Punjab Technical University, Jalandhar


Study scheme

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4th Semester

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** There should be industrial/institutional training of 6 weeks duration in the summer vacation after 4th semester
### 5th Semester

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* Department Elective-I:
  1. DE-1.1: Cellular & Mobile Communication
  2. DE-1.2: Microelectronics
  3. DE-1.3: Human Resource Management
  4. DE-1.4: Virtual Instrumentation
  5. DE-1.5: Neural Network & Fuzzy Logic

### 7th/8th Semester*

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** Department Elective-II:  
1. DE-2.1: Industrial Electronics  
2. DE-2.2: Wireless Communication Systems & Network  
3. DE-2.3: Bio-Medical Electronics  
4. DE-2.4: Mechatronics  
5. DE-2.5: Engineering Economics  

*** Department Elective-III:  
1. DE-3.1: Operating System  
2. DE-3.2: Image Processing  
3. DE-3.3: Satellite Communications  
4. DE-3.4: Reliability Engg.  
5. DE-3.5: TV Engg.
Detail Contents

1. **Fourier Series** Periodic functions, Euler's formula. Even and odd functions, half range expansions, Fourier series of different wave forms.

2. **Laplace Transforms** Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

3. **Special Functions** Power series solution of differential equations, Frobenius method, Legendre's equation, Legendre polynomial, Bessel's equation, Bessel functions of the first and second kind. Recurrence relations, equations reducible to Bessel's equation, Error function and its properties.


5. **Functions of Complex Variable** Limits, continuity, derivative of complex functions, analytic function, Cauchy-Riemann equation, conjugate functions, harmonic functions; Conformal Mapping: Mapping of a complex function, conformal mapping, standard transforms, mapping of standard elementary transformations, complex potential, applications to fluid flow problems; Complex Integration: Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions, singular points, poles, residue, complex integration using the method of residues, evaluation of real integrals by contour integration.

**Books**

- Advanced Engineering Mathematics by Kreyszing Erwin ; Wiley Eastern, New Delhi
- Numerical Solutions of Differential Equations by NK Jain ; Prentice Hall, Delhi.
- Differential Equations by Sharma and Gupta ; Krishna Prakashan Media (P) Ltd., Meerut.
EE-201 NETWORK ANALYSIS AND SYNTHESIS

Internal Marks: 40                      L T P
External Marks: 60                      3 2 0
Total Marks: 100

Circuits Concepts: Circuits elements,

Independent and dependent sources, signals and wave forms; periodic and singularity voltages, step, ramp, impulse, Doublet. Loop currents and loop equations, node voltage and node equations, Network Theorems, Superposition, Thevenin's Norton's Maximum Power Transfer, Reciprocity.

Time and Frequency Domain Analysis:

Representation of basic circuits in terms of generalised freq. & their response, Laplace transform of shifted functions, transient & steady response. Time domain behaviors from poles and zeros. Convolution Theorem.

Network Synthesis:


Filters Synthesis:

Classification of filters, characteristics impedance and propagation constant of pure reactive network, Ladder network, T section, IT section, terminating half section. Pass bands and stop bands. Design of constant-K, m-derived filters. Composite filters.

Books:

1. Network Analysis & Synthesis by Van Valkenberg
2. Network Analysis and Synthesis by Sudhakar Sham Mohan
3. Network Synthesis by IVS Iyer
4. Electric Circuits by JA Administer
5. Circuit Theory by Chakraborty
EC- 201     ELECTRONIC DEVICES AND CIRCUITS

Internal Marks:  40     L  T  P
External Marks:  60     3  1  0
Total Marks:    100

1.  Diode Circuits

pn junction diode, concept of band structure, potential barrier, diode as a circuit element, half wave, full wave and bridge rectifier and determination of rms, average value, ripple factor and regulation, capacitor input, inductor input, RC and RL filter circuits, special purpose diode; LED, LCD and Photo- diodes.

2.  Bipolar junction Transistors

pnp & npn, transistor construction and characteristics in CB, CE and CC modes. Determination of h parameters from transistor characteristics. h parameter equivalent circuit of transistor. Conversion of h parameter from CB to CE and CC configuration. Graphical analysis of transistors as an amplifier, special purpose transistors, UJT (construction and characteristics only), photo- transistors.

3.  Field Effect Transistors

Construction and characteristics of junction field effect transistor (JFET), MOSFET (both depletion and enhancement type), CMOSFET’s, parameters and equivalent circuit of an FET, biasing of FETs, FET as an amplifier in CS configuration.

4.  Transistor Biasing and Stabilization

Operating point, bias stability, various biasing circuits, stabilization against I_o, V_{BE} and beta. Bias compensation methods and thermal runaway.

5.  Small Signal Low Frequency Transistor

Analysis of transistor amplifier using h-parameters in CB, CE and CC configuration. Comparison of three configurations in term A_1, A_{21}, R_1, R_0. Frequency response of amplifier. Effect of an emitter bypass capacitor, coupling capacitor, emitter resistance and shunt capacitors on frequency response of amplifier. Analysis of emitter follower using Miller’s theorem.
EC-203 ELECTRONICS MEASUREMENTS AND INSTRUMENTATION

Internal Marks: 40  L  T  P
External Marks: 60  3 1 0
Total Marks: 100

1. ELECTRONIC INSTRUMENTS

Electronics voltmeter, VTVM Transistor voltmeter, Electronic Multimeter, CRO’s study of various stages in brief, measurement of voltage, current phase and frequency, special purpose oscilloscope, measurement of resistance, inductance, capacitance, using Kelvin’s Maxwell’s and Schering bridge. Effective resistance at high frequency, R meter, LCR meter.

2. INSTRUMENTATION FOR GENERATION AND ANALYSIS OF WAVEFORMS

Signal generators, function generator, wave analyzer, harmonic distortion analyzer, spectrum analyzer, spectrum analysis.

3. INSTRUMENT TRANSFORMER

Current and potential transformers, constructional features, ratio and phase angle error.

4. TRANSDUCERS

Principles of operation, qualitative treatment of strain gauge, LVDT, thermocouple, piezoelectric crystal and photoelectric transducers.

5. DATA ACQUISITION SYSTEM

Necessity of recorders, recording requirements, graphic recorders, strip chart recorders, magnetic tape recorders, digital tape recorders.

6. DISPLAY DEVICES

Electronic indicating instruments, seven segment display, fourteen segmental display Nixie tube.

7. TELEMETRY

Introduction, method of data transmission, types of telemetry systems and applications.

BOOKS RECOMMENDED

2. B. Stout - Basic Electrical Measurements
CS -252 OBJECT ORIENTED PROGRAMMING USING C++

Internal Marks: 40
External Marks: 60
Total Marks: 100
L T P
3 1 0

1. Basics of C & C++

Introduction, Basics, Data Type, Bit Field integer, Operations, Control Structures, Storage Classes, User Defined Data Type, Reserved Words and Standard 110 Statements in C & C++.

2. Object Orient Programming With C++

Introduction, Object Oriented Programming Concept, Objective of OPP, Programming Structure in C++, Data Abstraction

3. Overloading and Information Hiding

Introduction, Function Overloading, Information Hiding

4. Memory Management in C++:

Introduction, Constructor-Automatic Initialization of Objects, Dynamic Memory Management, Default Constructor, Copy Constructor, Constructor and Information Hiding, Destructor-Automatic Clear up of an Object

5. Inheritance

Introduction, Inheritance-Data and Code Sharing, Class Derivation, Ambiguity in Class Member Access, Virtual Base Class-A Remedy, Class Initialization in Inheritance, Arguments for the Base Class

6. Bindings and Polymorphism

Introduction, Bindings in C++, Polymorphism

7. Generic Facility

Introduction, Concept of Generic Facility, Generic Function, Overloading a Generic Function, Generic Classes

8. File Handling in C++

Introduction, Concept of Stream in C++, File Positioning Functions, Error Handling During File Operation
1. Study of Half wave, full wave & Bridge rectifiers.
2. Study of simple capacitive, T & $\pi$ filters
4. To plot the input and output characteristics of CE configuration.
5. To plot the input and output characteristics of CB configuration.
6. Determination of h- parameters of a transistors using output characteristics.
7. Design of transistor biasing circuits.
10. To plot JFET characteristics in CS configuration.
LIST OF EXPERIMENTS

1. Measurement of Inductance by Maxwell’s Bridge.
6. Determination of frequency & phase angle using C.R.O.
7. To find the Q of a coil using LCR-Q meter.
8. Study of Resonance.
CS-254 Lab III (Object Oriented Programming)

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<td>Total Marks:</td>
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**List of experiments:**

To write following programs in C / C++:

1. Using basic statements like control statements, looping statements, various I/O statements and various data structures.

2. Creating classes in C++ for understanding of basic OOPS features.

3. Representing concepts of data hiding, function overloading and operator overloading.

4. Using memory management features and various constructors and destructors.

5. Representing Inheritance, virtual classes and polymorphism.

6. Writing generic functions.

7. File handling programs.
EC- 202 ANALOG ELECTRONICS

Internal Marks: 40  
External Marks: 60  
Total Marks: 100

1. HIGH FREQUENCY TRANSISTOR

The high frequency T model, common base short circuit current frequency response, alpha cutoff frequency, common emitter short circuit current frequency response, hybrid pi CE transistor model, hybrid pi conductance in terms of low frequency h parameters, CE short circuit current gain obtained with hybrid pi model, current gain with resistive load.

2. LARGE SINGAL AMPLIFIERS

Class A direct coupled with resistive load, Transformer coupled with resistive load, design theory, power amplifier design, harmonic distortion, power output, variation of output power with load, thermal runaway, output transformer saturation, push-pull amplifiers, operation of class- A push-pull amplifier, class- B push-pull amplifier, crossover distortion, class AB push-pull amplifier, transistor phase inverter, conversion efficiency of class B amplifiers, design of Class- B push-pull amplifier, complementary- symmetry amplifier.

3. MULTISTAGE AMPLIFIERS

Coupling of transistor amplifiers, frequency response of coupled amplifiers, cascading of RC coupled amplifiers and their analysis. Tuned Amplifiers: single tuned, double tuned and stagger tuned amplifiers and their analysis.

4. FEEDBACK IN AMPLIFIERS

Types of feedback, effect of negative feedback on gain, bandwidth, stability, distortion and frequency response etc. Voltage series, current series, voltage shunt, current shunt feedback circuits and their analysis.

5. OSCILLATORS

Conditions of oscillations. Different types of oscillators: RC Phase Shift, Wein Bridge, Hartley, Colpitts and Crystal Oscillators. Derivation of expression for frequency and amplitude of these oscillators.

6. REGULATED POWER SUPPLIES

Zener diode as Voltage Regulator, Transistor Series and Shunt Regulators, Current limiting, Line and Load Regulation.

Books Recommended

1. Electronic Devices & Circuits by Millman- Halkias, Tata Mcgraw Hill
2. Electronic Devices & Circuits Theory by Boylestad, PH
3. Electronic Devices & Circuits by Allen Mottorshead, PHI
EC-204 Digital Electronics

Internal Marks: 40 L T P
External Marks: 60 3 2 0
Total Marks: 100

1. **Number System And Binary Code**: Introduction, Binary, Octal and hexadecimal number system. Signed and unsigned number, Binary operations-addition; Subtraction, Multiplication and division; Subtractions using 1's and 2's compliment; ASCII code; Excess 3 code Gray code.

2. **Minimization of logic function**: OR, AND,NOT,NOR,NAND,EX-OR, Basic theorem of Boolean Algebra, sum of products and product of sums, canonical form, Minimisation using theorems, minimisation using K-map and Q-M method. Incompletely specified functions.

3. **Combinational Logic Circuits**: Introduction, Combinational circuit design, multiplexers, demultiplexer, encoders, decoders, adders, subtracters and code converters, parity checker, BCD display drive, magnitude comparators.

4. **Sequential Circuits**: Introduction, flip flop SR, JK, D, T edge triggered and decked flip-flop, Registers. Type of Registers, circuit diagram, timing wave form and operations counters, counter design with state equation and state diagrams.


6. **Semiconductor Memories**: Introduction, Memory organisation, Classification and characteristics of memories, Sequential memories, ROMs, R/W memories. Content addressable memories. Programmable logic arrays, Charged-Coupled device memory.

7. **Logic Families**: RTL, DCTL, DTL, TTL, ECL and its various types, Comparison of logic families.

**Recommended Books**:

1. Digital principle and applications Malvino (TMH)
2. Modern digital electronics R. P. Jain (PIH)
3. Digital electronics principle Malvino (THM)
4. Modern digital systems design Cheung & ----- (WPC)
5. An Engg. Approach to digital design Eletcher (PIH)
EC-206  Signal and Systems

Internal Marks:  40  L T P
External Marks:  60  3  1  0
Total Marks:    100

System and Signal Analysis: Classification of signals and systems, signal representation using Fourier series, complex exponential Fourier series, Fourier series representation of periodic signals, periodic signal representation using Fourier transform, Fourier transform of periodic power signals, power spectral density, system response impulse, step and time domain response analysis, transfer function and frequency, Domain analysis effect of Transfer function on spectral densities, Stationary of non-Transients.

Random Signal Theory: Introduction to probabilities Definition, probability of Random events, Joint and conditional probability, probability Mass function statistical averages. Probability density functions and statistical averages. Examples of P.D. function, transformation of random variables random processes, stationary, true averages and Fygodic.


Books Recommended

1. Communication Signal and Systems by Simon Haykin
2. Signal and Systems by Oppenheim and Willsky
EC-208 Electromagnetic Field Theory

Internal Marks: 40
External Marks: 60
Total Marks: 100

1. Introduction Review of Electrostatic and Magnetostatics.


Recommended Books

Name of Book, Author, Publisher

1. Electromagnetic Wave : Jordan and Balmain : PHI And Radiation System

2. Electromagnetics : Kraus : T.M.H.

3. Telecommunications : Fraser
IC-204 Linear Control System

Purpose
This course is aimed at to provide a comprehensive treatment of the analysis and design of control systems so as to empower the students with knowledge which is sufficient to help them understand and analyse the practical problems in industry. Instructional

Objectives
At the end of this course, the students should:

1. be familiar with the basic concepts of control systems.
2. Be able to formulate the equations of linear electrical and non-electrical systems and establish analogies between them.
3. Derive characteristics equ. of a given system.
4. Be able to perform time-Domain and frequency domain analysis of systems.
5. Be able to determine stability of any given system.
6. Understand the importance of compensating networks and their design.
7. Be familiar with necessary control components.

Contents

1. Introduction
   Concepts Plant, Systems Servomechanism, regulating systems, disturbances, Open loop control system, closed loop systems, linear and non-linear systems, time variant & invariant, continuous and sampled data control systems, Block diagrams, some illustrative examples.

2. Modelling
   Formulation of equation of Linear electrical, mechanical, thermal Pneumatic and hydraulic system, electrical, Mechanical analogies. Use of Laplace transform, Transfer function, concepts of state variable modelling. Block diagram representation signal flow graphs and associated algebra, characteristics equation.

3. Time Domain Analysis
   Typical test - input signal, Transient response of the first and second order systems. Time domain specifications, Dominant closed loop poles of higher

4. Root Locus Technique: The extreme points of the root loci for positive gain. Asymptotes to the loci, breakaway points, intersection with imaginary axis, location of roots with given gain & sketch of the root locus plot.


Books Recommended

EC-210  LAB-IV ANALOG ELECTRONICS

Internal Marks:  30  L  T  P
External Marks: 20  0  0  2
Total Marks:      50

1. To study the various coupling techniques for transistor amplifiers.
2. To study the characteristics of a Class- A amplifier.
3. To study the characteristics of Class- B amplifier.
4. To study the characteristics of Class-C amplifier.
5. To study the characteristics of Class- AB amplifier.
6. To study the characteristics of Class- B push-pull amplifier.
7. To study the characteristics of complementary symmetry amplifier.
8. To study transistor series voltage regulator with current limit and observe current fold-back characteristics.
9. To study the response of RC phase shift oscillator and determine frequency of oscillation.
10. To study the response of Hartley oscillator and determine frequency of oscillation.
11. To study the response of Colpitt’s oscillator and determine frequency of oscillation.
12. To study the response of Wien Bridge oscillator and determine frequency of oscillation.
EC-212 Lab V  Digital Electronics

Internal Marks:  30  
External Marks:  20  
Total Marks:      50

1.  (a) Verification of the truth tables of TTL gates, e.g., 7400, 7402,7404, 7408, 7432,7486.
    (b) Design, fabrication and testing of low frequency TTL clocks using NAND gates.

2.  (a) Verification of the truth table of the Multiplexer 74150.
    (b) Verification of the truth table of the De-Multiplexer 74154.

3.  Design and verification of the truth tables of half adder and full adder circuits using gates 7483.

4.  Study and verification of the operations of ALU 74181 with regards to addition / subtraction / comparison.

5.  Design fabrication and testing of differentiator and integrator circuits using OP AMP.

6.  Design fabrication and testing of clipper and clamper circuits using OP AMP.

7.  Design fabrication and testing of
    (a) Monostable multivibrator of t=0.1 msec.approx.) using 74121/123. Testing for both positive and negative edge triggering, variation in pulse width and retriggering.

    (b) Free running multivibrator at 1 KHz and 1 Hz using 555 with 50% duty cycle. Verify the timing from theoretical calculations. 8. Design fabricate and test a switch debounce using 7400.

9.(a) Design and test of an S-R flip-flop using TOR/NAND gates.
    (b) Verify the truth table of a J-K flip-flop (7476)
    (c) Verify the truth table of a D flip-flop (7474) and study its operation in the toggle and asynchronous modes.

10. Operate the counters 7490, 7493 and 74192. Verify the frequency division at each stage. With a low frequency clock (say 1 Hz) display the count on LEDs.

11. (a) Verify the truth table of decoder driver 7447 / 7448. Hence operate a 7 segment LED display through a counter using a low frequency clock.
    (b) Repeat the above with the BCD to Decimal decoder 7442 and an array of LEDs.
IC-212 (Lab.- VI) Linear Control Systems

Internal Marks: 30          L T P
External Marks: 20          0  0  2
Total Marks:    50

At least eight of the following experiments are to be performed:

1. To study input-output characteristics of a potentiometer and to use two potentiometers as an error detector.
2. To study transmitter-receiver characteristics of a synchro set to use the set as control component.
3. To study the operation of a d-c positional servo system and to investigate the effect of damping and supply voltage on its response.
4. To study the operation of an a.c. position servo-system and to obtain effects of supply voltage and system parameter on its transient response.
5. To design different compensation network for the given cut off frequencies and to plot frequency response of these networks.
6. To use operational amplifiers as multiplier, summer, inverter and integrator.
7. To simulate a servo-system and obtain its characteristics with the use of controllers.
8. To study control action of light control device.
9. To study details of a magnetic amplifier and to obtain input-output characterization of this amplifier.
10. To study details of a two winding a-c servometer and to obtain its T-N characteristics.
11. To study PID-controller and to obtain the effect of proportional, integral and derivative control action.
12. To study details of an analog computer and solve a given second order differential equation using it.
13. To generate a sine-wave using a given analog computer with specified amplifier and frequency.
14. To study a stepper motor and control its direction speed and number of steps with the held of a microprocessor.
15. To obtain dynamic characteristics of a given solar cell array and to obtain the point of operation for maximum power transfer to the load.

16. To obtain T.F. of a field controlled d.c. servometer and to show its pole-zero configuration.

17. To obtain T.F. of an armature controlled d.c. servometer and to obtain its pole zero configuration.

18. To design, fabricate and to obtain characteristics of a high pass T type filter.

19. To design, fabricate and to obtain characteristics of low pass T type filter.

20. To design, fabricate and to obtain characteristics of band pass T type filter.

21. To design, fabricate and to obtain the characteristics of a composite low pass filter.

22. To design, fabricate and to obtain the characteristics of a composite high pass filter.

23. To design, fabricate and to obtain the characteristics of composite band pass filter.
EC-301

ANALOG COMMUNICATION SYSTEMS

Internal Marks: 40
External Marks: 60
Total Marks: 100

Base Band Signals and Systems: Introduction, Elements of communication system, Modulation & Demodulation, Mixing; Linear & Nonlinear, need of modulation, types of modulation systems, basic transmission signals.

Analog Modulation Techniques: Introduction, theory of amplitude modulation; AM power calculations, AM current calculations, AM modulation with a complex wave, theory of frequency modulation; mathematical analysis of FM, spectra of FM signals, narrow band of FM, Wide band FM, Theory of phase modulation, phase modulation obtained from frequency modulation, comparison of AM & FM, Comparison of PM & FM.

AM Transmission: Introduction, generation of Amplitude Modulation, Low level and high level modulation, basic principle of AM generation; square law modulation, Amplitude modulation in amplifier circuits, suppressed carrier AM generation (Balanced Modulator) ring Modulator, Product Modulator/balanced Modulator.

AM Reception: Receiver Parameters; Selectivity, Sensitivity, Fidelity, Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver; Basic elements of AM super-heterodyne Receiver; RF Amplifier, Neutralization of RF Amplifiers, Class of operation of RF Amplifiers, High power RF Amplifiers, Image Frequency Rejection, Cascade RF Amplifier, methods of increasing Bandwidth, frequency Conversion and Mixers; Additive Mixing, Bipolar Transistor Additive Mixer, self excited Additive Mixers, multiplicative mixing, Multiplicative Mixer using dual gate MOSFET, Tracking & Alignment, IF Amplifier, AM detector; square law detector, Envelope or Diode detector, AM detector with AGC, Distortion in diode detectors, AM detector Circuit using Transistor, Double heterodyne receiver, AM receiver using a phase locked loop (PLL), AM receiver characteristics.


FM Reception: Frequency demodulators, Tuned circuit frequency discriminators; Slope Detector, Balance Slope Detector, Foster Seeley discriminator, Ratio Detector, FM detection using PLL, Zero crossing detector as a Frequency Demodulator, quadrature FM demodulator, pre emphasis and de emphasis, limiter circuits, FM Capture effect, FM receiver, FM stereo transmission and reception, Two way FM Radio Transmitter and Receiver.


Pulse Modulation Transmissions and Reception: Introduction, Sampling Theorem Pulse Amplitude Modulation (PAM), Natural PAM Frequency Spectra for PAM, Flat-top PAM, Sample and hold circuits, Time division Multiplexing, PAM Modulator Circuit, Demodulation of PAM Signals, Pulse Time Modulation (PTM); Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), PPM Demodulator.

Recommended Text Books:

4. Roody Coolean “Electronic Communication Systems” PHI.
Detailed Contents

1. Quality and Total Quality Management; Excellence in manufacturing/service, factors of excellence, relevance of TQM.
2. Concept and definition of quality; total quality control (TQC) and Total Quality Management (TQM), salient features of TQC and TQM. Total Quality Management Models, benefits of TQM.
4. Customer: Satisfaction, data collection and complaint, redressal mechanism.
5. Planning Process: Policy development and implementation; plan formulation and implementation.
6. Process Management: Factors affecting process management, Quality function development (QFD), and quality assurance system.
7. Total Employees Involvement (TEI): Empowering employees: team building; quality circles; reward and Recognition; education and training, Suggestion schemes.
8. Problems solving Defining problem; Problem identification and solving process; QC tools.
11. Advanced techniques of TQM: Design of experiments: failure mode effect analysis: Taguchi methods

BOOKS:

1. Total Quality Management by Sunder Raju, Tata McGraw Hill
2. TQM for engineers by M. Zairi, Aditya Books
4. ISO 9000 Quality System by Dalela and Saurabh, Standard Publishers
EC-303  Antenna and Wave Propagation

Internal Marks: 40  
External Marks: 60  
Total Marks: 100  
L  T  P  3  1  0

1. **Introduction**: Physical concept of Radiation in single wire, two wire, and dipole, Current Distribution on a thin wire antenna.


3. **Linear Wire Antennas**: Retarded potential, Infinitesimal dipole, Current distribution of short dipole and half wave dipole, Far-field, Radiating near-field and reactive near-field region, Monopole and Half wave dipole.


5. **Aperture Antennas**: Field Equivalence principle, Rectangular and circular aperture antennas, Horn antenna, Babinet’s Principle, Slot Antenna, Reflector antenna.

6. **Ground wave Propagation**: Friis Free space equation, Reflection from earth’s surface, Surface and Space wave propagation for vertical and horizontal dipole, Field strength of Space wave, Range of space wave propagation, Effective earth’s radius, Effect of earth imperfections and atmosphere on space wave propagation, Modified refractive index, Duct propagation, Tropospheric propagation.

7. **Ionospheric Propagation**: Structure of ionosphere, propagation of radio waves through ionosphere, Refractive index of ionosphere, Reflection and refraction of waves by ionosphere, Critical frequency, Maximum usable frequency, Optimum working frequency, Lowest usable high frequency, virtual height, Skip Distance, Effect of earth’s magnetic field.

**Text Books:**
2. Electromagnetics and radiating systems, Jordan E.C.,PHI. 

**Reference Books:**

INTRODUCTION TO OPERATIONAL AMPLIFIERS: Block diagram of a typical Op-Amp, Schematic symbol, integrated circuits and their types, IC package types, Pin Identification and temperature range, Interpretation of data sheets, Overview of typical set of data sheets, Characteristics and performance parameters of and Op-Amp, Ideal Op-Amp, Equivalent circuit of an Op-Amp, Ideal voltage transfer curve, Open loop configurations: Differential, Inverting & Non Inverting. Practical Op-Amp: Input offset voltage, Input bias current, Input offset current, total output offset voltage, Thermal drift, Effect of variation in power supply voltages on offset voltage, Change in Input offset voltage and Input offset current with time, Temperature and supply voltage sensitive parameters, Noise, Common Mode configuration and common mode rejection Ratio.

NEGATIVE FEEDBACK IN OP-AMPS: Block diagram representation of feedback configurations, Voltage-series feedback Amplifier, Voltage shunt feedback amplifier, Differential amplifiers with one op-amp, two op-amps and three op-amps.


SPECIALIZED IC APPLICATIONS: 555 Timer: Pin configuration, Block diagram, application of 555 as Monostable and Astable Multivibrator.
Phase Lock Loops: Operating principles & applications of 565PLL

Voltage Regulators: Fixed voltage regulators, Adjustable voltage regulators, Switching Regulators.

Recommended Text Book:

Recommended Reference Books
1. Op Amps & Linear Integrated circuits by Coughlin
2. Op Amps & Linear Integrated circuits by RaviRaj Dudeja
EC-307 Microprocessor and its Application

Internal Marks: 40
External Marks: 60
Total Marks: 100

L  T  P
3  1  0

Introduction to Microprocessor: Overview of Microprocessor Structure and its operation. Microprocessor evolution and its types.

8085 Microprocessor: 8085 MPU, Memory Interfacing, Memory mapped I/O and peripheral mapped I/O 8085 Microprocessor Programming model. Introduction to 8085 instructions, programming techniques, counters and time delays, stack and subroutines, interrupts of 8085.

8086 Microprocessor: 8086 internal architecture, 8086 system configuration and timing, minimum and maximum mode, memory segmentation, address modes, instruction set descriptions and assembly language programming based on 8086.

Microprocessor system peripheral and interface: Introduction to interfacing, 8155, 8255, 8279, 8254, DMA controller, programmable interrupt controller, USART interfacing with 8085 MPU.

Recommended Text Books:
1. Microprocessor Architecture, Programming and application with 8085 by Gaonkar
2. Introduction to Microprocessor by B. Ram.
3. Microprocessor Interfacing, programming and hardware by D. V. Hall
EC-309 PULSE AND DIGITAL SWITCHING CIRCUITS

Internal Marks: 40          L  T  P
External Marks: 60          3  1  0
Total Marks: 100


Wide band Amplifiers: Frequency response of an amplifier, Short circuit current gain, Gain & Band width consideration, Compensation, Shunt compensation, Low frequency compensation, Distributed amplifiers.

Switching Characteristics of devices: Steady state and transient behaviors of electronic (Diode & transistor) Switches, Dynamic analysis of switches, Charge storage phenomena, Switching characteristics, Delay time, Rise time, Storage time and fall time, Use of Schotkey diode for reducing storage time. Behavior of MOS transistor as switch.

Non-Linear Wave shaping: Realization of clipping circuits (diode & transistor), comparators, champing circuits and sweep generators.

Multivibrators: Realization of astable, monostable, bistable, multivibrators using transistors, unsymmetrical, symmetrical triggering, Schmitt trigger circuits.

Books Recommended:

1. Pulse and Digital Switching Circuits – Milliman, Taub
2. Pulse and Digital Switching Circuits – G. K. Mithal
LIST OF EXPERIMENTS:

1. To obtain Amplitude modulated Envelop and determine depth of modulation
2. To study envelop detector for demodulation of AM signal and observe diagonal peak clipping effect.
3. Frequency modulation using voltage controlled oscillator.
5. Generation of single side band signal
6. To generate a FM Signal and measure Depth of modulation.
7. Detection of FM Signal using PLL.
8. To Study Super heterodyne AM receiver and measurement of receiver parameters viz. sensitivity, selectivity & fidelity.
9. Familiarisation of PLL, measurement of lock and capture range, frequency demodulation, frequency multiplier using PLL.
10. Sampling Theorem & Reconstruction of Signal from its Isamples using Natural Sampling, Flat Top Sampling & Sample & Hold Circuits.
11. To study the circuit of PAM modulator & Demodulator
12. To study the circuit of PWM modulator & Demodulator
13. To study the circuit of PPM modulator & Demodulator
EC-313  LAB VIII: LINEAR INTEGRATED CIRCUITS

List Of Experiments:

1. To study differential amplifier configurations.
2. To measure the performance parameters of an Op amp.
4. To study frequency response of an Op Amp.
5. To use the Op-Amp as summing, scaling & averaging amplifier.
6. To use the Op-Amp as Instrumentation amplifier.
15. Design a series regulators with an error amplifier to provide an output voltage of 5 volt at a load current of 1.5 Amp. Use a 741 Op-Amp and specify the Zener voltage necessary transistor gain and the maximum power dissipation of the transistor.
17. To examine the operation of a PLL and to determine the free running frequency, the capture range and the lock in range of PLL.
EC-315  Lab IX Microprocessor Lab.

Internal Marks:  30
External Marks:  20
Total Marks:      50

List Of Experiments:

1. Study of 8085 Microprocessor Kit.
2. Write a program to add two 8-bit number using 8085.
3. Write a program to add two 16-bit number using 8085.
4. Write a program to subtract two 8-bit number using 8085.
5. Write a program to subtract two 16-bit number using 8085.
6. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085.
7. Write a program to multiply two 8 bit numbers by rotation method using 8085.
8. Write a program to multiply 16-bit number with 8-bit number using 8085.
9. Write a program to generate fibonacci series using 8085.
10. Write a program to sort series using bubble sort algorithm using 8085.
11. Study 8086 Microprocessor kit
12. Write a program to copy 12 bytes of data from source to destination using 8086.
13. Write a program to find maximum and minimum from series using 8086.
14. Write a program to control the operation of stepper motor using 8085/8086 microprocessors and 8255 PPI.
15. Write a program for finding square of a number using look-up table and verify.
16. Write a program to control the temperature using 8085/8086 microprocessors and 8255 PPI.
17. Write a program to control the traffic light system using 8085/8086 microprocessors and 8255 PPI.
18. Write a program to control speed of DC motor using 8085/8086 microprocessors and 8255 PPI.
EC-302 MICROWAVE AND RADAR ENGINEERING

Internal Marks: 40  
External Marks: 60  
Total Marks: 100 

L T P

Microwave Tubes: Limitations of conventional tubes, construction, operation and properties of Klystron Amplifier, reflex Klystron, Magnetron, TWT, BWO, Crossed field amplifiers.

Microwave Solid State Devices: Limitation of conventional solid state devices at MW, Transistors(Bipolar, FET), Diodes(Tunnel, Varactor, PIN), Transferred Electron Devices(Gunn diode), Avalanche transit time effect (IMPATT, TRAPATT, SBD)

Microwave Components: Analysis of MW components using s-parameters, Junctions (E, H, Hybrid), Directional coupler, Bends and Corners, MW posts, S.S. tuners, Attenuaters, Phase shifter, Ferrite devices(Isolator, Circulator, Gyrorator), Cavity resonator, Matched termination.

Microwave Measurements: Power measurements using calorimeters and bolometers, Measurement of SWR, Frequency and wavelength, Microwave bridges.


Doppler Radars: Doppler determination of velocity, CW radar and its limitations, FMCW radar, Basic principle and operation of MTI radar, Delay line cancellers, Blind speeds and staggered PRFs.

Scanning and Tracking Techniques: Various scanning techniques(Horizontal, vertical, spiral, palmer, raster, nodding), Angle tracking systems(Lobe switching, conical scan, monopulse), Range tracking systems, Doppler(velocity)tracking systems.

Text books:
1. Microwave devices and circuits: Samuel Liao;PHI
2. Microwave devices and radar engg: M.Kulkarni;Umesh Publications
3. Introduction to radar systems: Merill I. Skolnik

Reference Books:
1. Foundation of Microwave Engg : R.E.Collin;McGraw Hill

34
EC-304 DIGITAL COMMUNICATION

Internal Marks: 40          L T P
External Marks: 60          3 1 0
Total Marks: 100


Digital Carrier Line Encoding & Multiplexing Techniques: Line Coding & its properties. NRZ & RZ types, signalling format for unipolar, Polar, bipolar (AMI) & Manchester coding and their power spectra (No derivation), HDB and B8ZS signalling, Fundamentals of time division multiplexing, T1 Digital Carrier system, Synchronization and Signaling of T1, TDM, PCM hierarchy, North-American Digital Hierarchy; T1 to T4 PCM TDM system (DS1 to DS4 signals), Bit versus word interleaving, Statistical TDM, Codecs & Combo Chips

Digital Carrier Modulation & Demodulation Techniques: Introduction, Information capacity, Shannon Limit for Information capacity, Bit Rate, Baud & M-Ary Encoding, Amplitude Shift Keying (ASK), ASK Spectrum, ASK Modulator, Coherent ASK Detector, Noncoherent ASK Detector, Frequency Shift Keying (FSK), FSK Bit Rate and Baud, Bandwidth and Frequency Spectrum of FSK, FSK Transmitter, Noncoherent FSK Detector, Coherent FSK Detector, FSK Detection Using PLL, Binary Phase Shift Keying, Binary PSK Spectrum, BPSK Transmitter, Coherent PSK Detection, Quadrature Phase Shift Keying (QPSK), QPSK Demodulator, Offset QPSK, π/4 QPSK, Comparison of conventional QPSK, Offset QPSK and π/4 QPSK, M-Ary BPSK e.g. 8 PSK & 16 PSK, Quadrature Amplitude Modulation (QAM); 8 QAM & 16 QAM transmitters and receivers, Band Width efficiency, Carrier Recovery; Squaring Loop & Costas Loop, Differential PSK, DBPSK transmitter and receiver, Constant Envelop Modulation; Minimum Shift Keying (MSK) & Gaussian Minimum Shift Keying (GMSK)

Simulation of above systems using ComSim and Matlab.

Recommended Text Books:

Recommended Reference Books:
5. Digital Communications/Mc Graw Hill 2nd Ed, Proakis J.J.
EC-306  Micro Controller and Embedded Systems

Internal Marks:  40          L  T  P
External Marks:  60          3  1  0
Total Marks:    100

Introduction:  8051 Micro controller: Comparison of Microprocessor and Micro controller, micro controller and embedded processors, overview of 8085 families.

8051 Assembly Language Programming: Introduction to 8051 Assembly programming, Assembling and running an 8051 program. Data Types and directives. 8051 flag bits and PSW register. Register banks and stack.

Jump loop and call instructions, I/O Port programming: Addressing modes and accessing memory using various addressing modes. Arithmetic instructions and programs, Logic instructions and programs, Single bit instructions and programming, Timer/counter programming in the 8051

Serial Communication: 8051 connection to RS 232, 8051 serial communication programming.

Real World Interfacing: LCD, ADC and sensors, Stepper motor, keyboard, DAC and external memory

Introduction to an embedded system and its design: Introduction to ES & its applications, design parameters of an ES and its significance (With respect to all parameter), present trends in ES, Embedded System design life cycle, product specifications and hardware, software partitioning, Co-design.

Introduction to latest micro controllers such as ARM processors and its applications.

Recommended Text Books:
1) The 8051 Microcontroller and embedded Systems by: - Ali Mazidi
2) Am embedded software primer, David e Simon, Pearson Education
3) Embedded system design by Frank vahid and Tony Givargus
Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance

Need for public awareness.

Unit 2: Natural Resources:

Renewable and non-renewable resources:

Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

b) Water resources: Use and over-Utilization of surface and ground water, floods, drought, conflicts and water, dams-benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.

• Equitable use of resources for sustainable lifestyles.

Unit 3: Ecosystems

• Concept of an ecosystem.
• Structure and function of an ecosystem.
• Producers, consumers and decomposers.
• Energy flow in the ecosystem.
• Ecological succession.
• Food chains, food webs and ecological pyramids.
• Introduction, types, characteristic features, structure and function of the following ecosystem :-
  a. Forest ecosystem
  b. Grassland ecosystem
  c. Desert ecosystem
  d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lectures)

Unit 4 : Biodiversity and its conservation

• Introduction – Definition : genetic, species and ecosystem diversity.
• Biogeographical classification of India
• Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
• Biodiversity at global, National and local levels.
• India as a mega-diversity nation
• Hot-spots of biodiversity.
• Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
• Endangered and endemic species of India
• Conservation of biodiversity : In-situ conservation of biodiversity.
Unit 5 : Environmental Pollution

Definition

- Causes, effects and control measures of :-
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear hazards

- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management : floods, earthquake, cyclone and landslides.

(8 lectures)

Unit 6 : Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people ; its problems and concerns. Case studies.
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.

- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
• Wildlife Protection Act
• Forest Conservation Act
• Issues involved in enforcement of environmental legislation.
• Public awareness.

Unit 7: Human Population and the Environment

• Population growth, variation among nations.
• Population explosion – Family Welfare Programme.
• Environment and human health.
• Human Rights.
• Value Education.
• HIV / AIDS
• Women and Child Welfare.
• Role of Information Technology in Environment and human health.
• Case Studies.

Unit 8: Field work

• Visit to a local area to document environmental and river forest grassland hill mountain.
• Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
• Study of common plants, insects, birds.
• Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)
EC-308 Digital Signal Processing

Internal Marks: 40
External Marks: 60
Total Marks: 100

Introduction: Basic elements of DSP system, Advantages and disadvantage of DSP over analog processing, Application of Digital signal processing.

Discrete time Signal and Systems: Elementary discrete time signals, Manipulation of discrete time signals, Classification of discrete time LTI system using convolution sum method, properties of LTI system, Analysis of LTI system using Difference equation.

Z-Transform: Direct Z-Transform and importance of ROC, properties of Z-Transform, Inverse Z-transform methods, Rational Z-transform function representation, system function of LTI systems in Z-domain, one sided Z-Transform.

Discrete Fourier Transform: Frequency domain sampling and reconstruction of discrete time signal, DFT as linear transformation, properties of DFT, use of DFT in linear filtering, Fast fourier transform (FFT), decimation in time, decimation in frequency algorithm, Goertzel algorithm.

Implementation of Discrete time system: Structures for realisation of discrete time system, Direct form, cascade form, parallel form and lattice form structures for FIR and IIR systems, Representation of numbers, Quantisation of filter coefficients.


DSP processor architecture fundamentals: Study of ADSP and TMS series of processor architectures.

Recommended Text book:
1. Digital Signal Processing: Proakis and Manolakis; Pearson education.

Recommended Reference Books:
1. Digital signal processing: Ifeachor; Pearson education.
2. Digital signal processing: Salivahanan, Vallavaraj, and Ganapriya; TMH.

Websites:
(i) www.ti.com
(ii) www.analog.com
(iii) www.bdti.com
(iv) www.bores.com
Department Elective-I
DE1.1
Cellular & Mobile Communication

Internal Marks: 40
External Marks: 60
Total Marks: 100

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems.


Elements of Cellular Radio Systems Design: General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems.

Interference: Introduction to co-channel interference, real time co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co-channel interference – different types.

Cell Coverage for Signal & Traffic: General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model- characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

Cell Site Antennas and Mobile Antennas: Characteristics, antenna at cell site, mobile antennas, Frequency Management and Channel Assignment, Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment.

Hand Off, Dropped Calls: Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

Operational Techniques: Parameters, coverage hole filler, leaky feeders, cell splitting and small cells, narrow beam concept.

Recommended Text Books:
2. Wireless and Digital Communications; Dr. Kamilo Feher (PHI)
INTRODUCTION: Advantages of IC’s, General classification of IC’s (Linear/Digital IC’s, Monolithic/ Hybrid IC’s), Basic IC fabrication steps

CRYSTAL GROWTH AND EPITAXY: Starting material for formation of crystal, Horizontal Bridgeman Method, Czochralski growth, Distribution of dopants, Zone refining, Silicon Float Zone process, Si-Wafer preparation, Epitaxial growth, Techniques used for epitaxial growth (LPE, VPE, MBE)

SILICON OXIDATION: Thermal oxidation process (Kinetics of growth, Thin oxide growth), Effect of impurities on the oxidation rate, Preoxidation Cleaning, Various oxidation techniques, Masking properties of SiO$_2$, IV PHOTO LITHOGRAPHY AND ETCHING, Pattern generation/Mask making, Contact and Proximity printing, Photoresists, Photolithography Process (Lift off technology, Fine line photolithography), Wet/Dry etching, Reactive Plasma etching techniques and applications

DIFFUSION AND ION IMPLANTATION: Basic diffusion process (Diffusion equation, Diffusion profiles), Extrinsic diffusion, Lateral Diffusion, Ion Implantation Process (Ion distribution, Ion Stopping), Implant Damage and Annealing process (Furnace and RTA), VI IC PACKAGING, Isolation Techniques, Testing of the Chip, Wire Bonding techniques, Flip Chip technique, Various Packaging methods and Materials, VII FABRICATION OF MONOLITHIC COMPONENTS, Fabrication of Diodes, Resistors, capacitors and inductors, Fabrication of BJT and FET, Fabrication of MOS Devices, CMOS fabrication techniques (n-well and p-well process sequences), Introduction to MEMS.

Recommended Text Books:
1. Fundamental of Semiconductor Fabrication: Gray S. May and Simon M. Sze
2. VLSI Technology: Sze.

Reference Books:
1. Microelectronics: Jacob and Millman
DE-1.3

HUMAN RESOURCE MANAGEMENT

Internal Marks: 40
External Marks: 60
Total Marks: 100


Training & Development: Difference between training and Development; Principles of Training; Employee Development; Promotion-Merit v/s seniority Performance Appraisal, Career Development & Planning.

Job analysis & Design: Job Analysis: Job Description & Job Description, Job Specification.

Job Satisfaction: Job satisfaction and its importance; Motivation, Factors affecting motivation, introduction to Motivation Theory; Workers' Participation, Quality of work life.


Integration: Human Relations and Industrial Relations; Difference between Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry; Employee Employer relationship Causes and Effects of Industrial disputes; Employees Grievances & their Redressal, Administration of Discipline, Communication in organization, Absenteeism, Labour Turnover, Changing face of the Indian work force and their environment, Importance of collective Bargaining; Role of trader unions in maintaining cordial Industrial Relations.


Recommended Text Books:

1. T.N.Chhabra- Human Resource Management (Dhanpat Rai & Co.)

Recommended Reference Books:

1. Lowin B. Flippo - Principles of personnel Management (Mc Graw-Hill)
2. R.C. Saxena - Labour Problems and social welfare (K.Math & Co.)
3. A Minappa and M. S. Saiyada - Personnel Management (Tata Mc. Graw-Hill)
4. C.B. Mamoria - Personnel Management (Himalaya Publishing House, Bombay)
5. T.N. Bhagotiwal - Economics of Labour and Industrial Relations (Sahitya Bhawan Agra)
DE-1.4

VIRTUAL INSTRUMENTATION

Internal Marks: 40  
External Marks: 60  
Total Marks: 100

Review of Virtual Instrumentation: Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

Programming Techniques: VIS & Sub VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, local & global variables, string & file Input.

Data Acquisition basics: ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation.

Common Instrument Interfaces: Current loop, Rs 232C/Rs 485, GPIB, System basics, interface basics: USB, PCMCIA, VXI, SCXI, PXI etc, networking basics for office & industrial application VISA & IVI, image acquisition & processing, Motion Control.

Use of Analysis Tools: Fourier transforms, Power spectrum, Correlation methods, windowing & flittering.

Application of VI: Application in Process Control projects, Major equipments-Oscilloscope, Digital Multimeter, 120 MHz Pentium Computers, Labview Software, Study of Data Acquisition & Control using Labview ® Virtual instrumentation for an Innovative Thermal Conductivity Apparatus to measure the Thermal Conductivity Apparatus- to measure the conductivity of non Newtonian fluids while they are subjected to sharing force.

Recommended Text Books:
NEURAL NETWORKS AND FUZZY LOGIC

Internal Marks: 40
External Marks: 60
Total Marks: 100

**Neural Networks characteristics:** History of development in neural Networks Principles, Artificial Neural Net terminology, Model of a neuron, topology, learning types of learning supervised unsupervised, re-inforcement learning.

**Basic Hopfield Model:** the perceptron, linear separability, Basic learning laws: Hebb's rule, Delta rule, Widrow & Hoff LMS learning rule, correlation learning rule, instar and outstar learning rules.

**Unsupervised learning:** competitive learning, K-means clustering algorithm, Kohonen's feature maps.


**Applications of neural nets such as pattern recognition:** optimization, associative memories, vector quantization, control, Applications in speech and decision making.

**Fuzzy Logic:** Basic concepts of Fuzzy Logic, Fuzzy vs Crisp set, Linguistic variables, membership functions, operations of fuzzy sets, fuzzy IF-THEN rules, variable inference, techniques, defuzzification techniques, basic fuzzy inference algorithm, Applications of fuzzy logic, Fuzzy system design, Implementation of fuzzy system, Useful tools supporting design.

**Recommended Text Books:**

2. Vegna Narayanan - Artificial Neural Networks
3. Bart Kosko - Neural Networks & Fuzzy Logic
4. Simon Haykin - Neural Networks
EC-310

LAB X: MICROWAVE Engineering

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List of Experiments:

1. Study of microwave components and instruments.
2. Measurement of crystal characteristics and proof of the square law characteristics of the diode.
8. Calibration of the attenuation constant of an attenuator.
9. Determination of the attenuation constant of an attenuator.
10. Determination of the standing wave pattern on a transmission line and finding the length and position of the short circuited stub.
EC-312

Lab-XI Digital Communication

Internal Marks: 30
External Marks: 20
Total Marks: 50

LIST OF EXPERIMENTS

1. Study of Time Division Multiplexing system.
2. Study of pulse code modulation and demodulation.
3. Study of delta modulation and demodulation and observe effect of slope overload.
4. Study pulse data coding techniques for various formats.
5. Data decoding techniques for various formats.
7. Study of frequency shift keying modulator and demodulator.
8. Study of phase shift keying modulator and demodulator.
10. Digital link simulation; error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ComSim.
List of Experiments:

1. Study of 8051/8031 Micro controller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a program to check a number for being ODD or EVEN and show the result on display.
5. Write a program to split a byte in two nibbles and show the two nibbles on display.
6. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order.
7. Write a program to find a factorial of a given number.
8. Study of Interrupt structure of 8051/8031 micro controllers.
9. Write a program to show the use of INT0 and INT1.
10. Write a program of Flashing LED connected to port 1 of the Micro Controller
11. Write a program to generate a Ramp waveform using DAC with micro controller.
12. Write a program to interface the ADC.
13. Write a program to control a stepper motor in direction, speed and number of steps.
14. Write a program to control the speed of DC motor.
15. Interfacing of high power devices to Micro-controller port-lines, LED, relays and LCD display.
EC-316 Lab XIII: Digital Signal Processing using MATLAB™

List of experiments:

Perform the following exercises using MATLAB™

1. To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.

2. To develop program modules based on operation on sequences like signal shifting, signal folding, signal addition and signal multiplication.

3. To develop program for discrete convolution and correlation.

4. To develop program for finding response of the LTI system described by the difference equation.

5. To develop program for computing inverse Z-transform.

6. To develop program for finding magnitude and phase response of LTI system described by system function H(z).

7. To develop program for computing DFT and IDFT.

8. To develop program for computing circular convolution.

9. To develop program for conversion of direct form realisation to cascade form realisation.

10. To develop program for cascade realisation of IIR and FIR filters.

11. To develop program for designing FIR filter.

12. To develop program for designing IIR filter.

Recommended Book:

1. DSP using Matlab : Ingle V.K., Proakis ; Vikas Publication.
EC-402  

**Computer Networks**

**Internal Marks:** 40  
**External Marks:** 60  
**Total Marks:** 100

**L T P**

**Data communication concepts:** Digital & Analog, Parallel & serial, Synchronous & Asynchronous, Simplex, Half duplex & Full duplex.

**Computer Networks:** Introduction, N/W Topology, Wired N/W Vs wireless N/W. Classification of computer N/W’s- LAN, MAN, WAN. Internet,Intranet & Extranet.

**Protocols & Protocol suits** (eg TCP/IP, IPX/SPX), Need of Protocols & their significance in Networking.

**N/W Reference Models:** OSI reference Model, TCP/IP reference Model, comparison of OSI & TCP/IP Ref Models.

**Networking H/W:** Ethernet cabling, The NIC, Repeater, Router, Bridges, Switches, Transcievers, hubs, Cable Modems.

Communication Switching Techniques: **Circuit Switching, Packet Switching & Message switching.**

**LAN standards (IEEE 802 PROJECT):** Ethernet, CSMA/CD, Token Ring, Token Bus, & their frame formats. FDDI.

**Data link & N/W layer** Services provided to N/W layer, Framing, Data link control: Flow control, Error Detection, HDLC & SDLC, concept of Routing & congestion control.

**Transport layer** Transport layer Protocols like TCP, UDP, connection Oriented Transport Protocol, TCP services.

**N/W Protocols:** Low level Protocols. SLIP, PPP NETBEUI, High level Protocols:- IP & IP Addresses, ARP,RARP

**Traditional Application:** Terminal Acess:Telnet, File transfer: FTP, Email: SMTP & MIME & POP3

**Modern Applications:** Web Applications :- HTTP, Internet and its Applications.

**Unix Networking concepts:** Introduction to sockets.

**Recommended References Books:**
EC-404  
Optical Fiber Communications

Internal Marks: 40  
External Marks: 60  
Total Marks: 100


2. Optical Fibers:  Geometrical-Optics Description; Step-Index Fibers, Graded Index Fibers, Wave Propagation; Maxwell’s Equations, Fiber Modes, Single-Mode-Fibers, Dispersion in Single-Mode Fibers; Group Velocity Dispersion, Material Dispersion, Wave guide Dispersion, Higher-order Dispersion, Polarization-Mode Dispersion, Dispersion-Induced Limitations; Basic Propagation Equation, Chirped Gaussian Pulses, Limitations on the Bit Rate, Fiber Bandwidth, Fiber Losses; Attenuation Coefficient, Material Absorption, Rayleigh Scattering, wave guide Imperfections, Nonlinear Optical effects; Stimulated Light Scattering, Nonlinear Phase Modulation, Four Wave Mixing, Fiber Manufacturing; Design Issues, Fabrication Methods, Cables and Connectors.


Text Books:
2. Senior J. Optical Fiber Communications, Principles & Practice, PHI.
EC-406

VLSI DESIGN & TECHNOLOGY

Internal Marks: 40  External Marks: 60  Total Marks: 100

L  T  P
4  1  0


VHDL Statements: Assignment statements, sequential Statements and process, Conditional statements, Case statements, Array and loops, Resolution functions, Packages & Libraries, Concurrent statements.

Combinational Circuit Design: VHDL models and simulation of combinational circuits such as Multiplexers, Encoders, Decoders, Code converters, Comparators, Implementation of Boolean functions etc.

Sequential Circuit Design: VHDL Models and simulation of sequential circuits, Shift registers, Counters etc.

Design of Microcomputer: Basic components of a computer, Specifications, Architecture of a simple Microcomputer system, Implementation of a simple microcomputer system using VHDL.

Design with CPLDs and FPGAs: Programmable logic devices: ROM, PLAs, GAL, PEEL, CPLDs and FPGA. Design and implementation using CPLDs and FPGAs.

Recommended Text Books:
3. “A VHDL Primer”: Bhasker; Prentice Hall 1995
EC-408

VLSI DESIGN LAB

Internal Marks: 30
External Marks: 20
Total Marks: 50

Combinational Design Exercises

1. Design of Gates
   a. Design of AND gate
   b. Design of OR gate
   c. Design of XOR gate
2. Design of XOR gate using other basic gates
3. Design of 2:1 Mux using other basic gates
4. Design of 2 to 4 Decoder
5. Design of Half-Adder, Full Adder, Half Subtractor, Full Subtractor
6. Design of 3:8 Decoder
7. Design of 8:3 Priority Encoder
8. Design of 4 Bit Binary to Grey code Converter
9. Design of 4 Bit Binary to BCD Converter using sequential statement
10. Design an 8 Bit parity generator (with for loop and Generic statements)
11. Design of 2,s Complementer for 8-bit Binary number using Generate statements

Sequential Design Exercises

12. Design of all type of Flip-Flops using (if-then-else) Sequential Constructs
13. Design of 8-Bit Shift Register with shift Right, Rhisft Left, Load and Synchronous reset.
15. Design of Synchronous 8-Bit universal shift register (parallel-in, parallel-out) with 3-state output (IC 74299)
17. Design
   a. Mod 3 Counter
   b. Mod 5 Counter
   c. Mod 7 Counter
   d. Mod 8 Counter
   e. Mod 16 counter
   f. 4 Bit Johnson counter
18. Design a decimal up/down counter that counts up from 00 to 99 or down from 99 to 00.
19. Design 3-line to 8-line decoder with address latch
20. Design of ALU
Department Elective II

DE-2.1

INDUSTRIAL ELECTRONICS

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**Characteristics of Selected Devices:** Fast recovery diodes, Schottky diode, SCR, gate trigger and commutation circuits, series and parallel connection of SCRs, Diac, Triac, UJT, Power MOSFETs.

**Controlled Rectifier:** Half wave and full wave with resistive & R-L-E and resistive-inductive loads. Free-wheeling diode, three phase rectifiers, Bridge rectifiers -half controlled and fully controlled.

**Inverter, Chopper And Cycloconverter:** Voltage driven, current driven, bridge, parallel, SCR versions, control of output voltage-PWM schemes, harmonic reduction

**Motor Control:** D.C. and A.C. motor control, reversible drives, closed loop control, commutatorless d.c. motor control.

**A.C. Voltage Controllers:** Types of AC Voltage Controllers, Integral cycle control, single phase voltage controller, Sequence control of AC voltage (Transformer tap changers)

**Books Recommended:**

Wireless Communication Systems & Networks

Internal Marks: 40
External Marks: 60
Total Marks: 100

Introduction: Mobile Radio Systems around the world, Examples of Wireless Communication Systems; Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems, Comparison of common Wireless Communication systems

Digital Communication through fading multipath channels: Fading channel and their characteristics- Channel modelling, Digital signalling over a frequency non selective slowly fading channel- frequency selective slowly fading channel- Calculation of error probabilities- Tapped Delay line model- The RAKE demodulator- performance-Concept of diversity branches and signal paths- Combining methods- Selective diversity combining-pre-detection and post-detection combining- Switched combining- maximal ratio combining- Equal gain combining.

Multiple Access Techniques for Wireless Communications: Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access, Packet Radio Protocols; Pure ALOHA, Sloted ALOHA, Capacity of Cellular Systems


Wireless Systems & Standards: AMPS and ETACS, United states digital cellular (IS-54 & IS 136), Global system for Mobile (GSM); Services, Features, System Architecture, and Channel Types, Frame Structure for GSM, Speech Processing in GSM, CDMA Digital standard (IS 95); Frequency and Channel specifications, Forward CDMA Channel,

**Wireless Local Area Networks (WLAN):** Components and working of WLAN, transmission media for WLAN, Modulation techniques for WLAN (DSSS, FHSS), IEEE 802.11 standards and protocols for WLAN (MACA, MACAW). Mobile Network and Transport layer: Mobile IP, Mobile TCP, traffic routing in wireless networks, wire less ATM. Wireless Local Loop(WLL): WLL Architecture, WLL Technologies and frequency spectrum.

**Future trends:** Blue Tooth technology, 4G mobile techniques, Wi-Fi Technology.

**Recommended Text Books:**

BIO-MEDICAL ELECTRONICS

Transducers and Electrodes: Different type of transducer and their selection for Biomedical applications; Inductive, capacitive, piezoelectric transducers, Thermistors: Radiation & Chemical thermometry; Electrode theory and Different types of Electrodes. Polarization, Electrode behaviour, Electrode-skin interface.

Origin of Bio-potentials: Electric activity of excitable cells, Neuron resting potential, Nerst equation : ECG, EEG, EMG, source of these potentials, generation of signals, recording.

Cardio Vascular Measurement: Measurement of blood pressure, balloon flow, cardiac output and cardiac rate.

Respiratory System Measurements: Respiratory mechanism; Measurement of gas volume, flow rate, carbon dioxide and oxygen concentration in exhaled air, respiration controller.

Medical Imaging Systems: Radiography, CAT scan, Ultrasonic scanning and nuclear medicine, principles and applications, Angiography, fluoroscopy.

Bio-effects of Microwaves: Interaction of microwaves with biological systems. Diathermy, Biological Hazards of microwaves as well as low fr

Therapeutic and Prosthetic Devices: Cardiac pacemakers, electrical stimulators, Defibrill'ors and cardioverters

Heamodialysis, Ventilators.

Electrical Safety: Physiological effects of electricity, Micro shock and Macro shock hazards; Electrical safety standards Basic approaches to shock protection.

Recommended Text Books:

DE-2.4  

MECHATRONICS

Internal Marks:  40  
External Marks:  60  
Total Marks:  100  

L T P
3 1 0

Introduction: Mechatronics & its scope; Role of CNC Machines; Advantages of CNC Machines; Applications of CNC Machines.

Electronics For Mechanical Engineers: Conductors, Insulators, Active & Passive Components used in Electronics, Transformers, Silicon controlled Rectifier, Integrated Circuits, Digital Electronics; Amplifiers; Sensors & Transducers.


Cnc Systems: Introduction; Configuration; Interfacing; Monitoring; Diagnostics; PLC & its Programming.

Programming Of Cnc Machines: Co-ordinate system; Aries & Motion Nomenclature; GO2/GO3 Circular Interpolation; Subroutines; Parametric Programming(User Macros) & R-Parameters.

Recommended Text Books:

1. Mechatronics by HMT, Tata Mc GrawHill
2. Introduction to Mechatronics and Measurement System by Michael B. Histand & David G. Alciatore
DE-2.5

ENGINEERING ECONOMICS

Internal Marks: 40
External Marks: 60
Total Marks: 100

Introduction: Engineering Economy & the Engineering process, bioenvironmental nature of engineering, economic efficiency, requirement of an economic study of an engineering project.

Costing: Elements of cost, elements of overhead cost, methods of distribution of overhead cost.


Replacement Studies: Reasons for replacement, factors to be considered in replacement studies, basic patterns, economic life of a project.

Economic Analysis of Investment: Criteria for comparison of alternatives, methods like present worth method, rate of return method, payout period & uniform annual cost method.


Books Recommended:

1. Jain, Narang & Dhinjra “Cost Accounting”
3. C. N. M. Reddy “Industrial Engg. & Management”
4. O.P. Khanna “Industrial Engineering”
Department Elective III

DE-3.1 OPERATING SYSTEMS

Internal Marks:  40  L  T  P
External Marks:  60
total Marks:  100


Operating System Structures: OS services, System Calls, System Structures, Layered Architecture of an OS.


CPU scheduling: Introduction, CPU scheduler, Scheduling criteria, Scheduling algorithms: FCFS, SJF, Priority scheduling, RR scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling

Process Synchronization: Co-operating process, Concurrency, Semaphores
Deadlocks: Introduction, Deadlock characteristics, Recognition methods, Dealing with deadlocks, Deadlock prevention, avoidance, detection and deadlock recovery.

Memory Management Basics: Introduction, Logical vs physical address space, Program relocation & mgmt techniques, Continuous storage allocation, Fixed partition contiguous storage allocation, Variable partition CSA, Non contiguous storage allocation, paging, segmentation.

Virtual Memory: Introduction, Swapping, Demand paging, Pure demand paging, Page replacement algo’s, FIFO, Optimal, LRU algo’s.

Device Mgmt & Storage Structure: I/O subsystems, I/O channels, Secondary storage, Disk structure, Disk scheduling, FIFO, Shortest seek time first SSTF scan, C-SCAN, Look &C-look Disk scheduling algo’s.


Case Study: UNIX &WIN NT

Recommended References Books:
1. Peter Galvin “Operating systems Concepts” Addison wessly
2. Ekta Walia “Operating systems Concepts”
DE-3.2 Image Processing

Internal Marks: 40
External Marks: 60
Total Marks: 100

1. **Introduction to Electronic Image Processing**: historical background, visual perception, image formation, sampling & Quantization & application of image Processing.

2. **Transforms used in Electronic Image Processing**: Review of 1-D & 2-D Fourier Transforms, Discrete Fourier transforms & other image transforms.

3. **Image Enhancement by Point operation**: An overview of point Processing, constant & non-linear operations between image & histogram techniques.

4. **Spatial Filtering & Fourier frequency Method**: Noise in image, Spatial & Special frequency filtering, image restoration.

5. **Non-Linear image processing techniques**: Non-linear Spatial/Mean/Adaptive & Homomorphic Filters

6. **Color Image Processing**: Color Models, examples of color image processing, Pseudo-coloring & color displays.

7. **Image segmentation & Representation**: Image Thresh-holding, Edge/Line & Point direction, Region based segmentation & Image representation.

8. **Introduction to Morphological filters & Image Compression**

Text Books:

Reference Books:
DE-3.3

SATELLITE COMMUNICATION

Internal Marks: 40
External Marks: 60
Total Marks: 100

Introduction: Origin of Satellite Communication, Current state of Satellite Communication, Advantages of Satellite Communication, Active & Passive satellite, Orbital aspects of Satellite Communication, System Performance. Communication Satellite Link Design - Introduction, general link design equation, system noise temperature, C/N & G/T ratio, atmospheric & econospheric effects on link design, complete link design, interference effects on complete link design, earth station parameters.

Satellite analog & digital communication Baseband analog(voice) signal, FDMA techniques, S/N ration, SCPC & CSSB systems, digital baseband signals & modulation techniques.

Multiple Access Techniques TDMA frame structure, burst structure, frame efficiency, superframe, frame acquisition & synchronization, TDMA vs FDMA, burst time plan, beam hopping, satellite switched, Erlang call congestion formula, demand assignment ctrl, DA-FDMA system, DATDMA.

Laser & Satellite Communication Link analysis, optical satellite link Tx & Rx, Satellite, beam acquisition, tracking & pointing, cable channel frequency, head end equation, distribution of signal, n/w specifications and architecture, optical fibre CATV system.

Satellite Applications Satellite TV, telephone services via satellite, data Communication services, satellites for earth observation, weather forecast, military appliances, scientific studies.

Recommended Text Books
1. Timothy Pratt “Satellite Communication”
2. D.C Aggarwal “Satellite Communication”
DE-3.4

Reliability Engineering

Internal Marks: 40  L T P
External Marks: 60
Total Marks: 100

Concepts of Reliability: Failure of systems and its modes: Measure of Reliability, Reliability Function, Hazard Rate, MTBF and their interrelations.

Reliability Data Analysis: Data Sources, Data Collection, Use of Reliability data, Reliability Analysis, Performance Parameters, Calculation of Failure Rate, Application of Weibull distribution.

System Reliability And Modeling: Series Systems, Parallel systems, Series Parallel systems, Time dependence, Reliability determination, Standby systems, r out of n configurations, Methods of tie set and cutsets of or reliability evaluation, Simulation and Reliability Predeiction, Monte Carlo Method.


Recommended Text Books:
1. Govil “Reliable Engineering”
2. K.K. Aggarwal “Reliable Engineering”
3. L. S. Srinath “Concepts in Reliable Engineering”
DE-3.5

TELEVISION ENGINEERING

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**Internal Marks:** Sound and picture transmission, Sound and picture reception, picture elements, frame and field frequencies, scanning process, interlaced scanning, resolution - vertical resolution, horizontal resolution, video bandwidth, receiver controls.

**External Marks:** Construction of composite signal, Horizontal & vertical sync details, scanning sequence details, functions of composite video signal.

**General Introduction**

**Sound and picture transmission**, **Sound and picture reception**, picture elements, frame and field frequencies, scanning process, interlaced scanning, resolution - vertical resolution, horizontal resolution, video bandwidth, receiver controls.

**Composite video signals and TV standards**

Construction of composite signal, Horizontal & vertical sync details, scanning sequence details, functions of composite video signal.

**Picture carrier signal transmission**

Negative transmission, vestigial side-band channel allocations, T.V. studio / control room.

**Television Camera and Picture Tube**

Camera lenses, T.V. camera tubes - Image orthicon, vidicon, plumbicon, comparison of various T.V. camera tubes, monochrome picture tube - principle of operation and characteristics.

**Broadcast Television receivers**


**Colour Television**

Colour fundamentals, mixing of colours and colour reception, chromaticity diagram, colour picture tubes and its types, colour T.V. transmission and reception-frequency interleaving, modulation of colour difference signals, colour burst signal, weighting factors.

**Recommended Text Books:**

2. Television simplified - Milton S. Kilver
5. Principles of Monochrome of colour television - R. R. Gula