

A. ELECTRONICS & COMMUNICATION ENGINEERING SEMESTER - III

EC/EE/ CS/IT 301	Engineering Mathematics - III	L	T/D/P	IM	EM	TM
		5	0	50	100	150

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 $P_n(x)$, orthogonality. Bessel function, $J_n(x)$ – recurrence formula, general function, orthogonality.

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, solution 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 and 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 (σ -known), the sampling distribution of the mean (σ -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:

- Ervin Kreyszig : Advanced Engineering Mathematics, Wiley Eastern
- Potter,Goldberg : Mathematical Methods, Prentice – Hall.
- Churchill R. V : Fourier series and Boundary value problems – Mc Graw Hill.
- Miller & Freind : Probability and Statistics for Engineers , Prentice Hall of India.
- Bowker and Lieberman : Engineering Statistics Prentice – Hall.
- Kirk - Patrick : Introductory Statistics and probability for engineering science and technology, Prentice Hall.
- Parzen E : Modern Probability theory and its Applications , Wiley Eastern.

EC/CS/ IT 302	Electrical Technology	L	T/D/P	IM	EM	TM
		4	0	50	100	150

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, application, armature reaction and commutation , types of motors, torque, speed, and power, characteristics, application, 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 and distribution of 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 : F.S. Bimbira, Khanna publications.
- Advanced Electrical Technology : H. Cotton, Wheeler publications.
- Electrical Machines : Nagarath & Kothari (TMH)

EC 303	Network Theory	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE I

Review of basic circuit concepts – Classification of the circuits,passive 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 IV

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 V

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 : Relationship 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. Pottic & 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

EC /CS 304	Digital Electronics	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE I

Number system and codes: Binary, Octal and Hexa-decimal number systems - Binary arithmetic, Binary coded decimal, Excess –3 code, Gray code error detection and correction – Boolean Algebra- Minimisation of Boolean function using Karnaugh Map and Quine – Mc Clusky methods –Formation of switching functions from word statements, realization 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 memory, Programmable logic array, devices - basic ideas- PLD Architecture – PAL and PLA

MODULE V

Logic families: DCTL, RTL, DTL, TTL, ECL, CMOS –Tristate 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 Intergrated Circuits”, Mc Graw Hill
5. Peatman, “ Digital Hardware Design”, Mc Graw Hill
6. Ronald J Tocci, “ Digital Systems, Principles and Applications” Prentice Hall.

EC/EE 305	Solid State Electronic Circuits	L	T/D/P	IM	EM	TM
		5	0	50	100	150

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. Valence 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 – depletion 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 – base width modulation – Transistor configurations – Characteristics – current amplification factors – relation between alpha & beta – comparison Ebers – 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 hetero junctions – V-I characteristics – real heterojunctions – frequency limitation of transistor – transit time effect – hetero junction 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 IVth edition, George B Rutkowski, Mc Graw Hill

EC 306	Basic Electronics Lab	L	T/D/P	IM	EM	TM
		0	3	75	75	150

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
 - a. Forward and reverse characteristics of a diode – measurement of forward resistance
 - b. Common base characteristics of a transistor – measurement of current gain, input resistance and output resistance, maximum ratings of the transistor.
 - c. Common emitter characteristics of a transistor – measurement of current gain, input resistance, maximum ratings of the transistor
 - d. Common source characteristics of a JFET – measurement of transconductance gm and drain to source resistance rds, use of FET as VVR.
4. Rectifying circuits
 - a. HW rectifier
 - b. FW rectifier
 - c. FW Bridge rectifier
 - d. 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

EC/CS 307	Electrical Lab	L	T/D/P	IM	EM	TM
		0	3	75	75	150

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 characteristics of compound generator
4. Load characteristics 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 test 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

SEMESTER - IV

EC/EE/ CS/ IT 401	Engineering Mathematics - IV	L	T/D/P	IM	EM	TM
		5	0	50	100	150

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 transformations.

MODULE II

Complex integration: Line integral, Cauchy's integral theorem, Cauchy's integral formulae, 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 divided differences interpolation polynomial.

MODULE IV

Finite differences: Operators Δ , ∇ , E 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 4th 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.

References:

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 Methods, S.Chand & Co. K. Gunavathy
7. E.V. Krishnamurthy, S.K. Sen : Numerical Algorithms, Affiliated East West.

EC/EE/ 402	Electronic Circuits	L	T/D/P	IM	EM	TM
		5	0	50	100	150

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 RC 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 frequency 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"
5. Allan Mottorshed, "Electronic Devices & Circuits"
6. Millman & Halkias, "Integrated Electronics"
7. Boylestead & Nashelsky, "Electronic Devices & Circuits"
8. Schilling & Belove "Electronic Circuits, Discrete & Integrated" TMH

EC 403	Microprocessors	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE I

Introduction to computer architecture and organisation:

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 micro programmed 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 microprocessors: Microcomputers and microprocessors, 8/16/32/64-bit microprocessor families; Internal architecture of Intel 8085 microprocessor. Block diagram, Registers, Internal Bus Organization, 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, hardware and software interface to MuP(8085)).

Text books

1. Goankar, Microprocessors Architecture Programming and Applications”, John Wiley
2. Hamacher C.V, “Computer Organization – 3rd Edition”, M.C. Graw Hill, New York, 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, 1997
3. Hayes J.P, “Computer Organisation and Architecture – 2nd Edition”, Mc Graw Hill, New York
4. Tanenbaum A.S, “ Structured Computer Organisation – 3rd Edition”, Prentice Hall, New Jersey
5. Douglas V.Hall, “Microprocessors & Interfacing to 8085 Introduction to”, Tata Mc Graw Hill
6. Ghose Sridhar, “ Microprocessors for Engineers and Scientists”
7. Lance A Leventhal, “Introduction to Microprocessors”, Prentice Hall

EC 404	Digital System Design	L	T/D/P	IM	EM	TM
		5	0	50	100	150

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 Moore 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 implementations 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

EC 405	Communication Engineering	L	T/D/P	IM	EM	TM
		4	0	50	100	150

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-Seeley 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 signaling system, type of signaling(pulse, multifrequency, voice freq, common channel signaling, 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”,McGraw Hill
- 3) Martin S Roden, “Analog and digital Communication systems”
- 4) Sol Lapatine, “Electronic communication”
- 5) Dennis Roody and John Coolen, “Electronic communication”,Prentice Hall
- 6) J Dunlop & D G Smith, “Telecommunication Engg”.

EC/EE/CS 406	Digital Electronics Lab	L	T/D/P	IM	EM	TM
		0	3	75	75	150

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 & J-K flip flops using NAND gates
4. Code converters – 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 designs 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

EC 407	Electronic Circuits Lab I	L	T/D/P	IM	EM	TM
		0	3	75	75	150

1. Study of RC and RLC circuits – Frequency responses, pulse responses, filter characteristics
2. Differentiating circuit and integrating circuit, Biasing of Active devices
 - a. Voltage biasing, current biasing and feedback biasing of BJT
 - b. Biasing of JFET
3. Amplifying circuits
 - a. Simple common emitter amplifier configuration – gain and bandwidth
 - b. Common source amplifier

Function of each component, gain measurement, frequency response.

4. Feedback amplifier circuits – current series and voltage shunt – gain and bandwidth
5. Oscillators – RC phase shift, Wein Bridge
6. Multivibrators – Astable, Bistable, monostable
7. Sweep circuits – Simple transistor sweep, bootstrap sweep
8. Series Voltage Regulator using transistors

SEMESTER - V

EC 501	Electromagnetic Theory	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE 1

Introduction: overview of vector analysis. Orthogonal coordinate systems- rectangular, cylindrical, spherical transformation, flux, circulation open and closed surface Divergence, gradient, curl, stokes theorem, static electric field, Columb's Law, super position, 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, primitivity, electric dipole ,polarization, boundary relations, divergence of the flux density, Laplacian field, Mapping Laplace equation, uniqueness theorem ,poissons 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 impedance – Time harmonic fields – solutions of wave equations.

MODULE IV

Poynting theorem – real and complex Poynting vector – interpretation - application of poynting theorem-power of 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 - Impedance matching quarter wave and half 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.

Text Books:

1. Field & waves cheng, pearson education (LPE)
2. electromagnetic waves & fields, Jordan and balmain PHI.

References :

1. W H Hayt-Engineering electromagnetic, Mc Graw hill

2. J D Kruas, 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 Whingnary, Fields and waves in communication Wiely.

EC 502	Signals and Systems	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE 1

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.

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, Nyquist 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 Sine wave 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 Philips, J M Parr, E A Riskin Third 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 – LC Andrews, B K Shivamoggi, PHI
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 Processing 3rd edition Stark/ Wood Pearson Education

EC 503	Advanced Microprocessors and Design	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE 1

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 2

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 3

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 2, Pentium 3 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 o various families of 8 bit micro controllers. System design techniques- interfacing of LCD, ADC, sensors, stepper motor, keyboard and DAC using microcontrollers. Communication standards – serial – RS 232, parallelIEEE 488,USB, AGP.

Texts:

1. Barry B Brey. “The INTEL Microprocessors - 8086/8088, 80186/80188, 80286, 80386, 80486 Pentium and Pentium pro processor, Pentium 2, Pentium 3, 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 Application” 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, Singapore.

EC504	Linear Integrated Circuits	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE 1

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 impedance-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 Opamp 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 references-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 – Butterworth- Chebyshev – Active Filters – I order and II order filters, Quality factor – Design – Gyrator – Negative Impedence 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 multiivibrator and its applications – 566 VCO chip- Phase locked loop (PLL) – Mathematical block diagram Derivation of capture range, 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 : Sergio Franco- 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 Circuits : Gray, John Wiley 2nd edition
4. Micro Electronics Horstian PHI 3rd edition
5. Microelectronic circuit Sedra & Smith Oxford 3rd edition
6. Op amps and Linear integrated Circuits ; D A Bell: second Edition PHI

EC 505	Industrial & Power Electronics	L	T/D/P	IM	EM	TM
		4	0	50	100	150

MODULE 1

Power transistors – Design of high power amplifier – Transistor as a switch – Parallel operation for 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 wavceforms 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 – multiquadrant 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 anlysis 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 Electronic And AC Drives B K Bose, Pearson Education
3. Introduction to Power Electronics D W Hart, Pearson Educaion
4. Mohan Undeland Robbins, “Power Electronics”, Converters application and design
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 Electronic: Asghar M syed PHI
9. Power Electronics: N Mohan John Wiely
10. The art of Electronics: Hays Cambridge

EC 506	Microprocessor Lab	L	T/D/P	IM	EM	TM
		0	3	75	75	150

PART A (compulsory)

1. study of a typical microprocessor trainer kit and its operations.
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. interface and programming of 8253/8254.
5. interface & 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 eeprom 2716,2732etc
- (*at least two topics from part b has to be covered).

EC 507	Electronic Circuits Lab II	L	T/D/P	IM	EM	TM
		0	3	75	75	150

PART A (Compulsory)

1. 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.
2. Circuits using op-amps for waveform generation.
 - (i) Astable, monostable multivibrators.
 - (ii) Wein bridge oscillator
 - (iii) Triangular, square wave form generators.
3. Second order Active RC filters
High pass, low pass
4. 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.

SEMESTER - VI

EC 601	Advanced Digital Signal Processing	L	T/D/P	IM	EM	TM
		5	0	50	100	150

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 Transforms- Walsh transform- Hadmard transform – Wavelet transforms.

MODULE II

2-D Signal Processing: Signals and systems- properties- seperability- 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 – specification – 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 – effect due to truncation and rounding – limit cycles – applications of IIR filters.

MODULE V

General purpose digital signal processors – Architecture – TMS320C54X fixed point processor TMS320C4X floating point processor, DSP563X Motorola processors – ADSP21XXX sharc processor – Applications of digital signal processing (only brief description required)

References:

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. Ifeakor & 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 & Devices	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE 1

Introduction to microwaves-microwave frequency range, significance of microwave frequency range-application 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-principle 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: measurements of power, wavelength, impedance, SWR, attenuation, Q and phase shift. Network Analysis, Anechoic chambers. Microwave safety measures.

MODULE IV

Microwave network analysis: Behaviour 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 shifter. 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 Ludwig PEA
8. RF & Microwave Electronics Illustrated. M. M. Radmanesh PEA

EC 603	Digital Communication	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE 1

Principles of Digital Data transmission : Sampling theorem – Sampling of Band pass and low pass signals (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 – Krefit inequality. Shannon – Fano coding - 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. Comparison of coded and uncoded system.

MODULE V

Vector representation of waveforms: G-S procedure, Coherent and non-coherent detection. Optimum receiver for AWGN – correlation receiver and MF receiver. Estimation Theory- Bayes estimation – 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 Communication Fundamentals and Applications : Bernard Sklar, Sklar Pearson 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. Pearson 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 Mc Graw-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, R.E.Viswanathan PHI
11. Analog and Digital Communication MS Roden PHI
12. Digital modulation and coding. Wilson, Pearson Education
13. Applied coding and information Theory for engineers, Wells, Pearson education

EC 604	Electronic Measure- ments & Instrumenta- tion	L	T/D/P	IM	EM	TM
		4	0	50	100	150

MODULE 1

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. Signal 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 measurements:-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 INSTRUMENTATIONS

MODULE IV

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 V

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 editon 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.

EC 605	Control Systems Engineering	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE 1

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 – generalized 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 the 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 V

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, servo motor, 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 Engineering Ramkayan Vikas Pub
9. Control Theory M N Bandyopadhyaya, PHI
10. Control Theory Glad, Vikas Thomson Pub

EC 606	Communication Lab I	L	T/D/P	IM	EM	TM
		0	3	75	75	150

PART A (COMPULSORY)

1. Active Filters Band Pass, Band reject (2nd 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. FM Demodulator and frequency synthesizing using PLL
 3. Frequency converter (mixed)
 4. Time division multiplexing.

PART B (*)

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

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

EC 607	Minor Project	L	T/D/P	IM	EM	TM
		0	3	150	0	150

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 6th 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.

SEMESTER VII

EC/EE/CS/ IT 701	Computer Net-works	L	T/D/P	IM	EM	TM
		5	0	50	100	150

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 layer - connection oriented and connection less services, Examples of networks: Novell Netware, Arpanet, and Internet. Examples of Data Communication Services: X.25 Networks, Frame relay, Broadband ISDN and ATM – physical layer txⁿ media - Narrowband ISDN services - Architecture - Interface, Broadband ISDN & ATM – Virtual circuits versus circuits 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-Routing 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 Demultiplexing. 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 Layer. Secure E-Mail-SSL –IP Security.

Reference:

- 1) James .F.Kurose and Keith W Rose, Computer Networking- A Top Down Approaching Featuring the internet, 2/e Pearson Education, 2003.
- 2) S.Keshav, An Engineering Approach to Computer Networking , Pearson education, 2002.
- 3) F. Halsall, Data Communication. Computer Network and Open System, 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, Communications and Networks, Tata McGraw Hill, 2000.
- 7) Bertsekas and Gallagar, Data Networks, 2/e, PHI, 1992.
- 8) Douglas Comer and David L. Stevens, Internetworking with TCP/IP Vol.I. II and III, Prentice Hall, New York. 1990.
- 9) Richard Stevens. W, TCP/IP Utilities – Vol.I, The protocols, Addison Wesley, 1994
- 10) Sidnie Feit, TCP/IP, Architecture. Protocols and implementation, McGraw-Hill, New York, 1993
- 11) Uyles Black, Computer Networks – Protocols, Standards and Interfacing, Prentice India, New Delhi, 1994.

EC 702	Radio Communication	L	T/D/P	IM	EM	TM
		4	0	50	100	150

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 points, n – point and half wave dipole sources, multiplications of patterns – binominal arrays. Coupling effects and mutual impedance – parasitic elements – Yagi – Uda antenna. Microwave antennas. Rectangular aperture – circular aperture – horn antenna – reflector antenna – 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 radiation waves by the surface of 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 threshold – correlation and matched filter – Kalman filters (basic concepts only) – detection sing multiple observation. Designing RADAR waveforms – bandwidth and pulse duration range – Doppler accuracy – pulse compression – FM chirp.

MODULE V

RADAR transmitters (frequency generation, and duplexers), receivers. RADAR display

– synthetic Raw displays – RADAR Antenna – CW RADAR – applications – CW RADAR with non zero IF 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) Understanding RADAR systems – Simon Kinsley & S Quegan Scitech
- 3) Introduction to RADAR systems – Skolnik MGH
- 4) Antennas – J D Krauss MGH Antennas for all applications – J D Krauss TMH

EC 703	VLSI Design	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE I

Introduction to Microelectronics – Monolithic and hybrid integrated - 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 – GaAe technology for implantation in IC fabrication.

MODULE II

The MOS device – (n- channel & p – channel – capacitance of MOS structure – accumulation, depletion and inversion, threshold voltage, current equation – 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 equation – 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 characteristic – NAND,NOR circuits using CMOS. Layout design of static MOS circuit – Layout rules – general principles & steps of layout design – use of stick diagrams – design rules – effects of scaling down.

MODULE IV

General consideration in subsystem design – Layout examples of NAND, NOR, Registers – pass transistors in implementing a circuit Logic design of MOS network – 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. Dougias A Pucknell, Kamran Eshraghian, “Basic VLSI Design”,PH
2. Milliman and grabel “Microelectronics” TMH.
3. Jan M Rabaey A Chandrakshan, B Nikolie “Digital Integrated Circuits- A Design prespective 2/e PHL
4. Thomas E Dellinger, “VLSI Engineering” PH International editions
5. SM Sze “VLSI Technology”
6. Weste and Eshraghian, “Principles of CMOS VLSI Design, A Design Perspective”, 2/e Pearson Education
7. Mead & Conway, “ Introduction to VLSI System Design”
8. Fabrius, “ Introduction to VLSI Design”

EC 704	Electroinc Product Design	L	T/D/P	IM	EM	TM
		4	0	50	100	150

MODULE I From Requirement to Product

Definition 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.

Module 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 packing of components, Integrated circuits, printed circuits and functional products – cables and connectors – design engineering and test documentation – component specification/ bill of materials.

MODULE III Thermal Design of Electronic Equipment

Heat generation and modes of heat transfer in electronic product – 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 ventilation – forced cooling – heat pipes for electronic cooling applications – cooling of power intensive IC chips – thermal considerations in PCB design.

MODULE 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 regulators – PCB design guidelines for EM compatibility.

MODULE 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 stimulation, 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 of active and passive circuits 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 Booshart, 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 MGH
9. Product Design And Manufacturing – A K Chitale & R C Gupta.
10. Portable Electronics Product Design And Development – Bert Haskell, MGH

EC 705	Elective I	L	T/D/P	IM	EM	TM
		4	0	50	100	150

EC 705 A 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 –NA fiber materials – fabrication – specifications of a typical optical fiber – reading a data sheet – attenuation characteristic dispersion various types and its effect on bandwidth dispersion shifted fiber polarization maintaining fiber.

MODULE II

Optical sources – direct & undirected band gap materials – LED structure – quondam efficiency – modulation. Laser diodes – rate equations – diode structure-single mode laser-modulation and temperature effects- quantum cascade lasers – metal partition and reflection noise photo detectors PIN, APD, photo detector noise-response time-structure of detectors receive unit.

MODULE III

Light coupling to optical fiber – fiber splices effect of misalignment on signal transmission fiber to fiber coupling – optical fiber couplers- coherent detection – comparisons – transceivers for fiber optical communication pre amplifiers type – optical receiver performance calculation – noise effect on system performance – receive 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 / de multiplexes – filters – isolators – circulators – optical switches – wavelength converters – fiber grating – tunable sources – tunable filters.

MODULE V

Optical networks – basic networks – sonnet/SDH – wave length routed networks – Nonlinear effects on network performance of various systems (WDM -DWDM -SOA) Optical CDMA – solutions – ultra high capacity networks.

References:

1. Optical Fiber Communication: Grad Keiser Mc Graw Hill Third Edition.
2. Optical Communication Components & System: J H Franz Narosa Publication
3. Fiber optical technology D K Mynbaev & LL Schemer Pearson Education Asia
4. Optical Fiber Communication and applications S C Gupta PHI

EC 705B EMBEDDED SYSTEMS

MODULE I

Overview of Embedded Systems :- Embedded systems, categories of embedded Systems, requirements of embedded systems, challenges and issues in embedded software development, applications of embedded systems in consumes 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 systems development process, Embedded operating systems, types of embedded operating systems.

MODULE III

8 Bit micro controllers – Architecture on chip peripherals instruction set/programming of Intel MCS51 family (8 bit) micro controller, interfacing of 8051 with LCB, ADC, sensors, stepper motor, keyboard, 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 application from the RT Linux system, embedded database applications using examples like salary survey, energy meter reading

MODULE V

Microchip PIC16 family – PIC 16F873 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, Wiley Dreamtech
2. The 8051 micro controllers, M A Mazidi & mazidi, Pearson Education.
3. Design with PIC micro-controllers: John B pearson Education

Reference:

1. Fundamentals of embedded software where C and Assembly Meet – Damet W Lewis.
2. DS101374. National Semiconductors reference manual
3. Embedded/ Real time systems: concepts, Design and programming, Dreamtech Software Team, wiley Dreamtech.
4. 1187D; Atmel semiconductor reference manual.
5. Atmel semiconductor website – www.atmel.com.
6. DS30292B: Microchip reference manual.
7. Microchip reference website – www.microchip.com
8. National semiconductors web site – www.national.com

EC 705C ARTIFICIAL ‘NEURAL NETWORKS

MODULE I

Fundamentals of ANN- Biological prototype-Neural Network Concepts, Definitions-Activation. Functions- single layer and multiplayer 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 – preprocessing the input vectors-initializing the weight vectors-Statistical properties. Training the Grossberg layer- Feed forward counter propagation Neural Networks-Applications

MODULE IV

Statistical methods - simulated annealing- Blotzman Training- Canchy training - artificial specific heat methods. Application to general non-liner optimization problems- back propagation and Canchy 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

Reference:

1. Satish Kumar, Neural Networks, Tata McGraw- Hill,2004.
2. Simon Haykin, Neural Networks, Pearson Education, 2003.
3. Martin T.Hagan, Howard B.Demuth, Mark Beale, Neural Network Design, Vikas Publishing House, 2002.
4. Linus Fe, Neural Network in computer intelligence, McGraw Hill
5. Philip D.Wasserman, Neural Computing (theory and practice)
6. Robert Hecht-Nilson, Nero Computing.
7. James A Anderson, An Introduction to Neural Networks
8. Jacek M Zurada, Introduction to Artificial Neural Networks

EC 705 D FUNDAMENTALS OF RF DESIGN

MODULE I

Components: Behavior at High Frequencies, wire, resistor, capacitor, inductor, 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 , Transmissions 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-Parameters, and other relevant two port parameters, RF Transistor Data Sheets. Microwave Printed Circuits & Microwave Solid State Devices. Bipolar Microwave Transistor, MESFFT MODFET/ HEMT Microwave ICs, 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 Imitations on matching Transmission line transformers Use of feedback in RF amplifier design for specified gain, bandwidth, and SWR

MODULE IV

RF Power amplifiers , RF power transistor characteristics ,biasing design .Matching of coaxial feed lines .Larger signal amplifier. 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, FLL structures & Architectures. Direct Digital Synthesis Microwave Measurements, Power Noise, spectra analyzers, Network Analyzers Software Radio and DSP in Receivers.

References:

- 1) Smith I Modest Communication Circuits, McGraw Hill,1986, 0-071155864
- 2) Bowick,RF Circuit Design, H W SAMS 1994
- 3) Chung & Levin Microwave Made Simple ,Principle\$ Applications ,Artech House 1985
- 4) R S Carson ,High frequency amplifiers (Wiley ,1982)-2nd ed
- 5) G Vendelin Design of amplifiers and oscillators by the S-parameter Method (Wiley)
- 6) Herbert L Krauss , Charles W Bestian & Frederick H Raab Solid State Radio Engineering.
- 7) (John Wiley & Sons ,1980)
- 8) Liao S Y.Microwave Device s &Circuits, Prentice Hall(3rd ed)
- 9) Meyr et al,Digital Communication Receiver Synchronization , Channel Estimation &signal Processing. Wiley,1997
- 10) Robert T Collin ,Foundation for Microwave Engineering, Mc Graw Hill1992

EC 706	Advanced Micro-processor Lab	L	T/D/P	IM	EM	TM
		0	3	75	75	150

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 typical 16-bit trainer kit and its operation.
 4. Interfacing Experiments with micro controllers.

Part B (*)

1. Contents 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
 - Multifunctional I/O cards
 - Data acquisition cards
 - Thermo couple input cards
 - OPTO I/O card
5. Familiarization of using a Logic Analyzer for trouble shooting PC based systems.
6. Interfacing Experiments with micro controllers.

* At least 3 topics have to be covered.

EC 707	Communication Lab II	L	T/D/P	IM	EM	TM
		0	3	75	75	150

Part A (Compulsory)

1. Digital Modulation and Demodulation Schemes (at least 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 experiments)

Part B (at least 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	L	T/D/P	IM	EM	TM
		0	2	50		50

Each student shall individually prepare and present a seminar on a topical of current relevance and submit a report 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 can vary from 45 minutes to one hour, determined by the department depending on the student strength with one or more panel of examiners.

SEMESTER VIII

EC 801	Audio and Video Engineering	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE I

Audio engineering : Audio frequency range – loudness - pitch – decibel-sound pick up device microphones-types condenser-carbon piezo electric – direction pattern – parameters microphones – 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 –differential and residual quantization –Vector quantization .Frequency 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 systems –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-colour 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 colour response of human eye, three colour theory, additive mixing of colour, chromaticity diagram, luminance and chrominance, colour difference signal and its generation. Frequency interleaving and colour burst signal colour TV picture tubes, CRT LCD and Plasma displays, monochrome and colour receptions detailed block schematic explanation, basic colour TV systems, PAL and NTSC – block schematic explanations.

MODULE V

Video coding and video compression, demand for video compression, video image representation, quantization for image data intraframe compression techniques, DPCM – DCT based transform coding, motion compensation – H261, video conference coding standard- MEPEG video compression, Digital audio broadcasting - block schematic explanation – audio compression and encoding HDTV : pixel transmission rate – video compression for HDTV.

Reference:

1. Multimedia 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	Modern Communication Systems	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE I

Optical communication: Fibre optic communication: Fiber optics- optical modulation-optical source LED. Semiconductor Laser diodes – optical detectors Photodiode – Pin diode APD Fibre transmitter and receiver design – basic principles of fiber 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 horizon system 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 orbits, frequency selection RF links – propagation characteristics – modulation methods – coding – multiple access space craft – antennas – transponders – inter satellite link – link power budget – earth station interface. Satellite systems : geo stationary systems, distress and safety systems, navigation systems, direct sound broadcast system, direct television broadcast system.

MODULE IV

Spread spectrum communication system: general concepts, frequency hopping , the frequency hopping transmitters, the frequency hopping receiver, time hopping. antijam consideration. CDMA telemetry and remote sensing: telemetry definition, different types, applications, image characteristics, contract 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 systems : the cellular concepts major propagation mechanisms, path loss models, shadowing models, small – scale fading and multipath fading, performance of some modulation techniques in fading channels. Modulation technique for wireless communication : analog, digital modulation, and spread spectrum modulation equalization, diversity, and channels coding diversity techniques, multiple access techniques for wireless communications FDMA, TDMA and CDMA, wireless systems and standards AMPS, global system for mobile (GSM), CDMA.

Reference:

1. Optical Fiber Communication Palis Education.
2. Optical Fiber Communication B Gupta Second Edition Phi
3. Wireless Digital Communication; Principles And Practice. T.S Rappaport, Pearson Education, Prentice Hall N J 1996
4. Mobile Communication; Sebiller Pearson Education, First Edition.
5. Satellite Communication, Dennis Roddy PHI

6. Satellite 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 Floyd F Sabins W H Freeman & C New York.
10. Principles Of Telemetry Patranabis – Tata Mc Graw Hill.
11. Mobile Satellite Communication D, Muples And M Rchharia Pearson Education.

EC 803	Industrial Organisation and Management	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE I

Organisation: Concept of organisation, characteristics of organization, Elements of organisation, organisation structure, organisation charts, Types of organisation, formal line, military or scalar organization, functional organization line & staff organization, project organization, matrix organisation, authority and responsibility, span of control, delegation of authority. Industrial ownership: types of ownership-single ownership, partnership, joint stock company, cooperative 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 behavior and demand concept, buying motives, influences of income level, product design, new product distribution, pricing decisions, major price policy consideration, 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 valuations, 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, journalizing, ledger accounts, subdivision of journal, cash book, banking transactions, trial balance ,preparation of trading, profit and loss account, and balance sheet, adjustment.

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 : S.K. Basu
7. First steps in book keeping : J.B. Batiboi
8. Management accounting : Hingrani & Bemnath.

EC 804	Elective II	L	T/D/P	IM	EM	TM
		5	0	50	100	150

EC 804 A DIGITAL IMAGE PROCESSING

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 psycho visual fidelity criteria models , elements of information theory. Error free compersion – 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 combine detection; edge linking and boundary description – local and global processing using Hough transformation – aggregation, region splitting and merging – use of motion in segmentation. Fundamentals of representation and description

Reference:

1. Gonzales and Woods. “Digital Image Processing”2Ed,Pearson Education, 2002
2. Anil K Jain “Fundamentals of Digital Image Processing”Pearson Education, 2002
3. Mark Nelson Jean-LoupGailly”TheDataCompression Book”2Ed BPB Publication
4. Pratt William K “Digital Image Processing” John Wiley&Sons
5. Chanda & Majumdar “Digital Image Processing & Analysis”, PHL
6. M. Sonka V Hlavac, R.Boyle, “Image Processing, Analysis and Machine Vision”,Vikas Publishing House.

EC 804 B BASIC DESIGN

MODULE I

Introduction to ASIC’s – types of ASICs- Design flow- CMOS- logic: CMOS transistors CMOS Design rules- Combinational Logic cell- Sequential logic cell- Data path logic cell- VO 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 PO 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 V

ASIC Construction: System partition – EPGA partitioning – partitioning methods – Floor planning & placement. Floor planning - placement – design flow. Routing: Global routing detailed routing – special routing – circuit extraction – DRC

Textbook:

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

References:

1. Andrew Brown – VLSI Circuits and system in silicon – Mc Graw Hill, 1991
2. S.D Brown, R.J Francis, J. Rox, Z.G Uranesic, “Field Programmable Gate Arrays”- Kluever Academic Publishers, 1992
3. Mohammad Ismail and Terri Fiez, “Analog VLSI Signal And Information Processing”, McGraw Hill, 1994.
4. S. Y. King, H. J Whilo House T Kailam, “VLSI and Modern Signal Processing McGraw Hill, 1985
5. Jose E. France Yannis Tsividis, “Design of Analog- Digital VLSI Circuits for Telecommunication and Signal Processing”, Prentice Hall, 1994

EC 804C	Mechatronics	L	T/D/P	IM	EM	TM
		5	0	50	100	150

MODULE I

Introduction –Mechatronics-Scope -key issues-evolution-elements of Mechatronics. Approach to modern engineering and design. Review of electronics for mechanical engineers.

MODULE II

Type displacement, position and proximity-velocity-signal processing DSP device –data inputting.

MODULE III

Mechanical-types-applications-electrical-type-applications- pneumatics &Hydraulics circuits. Application selection of actuators

MODULE IV

Type of controllers-programmable logic controllers-application –ladder diagrams. Microprocessor application in Mechatronics-programming-interfacing-computer applications.

MODULE V

Manufacturing : Mechatronics - automobile, Mechatronics - medical, Mechatronics - office automation case studies.

Text:

1 Bulton N."Mechatronics" Electronic control system for mechanical and electrical engineering, longman.1995.

Reference:

1. Dradly.D.A , Dawson. D., Burd, N.C, and Loader A.J, Mechatronics-Electronics in Products & Process-Chapmen & Hall. 1997.
2. HMT, "Mechatronics", Tata Mc Graw Hill, 1998.
3. GALIP ULSOYA and Devries ,W.R. "Micro computer application in manufacturing" John wiley,1989.
4. James harter, "Electro mechanics -Principles bejnConcept and Devices-Prentics Hall, 1995.

EC 804 D BIOMEDICAL INSTRUMENTATION

MODULE I

Source of bioelectric potential-resting& action potentials propagation of action potentials. The bioelectric potentials. Electrodes for ECG, EEG and EMG microelectrodes.

MODULE II

Biomedical recorders.Electrocardiograph –lead systems-block diagram of electrocardiograph. Electroencephalograph- Electromyography (Block diagram level treatment only) Inkjet recorder, UV recorders.

MODULE III

Therapeutic equipments –Cardiac pacemakers –External and implantable pacemakers power sources for implantable pacemakers lead and electrodes –cardiac defibrillatious

–implantable defibrillators –Electrosurgical machines ultrasonic therapy unit.

MODULE IV

Imaging systems- Basics of X ray machines-computed Tomography- Magnetic resonance imaging systems. Basic NMR components. Thermographic equipment. Realtime ultrasonic imaging systems

MODULE V

Bioielemetry- introduction components- implantable units. Single channel telemetry systems-multichannel wireless telemetry systems. Transmission of analog physiological signals over telephone lines.

References

1. Biomedical Instrumentation and Measurements, Leslie Cromwell
2. Hand book of Biomedical Instrumentation ,R.S.Khantpur.
3. Principles of Biomedical Instrumentation, Richard Aston.

EC 805	Project	L	T/D/P	IM	EM	TM
		0	10	300	0	300

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 panels consisting of at least three faculties including the project guide appointed by HOD

EC 805	VIVA-VOCE	L	T/D/P	IM	EM	TM
		0			100	100

Each student is required to appear for viva-voce examination, and he/she has to bring his / her seminar report and project report. Examination should assess the student's overall ability and knowledge in the field of Electronics and Communication. 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 in large.