CE/CS/EB/EC/EE/EI/IT/ME/MRE/SE 301ENGINEERING MATHEMATICS-III

Module I

Fourier series and Fourier integrals: Periodic functions, Euler formulae for Fourier coefficients, functions having arbitrary period, even and odd functions, half range expansions, Fourier integral, Fourier cosine and sine transformations,linearity property, transform of derivatives, convolution theorem (no proof)

Gamma and Beta functions, error functions - definitions and simple properties.

Module II

Special functions: Legendre polynomial, Rodrigue's formula- generation function, recurrence formula for Pn (x), orthogonality. Bessel function, Jn(x)- recurrence formula, general function, orthoganilty.

Module III

Partial differential equations: Solutions of equations of the form F(p, q) = 0, F(x,p,q)=0, F(y,p,q)=0, F(z,p,q)=0, $F_1(x,p) = F_2$ (y,q), Lagrange's form Pp+Qq = R.

Vibrating string : one dimensional wave equation, D'Alembert's solution, solution by the method of separation of variables. One dimensional heat equation, solution of the equation by the method of separation of variables, solutions of Laplace's equation over a rectangular region and a circular region by the method of separation of variables.

Module IV

Probability and Statistics: Probability distributions: random variables (discrete & continuous), probability density, mathematical expectation, mean and variance of a probability distribution, binomial distribution, Poisson approximation to the binomial distribution, uniform distribution , normal distribution

Curve fitting: method of least squares, correlation and regression, lines of regression.

Module V

Sampling distributions: population and samples, the sampling distribution of the mean (? known), the sampling distribution of the mean (? unknown), the sampling distribution of the variance, point estimation, interval estimation, tests of hypotheses, null hypotheses and significance tests, hypothesis concerning one mean, type I and type II errors, hypotheses concerning two means.

The estimation of variances :Hypotheses concerning one variance - Hypotheses concerning two variances.

Note: Treatment of the topics under Modules IV, V should be oriented towards application of statistical techniques to problems in real life.

References:

1. Ervin Kreyszig : Advanced Engineering Mathematics, Wiley Eastern
2. Potter, Goldberg : Mathematical Methods, Prentice - Hall
3. Churchill R.V. : Fourier series and Boundary Value Problems - McGraw Hill
4. Irvrin Miller & Freind : Probability and statistics for Engineers , Prentice Hall of India.
5. Bowker and Lieberman : Engineering Statistics Prentice - Hall
6. Kirk - Patrick : Introductory statistics and probability for engineering science and technology , Prentice -Hall
7. Parzen E : Modern Probability Theory and its Applications, Wiley estern.

CS/EB/EC/EI/IT/ME/MRE 302 ELECTRICAL TECHNOLOGY

Module I

Transformers : working principles and elementary theory of an ideal transformer, Constructional features of single phase transformer, emf equation, turns ratio, vector diagram , equivalent circuit, impedance transformation, transformer losses, flux leakage, efficiency, open circuit and short circuit test, load test. Auto transformer - working principle and saving copper, basic idea of current transformer and potential transformer, distribution and power transformer, applications , standard rating, IS specifications.

Module II

Basic principles of electrical machines: Concepts of motoring and generating action,

DC machines- Main constructional features, principles of operation, types of generators, emf equation, characteristics , applications, armature reaction and commutation, types of motors, torque, speed, and power, characteristics, applications, starting losses, and efficiency, speed control, testing, load test of dc machines.

Module III

AC Machines : Alternator- rotating field, speed and frequency, effect of distribution of winding, coil span, characteristics, emf equation, losses and efficiency, regulation (emf method only) ,applications, synchronous motor- principle of operation, over excited and under excited, starting, applications, synchronous capacitor.

Module IV

Induction Motor: Three phase induction motor, principles of operation, constructional features of squirrel cage and slip ring motors, torque-slip characteristics, starting, speed control, losses and efficiency.

Single phase induction motor: Principle of operation, types of single phase induction motors

Module V

Generation, transmission & distribution of electrical energy:

Different methods of power generation- thermal, hydro-electric, nuclear, diesel, gas turbine stations(general idea only), electrical equipments in power stations, concept of bus bar, load dispatching, methods of transmission, transmission lines, overhead lines and insulators, corona and skin effect of DC & AC distribution, substation (elementary idea only)

References.

Electrical Machines : By F.S.Bimbra, Khanna publications.

Advanced Electrical Technology : By H.Cotton, Wheeler publications.

Electrical Machines : Nagarath & Kothari, (TMH)

EC 303 NETWORK THEORY

Module I

Review of basic circuit concepts - Classification of circuits ,passive circuit elements, characteristics, sources definition of Graphs, cutsets and loops, true, incidence matrix Node and Mesh analysis by inspection : Application of graph theoretic methods to formulation of network equations - Two port networks - Characterisation in terms of hybrid and transmission parameters , Inter-connection of 2 ports - series , parallel and cascade.

Module II

Signal representation in time domain and frequency domain : Representation of a wave using Fourier expansion. Characteristics of signals - Unit step function , impulse, ramp functions and non sinusoidal signals, Network response in time domain.

Module III

Laplace Transform – Transfer function of linear systems Transients in linear circuits - Initial conditions - Rise and decay of current in RL circuit - Time constant - RC circuits with - impressed DC voltage - RL and RC circuits with applied sinusoidal voltage - DC transients in RLC circuits - Damping

Module III

Network transmission criteria : Signal distortion in transmission - relationship between bandwidth and rise time, delay time and network function - Filters : analysis of constant K and M derived filters .-

Module IV

Transmission lines: Types, Basic differential equations for V and I , Lumped parameter model, characteristic Impedence, propagation constant, phase and group velocities; Steady state response of lines: Relation ship between sending end and receiving end parameters, Impedence at a point, Impedence transformers, standing waves, Standing wave ratio, VSWR

References :

1) Roy C. choudhary "Network Analysis ,"
2) Pottie & Fitch ,"Theory of network and linear systems", Asian Publishing House
3) Van Valkinburg ,"Network Analysis" Indian Publishing House
4) Rider ,"Network Lines and Fields"
5) C A Demoor and E J Kah ,"Basic Circuit Theory"
6) Ruston and Burdogen ,"Electronic Network, Functions , Filters, Analysis"
7) N C Gupta , J W Daylogi ,"Circuit Analysis"
8) Sudhakar "Circuits &Networks Analysis & Synthesis" TMH

CS/EB/EC/EE/EI 304 DIGITAL ELECTRONICS

Module I

Number system and codes : Binary , Octal, and Hexa-decimal number systems - Binary arithmetic, Binary coded Decimal , Excess - 3 code GrayCode Error detection and correction - Boolean algebra - Minimization of Boolean function using Karnaugh Map and Quine - McClusky methods - Formation of switching functions from word statements , realisation using NAND, NOR & X - OR Gates . Combinational circuits- multiplexer demultiplexer decoder encoder

Module II

Sequential circuits : Flip-flops - RS , JK & T & D flip- flops , shift registers - counters - Asynchronous and synchronous counters , Up-Down counter, Modulo counter, Ring counter, Johnson counter - sequence generators - Analysis of sequential circuits - state table and diagrams

Module III

Arithmetic circuits : Half adder, Full adder , Subtractor, Serial and parallel addition - Carry look ahead adder - Binary multiplication and division - Multivibrators - Monostable and astable multivibrators using discrete gates .

Module IV

Memories – Static and Dynamic, ROM, RAM, EPROM, Flash Memmory, , Programmable logic array, devices - Basic ideas - PLD architecture - PAL and PLA

Module V

Logic families: DCTL, RTL, DTL, TTL, ECL, CMOS - Tri-state logic - specification and transfer characteristics of basic TTL - Standard logic levels - Current and voltage parameters - fan in and fan out - Propagation delay, noise consideration- interfacing of CMOS to TTL and interfacing of TTL to CMOS

References :

1) Taub & Schilling, “Digital Integrated Electronics”, Mc Graw Hill
2) Samuel C Lee , ”Digital Circuits and Logic Design”, Prentice Hall
3) A P Malvino ,”Digital Computer Electronics”, Tata Mc Graw Hill
4) Morris & Miller, “Design with TTL Integrated Circuit”, Mc Graw Hill
5) Peatman , ”Digital Hardware Design”, Mc Graw Hill
6) Ronald J Tocci , “Digital Systems, Principles and Applications “, Prentice Hall

EB/EC/EE/EI 305 SOLID STATE ELECTRONICS & CIRCUITS

Module I

Band theory of solids - Conductors , semiconductors and insulators - energy band diagram. -Semi conductor materials and their properties: elemental semiconductors- the energy band model of semiconductors. valance band model of semiconductor equilibrium concentration of electrons and holes- the fermi level and energy distribution of carriers inside the bands- temperature dependence of carrier concentration inside the bands. - Carrier transport in semi conductors - drift of carriers in electric fields, carrier flow by diffusion - constancy of fermi level across junction , Excess carriers in semi conductors - injection of excess carriers - recombination of excess carriers - continuity equation - current flow equation.

Module II

PN junction- Abrupt PN junction - energy band diagram - barrier potential, biasing PN junction, excess carrier calculation - current components diffusion - drift - boundary conditions for long and short diodes - PN junction characteristics - calculation of diffusion – dep;etion layer capacitance - simple model - principle of zener and avalanche diodes - photodiodes -LDR - tunnel diode and PIN diode -varactor diode.

Module III

Bipolar junction transistors - NPN, PNP types , Basic structures - biasing - mechanism of carrier flow - current components in transistors boundary conditions in active region - solution for short base width - basewidth modulation - Transistor configurations - Characteristics - current amplification factors - relations between alpha & beta - comparison Ebbers - Moll model - Field effect transistors : JFET - basic structures - principle of operation - Characteristics and current equation - basic principles of phototransistors - UJT, characteristics.

Module IV

MOSFET - semiconductor surfaces - C - V characteristics - the Si - SiO2 System - basic structures and operating principles - current equation - V-I characteristics - simple model - CMOS. Compound semiconductor - semiconductor heterojunctions - V-I characteristics - real heterojunctions - frequency limitation of transistor - transit time effect - heterojunction bipolar transistor.

Module V

DC power supplies - power transformers - rectification - half wave , full wave, bridge - expression for ripple factor, efficiency, comparison, diode ratings. filters - capacitor - inductor LC filters- use of bleeder resistor - voltage multipliers - dual power supplies - simple voltage regulator. Series regulators - IC regulators.

Text Books:-

1) Streetman , “Solid State Electronics Devices”, Pearson Education, (Module I to IV)
2) Ramanan,” Functional Electronics” (Module V)

References

1) “Electronic Devices “, Learning Material Series, ISTE, NewDelhi 1997
2) Electronic Devices & Circuits, Millman & Halkias
3} Solid state electronics IV th edition, George B Rutkowski, Mc Graw Hill

EB/EC/EI 306 BASIC ELECTRONICS LABORATORY

1. Study of - Multimeter, Signal generators, CRO etc. and measurement of electrical quantities (V,I,FREQUENCY,PHASE)

2. Testing of Passive and Active components - Resistors , Capacitors, inductors , Transformers , diodes, Transistors, etc.

3. Characteristics of Active devices
   i) Forward and reverse characteristics of a diode - measurement of forward resistance
   ii) Common base characteristics of a transistor - measurement of current gain, input resistance and output resistance, maximum ratings of the transistor.
   iii) Common emitter characteristics of a transistor - measurement of current gain, input resistance and output resistance, relation between and study of the effect of leakage current, maximum ratings of the transistor.
   iv) Common source characteristics of a JFET - measurement of transconductance gm and drain to source resistance r ds , use of FET as VVR.

4. Rectifying circuits
   i) HW rectifier
   ii) FW rectifier
   iii) FW Bridge rectifier
   iv) Filter circuits - Capacitor filter, inductor filter and Pi section filter
   (Measurement of ripple factor, maximum ratings of the devices)

5. Clipping and clamping circuits using diodes / transistors

CS/EB/EC/EI 307 ELECTRICAL **LABORATORY.**

Compulsory experiments

1. (a) Preliminary study of AC and DC Power supplies in the laboratory.
   (b) Study of instruments and their mode of use
2. Open circuit characteristics of
   (a) Self excited generator
   (b) Separately excited generator.
3. Load characteristic of compound generator
4. Load characteristic of shunt generator
5. Study of face plate starter and starting of DC motors
6. Load characteristics of DC series motor.
7. Swinburn's test
8. Polarity and transformation ratio test on single phase transfer.
9. O.C & SC test on single phase transformer - equivalent circuit
10. Load rest on single phase transformer.
11. Study of starting methods of squirrel cage and slip ring induction motor.
12. Load test on slip ring induction motor and study of characteristics.

Optional Experiments

1. Study of single-phase motors.
2. Load test of DC shunt motor.
3. Poly phase connection of single phase transformer.
4. Load test on squirrel cage induction motor
5. Study of alternators.

CE(A)/CS/EB/EC/EE/EI/IT/ME/SE 401 ENGINEERING MATHEMATICS IV

Module I

Complex Analytic functions and conformal mapping : curves and regions in the complex plane, complex functions, limit, derivative, analytic function, Cauchy - Riemann equations, elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions.

Conformal mapping: Linear fractional transformations, mapping by elementary functions like e^z, sin z, cos z, sin hz, and cos hz, Schwarz - Christoffel transformation.

Module II

*Complex integration***:** Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's series, Laurent's series, residue theorem, evaluation of real integrals using integration around unit circle, around the semi circle, integrating contours having poles, on the real axis.

Module III

Numerical Analysis : Errors in numerical computations, sources of errors, significant digits.
Numerical solution of algebraic and transcendental equations: bisection method, regula falsi method, Newton - Raphson method, method of iteration, rates of convergence of these method,
Solution of linear system of algebraic equations: exact methods, Gauss elimination method, iteration methods, Gauss-Jacobi method.
Polynomial interpolation : Lagrange interpolation polynomial, divided differences, Newton's devided differences interpolation polynomial.

Module IV

Finite differences: Operators ?,? ,? , and ?,Newton's forward and backward differences interpolation polynomials, central differences, Stirlings central differences interpolation polynomial.
Numerical differentiation: Formulae for derivatives in the case of equally spaced points.
Numerical integration: Trapezoidal and Simpson's rules, compounded rules, errors of interpolation and integration formulae. Gauss quadrature formulae (No derivation for 2 point and 3 point formulae)

Module V

Numerical solution of ordinary differential equations: Taylor series method, Euler's method, modified Euler's method, Runge-Kutta formulae 4^{th} order formula,
Solution of linear difference equations with constant co-efficients: Numerical solution of boundary value problems, methods of finite differences, finite differences methods for solving Laplace's equation in a rectangular region, finite differences methods for solving the wave equation and heat equation.

Books for Reference:

1. Ervin Kreyszig : Advanced Engineering Mathematics, Wiley Eastern
2. S.S.Sastry : Introductory Method of Numerical Analysis, Prentice -Hall of India
3. Ralph G. Stanton : Numerical Methods for Science and Engg., Prentice - Hall of India
4. S.D.Conte and Carl de Boor : Elementary Numerical Analysis Analograthmic approach - McGraw Hill
5. M.K.Jani, S.R.K Iyengar and R.K. Jain : Numerical Methods for scientific and Engineering Computations. Wiley Eastern.
6. P.Kandaswamy K.Thilagavathy : Numerical Mehtods , S.Chand & Co. K.Gunavathy
7. E.V.Krishnamurthy, S.K.Sen : Numerical Algorithms, Affiliated East West.

EB/EC/EE/EI 402 ELECTRONIC CIRCUITS

Module I

Small Signal amplifiers : Units of gain, low, frequency equivalent circuits - r-parameters , h-parameters - CE amplifier - Biasing techniques - stabilization of operating point - Methods of coupling - D.C coupled amplifier - CE RC coupled amplifier - concept of load lines- loading effect at the input and output - emitter follower as Buffer stage-Boot strapping - frequency response of RC coupled amplifier -- frequency analysis of R C coupled amplifier - lower cut-off frequency - upper cut-off frequency - 3 db bandwidth - Frequency response of DC coupled amplifier.

Module II

FET Amplifier : RC coupled common source amplifier - expression for gain - frequency response - comparison with BJT - FET as a voltage variable - resistor. Multistage Amplifier : Negative and positive feedback - Different types of negative feedback amplifier - voltage shunt-voltage series - current shunt - current series .

Module III

Power amplifier -classification - class A , class B, Class AB Class C and class D - Transformer coupled class Power amplifier - Transformerless class AB push-pull Power amplifier - complementary symmetry power amplifier - Harmonic distortion in Power amplifiers - Transistor rating -Heat sinks Oscillators - Principle of sinusoidal oscillators - Bark Hausen criteria - RC oscillators - phase shift wienbridge - LC oscillators - Hartley, Colpitts -clapp oscillator -

Module IV

Pulse circuits - pulse characteristics - Pulse shaping using RC circuits - Differentiating and integrating circuits - clipping and clamping circuits using diodes and transistors - Transistor as a switch sweep circuits - Transistor sweep circuits - voltage and current sweep - Miller sweep circuit - Bootstrap sweep circuit - UJT relaxation oscillator. Multivibrators using transistors - astable - monostable and bistable operation

Module V

High frequency amplifier - Tuned amplifier - coupled circuit, unilateralisation of transistor, Q-factor, single tuned, double tuned and stagger tuned amplifier (analysis not required) - Wide band amplifier : Gain-bandwidth trade off . Wide band transistor configuration cascade emitter coupled - broad banding, bandwidth trade-off, wide band transistor configuration with negative feed back, frequency compensation - low frequency RC compensation, High fequency compensation (analysis not required)

Reference :-

1) Millman & Halkias , "Electronic Devices & Circuits"
2) Bapat K N , "Electronic Devices & Circuits"
3) Ramanan," Functional Electronics"
4) Millman & Taub, "Pulse Digital and Switching Waveforms"
3) Allan Mottorshed, " Electronic Devices & Circuits"
4) Millman & Halkias , "Integrated Electronics"
5) Boylestead & Neshelsky ,"Electronic Devices & Circuits
6) Schilling & Belove "Electronic Circuits ,Discrete & Integrated" TMH

EB/EC 403 MICROPROCESSORS

Module I

Introduction to computer architecture and organization **:**Architecture trends of Microprocessors, efficiency versus performance, Introduction to CISC processor architecture, instruction set and addressing, RISC architecture; Memory organization, allocation and management; hierarchical memory structure and virtual memory; cache memory, Operating system concepts & architectural support - CPU organization – Control Unit, registers and ALU- Components of ALU and ALU organization - Control unit- sequencing of control signals -hard wired control and microprogrammed control –Overview of machine language and assembly language programming _ overview of one pass and two pass assemblers ,compilers, editors, debuggers, emulators, simulators etc.

Module II

*Introduction to 8 bit microprocessor***:** Microcomputers and microprocessors, 8/16/32/64-bit microprocessor families;

Internal architecture of Intel 8085 microprocessor: Block diagram, Registers, Internal Bus Organisation, Functional details of pins, Control signals, Concept of external Address / Data bus multiplexing, Demultiplexing, Interrupt features, Serial communication feature, DMA support

Module III

*Assembly Language Programming***:** 8085 instruction set : Instructions , Classifications, Addressing modes, - Stack Pointer and stack organization ,programming examples (Arithmetic fns , BCD fns, Sorting, Bit/String Manipulations, Subroutines(use of stack), Interrupt related and I/O related). - I/O mapped I/O, and memory mapped I/O techniques.

Module IV

Instruction Timing and Interrupts **:**Timing Diagrams (of various instructions): T- state, Machine cycle(Opcode fetch, Read /Write, Interrupt Acknowledge ,Bus Idle, etc), Instruction cycle .Programming examples dealing with delay routines, counters etc..

Interrupts: -types (h/w and s/w), Maskable /Non maskable , their organization , timing, branch address – priority , Polling

Module V

Interfacing concepts and devices: Memory interface: Concept of memory chip/chips interface to MuP(8085) with appropriate examples -Address space- Address decoding

Programmable interfacing devices:- Programmable peripheral interface(Intel 8255), Programmable timer interface (Intel 8253/54), Programmable display /Keyboard interface(Intel 8279), Programmable serial communication interface (Intel 8251)-(their architecture, register organization, initialization , hard ware and software inter face to MuP(8085)).

Text Books:

1) Goankar ,"Microprocessors Architecture Programming and Applications ", John Wiley
2) Hamacher C V, " Computer Organisation - 3rd Edition" , Mc.Graw Hill., NewYork ,1990

References :

1) Pal Chaudhary P, "Computer Organisation and Design" , Prentice Hall, New Delhi, 1995
2) Bartee T C, "Digital Computer Fundamentals", Mc.Graw Hill, New York, 1977
3) Hayes J P , "Computer Organisation and Architecture - 2nd Edition", Mc Graw Hill, NewYork,
4) Tanenbaum A S , "Structured Computer Organisation - 3rd Edition", Prentice Hall, NewJersey,
5) Douglas V Hall , "Microprocessors & Interfacing to 8085 Introduction to", Tata Mc GrawHill
6) Ghose Sridhar , "Microprocessors for Engineers and Scientists"
7) Lance A Leventhal, "Introduction to Microprocessors" Prentice Hall

EC 404 DIGITAL SYSTEM DESIGN

Module I

Introduction to combinational modules and modular networks. Standard combinational modules design of arithmetic modules. Implementation of combinational systems with ROM's and PLA's . Comparison with other approaches. Implementation of multimodule combinational systems- decoder networks, Mux trees , demux network, encoder network. shifter network and barrel shifters

Module II

Introduction to digital systems. Synchronous and asynchronous- state diagram, state names, mealy and moor machines binary description. Time behaviour of synchronous sequential systems. Minimisation of no. of states Specification of various types of sequential system

Module III

Canonical implementation- analysis and synthesis of networks in the canonical implementation. Flip flop modules and networks. Modular sequential networks

Module IV

Standard sequential modules-Registers - shift register - counters - RAM - content addressable memories and programmable sequential arrays (PSA) - Design of sequential systems with small number of standard modules - state register and combinational networks - use of ROMs in sequential networks - Counter and combinational networks - RAM and combinational networks - SR and combinational networks.

Module V

Multimodule implementation of sequential systems - Multimodule registers - Shift registers and RAMs - Multimodule counters - Sequential arrays - Introduction to hardware / Firmware algorithms.

Text Book:

1.)Milos D Ercegovac, Tomas Lang, "Digital systems and hardware / firmware algorithm", John Wiley

References :

1) William I Fletcher, "An engineering approach to Digital Design", Prentice Hall
2) Zvi Kohavi "Switching and Finite automata Theory"TMH
3) Hayes, "Digital system Design and Microprocessors" Mc Graw Hill
4) John B Peatman, " Digital Hard Ware Design", Mc Graw Hill

EC405 COMMUNICATION ENGINEERING

Module I

Introduction - communication process, source of information, channels, Noise - System noise sources, Noise & feed back, Noise figure - Electromagnetic Spectra. base band and pass band signals, Modulation process - need, band width requirements- frequency spectra of non-sinusoidal signals. Analogue vs Digital communication, Continuous and discrete spectra - band pass system .

Module II

Modulation :,- amplitude modulation , and angle modulation Basic principles,, Mathematical relationships. frequency modulation and phase modulation - Basic principles , Mathematical relationships. Comparison between amplitude modulation , and angle modulation spectral analysis of different modulators.

Module III

Modulators- Amplitude modulator, suppressed carrier DSB modulator - Balanced modulator - SSB modulator - Filter method, phase shift method & Third method - ISB modulators Vestigial side band modulator, Frequency modulator - Direct & indirect method - narrow band FM. Phase modulator Spectral analysis of these modulators Transmitters - AM transmitter,low level and high level SSB transmitter -, pilot carrier - FM transmitter - narrow band and wide band , FM stereo transmitter.

Module IV

Receiver :- Sensitivity , selectivity , signal to noise ratio .Demodulators-diode detector-FM detectors-phase detector-ratio detector- Foster-Siely discriminator-, AM receiver-(Block level treatment) - TRF receiver, super heterodyne receiver, , Double super heterodyne receiver - SSB receiver, communication receiver, AGC circuitry , FM receiver - FM stereo receiver (block level) Carrier thresholding. Capture effect.

Module V

Introduction to wire communication - telephony-telegraphy. Telephone traffic, traffic variation, switching and signalling system, type of signalling (pulse, multifrequency, voice freq. , common channel signalling , outband signalling). Switching network, basic analog switching systems, routing calls.

References :

1) George Kennedy, " Electronic communication systems", McGraw hill
2) Taub and Schilling, " Principles of communication systems", Mc Graw Hill
3) Martin S Roden "Analog and digital Communication systems"
4) Sol Lepatine , " Electronic communication"
5) Dennis Roody and John Coolen, "Electronic communication", Prentice Hall
6) J Dunlop & D G Smith , "Telecommunication Engg ", .

CS/EB/EC/EE/EI 406 DIGITAL ELECTRONICS LABORATORY

1. Transfer characteristics and specifications of TTL and MOS gate
2. Design of half adder and full adder using NAND gates.
3. Set up R-S & JK flip flops using NAND Gates
4. Code conveters - Binary to Gray and gray to Binary using mode control.
5. Asynchronous UP / DOWN counter using JK Flip flops
6. Design and realisation of sequence generators.
7. Study of shift registers and design of Johnson and Ring counter using it.
8. Binary addition and subtraction (a) 1's complement (b) 2's complement
9. Study of IC counters 7490, 7492, 7493 and 74192.
10. Astable and monostable multi-vibrators circuit using 555
11. ADC at least one method.
12. Study of MUX & DeMUX Circuits and ICs

EB/EC//EI 407 ELECTRONICS CIRCUITS LABORATORY 1

I Study of RC and RLC circuits - Frequency responses, pulse response, Filter characteristics,

II Differentiating circuit and integrating circuit Biasing of Active devices

i) Voltage biasing, current biasing and Feedback biasing of BJT

ii) Biasing of JFET

III Amplifying circuits

(i) Simple common emitter amplifier configuration - gain and bandwidth.

(ii)Common source amplifier

Functions of each component, gain measurement, frequency responses

IV Feedback amplifier circuits - Current series and voltage shunt - gain and bandwidth..

V Oscillators - RC phase shift. Wein Bridge

VI Multivibrators - Astable , Bistable,monostable.

VII Sweep circuits - Simple transistor sweep, bootstrap sweep.

VIII Series Voltage Regulator using transistors.

EC/EE/EI 501 ELECTROMAGNETIC THEORY.

Module I

Introduction: Overview of vector analysis. orthogonal co-ordinate systems- rectangular, cylindrical, spherical transformations, Flux, circulation open and closed surface Divergence, gradient, curl, stokes theorem. Static Electric Field : Coulomb's law, superposition, scalar potential, moment method, gradient, electric field, electric flux, Gauss's law for electric flux, capacitance of sphere, concentric sphere, coaxial cable and two wire transmission line. Energy stored in a charged capacitor.

Module II

Static Electric Field - Dielectric homogeneity, linearity, isotropy, permittivity, electric dipole, polarization, boundary relations, divergence of the flux density, Laplacian Field Mapping Laplace equation, uniqueness theorem, Poisson's equation .Static Magnetic Field - Ferromagnetic Materials, magnetic dipole, permeability, hysteresis, The Static Magnetic Field of Steady Electric Currents, magnetic flux, Biot-Savart law, Ampere's law, Gauss's law for magnetic flux, boundary conditions, inductance of a coaxial cable , two wire transmission line , energy stored in a magnetic field- Magnetic vector potential .

Module III

Time varying Electric and Magnetic Fields - Faraday's law, Stokes's theorem, self and mutual inductance, eddy current, displacement current. Maxwell's Equations integral & differential form - General solution of wave equation in free space - uniform plane waves - TEM waves -relation between electric and magnetic fields, phase velocity and group velocity - Plane waves in a lossy medium. Skin depth ,propagation constants and intrinsic impendence - Time harmonic fields - solutions of wave equations.

Module IV

Poynting theorem – real and complex Poynting vector – interpretation - application of pointing theorem - power flow in transmission lines, uniform plane waves. Wave polarization, Reflection of plane waves at plane boundaries - normal and oblique incidence – refraction - transmission -snells law -critical angle -Brewster angle -total internal reflection - evanescent wave concept. Guided waves –TE,TM,TEM waves, Velocity of propagation ,attenuation-wave impedance.

Module V

Transmission lines: analogy between circuit theory & EM theory. Uniform transmission line - V I solution - characteristic impedance. Terminated uniform transmission line- VSWR -impendence matching quarter wave and half wave length transformer, stub matching -single stub matching, double stub matching and tuning - pulses on a transmission line- smith chart –Impedance matching using Smith Chart. Transmission line transformers.. Waveguides: rectangular wave guide- modes of wave propagation- TE_{mn}, TM_{mn} waves, cut off wavelengths, derivation - dominant modes - Cylindrical Wave guides.

Texts:

1. Field & Waves Cheng, Pearson Education (LPE)
2. Electromagnetic waves and fields " , Jordan and Balmain PHI

References:

1) W. H. Hayt ,"Engineering Electromagnetic", Mc Graw Hill
2) J. D. Kraus ,"Electromagnetics",McGraw Hill
3) Electromagnetism ParmaniK PHI
4) Fundamentals Electromagnetism Guru Thomson
5) K. P. Harrington ,"Introduction to Electromagnetic Engineering",McGraw Hill
6) Edminister, "Electromagnetics", Schaum series
7) Elements of Electromagnetics Saddique ,Oxford
8) S Ramo ,W Whignary "Fields and Waves in Communication " Wiely

EC 502 SIGNALS AND SYSTEMS

Module I

Continuous Time signal: Energy and Power signals, Exponential and sinusoidal signals, periodicity, Impulse and step signals. Continuous Time systems: Properties- Linearity, stability, causality, memory, invertibility, time invariance. Analysis of LTI System – impulse response- convolution- graphical analysis-properties of convolution, Differential equation representation.

Frequency analysis of CT systems - Fourier series Fourier Transform .Properties Convolution, multiplication, correlation, Parseval's relationship, Examples. Inverse relationship between time and frequency, Time- Bandwidth product

Module II

Discrete Time signals: Energy and Power signals, Exponential and sinusoidal signals, periodicity, Impulse and step signals. Discrete Time systems: Properties: Linearity, stability, causality, memory, invertibility time invariance. Representation of systems- impulse response- convolution -

Difference equation representation. Frequency analysis of DT systems : Discrete Time Fourier Series Discrete Time Fourier Transforms, Discrete Fourier transform. Properties Convolution , Multiplication, correlation, duality, Examples.

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Module III

Filters: Ideal LPF Impulse response. Band pass filter Hilbert Transforms Pre Envelope, BP signals and systems, Phase and Group delay Applications of Fourier analysis to AM, SSB, PAM and FM Application of DTFT in DT sinusoidal AM analysis

Z Transforms: Properties Analysis of LTI systems using Z transforms the inverse Z transform - System function. Sampling of CT and DT signals. Sampling Theorem Nyqust rate. Reconstruction -- ideal, zero order hold.

Module IV

Random Processes: Review of random variables and pdf. Random processes, statistical averages. Stationary processes, Ergodic processes. Random processes and LTI systems. Random processes in frequency domain Power spectrum of stochastic processes, variance Auto correlation and spectral densities - Properties Power spectral density. Gaussian , Rayleigh, Rice probability density-and White processes, band limited and band pass processes.

Module V

Noise: .White noise, Narrow band noise, effective noise temperature and noise figure representation Sinewave contaminated with narrow band noise.Effect of noise in Linear modulation systems AM, SSB, DSBSC.Effect of noise in angle modulation, threshold effect and threshold extension, pre-emphasis and de-emphasis filtering.

Texts:

1. Signals & systems –Openheim & Wilsky PHI/Pearson Education
2. Communication Systems –Simon Haykin John Wiely
3. Communication Systems Engineering – Proakis & Salehi LPEA

References :

1) Signals, Systems, And transforms C L Phillips .J M . Parr. E A Riskin Thrid Edition Pearson Education
2) Signals and Systems -- R E Ziemer ,W H Tranter, D .R Fannin Fourth Edition Printice Hall
3) Analog Signal Processing with Laplace Transform & Active Filter Design Meador Vikas – Thomson Pub.
4) Analog & Digital Communication B P Lathi Oxford
5) Communication Systems B.P. Lathi B S Pub.
6) Integral Transforms for Engineers Bruce Carlson - L C Andrews, B K Shivamoggi", P H I
7) Continuous and discrete signals and systems S S Soliman, M D Srinath PHI
8) Linear signal & Systems B B Lathi Oxford
9) Probability Random variables, & Random process A Papolious TMH
10) Probability and random process with application to Signal Pracessing 3rd edition Stark/Wood Pearson Education.

EB /EC 503 ADVANCED MICROPROCESSORS AND DESIGN

Module I

Architecture 16 bit microprocessors: Intel 8086 Architecture –Memory address space and data organization – Segment registers and memory segmentation –I/O address space- Addressing modes – Comparison of 8086 and 8088. Basic 8086/8088 configuration – Minimum mode-Maximum mode-System timing - Bus interface. Interrupts and interrupt priority management .

Module II

Intel 8086 programming: 8086 Instruction set. Program development tools: editor, assembler, linker, locator, debugger and emulator. Assembly level programming with DEBUG and MASM- MS DOS Functions and BIOS Calls –programming examples using 8086.

Module III

Architecture of 32 bit Microprocessors: Intel 80386 Architecture –Special 80386 Registers –Memory management – interrupts and exceptions – management of tasks –Real, protected and virtual 8086 mode- Introduction to 80486 microprocessor –Architecture – Comparison with 80386 processor.

Module IV

Advanced Microprocessors: Introduction to Pentium and Pentium pro architectures: RISC concepts – BUS operation –Super scalar architecture –Pipelining –Branch prediction –Instruction and data caches – FPU –Comparison of Pentium and Pentium pro architecture. Introduction to Pentium II, Pentium III and Pentium 4 processors. RISC Architecture : Properties of RISC Systems Comparison with CISC architecture /

Module V

Introduction to micro controllers - comparison with microprocessors – Study of micro controller (MCS 51 family- 8051) - Architecture, instruction set, addressing modes and programming - Comparison of various families of 8bit micro controllers.

System design techniques – interfacing of LCD, ADC, sensors, stepper motor, keyboard and DAC using microcontrollers. Communication standards - serial –RS 232, parallel-IEEE 488, USB, AGP.

Texts :

1. Barry B.Brey, "The INTEL Microprocessors - 8086/8088, 80186/80188, 80286, 80386, 80486 Pentium and Pentium pro processor, Pentium II, Pentium III, Pentium 4 - Architecture, Programming and interfacing" Prentice Hall of India , 6 Ed, 2003.
2. Kenneth Ayala " The 8051 Microcontroller" West Publishing Company.
3. Mazidi " The 8051 Microcontrollers & Embedded Systems" Pearson Education.

References:

1) A.K.Ray &K.M.Bhurchandi "Advanced Microprocessors and peripherals"1st edition-TMH 2000.
2) YU-Cheng Liu & Glenn A Gibson," Microprocessor System , Architecture Programming & Design"
3) Kenneth Hintz & Daniel Tabak "Microcontroller architecture implementation and programming" , Mc Graw Hill In.Ed
4) Douglas V Hall," Microprocessors & Interfacing-Programming and Hardware" TMH
5) Avtar Singh , " The 8088 and 8086 Microprocessors_programming, Interfacing, Software, Hardware and Applications" PHI
6) Intel Users manual for 8086, 80386 & 80486, Pentium & Pentium pro
7) "Microprocessor Systems", Learning Material Series, ISTE, NewDelhi,1997
8) John B. Peatman, "Design with microcontrollers" McGraw Hill, Sing apore,

EB /EC 504 LINEAR INTEGRATED CIRCUITS

Module I

Integrated Circuits-Analog, Digital, Hybrid – Introduction to operational amplifiers – Basic differential amplifier - dual input balanced output and unbalanced output- Internal block schematic of op amp - Biasing used in IC- Constant current source- Current mirror Circuits- Active Load – Level Shifters- Power amplifier stages.power supply requirements - - Op-amp parameters - ideal op amp - transfer curve - equivalent circuit- Internal circuit analysis of a typical op-amp –Open loop gain –input and output impedence – Frequency response,frequency compensation. slew rate and its effect,typical data sheet 741.

Module II

Input bias current –offset - drift - compensating networks CMRR,SVRR,finite gain bandwidth and its effect in opamp circuits performance .Open loop configurations Op amp in closed loop configuration : Different feed back configurations- Voltage series feedback and voltage shunt feedback - concept of virtual ground- voltage follower - V/I converters,I/V converters and its applications - Differential amplifiers with one op amp and 3 op amps- Use of offset minimizing resistor (R_{OM}) and its design. Instrumentation amplifier IC and its application

Module III

Op amp applications- Summer- Subtractor- Log amplifier- Antilog amplifier- Integrator and differentiator Comparators: zero crossing- using voltage reference- regenerative (Schmitt trigger) comparators, window detector application – OP as comparators - Astable and monostable multivibrators- Triangular and saw tooth wave generators- - RC phase shift and Wien bridge oscillators-Sample and hold circuit- Peak detector circuit. Precision rectifiers, Voltage regulators-723 (block diagram, typical low voltage regulator circuit), 78XX, 79XX, 317.

Module IV

Filters : Transfer functions – LPF ,HPF,BPF, BRF Approximation methods –Butter worth – Chebyshev -Active Filters - I order and II order filters, Quality factor –Design- Gyrator- Negative Impendence Converter-Filter using Simulated Inductance –Universal Active Filters –All Pass filters. Switched Capacitive Filters

Module V

Specialized ICs and applications: 555 timers – Functional block diagram- Astable multivibrator, monostable multivibrator and its applications.- 566 VCO chip- Phase locked loop(PLL) - Mathematical block diagram Derivation of capture rage , lock range and pull in time capture and lock range- 565 PLL - PLL applications: Frequency multiplication and division- AM demodulation- FM detection- FSK demodulation Analog multiplier circuits and applications. ADC and DAC – performance specification –weighted, R-2R ; successive approximation , flash, integrating.

Texts:

1. Op amps and Linear Integrated circuits : R F Coughlin - Pearson Education/PHI
2. Design with operational Amplifiers Analog Ics :Sargio Franko-2nd Edition McGraw Hill
3. Microelectronics : Millman & Grabel TMH

References:

1) Op-amps and Linear integrated Circuits: Gaykwad : PHI
2) Integrated circuits : K R Botkar
3) Analog Integrated Citcuits: Gray John Wiely 2nd edition
4) Micro Electronics Horstian PHI 3rd edition
5) Microelectronic circuit Sedra & Smith Oxford 3rd edition
6) Opamps and Linear integrated Circuits: D A Bell : second EditionPHI

EB/EC/EE /EI 505 INDUSTRIAL AND POWER ELECTRONICS

Module I

Power transistors - Design of high power amplifier - Transistor as a switch - Parallel operation of transistor - Power MOSFET - Operating principles - Structure and characteristics. Thyristors- Classification & Constructional Details. SCR - Working principle - turn on, turn off and V - I characteristics - gate characteristics, and rating: Series and parallel operation of SCR - TRIAC - characteristics, modes of operation, Trigger circuits - magnetic & solid state , half- wave and full-wave operation .

Module II

Single phase controlled rectifiers - half-wave, full-wave, half-controlled and fully controlled - typical waveforms with R, RL, RL with diode and RL with voltage source - voltage and current equation for half-wave controlled rectifier. Three phase half-wave and full-wave controlled rectifier with R load, waveforms. DC motor speed control - various schemes - multiquardrant operation - simple circuits for speed control of series, PM and separately excited motors.

Module III

Commutation schemes -(different classes) waveforms - single-phase invertors - series, parallel and bridge -PWM invertor - square wave and sin wave output. Chopper circuits using SCR transistor (detailed analysis not required) - Jones Chopper. A.C Motor speed control - various schemes - electronic control of speed of induction motors and synchronous motors .

Module IV

Static switches - Timer circuits - Flasher circuits . Switching regulators - Basic concepts and analysis and design of Buck, Boost, Buck-Boost and derived converters . UPS - Characteristics - Configuration - application - battery selection, charging circuits. Thyristor protection - over current, over voltage , di/dt , dv / dt, gate protection , RFI minimization, Thyristor mounting and heat transfer.

Module V

Principle, characteristics and application of induction heating and dielectric heating - Ultrasonic - characteristics - application in non-destructive testing - application of power electronics in welding.

References:-

1) Power Electronics Rashid ,Pearson Education /PHI
2) Modern Power Electronics And AC Drives B K Bose ,Pearson Education
3) Introduction to Power Electronics D W Hart ,Pearson Education.
4) Mohan Undeland Robbins," Power Electronics", - Converters application and design" , WE
5) "Power Electronics J Michanel Javob Vikas Thomsan Pub
6) P C Sen, " Power Electronics", Tata Mc Graw Hill
7) Singh & Khanchandani "Power Electronics" Tata Mc Graw Hill.
8) "Power Electronics Asghar M syed PHI
9) Power Electronics N Mohan John Wiely
10) The art of Electronics Hays Cambridge

CS/ EB/ EC/ EE / EI/ 506 MICROPROCESSOR LAB

Part A (Compulsory)

1. Study of a typical microprocessor trainer kit and its operation
2. Simple programming examples using 8085 instruction set. To understand the use of various instructions and addressing modes - Monitor routines.
3. Interfacing and programming of 8255.(eg: traffic light control, burglar alarm, stop watch)
4. Interfacing and programming of 8253/ 8254.
5. Interfacing and programming of 8279.

Part B*

1. A/D and D/A converter interface
2. Stepper motor interface
3. Display interface
4. Programming of different types of EPROM 2716, 2732 etc

(* At least two topics from part B has to be covered.)

EC 507 ELECTRONIC CIRCUITS LAB II

PART A (Compulsory)

I Linear circuits

Circuits using OP- Amps - Inverting & non inverting amplifiers , Summing Amplifier, Differential Amplifier, Instrumentation Amplifier, Integrators & Differentiators , Measurements of offset voltage and its compensation .Precision rectifiers

II Circuits using op-amps for waveform generation.

i) Astable, monostable multivibrators .
ii) Wein bridge oscillator
iii) Triangular, square wave form generators.

III Second order Active RC filters

High pass, low pass

IV Voltage regulators using 723 with short circuit protection..

PART B (*)

1. Characteristics of SCR, TRIAC, MOSFET
2. Trigger circuits for full wave/halfwave fully controlled / half controlled thyristor circuits.
3. Study of phase control rectifier - Resistive load, inductive load, effect of free wheeling diode.
4. Study of motor speed control.
5. Study of UPS / SMPS

* Atleast two topics from part B has to be covered.

EC 601 ADVANCED DIGITAL SIGNAL PROCESSING

Module I

Review of LTI systems, Z transforms, Discrete Fourier series ,Discrete Time Fourier Transform and their properties - Fast Fourier Transform Decimation in time FFT algorithms - decimation in frequency FFT algorithms - FFT algorithms for N a composite number, Block convolution ,Discrete Hilbert transform– Other discrete transforms -.Discrete Cosine transform-Walsh transform – Hadmard transform – Wavelet transforms.

Module II

2-D signal processing: Signals and systems – properties - separability –periodicity – convolution – stability – Difference equation – stability theorems –shank's – Huang's – DeCarlo – Strintzis theorem. Z transform – properties –.Fourier transform – properties .

Module III

Introduction to digital filter design – specifications- FIR Digital Filters - Realizations - direct - cascade - lattice forms - hardware implementation - FIR filter design using Fourier series - window functions - frequency sampling technique- Finite word length effects in FIR filter design- Applications of FIR filters.

Module IV

IIR Digital Filters - Realizations - Direct - Cascade - Parallel forms - hardware implementation - Analog filter approximations - Butterworth and chebychev approximations – Transformation techniques-The method of mapping of differentials - impulse invariant transformation - Bilinear transformation - Matched Z transform technique - Finite word length effects in IIR filter design- effects due to truncation and rounding-limit cycles- Applications of IIR filters

Module V

General purpose digital signal processors – architecture- TMS320C54X fixed point processor-TMS320C4X floatingpoint processor, DSP563X motorola processors-ADSP21XXX sharc processor-Applications of Digital signal processing (Only brief description required

Reference :-

1) Oppenheim & Ronald W Schafer," Digital Signal Processing", Pearson education
2) .Andreas Antoniou , "Digital Filters Analysis & Design", Prentice Hall India
3) R Rabiner & B. Gold , "Theory & Application of Digital Signal processing", Prentice Hall India
4) Andreas Antoniou , "Digital Signal Processing", Prentice Hall India
5) John G Proakis & Dimitris G Manolakis ,"Digital Signal Processing",Pearson education
6) Sanjit K.Mithra , , "Digital Signal Processing", Tata Mc –Graw Hill.
7) Emmanuel C. Ifeachor & Barni W.Jerris,"Digital Signal Processing (a practical approach", Pearson education
8) Charles S.Williams,"Designing digital filters",PHI
9) JAE S.Lim, Alan V.Oppenheim, "Advanced topics in signal processing", Prentice Hall

EC 602 MICROWAVE TECHNIQUES AND DEVICES

Module I

Introduction to microwaves - microwave frequency range , significance of microwave frequency range - applications of microwaves . Microwave passive components - Wave guides. Cavity resonators - rectangular and circular cavities - Q factor- Coupling two cavities. Scattering matrix - Concept of N port scattering matrix representation- Properties of S matrix- S matrix formulation of two-port junction. Microwave junctions - Tee junctions -Magic Tee - Rat race - Corners - bends and twists - Directional couplers - two hole directional couplers- S matrix of microwave components. Ferrites - important microwave properties and applications – Termination - Gyrator- Isolator- Circulator- Phase changer- Attenuator.

Module II

Microwave semiconductor devices- operation - characteristics and application of BJTs and FETs - Principles of tunnel diodes - Varacter and Step recovery diodes - Transferred Electron Devices - Gunn diode- Avalanche Transit time devices- IMPATT and TRAPATT devices. Parametric devices - Principles of operation - applications of parametric amplifier .Microwave monolithic integrated circuit (MMIC) - Materials and fabrication techniques

Module III

Microwave tubes- High frequency limitations - Principle of operation of Multicavity Klystron, Reflex Klystron, Traveling Wave Tube, Magnetron. Microwave measurements: Measurement of power, wavelength, impedance , SWR, attenuation , Q and Phase shift . Network Analysers, Anechoic chambers. Microwave safety measures.

Module IV

Microwave network analysis: Behavior of Wire, Resistors, Capacitors, Inductors at high frequencies.Impedance concept - matrix representation - Y, Z and S parameters. Solution using Smith Chart - Matching networks - The impedance matching of networks using LC networks - single stub and double stub tuners. Transient transmission line analysis and applications. PCB Design Criteria for microwave Circuits. Microwave filters(Basic concepts only)

Module V

Microwave amplifiers : theory- amplifier classes-efficiency -dynamic range. Negative resistance amplifiers - LNA . Gunn diode as Oscillator, amplifier. PIN diode -switches - phase shifters. Mixers: theory- mixer diodes and matching - single-ended and balanced diode mixers- FET mixers. Detectors

References:-

1) Samuel Y Liao , “Microwave Devices & Circuits” Prentice Hall India
2) Reich , “Microwave Techniques” East West Press
3) K. C Gupta , “Microwaves”- Wiley Eastern
4) R. Chatterjee ,”Elements of Microwave Engineering”- East West Press
5) Collin, “Foundations for microwave engineering”, Mc Graw Hill
6) Microwave Engineering Pozar Wiley
7) RF Design Ludvirg PEA
8) RF & Microwave Electroinics Illusrated. M.M.Radmanesn PEA

EC 603 DIGITAL COMMUNICATION

Module I

Principles of Digital Data transmission : Sampling theorem – Sampling of Band pass and low pass (with proof). Pulse modulation –PAM- PPM,- PWM . Multiplexing – TDM, FDM.Uniform and nonuniform quantisation.. PCM, DPCM , delta & adaptive delta modulation. Calculation of quantisation noise. Noise in PCM and Delta modulation.

Module II

Base band data transmission: - Base band binary data transmission system- Inter symbol interference- Nyquist pulse shaping criteria– line coding, pulse shaping, scrambling techniques, regenerative repeaters. Eye diagram .Equalization- Adaptive equalization.

Detection of error probability: Gaussian probability function- properties- error function- complementary error function . - BPSK, QPSK, DPSK, QASK, BFSK, MSK, M-ary communication.

Module III

Information theory – Discrete messages , concept of amount of information, entropy , information rate. Source coding- Kreft inequality Shannon - Fano and Huffman coding. Shannon's theorem, Channel capacity, Types of channels, Symmetric channels, Binary Symmetric Channel. capacity of Gaussian channel- Trade off between band width and signal to noise ratio, Capacity of a channel with infinite band width, Optimum modulation system . Use of orthogonal signal to attain Shannon 's limit. Efficiency of orthogonal signal transmission.

Module IV

Codes for error detection and correction:- Parity check coding, Linear block codes, Error detecting and correcting capabilities, Generator and Parity check matrices, Syndrome decoding, Hamming codes, Encoding and decoding of systematic and unsystematic codes. Cyclic codes:- Generator polynomial, Generator and Parity check matrices, Encoding of cyclic codes, Syndrome computation and error detection, Decoding of cyclic codes. Convolutional codes:- Encoding. decoding of convolutional codes : State, Tree and Trellis diagrams, Maximum likelihood -Viterby algorithm, Sequential decoding Burst error correction -Interleaving techniques - Block and convolutional interleaving, Coding and interleaving applied to CD recording - ARQ:- Types of ARQ, Performance of ARQ. Comparision of coded & uncoded system.

Module V

Vector representation of waveforms: G-S procedure. Coherent and Non-coherent detection .Optimum receiver for AWGN – correlation receiver and M F receiver..Estimation Theory- Bayes estimatioin- MAP, MLE

Application of Estimation theory in communication :Binary shift keying and frequency shift keying- probability of error. Performance of Binary schemes. Error performance.

Texts:

1. B.P.Lathi :Modern Digital and Analog communication system .Oxford 3rd edition
2. Digital Communications Fundamentals and Applications: Bernard Sklar, Sklar Person Education

Reference:

1) Principles of Communication R. E.Ziemer/W H Tranter Fifth Edition John Wiely(fifth module)
2) Wayne Tomasi : Morden Electronic communication Systems. Person Education /PHI
3) John G Proakis : Digital Communication. MGH
4) Digital Communication Techniques Simon ,Hindey Lindsey PHI
5) Communication Systems: Simon Haykin, John Wiley & Sons. Pvt. Ltd.
6) Principles of Communication Systems: Taub & Schilling, Tata McGraw-Hill
7) Digital and Analog Communication System: K Sam Shanmugam. John Weily
8) Communication Systems Engineering: Proakis, Pearson Education.
9) Digital & Analog Communication System- Leon W Couch, Pearson Education/PHI.
10) Introduction to statistical Signal Processing With Applications M D Srinath,P K.Rajasekaran, RE. Viswnathan PHI
11) Analog And Digital Communication M S Roden PHI
12) Digital modulation and coding . Wilson, Pearson Education
13) Applied coding and information Theory for engineers , Wells, Pearson education.

EC604 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Module I

General measurement system: Static characteristics -, accuracy, precision, linearity, hysteresis, threshold, dynamic range, calibration., standards. Errors – measurement of errors, error reduction. Dynamic characteristics:-Transfer function-first and second order instruments-first and second order response –dynamic errors and dynamic compensation .Loading effect. Signals and noise in measurement system:-deterministic and random signals –noise sources- methods of reducing noise and interference. Reliability, choice and economics of measurement system.

Module II

Transducers and sensors: Transducers- sensors- active and passive, analog and digital transducers .review of transducers for pressure, velocity, vibration, torque, temperature. LVDT, piezo electric transducers.Impedance measurement:- dc bridges for low, medium and high resistance-ac bridges for capacitance and inductance . Sources of error in bridge circuits, precautions. Vector impedance meter, digital impedance meter. Multimeters :- Principles of analog multimeter- digital multimeter (dual slope integrations**)**

Module III

Signal generators:- AF and RF generators- Function generator- sweep frequency generator- Frequency synthesizers. Signal analyzers:- Wave analyzer –spectrum analyzer. Frequency and time measurement. Display instruments:-alphanumeric displays, Digital storage oscilloscope, sampling oscilloscope. Recording instruments:- self balancing system, strip chart recorders, x-y- recorders.

Industrial Instrumentation

Module I

Temperature measurements:- RTD, Thermocouples-different types. Radiation thermometer, Optical pyrometer. Pressure measurements: Elastic type pressure gauges. Measurement of low pressure-McLeod gauge, Ionization gauge, solid state pressure transducers. Flow measurements:- Head type flow meters, mass flow meters. Electromagnetic flow meter, laser-Doppler anemometer, Ultra sound flow meters.

Module II

Analytical Instruments:- Gas Analysis, Chromatography, Mass spectrometer. Basic concepts of programmable logic controllers. Data Acquisition System:- signal conditioning , multiplexing and demultiplexing, telemetry-block diagram, characteristics and different types. Power plant Instrumentation: Basic schematic of a power plant.

References:

1) Modern Electronic Instrumentation and Measurement Techniques- W.D. Cooper PHI
2) Principles of Measurement Systems- Bulentley 3rd edition Pearson education
3) Elements of Electronic Instrumentation and Measurement- Joseph J. Carr. 3rd edition Pearson education
4) Principles of Industrial Instrumentation –D. Patranabis- TMH
5) Instrumentation Devices and Systems - C.S. Rangan, G.R. Sharma TMH
6) Mechanical Measurements -Beckwith, Marangoni -5th edition Pearson education
7) Transducers and Instrumentation- D.V.S. Murty -PHI
8) Industrial Instrumentation AL Sutllo & Jerry D Faulk.

CS/ EB/EC/EI 605 CONTROL SYSTEM ENGINEERING

Module I

Basic idea of control systems and their classification - differential equations of systems - linear approximation - Laplace transform and transfer function of linear system - Model of physical system (Electrical, mechanical and electromechanical)- block diagram - signal flow graph - Mason's gain formula.

Module II

Time domain analysis - Representation of deterministic signals - First order system response - S-plane root location and transient response - impulse and step response of second order systems - performance - characteristics in the time domain - effects of derivative and integral control - steady state response - error constant - generalised definition of error coefficients - concepts of stability - Routh - Hurwitz criterion.

Module III

Frequency domain analysis - frequency response - Bode plot, Polar plot, Nicol's chart - closed loop frequency response and frequency domain performance characteristics. Stability in frequency domain. Nyquist criterion.

Module IV

Root locus method - basic theory and properties of root loci - procedure for the construction of root loci - complete root locus diagram. Design and compensation of feed back control system :- approaches to compensation - cascade compensation networks and their design in the frequency domain - simple design in S-plane.

Module VI

State variable methods :- introduction to state variable concepts - state variable description of linear dynamic systems - representation in matrix forms - block diagram and signal flow graph representation of state equations - Transfer matrix from state equations - transition matrix - general solution for linear time invariant state equations. Control system components :- Error detectors , servomotor, tachogenerator, servo amplifier, magnetic amplifier, rotating amplifier - Basic principles of adaptive control systems.

References:

1) Ogata K, " Modern Control Engineering", Prentice Hall/Pearson
2) Dorf Morden Communication Systems ,Pearson Education
3) Franklin Feed back Control Systems, Pearson Education
4) Kuo B. C , "Automatic Control System", Prentice Hall
5) Nagoor Kani :Control Systems, R B P
6) Ogata Discrete Time Control Systems ,Pearson Education
7) Nagarath & Gopal, " Control System Engineering", Wiley Eastern
8) Control Engineerng Ramkayan Vikas Pub
9) Control Theory M N Bandyopadhyaya ,PHI
10) Control Theory Glad , Vikas Thomson Pub

E C 606 COMMUNICATION LAB I

PART A (compulsory)

1. Active Filters Band Pass, Band reject (II order Butterworth)

2 Amplitude modulation - Collector modulation - measurement of modulation Index.

3. Frequency modulation using FET and VCO - Frequency deviation

4. IF amplifier - Frequency response

1. AM Demodulator and Delayed AGC

2. F. M. Demodulator and Frequency synthesizing using PLL

3. Frequency Converter (Mixer)

4. Time division multiplexing

PART B (*)

1. PAM.modulator and demodulator
2. PWM modulator and Demodulator
3. PPM modulator and Demodulator.

* Atleast two topics from part B has to be covered

EC 607 MINOR PROJECT

Each batch of (max of 5) students shall design, develop and realize an electronic product. Basic elements of product design must be considered. Electronic part must be an Analog or Digital system covered up to VI semester. Student has to submit a project report at the stipulated time. Product has to be demonstrated.

Guidelines for evaluation:

Attendance and Regularity	15 Marks
Work knowledge and Involvement	60 Marks
Overall quality of work	15 Marks
Level of completion and demonstration	35 Marks
Project Report	25 Marks

? External projects are not encouraged

CS/EC//IT 701 COMPUTER NETWORKS

Module I

Introduction to Computer Network and Physical Layer
Types of Networks: Broadcast and Point-to-point- LAN-MAN-WAN- Wireless networks. Layered Architecture and Reference Models: Layered architecture- OSI reference model, TCP/IP reference model – Internet Protocol Stack – Network Entities in Layers- Connection oriented and Connection less services, Examples of networks: Novell Netware, Arpanet, and Internet. Examples of Data Communication Services: X.25 Networks, Frame relay, Broad band ISDN and ATM. Physical Layer: Transmission media- Narrow band ISDN: Services-Architecture- Interface , Broad band ISDN and ATM- Virtual Circuits versus Circuit Switching –Transmission in ATM networks . FDDI

Module II

Link Layer and Local Area Networks Data link layer:
Service provided by data link layer-Error detection and correction Techniques-Elementary data link layer protocols-Sliding Window protocols- Data link layer in HDLC, Internet and ATM . Multiple Access protocols: Channel partitioning protocols: TDM-FDM-Code Division Multiple Access(CDMA) .Random Access protocols : ALOHA-CSMA and CSMA/CD . Local area Network: LAN addresses- Address Resolution Protocol-Reverse Address Resolution Protocol. Ethernet: Ethernet Technologies-IEEE standards- Hubs-Bridges and Switches

Module -III

Network Layer and Routing
Network Service model – Datagram and Virtual circuit service-Roting principles-Link state routing-distant vector routing-hierarchical routing-multicast routing-IGMP Internet Protocol (IP): IPv4 addressing-routing and forwarding datagram-datagram format-datagram fragmentation- ICMP- DHCP- Network Address Translators (NATs)-IPv6 packet format-transition from IPv4 to IPv6-Mobile IP. Routing in the Internet: Intra Autonomous System Routing : RIP and OSPF-Inter Autonomous System Routing : BGP – Network layer in ATM.

Module IV

Transport Layer
Transport Layer Services-Relationship between Transport Layer and Network Layer-Transport Layer in Internet-Multiplexing and De multiplexing. Connectionless Transport: UDP-Segment structure-Checksum Connection Oriented Transport: TCP-TCP connection-TCP Segment Structure-Round trip Time estimation and Time out-Reliable Data transfer-Flow control-TCP connection Management. Congestion Control: Causes and costs of congestion- Approaches to congestion control- TCP congestion control: Fairness-TCP delay modeling. ATM ABR congestion control. ATM AAL Layer protocols.

Module V

Application Layer and Network Security .
Application Layer Protocols- WWW and HTTP-File transfer Protocol: FTP Commands and Replies – Domain Name System (DNS)- SMTP - SNMP- multimedia. Remote Procedure Call. Security in Computer Networks: Principles of Cryptography-Symmetric key-Public key-authentication protocols-Digital Signatures – Firewalls. Security in different Layers: Secure E-mail- SSL – IP security.

References:

1. James F. Kurose and Keith W. Ross, Computer Networking – *A Top-Down ApproachFeaturing the Internet,* 2/e Pearson Education ,2003
2. S. Keshav, *An Engineering Approach to Computer Networkin*g, Pearson education ,2002
3. F. Halsall, *Data Communication, Computer Networks and Open System*s, Addison Wesley, 1996
4. Andrew S. Tanenbaum, *Computer Networks* , 4/e, Pearson education, 2003
5. Behrouz A. Fourouzan ,*Data Communications and Networking,* 2/e Tat McGrawhill,2000
6. Leon-Garcia and I. Widjaja, *Communication Network*s, Tata McGraw Hill, 2000
7. Bertsekas and Gallagar , *Data Network*s, 2/e, PHI, 1992
8. Douglas Comer and David L. Stevens, *Internetworking with TCP/IP Vol. I, II, and II*I,Prentice Hall, New York, 1990
9. Richard Stevens. W, *TCP/IP Utilities - Vol. I, The protocol*s, Addison Wesley, 1994
10. Sidnie Feit, *TCP/IP, Architecture, Protocols and implementatio*n, McGraw-Hill, New York, 1993
11. Uyless Black, *Computer Networks - Protocols, Statndards and Interface*s, Prentice Hall India, New Delhi, 1994

EC 702 RADIO COMMUNICATION

Module I

Fundamentals of Electromagnetic Radiation – Potential functions - Retarded potential. The Short dipole – short current element - near and far fields. Loop antenna. Basic antenna parameters - radiated power - radiation resistance - radiation efficiency - radiation pattern - effective aperture area - antenna beam width - directivity - **gain – of dipole , half wave dipole , folded dipole and monopole.**

Module II

Antenna arrays - Broad side - end fire arrays. Radiation pattern of two point, n- point and half wave dipole sources , multiplication of patterns- binomial array. Coupling effects and mutual impedance - parasitic elements - Yagi-Uda antenna. Microwave antennas - rectangular aperture - circular aperture - horn antenna - reflector antennas - corner , parabolic reflectors - helical antennas - micro strip patch antennas. - reciprocity - Transmit – receive system. Effects of ground on antenna performance- grounded antennas- effects of antenna height .

Module III

Antennas. Measurements - Gain - Radiation pattern- SWR.-radiation resistance.
Propagation of radio waves - ground waves - Reflection of radio waves by surface of the earth. Space wave propagation – considerations in space wave propagation- atmospheric effects. Ionosphere and its effects on radio waves –mechanism of ionosphere propagation- refraction and reflection of sky waves by ionosphere – ray paths – skip distance – maximum usable frequency - vertical and oblique incidence - fading of signals – selective fading – diversity reception. Duct propagation

Module IV

Introduction to RADAR – RADAR range equation – pulse RADAR- applications of RADAR – accuracy and resolution – Doppler effect to find velocity – pulse repetition frequency - unambiguous range and velocity – factors affecting the performance of RADAR – RADAR detection theory – designing thresholds – correlation and matched filter – Kalman filters (basic concepts only) - detection using multiple observation. Designing RADAR waveforms - bandwidth and pulse duration range - Doppler accuracy - pulse compression – FM chirp.

Module V

RADAR transmitters (Frequency generation, power amplifiers and duplexers),Receivers. RADAR displays – synthetic and Raw displays - RADAR antennas – CW RADAR – applications – CW RADAR with non zero IF – FM CW RADAR – FM CW Altimeter – MTI and pulse Doppler RADAR – Tracking RADAR – Sequential lobing and conical scanning - helical scanning - monopulse tracking - SAR. Electronic counter measures – main beam jamming – side lobe jamming – passive ECM.

References :

1) Principles of RADAR, Second Edition, J C TOOAY PHI
2) UNDER Standing RADAR systems – Simon Kinsley & S Quegan Scitech
3) Introduction to RADAR Systems – Skolnik MGH
4) Antennas - J D Krauss MGH
5) Antennas for all applications - J D Krauss TMH

EC 703 VLSI DESIGN

Module I

Introduction to Microelectronics - Monolithic and hybrid integrated circuits - Bipolar and MOS technology - Fabrication of active and passive components, bonding, packaging. Concept of SSI, LSI, VLSI. Introduction to thick film and thin film technology - resistors, capacitors - VLSI process integration - fundamental considerations in IC processing - NMOS IC technology - CMOS IC technology - BiCMOS IC technology. - GaAs technology. Ion implantation in IC fabrication

Module II

The MOS device - (n - channel & p- channel) - capacitance of MOS structure - accumulation, depletion and inversion, threshold voltage, current equations - characteristics, channel pinch-off. Second order MOS device effects : short-channel effect, narrow width effect, sub-threshold current, device saturation characteristics. The basic inverter using MOS-circuit - current equations - pull up_ pull down ratios- Alternate forms of pull up

Module III

Basic circuit concepts- sheet resistance, area capacitance, inverter delays - effect of loading - basic NAND, NOR circuit - super buffers - pull up and pull down characteristics. The CMOS inverter characteristics – NAND, NOR circuits using CMOS. Layout design of static MOS circuits - Layout rules - general principles & steps of lay-out design - use of stick diagrams - design rules - effects of scaling down.

Module IV

General considerations in subsystem design - Layout examples of NAND, NOR, registers – pass_transistors in implementing a circuit. Logic design of MOS networks - combinational circuits - clocked sequential circuit - drivers for bus lines - dynamic RAM - Forming arrays of RAM. Implementation approaches-custom circuit design, cell based design, array based design.

Module V

Timing issues in VLSI system design: timing classification- synchronous timing basics – skew and jitter- latch based clocking- self timed circuit design - self timed logic, completion signal generation, self timed signaling–synchronizers and arbiters, clock generation and synchronization-synchronous versus asynchronous design.

References

1) Douglas A Pucknell, Kamran Eshraghian , "Basic VLSI Design", P H
2) Millman and Grabel "Microelectronics" TMH.
3) Jan M. Rabaey, A. Chandrakasan, B. Nikolic"Digital Integrated Circuits- A Design perspective " 2/e, PHI.
4) Thomas E. Dillinger , "VLSI Engineering ", PH International editions.
5) S M Sze, " VLSI Technology"
6) Weste and Eshraghian,"Principles of CMOS VLSI Design,A Systems Perspective",2/e, Pearson Education.
7) Mead & Conway , "Introduction to VLSI System Design"-
8) Fabricius, " Introduction to VLSI Design".
9) Charles H Roth Jr – "Fundamentals of Logic Design" 4 Ed, Jaico Publishers, 2002

704/EI 705 D ELECTRONIC PRODUCT DESIGN

I **From Requirement to Product**

Definitions of Science, Engineering, and Technology- Engineering design as real life problem solving- Requirement analysis of Electronic products- Formulation of product requirement specifications and target specifications. The design process- Computer Aided Design- Product conceptualization- Product architecture- Product synthesis- Design analysis- Portable Electronic Design Factors. Product Life Cycle, Representation of development tasks using standard tools showing timing and dependencies.

II **Electronic Product Design**

Various dimensions of Electronic Product Design- Industrial design and Engineering design- DFx methodologies in product design- Quality by design analysis- Sketches and Engineering drawing of Electronic products. Aesthetics and Ergonomics- Inputs, control and display interface. Electronic

interconnection and Packaging of components, Integrated circuits, Printed circuits and Functional products- Cables and connectors- Design Engineering and Test Documentation – Component Specification/ Bill of materials.

III **Thermal Design of Electronic Equipment**

Heat generation and modes of heat transfer in Electronic products- Selection of Power Semiconductor Devices based on thermal considerations- Selection/Design of Heat Sinks- Factors affecting the design of heat sinks and its cooling effectiveness- Assembly of components on heat sinks- Electrical analogue of thermal circuits- Enclosure design of Electronic Equipments and thermal considerations- Design guidelines for Ventilations- Forced cooling- Heat pipes for electronic cooling applications- Cooling of power intensive IC chips- Thermal Considerations in PCB design.

IV **Electromagnetic Interference and Design for Electromagnetic Compatibility**

Electric Field Interference, Magnetic Field Interference, Conducted noise etc. in Electronic Equipment- Sources of EMI, inter and intra system EMI- Noise performance of passive components- Cabling, Shielding and Grounding - Cables, Connectors, components and equipments for interference suppression/minimization- Intrinsic noise sources and their management- EMI standards and Regulations- PCB design guidelines for EM compatibility.

V **Electronic Design Automation Tools**

PCB design process- Design rules for analog, digital, high-frequency, power-electronic and MW PCBs. Introduction to PC based Electronic Design Automation Tools: Schematic Capture, Circuit Simulation, Layout Design etc. Features of such packages with reference to popular EDA tools such as Orcad- Designing PCBs for manufacturability- Design considerations for power efficiency. Introduction to SPICE simulation of circuits- Circuit description- Modeling ofactiveand passive circuit elements. Circuit analysis- DC, AC, Transient and Parametric analysis. (For this module tutorial sessions on an EDA tool is recommended)

References

1. Product Design & Development- Karl T. Ulrich & Steven D. Eppinger, MGH.
2. Product Design & Manufacturing- John R. Lindberg, PHI.
3. Thermal Design of Electronic Equipment- Monogram by CEDT, IISc. Bangalore.
4. PCB Design & Technology- Waller C. Bosshart, TMH
5. Noise Reduction Techniques in electronic systems- Henry W. Ott.
6. Electronic Product Design for Automated Manufacturing- Richard Stillwell, Marcel Dekker Pub.
7. Spice for circuits & Electronics using Pspice- Mohammed H. Rasheed, PHI
8. Printed Circuits Handbook- Clyde F. Coombs, Jr., MGH
9. Product Design and Manufacturing- A.K. Chitale & R.C. Gupta
10. Portable Electronics Product Design and Development – Bert Haskell, MGH

EB/EC 705A OPTO ELECTRONICS

Module I

Nature of light – Basic optical laws-optical fiber-ray analysis- wave propagation in dielectric slab wave guide- mode theory of optical fibers- multi mode fibers – single mode – graded index fiber – N A- Fiber materials –Fabrication- Specifications of a typical optical fiber- reading a data sheets - attenuation Characteristics- dispersion various types and its effects on bandwidth-dispersion shifted fiber –polarization maintaining fiber.

Module II

Optical sources- direct & indirect band gap materials- LED structure-quantum efficiency - modulation. Laser diodes-rate equations-diode structure-single mode laser-modulation and temperature effects- quantum cascade lasers- modal Partition and reflection noise. Photo detectors: PIN, APD, Photodetector noise-response time-structure of detectors receiver units.

Module III

Light coupling to optical fiber- fiber splices effect of misalignment on signal transmission- fiber-tofiber coupling- optical fiber couplers -Coherent detection –comparisons -Transceivers for fiber optic communication pre amplifier type- optical receiver performance calculation - noise effect on system performance –receiver modules.

Module IV

Components for Fiber optic Networks- Couplers/Splitters- -semiconductor optical amplifier-bandwidth of SOPA- Polarization dependant gain –noise-erbium doped fiber amplifiers- WD multiplexes / demultiplexers- Filters- isolator-circulators-Optical switches-wavelength converters-Fiber gratings-tunable sources –tunable filters.

Module V

Optical networks- Basic networks-sonnet/ SDH-wavelength routed networks -Nonlinear effects on network performance-performance of various systems (WDM –DWDM+ SOA) - Optical CDMA-solitons-Ultra high capacity networks-

References:

1. Optical Fiber Communication: Gred Keiser Mc Graw Hill Third edition
2. Optical communication components & Systems : J H Franz Narosa Publication
3. Fiber Optic Technology D K Mynbaev & LL Scheiner Pearson Education Asia
3. Optical Fiber Communication and applications S C Gupta PHI

EB/EC/EI 705B EMBEDDED SYSTEMS

Module I

Overview of Embedded System:- Embedded System, Categories of Embedded System,Requirements of Embedded Systems, Challenges and Issues in Embedded Software Development, Applications of Embedded Systems in Consumer Electronics, Control System, Biomedical Systems,Handheld computers, Communication devices.

Module II

Embedded Hardware & Software Development Environment :- Hardware Architecture, Micro-Controller Architecture, Communication Interface Standards, Embedded System Development Process, Embedded Operating systems, Types of Embedded Operating systems.

Module III

8Bit microcontrollers – Architecture on chip peripherals instruction set/programming of Intel MCS51 family (8 bit) microcontroller,Inter facing of 8051 with LCD,ADC,sensors,stepper motor,key board, DAC,memory

Module IV

Real Time & Database Applications : Real-Time Embedded Software Development, Sending a Message over a Serial Link, Simulation of a Process Control System, Controlling an Appliance from the RTLinux System, Embedded Database Applications using examples like Salary Survey, Energy Meter Readings.

Module V

Microchip PIC16 family – PIC16F873 processor – features – architecture – memory organization – register file map – I/O ports – PORTA - PORTB – PORTC – Data EEPROM and flash program memory – Asynchronous serial port – SPI mode – I2C mode.

Text :

1.Programming for Embedded Systems- Dreamtech Software Team, Wiley Dreamtech
2. The 8051 micro controllers , M A Mazidi& Mazidi, Pearson Education
3. Design with PIC micro-controllers: John B Peatman, Pearson Education

References

1) Fundamentals of Embedded Software where C and Assembly Meet – Daniel W Lewis.
2) DS101374: National Semiconductor reference manual.
3) Embedded / RealTime systems: Concepts, Design and programming, Dreamtech Software Team, Wiley Dreamtech
4) 1187D: Atmel semiconductor reference manual.
5) Atmel semiconductor web site – www.atmel.com
6) DS30292B: Microchip reference manual.
7) Microchip semiconductor web site – www.microchip.com
8) National semiconductor web site – www.national.com

CS/EB/EC/EI/IT 705 C ARTIFICIAL NEURAL NETWORKS

Module I

Fundamentals of ANN – Biological prototype – Neural Network Concepts, Definitions - Activation. Functions – single layer and multilayer networks. Training ANNs – perceptrons – Exclusive OR problem – Linear seperability – storage efficiency – perceptron learning - perceptron training algorithms – Hebbian learning rule - Delta rule – Kohonen learning law – problem with the perceptron training algorithm.

Module II

The back propagation Neural network – Architecture of the back propagation Network – Training algorithm – network configurations – Back propagation error surfaces – Back propagation learning laws – Network paralysis _ Local minima – temporal instability

Module III

Counter propagation Networks – Architecture of the counter propagation network – Kohonen layer – Training the Kohonen layer – pre-processing the input vectors – initialising the weight vectors – Statistical properties. Training the Grossberg layer- Feed forward counter propagation Neural Networks – Applications.

Module IV

Statistical methods – simulated annealing – Bloltzman Training – Cauchy training -artificial specific heat methods. Application to general non-linear optimisation problems – back propagation and Cauchy training.

Module V

Hopfield net – stability – Associative memory – statistical Hopfield networks – Applications – ART NETWORKS – GENETIC ALGORITHMS –Bi-directional Associative memories- retrieving stored information . Encoding the association – continuous BAMS

References

1) Linus Fe, *Neural Network in Computer Intelligence* , McGrawHill
2) Philip D.Wasserman, *Neural Computing(Theory and Practice)*
3) Robert Hecht-Nilson, *Neuro Computing*
4) James A.Anderson, *An Introduction to Neural Networks*
5) Jack M. Zureda, *Introduction to Artificial Neural Systems*

EC705D FUNDAMENTALS OF RF DESIGN

Module I

Components: Behavior at High Frequencies: Wire, Resistors, Capacitors, Inductors, Torroids, and their winding, Impedance Transformation, Coupling of resonant circuits,.
Transmission lines & Impedance Matching: Transmission line theory. The Smith Chart and impedance matching.
Microwave Filter Theory: Filter theory, Transmission Line Transformations and microwave filters.

Computer-Aided Design and Analysis Interconnection of networks Analysis techniques
Optimization Use of SPICE

Module II

The Transistor at Radio Frequencies: Equivalent Circuit, Y-Parameters, S-Parameters, and other relevant two-port parameters, RF Transistor Data Sheets.
Microwave Printed Circuits & Microwave Solid State Devices: Bipolar Microwave Transistor, MESFET, MODFET/HEMT Microwave IC's, Microwave Diodes, and MODAMPs, Striplines, Micro strips, Printed Microwave Components, Surface Acoustic Wave device.

Module III

High frequency Amplifier Design. Small Signal RF Amplifier Design: Biasing, Designs using Y and S Parameters, Broadband Amplifiers, Single Stage, Multistage designs.
Gain and stability analysis using S parameters. Wide Bandwidth Design Fundamental limitations on matching Transmission line transformers
Use of feedback in RF amplifier design. Design for specified gain, bandwidth, and SWR.

Module IV

RF Power Amplifiers: RF Power Transistor Characteristics, Biasing, Design, Matching to Coaxial Feed lines
Large Signal Amplifiers Amplifier classes and efficiency Dynamic range
Intermodulation distortion Third-order intercept Design of large signal linear amplifiers.Design of large-signal class-C amplifiers Design of switch-mode amplifiers
Power combiners Directional couplers Hybrids.

Module VI
Phase-locked loop, Oscillator, Synthesizer, Phase noise, PLL structures & Architectures. Direct Digital;Synthesis
Microwave Measurements: Power, Noise, Spectrum Analysers, Network Analysers
Software Radio and DSP in Receivers

References:

1) Smith J, *Modern Communication Circuits*, McGraw Hill, 1986, 0-071155864
2) Bowick, *RF Circuit Design*, H W SAMS 1994
3) Chung & Levien, *Microwaves Made Simple: Principles & Applications*, Artech House 1985
4) R S Carson, *High Frequency Amplifiers* (Wiley, 1982) (2nd ed), 0-471-86832-9
5) G Vendelin, *Design of amplifiers and Oscillators by the S-parameter Method*, (Wiley, 1982)
6) Herbert L Krauss, Charles W Bostian & Frederick H Raab, *Solid State Radio Engineering*,
7) (John Wiley & Sons, 1980)
8) Liao S.Y, *Microwave Devices & Circuits*, Prentice Hall (3rd ed), 1990
9) Meyr et al, *Digital Communication Receivers, Synchronisation, Channel Estimation & Signal Processing*, Wiley, 1997, 0-471-50275-8
10) Robert. T. Collin, Foundations for Microwave Engineering, McGraw Hill 1992

EC 706 ADVANCED MICROPROCESSOR LAB

PART A

1. Introduction to IBM/PC and its DEBUG program commands
   - Examining and modifying the contents of the memory
   - Assembling 8086 instructions with the ASSEMBLER commands
   - Executing 8086 instructions and programmes with the Trace and GO Command.
   - Debugging a program
2. Assembly language program development using IBM/PC Macro assembler
   - Creating an Assembler source file
   - Assembling source program with MASM
   - The link program - creating a RUN module
   - Typical programming examples.
3. Study of typical16-bitt trainer kit and its operation.
4. Interfacing Experiments with micro controllers

PART B (*)

1. Concept of interfacing the 16 bit trainer kit with IBM/PC and down loading the program developed in IBM PC using MASM
2. Familiarization of using an In Circuit Emulator for 8086/8086 based systems.
3. Familiarization of using typical ADD on cards for IBM PC and their applications
   - ADC cards
   - Multifunction I/O cards
   - Data acquisition cards
   - Thermo couple input cards
   - OPTO I/O card
4. Familiarization of using a Logic Analyzer for trouble shooting ?P based Systems.
5. Interfacing Experiments with micro controllers.

* At least 3 topics have to be covered.

EC 707 COMMUNICATION LAB II

PART A

(Compulsory)

1. Digital Modulation and Demodulation Schemes (atleast two schemes).
2. Optical fiber Communication (Analog and Digital , 2 Experiments).
3. Microwave Communication(2 Experiments)
4. Digital Signal Processing using DSP trainer kit (At least 2 Expts.)

PART B

(Atleast 2 Experiments)

1. DSP using software tools
2. Communication system simulation using software tools
3. DAS using Microprocessors.
4. Experiments on Computer communication

EC 708 SEMINAR

Each student shall individually prepare and submit a seminar report on a topic of current relevance on stipulated time. Few panels consisting of three teachers (internal) each should evaluate the seminar report and the presentation. Marks should be distributed considering report writing, presentation, technical content, depth of knowledge, brevity and references and their participation in seminar. The time allotted for presentation is 30 minutes.

EC 801/EI 804E Audio and Video Engineering

Module I

Audio Engineering: Audio frequency range – loudness —pitch - decibel - sound pick up devices microphones –types condenser –carbon –piezo electric - direction pattern – parameters of microphone: - frequency range- sensitivity - impedance-noise. Sound reproduction devices: loud speaker- typical specifications Production of speech signal: - Simple view of speech production – spectrogram Acoustics of speech production. Uniform tube model- discrete time model –vocal fold / Vocal tract interaction Characteristics of hearing —acuity threshold and masking of detection

Module II

Speech coding and Compression:- companding- adaptive quantization - diferential and residual quantization –Vector quantization. Frequecy domain coding : Subband coding . Model based coding : linear predictive coding –VQ LPC coder. MPEG : Block diagram of audio encoder decoder. Recording of sound: recording media- magnetic – optical storage systems Coding and decoding applied to CD

Module III

Video Engineering : Elements of Television system:- Basic block schematic of television transmitter and receiver, camera , picture tube, Scanning, human factor consideration, flicker, interlaced scanning, number of scanning lines, Horizontal and vertical resolution, maximum video frequency, resolution and bandwidth, Composite video signal - vertical and horizontal synchronization Television camera: - Working principle of CCD- its working - Color television camera: block schematic explanation Modulation -Positive and negative modulation and its comparison, high level and low level modulation and its comparison. vestigial side band transmission. Transmission of sound signal.

Module IV

Colour Television: Compatibility consideration, Color response of human eye, Three color theory, additive mixing of colors, chromaticity diagram, Luminance and chrominance, color difference signal and its generation, Frequency interleaving and Colour burst signal Colour TV picture tubes : CRT, LCD and plasma displays.Monochrome and colour reception: Detailed block schematic - Block schematic explanation Basic colour television systems: PAL and NTSC -Block schematic explanation

Module V

Video coding and video compression: Demand for video compression- video image representation- quantization of image data intraframe compression techniques; DPCM - DCT based transform coding - Motion compensation –H. 261 video conference coding standard - MEPEG video compression. Digital audio bradcasting- Block schematic explanation-Audio compression and source encoding – HDTV: pixel transmission rate – video compression for HDTV

I. References

1. Multi Media Communication Fred Halsal Pearson Education
2. Basic Television Engineering: Bernad Grob, Mc Graw Hill.
3. Monochrome and colour television: R R Gulati, Wiley Eastern
4. Discrete time Speech Signal Processing :Thomas Quatieri Pearson Education
5. Digital Communication B salkar :Pearson Education
6.The Electronics Hand Book :J C Whitaker IEEE press

EC 802 MORDERN COMMUNICATION SYSTEMS

Module I

Optical communication : Fibre optic communication : Fibre optics- optical modulation - optical source LED Semiconductor Laser diodes- optical detectors Photodiode – Pin diode –A P D Fibre transmitter and receiver design - basic principles of design of fibre optic communication system – digital modulation methods Effect of noise Performance -Link power budget – Raise time budget

Module II

Microwave communication: Basic principles of microwave links - Microwave relay system - choice of frequency - line of sight and over the horizon systems - modulation methods - block schematics of terminal transmitters and receivers - microwave repeaters - microwave antennas - propagation characteristics - basic principles of design of a microwave link.

Module III

Satellite communication: Orbit of communication satellite -Satellite Constellation - Orbital parameters, Orbital perturbations, Geo stationary orbits ,Low Earth and Medium orbits .Frequency selection R F links – Propagation characteristics - modulation methods –coding- multiple access- space craft- antennas - transponders – inter satellite link - link power budget -earth station .Interference

Satellite Systems: Geo stationary systems, Distress and safety systems, Navigation Systems, direct sound broadcast system, Direct television broadcast system.

Module IV

Spread spectrum communication: General concepts, frequency hopping, the frequency hopping transmitter, the frequency hopping receiver, time hopping, Antijam consideration. CDMA.

Telemetry and Remote sensing: Telemetry definition, different types, Applications, Image characteristics, contrast ratio, spatial resolution , resolving power, brightness, tones etc.

Remote sensing system: Framing systems, scanning systems, characteristics of aerial photographs, spatial and ground resolution, relief displacement etc. IR detection and imaging technology - characteristics of IR images, Application of remote sensing.

Module V

Wireless communication system: The cellular concepts Major propagation mechanisms, path loss models, shadowing models. Small-Scale fading and Multipathfading, performance of some modulation techniques in fading channels.

Modulation techniques for wireless communication: Analog , Digital Modulation, and spread spectrum modulation. Equalization, Diversity, and Channel Coding Diversity techniques, Multiple access techniques for wireless communications FDMA, TDMA, and CDMA

Wireless system and Standards AMPS, Global System for mobile (GSM), CDMA

References :

1) Optical Fiber communication Palis Pearson Education
2) Optical Fiber Communication B Gupta second edition PHI
3) Wireless digital communications; Principles and practice. T.S.Rappaport, Pearson Education /,Prentice Hall,NJ,1996.
4) Mobile Communications; Schiller Pearson Education, first edition
5) "Satellite Communication", Dennis Roddy PHI
6) Satelite Communication System Engineering W L Prichard Pearson Education.
7) Introduction to wireless and mobile systems A Grarwal & An Zeng Vikas Tomson
8) Analog and digital Communication B P Lathi Oxford
9) Remote Sensing - Principle And Interpretation Flyod F Sabins W H Freeman & C New York
10) Principles of Telemetry Patranabis , Tata McGrawHill
11) Mobile satellite Communication D . Muples and M Rchharia Pearson Education
12) Wireless digital communications, K.Feher, PHI, New Delhi,1995

CS/EB/EC/IT 803 INDUSTRIAL ORGANISATION AND MANAGEMENT

Module I

Organisation : Concept of organisation, characteristics of organisation, elements of organisation, organisational structure, organisation charts, Types of organisation- formal line, military or scalar organisation, functional organisation, line & staff organisation, project organisation, matrix organisation, authority and responsibility, span of control, delegation of authority.

Industrial ownership: Types of ownership- single ownership, partnership, joint stock company, co-operative societies, public sector, private sector, scientific management- review of different schools of thoughts.

Module II

Personal Management: Recruitment and training, labour turnover, operator training, suggestion systems.

Industrial safety: working conditions, environmental factors, psychological attitude to work and working conditions, fatigue, accidents and hazards.

Wages and Incentives: feature of wages, time and piece rate, different incentive plans, profit sharing, job evaluation and merit rating, factors of comparison and point rating.

Industrial relations: industrial disputes, collective bargaining, trade unions, workers' participation in management, labour welfare.

Module III

Marketing Management: Concept of marketing VS sales approach, consumer behaviour and demand concept, buying motives, influence of income level, product design, new product distribution, pricing decisions, major price policy considerations, pricing methods and tools, break even analysis and marginal costing in pricing, sales promotion, marketing research, test marketing, marketing of services, advertising management- types of advertising, choice of media, economic and psychological factors in advertising.

Module IV

Finance Management : Tasks, evolution of corporate management, long term financing, equity, preference and debenture capitals, term loans, dividends and share valuation, legal aspects of dividends, short term financing, working capital influencing factors, cash budgeting, terms of liquidity, management of receivable and inventories, budgets and budgetary control-objectives of budgeting, classification, ratio analysis.

Module V

Management accounting: Fundamentals of book keeping, journalising, ledger accounts, subdivision of journal, cash book, banking transactions, trial balance, preparation of trading, profit and loss account, and balance sheet, adjustments.

References:

1. Industrial Organisation and Management : Bethel et.al, McGraw Hill
2. Principles of Industrial Management : Kootnz & Donnel
3. Financial Management : Prasanna Chandra, Tata McGraw Hill
4. Operation Management : Fabricky et al, Tata McGraw Hill
5. Hand Book of MBO : Reddin & Ryan, Tata McGraw Hill.
6. Industrial finance of India : SK Basu
7. First steps in book keeping : J B Batliboi
8. Management accounting : Hingrani & Bemnath.

EB/EC/EI 804A DIGITAL IMAGE PROCESSING (Elective)

Module I

Digital image fundamentals: representation - elements of visual perception - simple image formation model - Image sampling and quantization - basic relationships between pixels - imaging geometry. Review of matrix theory results: Row and column ordering - Toeplitz, Circulant and Block matrices. Review of Image transforms: 2D-DFT, FFT, Walsh , Hadamard , Haar, DCT and Wavelet transforms.

Module II

Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters. Frequency domain methods: low pass filtering, high pass filtering, homomorphic filtering. Generation of spatial masks from frequency domain specifications.

Module III

Image restoration: Degradation model - Diagonalization of circulant and Block circulant matrices - Algebraic approaches - Inverse filtering - Wiener filter - Constrained Least squares restoration - Interactive restoration - Geometric transformations. Fundamentals of Colour image processing: colour models - RGB, CMY, YIQ, HIS - Pseudo color image processing - intensity slicing, gray level to color transformation.

Module IV

Image compression: fundamentals- redundancy: coding, inter pixel, psychovisual, fidelity criteria, Models, Elements of information theory, Error free compression- variable length, bit plane, lossless predictive, Lossy compression- lossy predictive, transform coding. Fundamentals of JPEG, MPEG, Fractals.

Module V

Image segmentation: Detection of discontinuities - point, line and edge and combined detection ; Edge linking and boundary description - local and global processing using Hough transform – Thresholding - Region oriented segmentation - basic formulation, region growing by pixel aggregation, region splitting and merging - Use of motion in segmentation. Fundamentals of Representation and Description.

References:

1) Gonzalez and Woods, “Digital Image Processing”, 2 Ed, Pearson Education, 2002.
2) Anil K. Jain “Fundamentals of Digital Image Processing”, Pearson Education, 2003.
3) Mark Nelson, Jean-Loup Gailly “The Data compression Book” 2 Ed, bpb Publications.
4) Pratt William K.,”Digital Image Processing”, John Wiley & sons
5) Chanda & Majumdar, “Digital Image Processing and Analysis” , PHI.
6) M.Sonka,V. Hlavac, R. Boyle, “Image Processing, Analysis and Machine Vision”, Vikas Publishing House

EC/EI 804B ASIC DESIGN

Module I

Introduction to ASICs: - Types of ASICs - Design flow - CMOS logic: CMOS transistors CMOS Design rules - Combinational Logic Cell -Sequential logic cell - Data path logic cell – I/O cells - ASIC library design: Transistors as Resistors - Transistor Parasitic Capacitance-Logical effort.

Module II

Programmable ASICs: - Anti fuse - static RAM - EPROM and EEPROM technology – practical issues - Programmable ASIC logic cells : Actel ACT - Xilinx LCA - Altera FLEX - Altera MAX. Programmable ASIC I/O cells : DC & AC inputs and outputs - Clock & Power inputs - Xilinx I/O blocks.

Module III

Programmable ASIC interconnect: Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 - Altera FLEX. Programmable ASIC design software : Design systems - Logic Synthesis - Half gate ASIC. Low level design entry : Schematic entry - Low level design language - PLA tools - EDIF- CFI design representation.

Module IV

Logic synthesis: Verilog and logic synthesis -VHDL and logic synthesis. Simulation: types of simulation. : Testing: boundary scan test – fault simulation - automatic test pattern generation.

Module VI

ASIC construction: System partition - FPGA partitioning - partitioning methods - Floor planning and placement: floor planning - placement - physical design flow. Routing : global routing - detailed routing - special routing - circuit extraction - DRC.

Text book:

1. M.J.S .Smith, - Application - Specific Integrated Circuits – Pearson Education -1997.

References:

1) Andrew Brown, - VLSI Circuits and Systems in Silicon -, McGraw Hill, 1991.
2) S.D. Brown, R.J. Francis, J. Rox, Z.G. Uranesic, "Field Programmable Gate Arrays"- Kluever Academic
3) Publishers, 1992.
4) Mohammed Ismail and Terri Fiez, "Analog VLSI Signal and Information Processing", McGraw Hill, 1994.
5) S. Y. Kung, H. J. Whilo House, T. Kailath, " VLSI and Modern Signal Processing ", Prentice Hall, 1985.
6) Jose E. France, Yannis Tsividis, " Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing", Prentice Hall, 1994.

EB/EC/EI 804 C – MECHATRONICS

Module I

Introduction to mechatronics - mechatronics in manufacturing - mechatronics in products - scope of mechatronics - fundamentals of numerical control - advantages of NC systems - classification of NC systems - point to point and contouring systems - NC and CNC - incremental and absolute s ystems - open loop and closed loop systems - features of NC machine tools - fundamentals of machining - design consideration of NC machine tools - methods of improving machine accuracy and productivity - special tool holders

Module II

System devices - system drives - hydraulic systems - DC motors - stepping motors - AC motors - feedback devices - encoders - pulse digitizers - resolvers - inductosyn - tachometers - counting devices - flip flops - counters - decoders - digital to analog converters - interpolation - linear interpolator - circular interpolators – Complete interpolator-Control Loops for CNC-CNC software interpolator - flow of data in NC machines

Module III

Computer Integrated Manufacturing (CIM)

Introduction-Automated Storage and Retrieval Systems - Group Technology-Computer Aided Process Planning-Material Requirement Planning-Computer Aided Inspection- Machine Vision

NC part programming - manual programming - concepts - tape formats - tab sequential - fixed block word address and variable block formats - part programming examples - point to point programming and simple contour programming - computer aided programming - concepts - post processor programming languages - APT programming - part programming examples

Module IV

Industrial robotics - basic concepts - robot anatomy - robotics and automation - specification of robots - resolution - repeatability and accuracy of manipulator - classification of robots - industrial application –robot control systems - robot drives - characteristics of end of arm tooling – end effectors - sensors - tactile, proximity and range sensors - contact and non-contact sensors - velocity sensors - touch and - slip sensors - force and torque sensors

Robot programming - lead through programming - textual programming - programming languages –generations robot programming languages - robot language structure - on line and offline programming - intelligent robots

Module V * (This Module is only for internal evaluation)

Computer Aided Design (CAD)

Design Process-Application of Computers for Design- Benefits of CAD AutoCAD –file menu –edit menu –draw menu – modify menu-format menu- tools menu- AutoCAD Dimensioning- 3D representations in CAD- View menu - 3D drawing Entities- Rendering in Auto CAD- solid and surface modelling, comparisons with 2D methods, spline curve and surface representations, parametric methods and data exchange

Reference books

1. Yoram Koren, Computer Control of Manufacturing Systems, McGraw Hill
2. HMT, Mechatronics, TMH.
3. Michel P. Groover, Industrial Robots-Technology, Programming and Applications, McGraw Hill
4. M.P. Groover, and Emory W, Zimmers, CAD/CAM:Computer Aided Design and Manufacturing, Prentice – Hall Englewood Cliffs
5. C.Ray Asfahl ,Robotics and Manufacturing Automation, John Willey & Sons, Inc.
6. Fu K.S., Gonzales et al, Robotics-Control, Sensing, Vision and Intelligence, McGraw Hill.
7. Yoram Koren & Ben Yuri, Numerical Control of Machine Tools, Khanna Publishers.

*For University Examination, Questions from First four modules only and Fifth module is for internal evaluation.

EC/EE804 D /EI 801 BIO MEDICAL INSTRUMENTATION

Module I

Source of bio electric potential – resting and action potential – propagation of action potential – The bio electric potential – Electrodes for ECG ,EEG and EMG- Micro electrodes

Module II

Bio medical recorders- electro cardio gram –lead systems – block diagram of ECG – EEG – EMG (Block diagram level treatment only)- Ink jet recorders- UV recorders

Module III

Theraputic equipments – Cardiac Pacemakers – External and Implantable pacemakers – power sources for Implantable pace makers leads and electrodes – Cardiac defibrillators – Implantable Defibrillators – electro surgical machines – Ultra sonic therapy unit.

Module IV

Imaging Systems – Basics of X-ray machines – Computed Tomography – MRI Systems – basic NMR components –Thermographic Equipment –Real time ultra sonic Imaging systems.

Module V

Bio telemetry – Inntroductuion –components – implantable units –single channel telemetry systems – multichannel wireless telemetry systems – transmission of analog physiological Signals over telephone lines.

References:

1. Bio medical Instrumentation and Measurements , Leslie Cromwell
2. Hand book of bio medical instrumentation R.S. Khandpur
3. Principles of Bio medical Instrumentation , Richard Aston .

EC 805 PROJECT

The project work commencing from the VII th semester shall be completed and project report shall be submitted by each student by the end of the VIII th semester. There will be an internal examination of the project that includes demonstration and oral examination of the project work. The evaluation panel shall consisting of at least three faculty members including the project guide as appointed by Head of the department

EC 806 VIVA_VOCE

Each student is required to appear for a viva-voce examination, and he/she has to bring his/her seminar report and project report. The evaluation panel should contain at least one External and Two internal examiners appointed by the university. There can be more than one panel in case the number of students is large