Punjab Technical University, Jalandhar

B.Tech. Electronics & Communication Engg.

Study scheme

3rd Semester

Course code	Course Title	L	T	P	Int.	Ext.	TOTAL
AM-201	Applied Mathematics-III	4	1	0	40	60	100
EE-201	Network Analysis & Synthesis	3	2	0	40	60	100
EC-201	Electronics Devices & Circuits	3	1	0	40	60	100
EC-203	Electronic Measurement & Instrumentation	3	1	0	40	60	100
CS –252	Object Oriented Programming using C++	3	1	0	40	60	100
EC-205	Lab.-I (Electronic Devices & Networks)	0	0	2	30	20	50
EC-207	Lab.-II (Instrumentation)	0	0	2	30	20	50
CS-254	Lab.-III (Object Oriented Programming)	0	0	2	30	20	50
WS	*Workshop Training	-	-	-	60	40	100
	TOTAL	**16**	**6**	**6**	350	400	750

4th Semester

Course code	Course Title	L	T	P	Int.	Ext.	TOTAL
EC-202	Analog Electronics	3	1	0	40	60	100
EC-204	Digital Electronics	3	2	0	40	60	100
EC-206	Signals and Systems	3	1	0	40	60	100
EC-208	Electromagnetic Field Theory	3	1	0	40	60	100
IC-204	Linear Control Systems	3	2	0	40	60	100
EC-210	Lab.-IV (Analog Electronics)	0	0	2	30	20	50
EC-212	Lab.-V (Digital Electronics)	0	0	2	30	20	50
IC-212	Lab.VI (Linear Control Systems)	0	0	2	30	20	50
	General Fitness				100		100
	TOTAL	**15**	**7**	**6**	**390**	360	750

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

5th Semester

CODE	SUBJECT	TH	TUT	PR	INT	EXT	TOTAL
EC-301	Analog Communication Systems	3	1	0	40	60	100
ME-251	Total Quality Management	3	1	0	40	60	100
EC-303	Antenna & Wave Propagation	3	1	0	40	60	100
EC-305	Linear Integrated Circuits	3	1	0	40	60	100
EC-307	Microprocessors & its applications	3	1	0	40	60	100
EC-309	Pulse, Digital & Switching Circuits	3	1	0	40	60	100
EC-311	Lab-VII: Analog Communication Systems	0	0	2	30	20	50
EC-313	Lab-VIII: Linear Integrated Circuits	0	0	2	30	20	50
EC-315	Lab-IX: Microprocessors	0	0	2	30	20	50
	Institutional Training				60	40	100
	TOTAL: 32 Contact Hrs.	**18**	**6**	**6**	**390**	**460**	**850**

6th Semester*

CODE	SUBJECT	TH	TUT	PR	INT	EXT	TOTAL
EC-302	Microwave & Radar Engineering	3	1	0	40	60	100
EC-304	Digital Communication	3	1	0	40	60	100
EC-306	Micro-Controller & Embedded Systems	3	1	0	40	60	100
CE-216	Environment Science	3	1	0	40	60	100
EC-308	Digital Signal Processing	4	1	0	40	60	100
*	Department Elective-I	3	1	0	40	60	100
EC-310	Lab-X: Microwave Engineering	0	0	2	30	20	50
EC-312	Lab-XI: Digital Communication	0	0	2	30	20	50
EC-314	Lab-XII: Micro-Controller	0	0	2	30	20	50
EC-316	Lab-XIII: Digital Signal Processing using MATLAB	0	0	2	30	20	50
	General Fitness	-	-	-	100	-	100
	TOTAL: 33 Contact Hours	**19**	**6**	**08**	**460**	**440**	**900**

*** 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*					
	Course Title		**Internal**	**Ext.Viva**	**TOTAL**
	6-month Industrial Training		500	500	**1000**

7th / 8th Semester

CODE	SUBJECT	TH	TUT	PR	INT	EXT	TOTAL
CS-402	Computer Networks	4	1	0	40	60	100
EC-404	Optical Fiber Communications	3	1	0	40	60	100
EC-406	VLSI Design & Technology	4	1	0	40	60	100
**	Department Elective-II	3	1	0	40	60	100
***	Department Elective-III	3	1	0	40	60	100
EC-408	Lab-XIV: VLSI	0	0	2	30	20	50
EC-410	Major Project	0	0	6	180	120	300
	General Fitness	-	-	-	100	-	100
	TOTAL: 30 Contact Hours	**17**	**5**	**8**	**510**	**440**	**950**

**** 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.

AM 201 MATHEMATICS-III

Internal Marks: 40 **L T P**
External Marks: 60 **4 1 0**
Total Marks: 100

Detailed 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.

4. Partial Differential Equations Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients Applications: Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation, solution by the method of separation of variables. Laplacian in polar coordinates.

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

Higher Engineering Mathematics by BS Grewal : Khanna Publishers, 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 Nortan'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 :

Network functions, Impedance & Admittance function, Transfer functions, Relationship between transfer and impulse response, poles and zeros and restrictions, Network function for two terminal pair network. Sinusoidal network in terms of poles & zeros. Real liability condition for impedance synthesis of RL & RC circuits. Network synthesis techniques for 2-terminal network, Foster and Cauer forms.

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 propose 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_{co}, 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, piezo-electric crystal and photoelectric transducers.

5. DATA ACQUISTION 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

1. A.K. SAWHNEY- Electrical and Electronic Measurements and Instrumentation.
2. B. Stout- Basic Electrical Measurements
3. D. Cooper- Electronic Instrumentation and Measurement Techniques.

CS -252 OBJECT ORIENTED PROGRAMMING USING C++

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

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

EC-205LAB-I (ELECTRONIC DEVICES AND NETWORKS)

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

1. Study of Half wave, full wave & Bridge rectifiers.
2. Study of simple capacitive, T & π filters
3. Study of Zener regulator.
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.
8. Study of frequency response of RC coupled amplifier.
9. Study of an emitter follower circuit.
10. To plot JFET characteristics in CS configuration.
11. Study of frequency response of CS- FET amplifier.
12. Design of constant K filters.
13. Design of m- derived filters.

EC-207LAB-II INSTRUMENTATION

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

LIST OF EXPERIMENTS

1. Measurement of Inductance by Maxwell's Bridge.
2. Measurement of small resistance by Kelvin's Bridge.
3. Measurement of Capacitance by Schering Bridge.
4. Measurement of Frequency by Wein Bridge.
5. Measurement of medium resistance by Wheat Stone'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)

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

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 **L T P**
External Marks: 60 **3 1 0**
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 invertor, 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 triggerred and decked flip-flop, Registers. Type of Registers, circuit diagram, timing wave form and operations counters, counter design with state equation and state diagrams.

5. D/A and A/D Converters : Introduction, Weighted register D/A converter, binary ladder D/A converter, steady state accuracy test, D/A accuracy and resolution, parallel A/D converter, Counter type A/D converter Successive approximation A/D converter. Single and dual slope A/D converter A/D accuracy and resolution, Voltage of frequency conversion, Voltage of time conversion.

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 speriodic 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 Defination, 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.

Signal Transmission Through Linear Networks : Convolution theorem, its graphical intrepretation. Conditional function with a unit Impulse function. The sampling theorem low pass and band pass network, matched filter, input output relations with random inputs, envelope detector, equivalent noise band width Noise. Introduction to thermal noise, shot noise partial noise, low frequency or flicker, Gaussion Noise, burst noise, avalanche noise bipolar transistor noise, F.E.T. noise, Equivalent input noise signal to noise ration, noise factor, amplifier input noise in terms of F-Noise factor or amplifiers, Noise temperature, Noise equivalent Bandwidth, Noise fig. Experimental determination of noise figure, Pulse response & Digital No. & elimination.

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

1. Introduction Review of Electrostatic and Magnetostatics.

2. Time Varying Fields Maxwell's equations in differential and integral forms concept of displacement current. Boundary conditions.

3. Electromagnetic Waves Wave equation and its solution in different media, plane wave, Sinusoidal time variation, polarization. Reflection of waves by perfect di electronics and by perfect insulators. Surface impedance, Poynting theorem and Poynting vector.

4. Guided Waves Waves between parallel planes. TE and TM waves and their characteristics. TEM waves, velocities of propagation, Attenuation in parallel plane guides, wave impedance.

5. Transmission Lines Circuit representation of parallel plane transmission lines. Parallel plane transmission line with losses. Law loss RF and UHF transmission lines. Distortionless condition. Transmission line charts-impedance matching.

6. Wave Guides Rectangular and circular wave guides. TE and TM waves in rectangular wave guides. Impossibility of TEM wave in wave guides. Wave impedance and characteristics impedances. Transmission line analogy for wave guides. Attenuation and factor of wave guides. Dielectric slab wave guides.

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

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

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 Pneugmatic 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. order systems. Steady state error and coefficients. Pole-zero location and stability. Routh-Hurwitz Criterion.

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

5. Frequency Domain Analysis: Closed loop frequency response, bodeplots, stability and loop transfer function. Frequency response specification relative stability, relation between time and frequency response for second order systems. A and N-circles, Log. Magnitude versus phases angle plot. Plot Nyquist criterion.

6. Compensation: Necessity of compensation series and parallel compensations, Compensating network, application of lag and lead compensation.

7. Control Components: Error detectors- potentiometers and synchronous, servo motor A.C. and D.C. technogenerators, Magnetic amplifiers.

Books Recommended

1. Modern Control Engg. by K. Ogata, Prentice Hall, New Delhi, 1974.
2. Control System Components by J.F. Gibsen, Mcgraw Hill, 1963.
3. Automatic Control System by B.C. Kuo, Prentice Hall, 3rd Ed., 1978.
4. Control System Engineering by I.J. Nagrath & Gopal, Wiley Eastern Ltd., New Delhi, 1975.

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 **L T P**
External Marks: 20 **0 0 2**
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 with and retriggering.

(b) Free running multivibrator at 1 KHz and1 Hz using 555 with 50% duty cycle. Verify the timing from theoretical calculations. 8. Design fabricate and test a switch depouncer 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 asyneronous 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 **L T P**
External Marks: 60 **3 1 0**
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 exicted 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 hetro-dyne receiver, AM receiver using a phase locked loop (PLL), AM receiver characteristics.

FM Transmission: FM allocation standards, generation of FM by direct method, varactor diode Modulator, Cross by Direct FM Transmitter, Phase-Locked-Loop Direct FM Transmitter, Indirect generation of FM; Armstrong method, RC phase shift method, Frequency stabilised reactance FM transmitter.

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.

SSB Transmission: Introduction, Single Side band systems, AM-SSB; Full carrier, Suppressed carrier , reduced carrier, Independent side band, and Vestigial side band, Comparison of SSB Transmission to conventional AM, Generation of SSB; Filter method, Phase Shift Method, Third Method.

SSB Reception: SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Single Side band receivers; Single side band BFO Receivers, Coherent Single side band BFO Receivers, Single Side band Envelop detection receiver, Multi Channel Pilot Carrier SSB 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:

1. Wayne Tomasi, "Electronic Communication System Fundamentals through Advance" 4th Edition Pearson Education.
2. Symon Hykens "Analog Communication Systems" John Wiley & Sons .
3. Taub & Schilling "Principles of Communication System" Tata Mc-Graw Hill.
4. Roody Coolean "Electronic Communication Systems" PHI.

ME-251 TOTAL QUALITY MANAGEMENT

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

Detailed Contents

1. Quality and Total Quality Management; Excellence im 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.
3. Just-in-time (JIT): Definition: Elements, benefits, equipment layout for JIT system, Kanban system MRP (Material Requirement planning) vs JIT system, Waste elimination, workers involvement through JIT: JIT cause and effect chain, JIT implementation.
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.
9. Benchmarking definition, concept, process and types of benchmarking.
10. Quality Systems: Concept of quality system standards: relevance and origin of ISO 9000; Benefits; Elements of ISO 9001, ISO 9002, ISO 9003.
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
3. Total Quality Management Handbook by J.L. Hradeskym MCGraw Hill
4. ISO 9000 quality System by Dalela and Saurabh, standard Publishers

EC-303 Antenna and Wave Propagation

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

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

2. **Fundamental Parameters of Antenna**: Radiation Pattern, Radiation Power Density, Radiation intensity, Directivity, Gain, Antenna efficiency, Beamwidth, Bandwidth, Polarisation, Antenna Input Impedance, Elementary idea about self and mutual impedance, Radiation efficiency, Effective aperture, Antenna Temperature.

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.

4. **Antenna Arrays:** Array of two point sources, Array factor, n-element linear array with uniform amplitude and spacing, Analysis of Broadside array, Ordinary end-fire array, Hansen-woodyard end fire array, n-element linear array with non-uniform spacing, , Analysis of Binomial and Dolph-Tschebyscheff array, Scanning Array, Superdirective array.

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:

1. Antenna Theory , Balanis C.A ,John Wiley & sons.
2. Electromagnetics and radiating systems, Jordan E.C.,PHI.

Reference Books:

1. Antenna and radio wave propagation, Collins R.E., McGraw Hill.
2. Antenna Theory , Krauss J.D.,McGraw Hill.

EC-305 LINEAR INTEGRATED CIRCUITS

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

DIFFERENTIAL AND CASCODE AMPLIFIERS: Introduction, Differential Amplifier, Differential Amplifier Circuit Configuration, Dual Input-Balanced output Differential Amplifier, Dual Input-Unbalanced output Differential Amplifier, Single Input-Balanced output Differential Amplifier, Single Input-unbalanced output Differential Amplifier with their DC and AC analysis, Differential Amplifier with swamping resistors, Constant current bias, Current Mirror, Cascaded differential Amplifier Stages, Level Translator, CE-CB configuration.

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, Effcet 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.

FREQUENCY RESPONSE OF AN OP-AMP: Frequency response, Compensating Networks, Frequency response of Internally compensated Op-Amps, Frequency response of Non-compensated Op-amps, Closed loop frequency response, Slew rate, causes of slew rate and its effect on applications

APLICATIONS OF OP-AMP: DC and AC amplifiers, Peaking Amp, Summing, Scaling and Averaging Amp, Instrumentation Amplifier, V to I and I and to V converter, Log and Antilog Amp, Integrator, Differentiator. Active filters: First order LP Butterworth filter, Second order LP Butterworth filter, First order HP Butterworth filter, Second order HP Butterworth filter, Higher order filters, Band pass filter, Band reject filters, All pass filter, Phase shift oscillator, Wein bridge oscillator, Quadrature oscillator, Square wave generator, Triangular wave generator, Sawtooth wave generator, Voltage controlled oscillator, Basic comparator, Zero crossing detector, Schmitt trigger, window detector, V to F and F to V converters, A to D and D to A converters, Peak Detector, Sample and Hold Circuit.

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:

1. Op Amps & Linear Integrated circuits by Ramakant Gayakwad.

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

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

8085 Microprocessor: 8085 MPU, Memory Interfacing, Memory mapped I/O and peripheral mapped I/O 8085 Microprocessor Programming model. Intrduction 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

Linear Wave Shaping: High Pass circuits, Response to Standard waveforms, Differentiator, Double differentiation, Low pass circuits, response to standard waveforms, Integrator, Attenuator, RLC circuits, Ringing circuits.

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

EC-311 Lab-VII Analog Communication Systems

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

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.
4. Generation of DSB-SC signal using balanced modulator.
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 lsamples 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 CIRUITS

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

List Of Experiments:

1. To study differential amplifier configurations.
2. To measure the performance parameters of an Op amp.
3. Application of Op amp as Inverting and Non Inverting amplifier.
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
7. Design differentiator and Integrator using Op-Amp.
8. Application of Op Amp as Log and Antilog amplifier
9. Design Low pass, High pass and Band pass 1^{st} order butterworth active filters using Op Amp.
10. Design Phase shift oscillator using Op-Amp.
11. Design Wein Bridge oscillator using Op-Amp.
12. Application of Op Amp as Sawtooth wave generator.
13. Application of Op Amp as Zero Crossing detector and window detector.
14. Application of Op Amp as Schmitt Trigger.
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.
16. Design a delay circuit using 555.
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 **L T P**
External Marks: 20 **0 0 2**
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 **L T P**
External Marks: 60 **3 1 0**
Total Marks: 100

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, Gyrator), Cavity resonator, Matched termination.

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

Introduction to Radar Systems: *Basic Principle:* Block diagram and operation of Radar, Radar range Equation, PRFs and Range Ambiguities, Applications of Radar.

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
2. Microwave Engg: K.C Gupta

EC-304 DIGITAL COMMUNICATION

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

Digital Transmission: Introduction, Advantages of Digital Transmission, Pulse Code Modulation; PCM Sampling, Sampling Rate, Aliasing, quantisation error, Uniform and Non uniform quantization, Dynamic Range, Coding efficiency, A law & μ law companding, Bandwidth of PCM, Block diagram of PCM system, Delta Modulation, Continuously variable Slope Delta Modulator (CVSDM) or Adaptive Delta Modulation, Differential Pulse Code Modulation, Intersymbol Interference, Eye Patterns, Signal power in binary digital signals.

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, Non-coherent ASK Detector, Frequency Shift Keying (FSK), FSK Bit Rate and Baud, Bandwidth and Frequency Spectrum of FSK, FSK Transmitter, Non-coherent 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, $\pi/4$ QPSK, Comparison of conventional QPSK, Offset QPSK and $\pi/4$ 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:

1. Communication Systems, Fourth Edition, Simon Haykin, Wiley publication.
2. Electronic Communication Systems, Tomasi, 4th edition, Pearson Publications.

Recommended Reference Books:

1. Modern Electronic Communication, (6th edition), by Gary M. Miller, published by Prentice-Hall, 1999
2. Introduction to Communication Systems, third edition, by F. G. Stremler, Addison-Wesley, 1990.
3. Digital Communication, E.A. Lee and D.G. Messerschmitt, , Kluwer Academic Publishers,1994
4. Digital Communication Receivers, H. Meyr, M. Moeneclaey, S.A. Fechtel, Wiley, 1998
5. Digital Communications/Mc Graw Hill 2nd Ed, ProakisJ.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 Microocntroller 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

CE-216 ENVIRONMENTAL SCIENCE

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

Unit 1 : The Multidisciplinary nature of environmental studies

Definition, scope and importance

(2 Lectures)

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 loass, 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 rahabilitation 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 (Preventation 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.

(7 lectures)

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 **L T P**
External Marks: 60 **4 1 0**
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 equqtion.

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.

Design of digital filters: Fundamentals of filter design, Design of FIR filter using Window method,Design of IIR filter by Impulse invariance, bilinear transformation and matched Z transform technique.Analog amd digital domain frequency transformation.

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 gananpriya; 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 **L T P**
External Marks: 60 **3 1 0**
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.

Cellular Wireless Communication Systems: Second generation cellular systems: GSM specifications and Air Interface - specifications of various units, 2.5 G systems: GPRS/EDGE specifications and features, 3G systems: UMTS & CDMA 2000 standards and specifications

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:

1. Mobile Cellular Telecommunications; 2nd ed.; William, C Y Lee McGraw Hill
2. Wireless and Digital Communications; Dr. Kamilo Feher (PHI)
3. T.S. Rappaport, “Wireless Communication, principles & practice”, PHI, 2001.

DE-1.2

MICROELECTRONICS

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

INTRODUCTION: Advantages of IC's, General classification of IC's(Linear/Digital IC's , Monolithic/ Hybrid IC's), Basic IC fabrication steps

CRYSTAL GRTOWTH 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 PHOTOLITHOGRAPHY AND ETCHING, Pattern generation/Mask making, Contact and Proximity printing, Photoresistsl, 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 **L T P**
External Marks: 60 **3 1 0**
Total Marks: 100

Introduction: Introduction to Human Resource Management and its definition, functions of Human Resource Management & its relation to other managerial functions. Nature, Scope and Importance of Human Resource Management in Industry, Role & position of Personnel function in the organization.

Procurement and Placement: Need for Human Resource Planning; Process of Human Resource Planning; Methods of Recruitment; Psychological tests and interviewing; Meaning and Importance of Placement and Induction, Employment Exchanges (Compulsory Notification of vacancies) Act 1959, The Contract Labour (Regulation & Abolition) Act 1970.

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.

The Compensation Function: Basic concepts in wage administration, company's wage policy, Job Evaluation, Issues in wage administration, Bonus & Incentives, Payment of Wages Act-1936, Minimum Wages Act-1961

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.

Maintenance: Fringe & retirement terminal benefits, administration of welfare amenities, Meaning and Importance of Employee Safety, Accidents-Causes & their Prevention, Safety Previsions under the Factories Act 1948; Welfare of Employees and its Importance, Social security, Family Pension Scheme, ESI act 1948, Workmen's Gratuity Act 1972, Future challenges for Human Resource Management.

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 **L T P**
External Marks: 60 **3 1 0**
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 transfo+rms, 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:

1. Gary Johnson, Labview Graphical Programming second edition, MC GrawHill, Newyork, 1997.
2. Lisa K.Wells & Jeffrey Travis, Labview for everyone, Prentice Hall, New Jersey, 1997.

DE-1.5

NEURAL NETWORKS AND FUZZY LOGIC

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
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 algorethm, Kohonen's feature maps.

Radial Basis: Function neural networks, basic learning Laws in RBF nets, Recurrent networks, recurrent back propagation, Real Time Recurrent learning algorithm. Introduction to counter Propagation networks, CMAC networks, ART networks.

Applications of neural nets such as pattern recoginition: 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, defuzzication techniques, basic fuzzy inference algorithm, Applications of fuzzy logic, Fuzzy system design, Implementation of fuzzy system, Useful tools supporting design.

Recommended Text Books:

1. Fuzzy Systems Design Principles, Building Fuzzy IF-THEN Rule Bases By Riza C. Berkin & Trubatch, JeeeBcss
2. Vegna Narayanan - Artificial Neural Networks
3. Bart Kosko - Neural Networks & Fuzzy Logic
4. Simon Haykin - Neural Networks

EC-310

LAB X: MICROWAVE Engineering

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

L T P
0 0 2

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.
3. Measurement of klystron characteristics. 4. Measurement of VSWR and standing wave ratio.
4. Measurement of Dielectric constants.
5. Measurement of Directivity and coupling coefficient of a directional coupler.
6. Measurement of Q of a cavity.
7. Calibration of the attenuation constant of an attenuator.
8. Determination of the radiation characteristics and gain of an antenna.
9. Determination of the phase-shift of a phase shifter.
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 **L T P**
External Marks: 20 **0 0 2**
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.
6. Study of amplitude shift keying modulator and demodulator.
7. Study of frequency shift keying modulator and demodulator.
8. Study of phase shift keying modulator and demodulator.
9. Error Detection & Correction using Hamming Code
10. Digital link simulation; error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ComSim.

EC-314
Lab XII Micro controller

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

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 excercises 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 **L T P**
External Marks: 60 **4 1 0**
Total Marks: 100

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.

Comminication 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 & congesition 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

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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:

1. William Stallings "Computer Networking with Internet Protocols And Technology", Pearson Education.
2. Keneth C. Mansfield, Jr. James L. Antonakos "An Introduction to Computer Networking", PHI.

EC-404

Optical Fiber Communications

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

1. **Introduction:** Need of Fiber Optic Communications, Evolution of Light wave Systems, Basic Concepts; Analog & Digital Signals, Channel Multiplexing, Modulation Formats, Optical Communication Systems, Light wave System Components; Optical Fibers as a Communication Channel, Optical Transmitters, Optical Receivers.

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

3. **Optical Transmitters:** Basic Concepts; Emission and Absorption Rates, p-n Junctions, Non radiative Recombination, Semi conductor Materials, Light Emitting Diodes; Power-current Characteristics, LED spectrum, Modulation Response, LED Structures, Semi Conductor Lasers; DFB Lasers, Coupled Cavity semiconductor Lasers, Tunable Semiconductor Lasers, Vertical Cavity Semiconductor Lasers, Laser Characteristics, Small & Large Signal Modulation, Spectral Line width, Source Fiber Coupling.

4. **Optical Receivers:** Basic concepts, p-n Photo Diodes, p-i-n Photo Diodes, Avalanche Photo Diode, MSM Photo detector, Receiver Design, Receiver Noise; Noise mechanism, Receiver sensitivity; Bit error rate, Minimum Receiver Power, Sensitivity Degradation, Receiver Performance.

5. **Light Wave Systems:** System Architecture, Loss limited Light wave systems, Dispersion limited Light wave systems, Power Budget, Long Haul systems, Sources of Power Penalty; Model Noise, Dispersive Pulse Broadening, Mode Partition Noise, Frequency Chirping, Reflection Feedback Noise.
6. **Multi channel Systems:** WDM Light wave systems, Optical TDM Systems, Subscriber Multiplexing, Code Division Multiplexing.

Text Books:

1. Govind P. Agrawal, Fiber Optics Communication Systems John Wiley & Sons (Asia) Pte Ltd.
2. Senior J. Optical Fiber Communications, Principles & Practice, PHI.
3. Keiser G., Optical Fiber Communication Mc graw-hill.

EC-406

VLSI DESIGN & TECHNOLOGY

Internal Marks: 40 **L T P**
External Marks: 60 **4 1 0**
Total Marks: 100

Introduction: Introduction to Computer-aided design tools for digital systems. Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, Logical operators. Types of delays, Entity and Architecture declaration. Introduction to behavioural, dataflow and structural models.

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:

1. IEEE Standard VHDL Language reference Manual(1993)
2. Digital Design & Modelling with VHDL & Synthesis : KC Chang; IEEE Computer Society Press.
3. “A VHDL Primmer”: Bhasker; Prentice Hall 1995
4. “Digital System Design using VHDL”:Charles. H. Roth; PWS(1998)
5. “VDHL-Analysis & Modelling of Digital Systems”: Navabi Z; McGraw Hill
6. VHDL-IV Edition:Perry; TMH(2002)
7. “Introduction to Digital Systems”: Ercegovac. Lang & Moreno; John wiley(1999)
8. Fundamentals of Digital Logic with VHDL Design: Brown and Vranesic; TMH(2000)
9. Modern Digital Electronics-III Edition : R.P Jain; TMH(2003)

EC-408

VLSI DESIGN LAB

Internal Marks: 30 **L T P**
External Marks: 20 **0 0 2**
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 Substractor, Full Substractor
6. Design of 3:8 Decodre
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.
14. Design of Synchronous 8-bit Johnson Counter.
15. Design of Synchronous 8-Bit universal shift register (parallel-in, parallel-out) with 3-state output (IC 74299)
16. Design of 4 Bit Binary to BCD Converter using sequential statement.
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

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

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:

1. Power Electronics - P.C. Sen, Tata McGraw Hill Publishing Co., Ltd., 1987.
2. Power Electronics and Control - S.K. Dutta, Prentice Hall of India Pvt. Ltd., 1986.

DE-2.2

Wireless Communication Systems & Networks

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
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 characterstics- 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 ALLOHA, Capacity of Cellular Systems

Wireless Networking: Introduction, Difference between Wireless & Fixed Telephone Networks, Development of Wireless Networks, Traffic Routing in Wireless Networks, Wireless Data Services, Common Channel signaling, Broad band ISDN & ATM, Signaling System No. 7(SS-7), Personal Communication Services/ Networks, Protocols for Network Access, Network Databases.

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); Frquency and Channel specifications, Forward CDMA Channel,

Reverse CDMA Channel, CT2 Standard for Cordless Telephones, Personal Access Communication System, Pacific Digital Cellular, Personal Handyphone Systems, PCS and ISM Bands, Wireless Cable Television.

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:

1. Theodore S.Rappaport, “Wireless communications:Principles and practice”, third Indian reprint Pearson Education Asia 2003.
2. Raj Pandya, “Mobile and Personal Communication systems and services”, Prentice Hall of India, 2001.

DE-2.3

BIO-MEDICAL ELECTRONICS

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

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, Angio graphy, flour scopy.

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:

1. Medical Instrumentation : Application & Design - John G. Webster, Houghton Miffin & Co., Boston, 1978.
2. Biomedical Instrumentation - Marvin D. Wwirs, Chilton Book Co., London, 1973.

DE-2.4

MECHATRONICS

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

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

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

Mechanical Systems For Electronics Engineers: Concepts, Materials & its Science, Heat Treatment, Electrochemistry, Electroplating, Splinter, Bearings, Measuring Systems, Control Systems, Software & Interfaces, Ganging, Guideways, Feedback Elements, Hydraulics.

Electrical Systems: AC & DC Drives, Spindle drives, Motors, Feed drives, Servo Principle, Wiring of Cabinets.

Cnc Systems: Introduction; Configuration; Interfacing; Monitoring; Diaagnostics; 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 **L T P**
External Marks: 60 **3 1 0**
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.

Depreciation: Introduction, classification, methods of calculation of depreciation, depletion.

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.

Book – Keeping: Necessity of book-keeping, terms used, systems of book-keeping, classification of assets, trial-balance, profit- loss a/c, balance sheet.

Cost Estimation: Introduction, prerequisites of estimation, estimation of material & labour cost, estimate/cost sheet.

Books Recommended:

1. Jain, Narang & Dhinjra “Cost Accounting”
2. S. P. Aggarawal & P.C. Jain (New Age Pub) “Advanced 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 **3 1 0**
Total Marks: 100

Operating System Concepts An Introduction: What is an OS, Need of OS, Different views of an OS, Evolution of OS, Batch Processing, Multiprocessing, Multiprogramming, Time Sharing, Real Time Systems, Network OS, Parallel Processing, Distributed Processing.

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

Introduction to process: Concept of process, Process states and there transitions, PCB, Process Scheduling, Operations on process: Process creation and termination, Threads: User level and kernel level threads.

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, Recognization 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.

File System Interface & implementation: File concepts, File naming, File attributes, File access methods, Directory structure.

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.

Protection & Security Introduction: Introduction, Goals of protection, Access rights, Access matrix, Security & its goals, Authentication, Passwords, Encryption, Viruses, worms, Dealing with viruses.

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 **L T P**
External Marks: 60 **3 1 0**
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 & Homo-morphic 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:

1. Fundamentals of electronic image processing by Arthur R. Weeks, Jr., Eastern Economy Edition 2003, SPIE Press, Prentice hall of India New Delhi.

Reference Books:

1. Digital Image Processing by Rafael C. Gonzale & Richard E. Woods, Pearson Education Asia(2nd edition 2002)
2. Fundamentals of digital image processing by A.K.Jain, 1989, Prentice Hall Englewood Cliffs, N.J.

DE-3.3

SATELLITE COMMUNICATION

Internal Marks: 40 **L T P**
External Marks: 60 **3 1 0**
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 chaanel 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	**3 1 0**
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.

Maintainability And Availability: Maintainability and its equation, Factors affecting maintainability, Measures of maintainability, Mean Down Time, Availability intrinsic availability equipment availability & Mission availability, Replacement Process and Policies.

Life Testing of Equipments: Non destructive tests, Destruction tests and their mathematic modelling, Quality and Reliability, Measurement & Prediction of Human Reliability, Reliability and safety, Safety margins in critical devices, Case studies.

Value Engineering: Techniques in value Engineering structures of Engg. Reliability Management.

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

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

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 Design specifications for T.V. receiver in India, R. F. tuner, Block diagram of V.H.F tuner, types of tuners, transistor tuners, video I.F. amplifier, synchronisation and staggered tuning, inter stage coupling methods, types of trap circuits, transistor video I.F. amplifier circuits , video detector, D.C. component restoration, sound I.F. take off, video amplifier requirements, low frequency compensation, H. F. compensation ,A G.C- its types, and E.H.T. generation, synchronising circuits and control oscillators, horizontal deflection circuits, vertical deflection circuits, alignment of monochrome and colour T.V. 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:

1. Television Engg. - By Dhake Arvind, M. Tata McGraw hill
2. Television simplified - Milton S. Kilver
3. Basic Television Principles and servicing - Bernard Grob. McGraw Hill
4. Principles of Television Engg. - Fink. McGraw Hill
5. Principles of Monochrome of colour television - R. R. Gula