIT 1 : ANTENNA FUNDAMENTALS - Antenna parameters, Radiation from a current element in free space. Quarter & half wave antenna. Reciprocity theorem. Resonant and non-resonant antenna. Effective length and aperature, gain, beamwidth, directivity, radiation resistance, efficiency, polarization, impedance and directional characteristics of antenna, antenna temperature.

.**UNIT 3 : ANTENNAS -** V and Rhombic antennas, Folded dipole, Yagi-Uda antenna, Frequency independent antennas, Log-periodic antennas,UHF and Microwave antennas- Antenna with parabolic reflectors, Horn and Lens antennas, Helical antennas, Square and Circular loop antennas, Fundamentals of Slot and Microstrip antennas.

UNIT 2 : ANTENNA ARRAYS - Two element array, N-element linear arrays, Broadside, End fire, collinear and combination arrays, Multiplication of patterns, Binomial arrays. Effect of ground on antennas, Antenna loading

Antenna Measurements - Antenna impedance, radiation pattern, gain, directivity, polarization and phase measurements

UNIT 4 : RADIO WAVE PROPAGATION - Mechanism of radio wave propagation, Reflection, Refraction interference and diffraction of radio waves. Theory of ground wave, space wave and sky wave propagation. Plane earth reflection, Reflection factors for horizontal and vertical polarizations. Duct propagation and tropospheric scattering.

UNIT 5 : Various Ionospheric layers. Characteristics of ionosphere and its effects on wave propagation. Critical frequency, Virtual height, skipzone & maximum usable frequency. Multiple hop transmission. Oblique & vertical incidence transmission. Effect of earth's magnetic field, solar activity and meteorological conditions on wave propagation.

7AI 6.2 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.

7AI 6.3 ROBOTICS

UNIT 1: INTRODUCTION - Introduction, Brief history, Types of Robots, Technology of Robots, Basic Principle in Robotics, Notation, Symbolic Computation and numerical Analysis.

MMATICAL REPRESENTATION OF ROBOTS: Introduction, Position and Orientation of a riid Body, Transformation B/w Coordinates ,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 Langrangian Formulation, Dynamic Equation of Motion ,Recursive Formulation of dynamics if Manipulators.

UNIT 3: TRAJECTORY PLANNING AND GENERATION-Introduction ,Joint Space Schemes, Joint Space Schemes with via Points, Cartesian Space Schemes, Some Additional issues in Trajectory Planning.

UNIT 4: POSITION AND FORCE CONTROL OF MANIPULATERS-Introduction, Feedback Control of a Single –link Manipulator, PID control of a Multi –link Manipulator, Nonlinear Control of Manipulators, Simulation and Experimental Results ,Nonlinear control of constrained and parallel Manipulators, Cartesian control of Manipulators, Force Control of Manipulators, Hybrid Position/Force Controller, Stability Analysis of nonlinear control Schemes, Advanced Topics in Non-linear control of Manipulators.

UNIT 5: MODELING AND CONTROL OF FLEXIBLE MANIPULATORS-Introduction, Modeling of a Flexible joint, Euler-Bernoulli Beam Model, Kinematic Modeling of multi–link Flexible Manipulators, Discretization methods, Equation of Motion of Multi-link Flexible Manipulators control of Flexible Link manipulators ,Other Topics in Flexible Manipulators.

7AI 7 TELEMATICS LAB

1. To measure selectivity & sensitivity of Radio receiver.
2. To measure Signal to Noise ratio of Radio receiver.
3. To study Satellite communication for audio/tone transmission.
4. To study the theory of CDMA-Direct sequence spread spectrum modulation & demodulation.
5. To study the establishment of link between satellite & GPS trainer & measure the latitude & longitude of satellite.
6. To study the working of various sections in a (GSM handset) mobile phone.
7. To study Delta modulation-demodulation and slope overload.
8. To study the working of Basic rate access ISDN system.
9. To study the units of EPABX system and to analyze & measure:
   (a) Ring detection phenomena
   (b) Trunk relay switching
   (c) OFF hook detection
   (d) Frequency of dial tone, busy tone, ring-back tone and DTMF signals.
10. To observe the following on EPABX system:
   (a) Call transfer
   (b) Do not disturb
   (c) Hot Line
   (d) Conference.
11. To setup an optical link between two subscriber.
12. Real time study of GSM for call control command & call setting command.

7AI8 DIGITAL SIGNAL PROCESSING LAB

Modeling and simulation using MAT LAB

1. Realising a given block diagram having multiplier, adder/subtractor and system (Discrete/Continuous) with given Impulse response. Calculating output for given input.
2. To simulate the transmitter and receiver for BPSK
3. To design and simulate FIR digital filter (LP/HP).
4. To design and simulate IIR digital filter (LP/HP).

DSP Lab using TMS320C6XXX DSP Kits

5. To study the architecture of TMS320C6XXX DSP kits using Bloom with DSP.
6. To generate wave form (SINE, COSINE, SQUARE & TRIANGULAR).
7. Verification of Sampling Theorem.
8. Verification of linear/circular convolution.
9. To design FIR and FIR digital filter (LP/HP).

8AI 1 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

8AI 2 VLSI DESIGN

UNIT 1 : FABRICATION PRINCIPLES - Brief introduction to Lithography, Diffusion, Ion implantation, Electron Beam Technology, nMOS and CMOS fabrication process.

UNIT 2 : INTRODUCTION TO MOS TECHNOLOGY - Basic MOS transistors, Enhancement Mode transistor action, Depletion Mode transistor action, I_{ds} versus V_{ds} relationship for MOS, Aspects of threshold voltage, MOSFET scaling and small geometry effects, MOSFET capacitances, Transistor Transconductance g_m, MOS transistor circuit Model.

UNIT 3 : ANALOG DESIGN - The nMOS inverter, Pull up to Pull-down ratio for a nMOS Inverter and CMOS Inverter (β_n/β_p), Noise Margin, Power dissipation, MOS Inverting amplifier, CMOS Differential amplifier, Operational amplifier: Characterization and CMOS Two Stage amplifier.

UNIT 4 : DIGITAL DESIGN - The inverter, Combinational Logic, NAND Gate, NOR gate, Compound Gates, 2 input CMOS Multiplexer, Memory latches and registers, Transmission Gate.

UNIT 5 : BASIC LAYOUT ISSUES - Layout issues for inverter, NAND, NOR Gates and Transmission Gate, Complex Logic gates Layout, Layout optimization for performance. Introduction to VHDL, VHDL codes for combinational circuits, flip-flops and registers.

8AI 3 DATA COMMUNICATION & NETWORKS

UNIT 1 : INTRODUCTION TO NETWORKS - Introduction to LAN , MAN ,WAN, Various topologies, Protocol architecture: OSI, TCP/IP(ARP, RARP, TCP, UDP, FTP, TELNET). Concepts of ATM.
UNIT 2 : PHYSICAL LAYER - Guided media (twisted pair, UTP Cables, coaxial, optical fiber cables), Un-guided media (wireless, microwave, satellite). NRZ, Bipolar AMI, Manchester and Differential Manchester encoding techniques, Scrambling techniques.
UNIT 3 : DATA LINK LAYER - Framing, Simplex protocol, Simplex stop & wait protocol, Sliding window protocol, One bit sliding window, go back to n protocol, selective repeat, HDLC, Data link layer in internet.
UNIT 4 : MEDIUM ACCESS SUB-LAYER - Static & dynamic channel allocation, ALOHA, slotted ALOHA, persistent and non-persistent CSMA, CSMA/CD, IEEE standards 802.2 to 802.6 High speed LAN-FDDI, fast Ethernet, Brief introduction to Hubs, Bridges, Routers.
UNIT 5 : NETWORKS LAYER- Organization & service provider routing, adaptive & Non-adaptive routing algorithms, Congestion controls algorithms, Network layer in the Internet. Network layer in the Internet: IPv4 & IPv6 Protocols.

8AI 4. 1 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

8AI4.2 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.

8AI4.3 INSTRUMENTATION SYSTEM RELIABILITY

UNIT 1 : SYSTEM RELIABILITY - Introduction, Series configuration, Parallel configuration, Mixed configuration, Methods of solving complex systems.
UNIT 2 : RELIABILITY IMPROVEMENT - Introduction, Improvement of components, Redundancy, Element redundancy, Unit redundancy, Standby redundancy.
UNIT 3 : FAILURE DATA ANALYSIS - Introduction, Failure data, Mean failure rate, Mean time to failure (MTTF), Mean time between failures (MTBF), Graphical plots, MTTF in terms of failure density, Generalization, Reliability in terms of hazard rate & failure density, MTTF in Integral form, Reliability in other situations.
UNIT 4 : FAULT TREE ANALYSIS- Introduction, Fault tree construction, Calculation of reliability from fault tree.
UNIT 5 : TIE SET & CUT SET: Introduction and methods. Maintainability & availability: Introduction, Maintainability, Availability, System down time.

8AI5 DATA COMMUNICATION & NETWORKS LAB

Unix Environment

1. Study of perfect transmission on a point-to-point link on LAN trainer.
2. To study data transfer between nodes over a network using the stop and wait protocol.
3. To study data transfer between nodes over a network using the sliding window protocol.

4,5,6 To study the packet communication between number of nodes connected to a communication bus using (i) ALOHA protocol (ii) CSMA protocol (iii) CSMA/CD

7. To study the token passing access method for BUS LAN.
8. To study the token passing access method for RING LAN

SIMULATION OF NETWORK PROTOCOLS

9. PRELIMINARIES: Study and use of common TCP/IP protocols and term viz. telnet rlogin ftp, ping, finger, Socket, Port etc.
10. a. Simulation of pure and slotted ALOHA.
    b. Simulation of link state routing algorithm.

DEVELOPMENT OF CLIENT SERVER APPLICATION:

11. Develop 'telnet' client and server which uses port other than 23.
12. Write a finger application which prints all available information for five users currently logged on and are using the network for longest duration. Print the information in ascending order of time.

8AI6 COMPUTER CONTROL LAB

1. To plot and analyze step/impulse response of a first order system in
   (i) Non interacting mode (ii) Interacting mode.
2. To design and study the effect of PI and PID control actions on a temperature control system. Also tune the controller with closed loop method.
3. 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.
4. To design PI controller for flow control system using open/closed loop tuning techniques and to optimize system performance.
5. To configure and study the following advanced control system for a multi parameter process:
   (a) Cascade control
   (b) Feedforward control
   (c) Ratio control
6. Study of ladder logic for real time water filling system using PLC trainer.
7. To develop and test ladder logic in simulation mode and study the use of timers and counters in ladder diagram.
8. To study the spectrophotometer and estimate the
   (i) Percent transmittance.
   (ii) Absorbance
   (iii) Concentration of a given solution with single wavelength mode.
9. To study the flame photometer and estimate the concentration of Na and K in a given solution with (i) High concentration mode (ii) Low concentration mode.
10. To observe the ECG waveforms of a human body using standard bipolar leads and
    (a) Study P-Q-R-S-T waves for different configurations.
    (b) Analyze the abnormalities present in heart by monitoring the heart rate.
11. To design P & PI controller for a pressure control system with SCADA software and compare the performance.
12. To study the characteristics of air purge system and measure the level and liquid density.

8AI7 SIMULATION & DESIGN LAB

Make schematic design and PCB layout of following circuits.

1. FET Amplifier in common drain mode.
2. Mod-13 asynchronous counter.
3. 3-bit DAC with Op-amp.
4. Active filter using Op-amp (i) Band Pass (ii) Band Reject (iii) High Pass (iv) Low Pass
5. Oscillator (i) Colpitts (ii) R-C Phase Shift

Design the following circuit using appropriate software like VHDL/FPGA.

6. 3-input NAND gate.
7. Half adder.
8. D-Latch.
9. Serial in, serial out shift register.
10,11**.** Measurement of Propagation loss and numerical aperture.
12. Characterization of laser diode and light emitting diode.

8AI8 INDUSTRIAL ECONOMICS AND MANAGEMENT

UNIT 1 : Organizational forms, Profit maximization and other objectives of industrial firms, Theory of profitability, Economies of scale.
Financing of Industries- Need and sources of finance, Role of special financial institutions, Investment criteria-NPV, IRR.
UNIT 2 : Approaches to industrial location analysis, Productivity analysis, Input-Output analysis, Concentration of economic power.
New Industrial Policy – Critical analysis, Role of technology and entrepreneurship in industrial development.
UNIT 3 : Management – Principles of management, functions-planning, Organization staffing, Directing, Controlling, Coordination, Decision making.
UNIT 4 : Production Management – Total quality management, JIT, Quality circle, Quality-ISO9000, ISO14000, KANBAN, Bench marking, Effective communication.
UNIT 5 : Labour Legislations.