# B.TECH. DEGREE COURSE

## SYLLABUS

# ELECTRONICS & COMMUNICATION ENGINEERING BRANCH

# THIRD SEMESTER

## ENGINEERING MATHEMATICS - II

**CMELPA 301** **3+1+0**

**Module 1**

**Vector differential calculus**: Differentiation of vector functions- scalar and vector fields- gradient - divergence and curl of a vector function - their physical meaning - directional derivative - scalar potential- conservative field – identities - simple problems.

**Module2**

**Vector integral calculus**: Line- surface and volume integrals- work done by a force along a path- application of Green's theorem- Stoke's theorem and Gauss divergence theorem.

**Module 3**

**Function of complex variable**: Definition of analytic function and singular points- derivation of C.R. equations in Cartesian co-ordinates- harmonic and orthogonal properties- construction of analytic function given real or imaginary parts- complex potential- conformal transformation of functions like $Z^n$, $e^z$, 1/z, Sin z, $z + k^2/z$ - bilinear transformation- cross ratio- invariant property- simple problems.

**Module 4**

**Finite differences**: meaning of $\Delta, \nabla$, E, $\mu$, $\delta$ - interpolation using Newton's forward and backward formula- central differences- problems using Stirlings formula- Lagrange's formula and Newton's divided difference formula for unequal intervals.

**Module 5**

**Difference Calculus**: Numerical differentiation using forward and backward differences. Numerical integration- Newton-Cote's formula- trapezoidal rule- Simpson's $1/3^{rd}$ and $3/8^{th}$ rule- simple problems- difference equations - solutions of difference equations.

**References**


1. Advanced Engg. Mathematics: Erwin Kreyzing- Wiley Eastern. Pub.
2. Higher Engg. Mathematics: B. S. Grewal- Khanna publishers.
3. Numerical methods in Science and Engineering: M K Venkataraman- National Pub.
4. Numerical methods: S Balachandra Rao- University Press.
5. Advanced Engineering Mathematics: Michael D Greenberg- PHI.
6. Theory and Problems of Vector analysis: Murray Spiegel- Schaum's- Mc Graw Hill.

## NETWORK THEORY

**LA 302** **2+1+0**

**Module 1**

Source transformation- Mesh and Node voltage Analysis – Coupled circuits – Dot conventions – Analysis of coupled circuits.

**Module 2**

Network theorems-Super position theorem- Reciprocity theorem - Thevenin's theorem- Norton's theorem- Millman's theorem- Maximum power transfer theorem- Tellegen's theorem- Graph of a network -Trees- co-trees -Incident matrix- cut- set matrix-tie-set matrix- Analysis of networks- equilibrium equations.

**Module 3**

Fourier Analysis and Laplace transform - Fourier analysis of periodic signals- Trignometric and exponential forms- Non periodic signals and Fourier transforms- Frequency spectrum of periodic waveforms - Laplace Transform- Review of theorems-Laplace transform of important signal waveforms - Periodic functions- Initial value and final value Theorems- DC&AC transients- Solution of network problems using Laplace transform.

**Module 4**

Two-port Networks and Filters - Voltage and Current ratios of two - port networks -Admittance- impedance- hybrid and transmission parameters of two port networks. Passive filters as two port networks- Characteristics of ideal filters-Image impedance- Constant K low pass- High pass and Band pass filters- m-derived filters-Composite filters.

**Module 5**

Network Synthesis – Realizability concept – Hurwitz property – positive realness – properties of positive real function – Synthesis of R, L, RC and LC driving point functions – Foster and Cauer forms.

**References**


1. Network analysis -M.E Van Valkenburg, PHI
2. Circuits and Networks – analysis & synthesis – A. Sudhakar & S P ShyamMohan
3. Network and Systems -D Roy Chaudhary
4. Network analysis and synthesis-Franklin F Kuo – John Wiley & Sons
5. Engineering Circuit Analysis-W H Hayt & Jack Kennerly – Mc-Graw Hill

## ELECTRICAL TECHNOLOGY

**LA 303** **2+1+0**

**Module 1**

D.C.Generator – O.C.C. – Condition for self excitation – field critical resistance – critical speed – Load characteristics of generators – Losses – power flow diagram – efficiency – Condition for maximum efficiency – Applications.

**Module 2**

D C motor – starter – 3 point and 4 point starters – torque equation – speed equation – speed torque – characteristics of shunt, series and compound motors – Losses – efficiency – Brake test – Swinburne's test – speed control – field control – armature control – series parallel control – applications.

**Module3**

Transformers: transformer on no-load and load operation – phasor diagram – equivalent circuit – regulation – losses and efficiency – o.c. and s.c. test – applications – Design of step down transformers like 230/6-0-6V, – Basic principles of 3 phase tranformer – autotransformer – applications.

**Module 4**

A.C Machines: 3 phase induction motors – rotating magnetic field – torque equation – slip – torque-slip characteristics – operating characteristics – starting of 3 phase induction motors – starters – single phase induction motors – constructional features – types – working and characteristics only (no analysis) – constructional features of synchronous machines – principle of operation of alternator – emf equation – regulation by emf and mmf method – principle of operation of synchronous motor – starting of synchronous motor.

**Module 5**

Special Machines: A C and D C servo motors – synchros – constructional features – working of a tachogenerator – stepper motors – construction, working, applications and specifications of stepper motors – universal motors - constructional features – typical applications – criteria for selection of motors – electromagnetic relays – contactors.

**References**


1. Electrical & Electronic Technology: Hughes, Pearson Education
2. Electrical Technology: H. Cotton
3. Electrical Machines: R.K.Rajput
4. Electrical Design Estimating & Costing: K.B.Raina & Bhattacharya
5. Electrical Machines & Power systems: Vincent Del Toro

## SOLID STATE DEVICES

**LA304** **3+1+0**

**Module 1**

Energy bands and charge carriers in semiconductors: energy bands- metals- semiconductors and insulators- direct and indirect semiconductors- charge carriers in semiconductors: electrons and holes- intrinsic and extrinsic material- n-material and p-material- carrier concentration: fermi level- EHPs- temperature dependance- conductivity and mobility- drift and resistance- effect of temperature and doping on mobility- hall effect.

**Module 2**

Diffusion of carriers- derivation of diffusion constant D- Einstein relation- continuity equation- p-n junctions: contact potential- equilibrium fermi levels- space charge at junctions- current components at a junction: majority and minority carrier currents- zener and avalanche breakdown- capacitance of p-n junctions.

**Module 3**

p-n junction diodes: volt-ampere characteristics- switching time- rectifier action- Zener diodes: volt-ampere characteristics- Tunnel diodes: tunneling phenomena- volt-ampere characteristics- Varactor diodes- Photo diodes: detection principle- light emitting diodes.

**Module 4**

Bipolar junction transistors: npn and pnp transistor action- open circuited transistor- biasing in active region- majority and minority carrier distribution- terminal currents- amplification and switching- $\alpha$ and $\beta$ gain factors- emitter efficiency $\gamma$- schottky transistors- photo transistors.

**Module 5**

Field effect transistors: operation- pinch off and saturation- pinch off voltage- gate control- volt-ampere characteristics- MOSFETS: n MOS and p MOS: comparison- enhancement and depletion types- control of threshold voltage- MOS capacitance.

**References**


1. Solid state electronic devices - Ben G Streetman- Pearson Education
2. Microelectronic Devices: Nagchaudhari, Pearson Education
3. Integrated electronics – Millman and Halkias- Mc Graw Hill.
4. Physics of semiconductor devices - S M Sze- Mc Graw Hill.
5. Semiconductor devices – Nagchoudhary- Tata Mc Graw Hill.
6. Physics of semiconductor devices: Shur- PHI.
7. Theory of Semiconductor devices: Karl Hess- PHI.

## ELECTRONIC CIRCUITS - I

**LA 305** **3+1+0**

**Module 1**

Rectifiers and Power supplies: Half wave- full wave and bridge rectifiers- working- analysis and design- C filter analysis- regulated power supplies: series and shunt- design of regulated power supplies for specified output conditions- current limiting- short circuit protection- IC regulated power supplies.

**Module 2**

Transistor as an amplifier: Transistor at low frequencies- h parameter model analysis- expression of voltage and current gain- input and output impedance- CE- CB and CC configurations- comparison- transistor parameters from static characteristics- FET: operation- characteristics- small signal model.

**Module 3**

Transistor Biasing: operating point- DC and AC load lines- Q point selection- bias stability- definition of stability factors- derivation of stability factor for $I_{CO}$ variation- fixed bias- collector to base bias- self bias circuits- bias compensation- compensation for $I_{CO}$ and $V_{BE}$.

**Module 4**

RC Coupled amplifier: working- analysis and design- phase and frequency response- FET amplifier: biasing- analysis and design.

**Module 5**

Wave shaping circuits: clipping- clamping- RC integration- differentiation- transistor as a switch- astable multivibrator- working and design- UJT- working and applications- simple sweep circuit.

**References**


1. Electronic devices and circuits: Boylsted & Nashelsky- Pearson Edn.
2. Integrated Electronics: Millman & Halkias- Mc Graw Hill.
3. Electronic Principles: Malvino- Tata Mc Graw Hill.
4. Electronic devices and circuits: Bogart- UBS.
5. Electronic devices and circuits: Allen Mottershed- PHI.
6. Electronic devices: Floyd- Pearson Edn.
7. Electronic devices and applications: B Somanathan Nair- PHI.
8. Electronic devices and circuits: J B Gupta- S K Kataria & Sons Pub.

## COMPUTER PROGRAMMING

**LA 306** **3+1+0**

**Module 1**

**Introduction to C**: C fundamentals - The character set - identifiers and keywords - Data types - constants - variables and arrays - declarations - expressions - statements - symbolic constants- arithmetic operators - Relational and Logical operators - The conditional operator - Library functions - Data input and output - getchar – putchar, scanf, printf - gets and puts functions - interactive programming.

**Module 2**

**Control Statements:** While - do while - for - nested loops -if else switch- break - continue - The comma operator - go to statement, Functions - a brief overview - defining a function - accesing a function - passing arguments to a function - specifying argument - data types - function prototypes - Recursion.

**Module 3**

**Program structure**: storage classes - Automatic variables - external variables - multi file programs. Arrays: defining an array - processing an array - passing arrays in a function – multi dimensional arrays - array and strings. Structures and unions: defining a structure - processing a structure - user defined data types - passing structure to a function – self referential structures - unions.

**Module 4**

**Pointers**: Fundamentals - pointer declaration - passing pointers to a function - pointers and one dimensional arrays - operations on pointers - pointers and multi dimensional arrays – passing functions to other functions.

**Module 5**

**Data files**: Opening and closing of a data file - creating a data file - processing a data file, low level programming - register variables – bit wise operation - bit fields - enumeration - command line parameters - macros - the C pre-processor.

**Text Book**

1. Programming with ANSI and Turbo C: Ashok N Kanthane, Pearson Edn.

**References**

1. Theory and problems of programming with C- Gottfried, Schaum's series.
2. The C programming language: Kernighan & Ritche, PHI.
3. Programming Techniqes through C: Venkateshmurthy, Pearson Edn.
4. Programming in C: Balaguruswamy, Tata Mc Graw Hill.

5. Programming Ansi C: Ram Kumar.
6. Computer Programming: Rajaraman, PHI.

## ELECTRICAL LAB

**LA 307** **0+0+4**

1. Measurement of Electric power (single phase and three phase) and energy using wattmeter and energy meter.
2. Study of star-delta connections.
3. O.C.C. and Load characteristics of D.C. generators.
4. Swinburne's test.
5. Load characteristics of D.C. shunt, series and compound motors
6. O.C and S.C test on single-phase transformer.
7. Load test on step-up/step-down transformer; calculation of efficiency and regulation at different power factors.
8. Study of starting of three phase induction motors and load test on squirrel cage induction motor.
9. Load test on slipring induction motor.
10. Study of stepper and servomotors.
11. Load test on single phase induction motor.
12. Pre-determination of regulation of the alternator by emf and mmf method.

## BASIC ELECTRONICS LAB

**L 308** **0+0+4**

1. Familiarization of CRO, DVM, AF generator etc and soldering practice.
2. Characteristics - Diode, Transistor, FET, UJT. Determination of parameters.
3. Design and testing of DC power supplies for specified output.
4. Design of Single stage RC coupled amplifier. Determination of Band width.
5. Design of FET amplifier. Determination of Band width.
6. Wave shaping. Design of clipping, clamping, RC differentiator & Integrator.
7. Design of Astable multi-vibrator for specified time period - sharpening of edges.
8. Simple sweep circuit.
9. Familiarization of data sheets of components – OA79, 1N4001, SZ6.8, BC107, BC547, BC557, BFW10, 2N2646.
10. Simulation of simple circuits using Spice.

**Note**

New experiments may be added in the above list concerned to the relevant theory paper (LA 305).

# FOURTH SEMESTER

## ENGINEERING MATHEMATICS - III

**CMELRPTA 401** **3+1+0**

**Module 1**

**Ordinary Differential Equations**: Linear Differential equations with constant coefficents - Finding P.I. by the method of variation of parameters – Cauchys equations- Linear Simultaneous eqns- simple applications in engineering problems.

**Module 2**

Partial Differential Equations - formation by eliminating arbitrary constants and arbitrary Functions - solution of Lagrange Linear Equations –Charpits Method – solution of homogeneous linear partial differential equation with constant coefficients – solution of one dimensional wave equation and heat equation using method of separation of variables – Fourier solution of one dimensional wave equation.

**Module 3**

**Fourier Transforms**: - Statement of Fourier Integral Theorems – Fourier Transforms – Fourier Sine & Cosine transforms - inverse transforms - transforms of derivatives – Convolution Theorem (no proof) – Parsevals Identity - simple problems.

**Module 4**

**Probability and statistics**: Binomial law of probability - The binomial distribution, its mean and variance - poisson distribution as a limiting case of binomial distribution - its mean and variance - fitting of binomial & poisson distributions - normal distribution - properties of normal curve - standard normal curve - simple problems in binomial, poisson and normal distributions.

**Module 5**

**Population & Samples**: Sampling distribution of mean ($\sigma$ known) –Sampling distribution of variance, F and Chi square test – Level of significance - Type 1 and Type 2 errors – Test of hypothesis – Test of significance for large samples – Test of significance for single proportion, difference of proportions, single mean and difference of means (proof of theorems not expected).

**References**


1. Higher Engineering Mathematics - B.S. Grewal, Khanna Publishers.
2. Engineering Mathematics Vol.II -3rd year Part A & B - M.K. Venkataraman, National Publishing Company
3. Elements of Partial Differential Equations - Ian N.Sneddon.,McGraw Hill.
4. Miller and Fread's Probability and statistics for engineers – Richard A Johnson, Pearson Education Asia / PHI.
5. A text book of Engineering Mathematics (Volume II) – Bali and Iyengar, Laxmi Publications Ltd.
6. Advanced Engg. Mathematics Erwin Kreyszig, Wiley Eastern Ltd.
7. Probability and statistical inferences – Hogg and Tanis, Pearson Education Asia.

## DIGITAL ELECTRONICS AND LOGIC DESIGN

**LA 402** **3+1+0**

**Module 1**

Gates –Inverter - OR gates - AND gates - NOR Gates - De Morgan's Theorems - NAND Gates - EXCLUSIVE-OR Gates - Tristate Inverter - TTL Circuits - Digital Integrated Circuits - 7400 Devices - TTL Characteristics - TTL Overview - AND -OR- NOT Gates - Open-Collector Gates – CMOS gates.

**Module 2**

Boolean Algebra and Karnaugh Maps - Boolean Relations - Sum-of-Products method - Algebraic Simplification - Karnaugh maps – Pairs – Quads - and Octets - Karnaugh Simplifications - Don't-Care Conditions. Multiplexers - de-multiplexers - decoder and encoder.

**Module 3**

Arithmetic-Logic Units - Binary Addition - Binary Subtraction - Half Adders - Full Adders - Binary Adders - signed Binary Numbers - 2's Complement - 2's-Complement Adder-Subtractor.

**Module 4**

Flip Flops - RS Latches - Level Clocking - D Latches - Edge-Triggered D & T Flip-Flops - Edge-Triggered JK Master-slave Flip-Flop.

**Module 5**

Registers and Counters - Buffer Registers - Shift Registers - Controlled Shift Registers - Ripple Counters - Synchronous Counters - Ring counters - Modulo counters - Three-State Register. ROMs – PROMs and EPROMs - RAMs. A small TTL Memory.

**References**


1. Digital Fundamentals: Floyd, Pearson Edn.
2. Digital Design: Wakerly, Pearson Education.
3. Fundamentals of digital circuits: A Anand Kumar, PHI
4. Digital Integrated Electronics: Taub and Shilling, McGraw Hill,
5. Digital electronics: D C Green, Pearson Edn.
6. Digital Logic and state machine design: Comer, Oxford.
7. Digital electronic principles and applications: A K Maini, Khanna Pub.
8. Digital electronic principles: Malvino and Leach, Mc Graw Hill.
9. Logic and computer design fundamentals: M Morris Mano, Pearson Edn.

## COMMUNICATION ENGINEERING

**LA 403** **3+1+0**

**Module 1**

**Introduction**: communication systems – Modulation - need for modulation- bandwidth- Amplitude modulation - theory- mathematical representation- frequency spectrum - USB & LSB- power relation- Frequency modulation - theory- mathematical representation- frequency spectrum- Phase modulation- comparison of AM- FM- PM.

**Module 2**

**Radio transmitters**: AM transmitter - block diagram - Solid state modulators - circuit explanation- FM transmitter - reactance modulator- varactor diode modulator- Amstrong modulator.

**Module 3**

**Radio receivers**: Tuned radio frequency receiver- superheterodyne receiver - block schematic- selectivity- sensitivity- importance of IF - image frequency rejection - AM receivers - schematic explanation - RF amplifiers - circuit explanation - Mixer circuits - IF amplifiers - circuit explanation- simple diode detector - Automatic gain control circuit - simple and delayed AGC - FM receivers - block schematic explanation - amplitude limiting - FM demodulators: slope detectors- phase discriminator- ratio detectors.

**Module 4**

**Side band communication**: Single side band transmission - suppression of carrier - balanced modulator - filtering of unwanted sideband - SSB receivers - block schematic explanation - pilot carrier receiver - suppressed carrier receiver - Vestigial side band transmission - transmitter and receiver responses - advantages of VSB in television.

**Module 5**

Telephone Systems - Telephone subscribers loop circuit - subscribers line interface circuit - Pulse and tone signaling - Frequency assignments - Electronic telephone - block schematic of a telephone set- block schematic of single line analog SLIC board - two wire repeaters - Electronic private automatic branching exchange - basic block schematic- Power line communication: block schematic explanation- Facsimile - FAX transmitter and receiver.

**References**


1. Electronic communication Systems: Wayne Tomasi- Pearson Edn.
2. Electronic communication: Roody and Coolen- PHI.
3. Electronic Communication systems: George Kennedy- Mc Graw Hill.
4. Electronic and radio engineering: A P Mathur.
5. Telephony and Carrier current engineering: P N Das.
6. Modern communication Systems: Couch- PHI.

## ELECTRONIC CIRCUITS - II

**LA 404** **3+1+0**

**Module 1**

High frequency equivalent circuit of a transistor. Hybrid pi model - explanation of components -r parameters in terms of h parameters -Tuned amplifiers -principle - single tuned and double tuned amplifiers -frequency response -applications (no analysis) -multistage amplifiers -frequency response.

**Module 2**

Feedback -different types -positive, negative, voltage, current, series and shunt feedback -Feedback in amplifiers -its effect on amplifier performance -typical feedback arrangements -emitter follower -darlington emitter follower -cascade amplifier (principles only) -difference amplifier.

**Module 3**

Oscillators -conditions for oscillation -analysis and design of RC phase shift oscillator, general form of oscillator circuit -working of Hartley, Colpitt's, Crystal, tuned collector and Wien Bridge oscillators.

**Module 4**

Mono-stable multi vibrator -analysis -design -applications -triggering -Bistable multi-vibrator -analysis and design -different methods of triggering -commutating capacitor -Schmitt trigger -working -design.

**Module 5**

Large signal amplifier -harmonic distortion -analysis of class A, class B, class C and class D amplifiers -complimentary and symmetry stage -sweep generators - voltage and current sweeps -time base generators -linearisation -miller and bootstrap sweeps - applications.

**References**


1. Electronic devices and circuits -Boylsted & Neshelsky, Pearson Edn.
2. Integrated electronics -Millman & Halkias , Mc Graw Hill
3. Electronic principles -Malvino
4. Electronic devices and circuits -Bugart
5. Microelectronics Digital and Analogue -Botkar.

## SIGNALS AND SYSTEMS

**LTA 405** **2+1+0**

**Module 1**

Dynamic Representation of Systems - Systems Attributes- Causality - linearity- Stability- time-invariance. Special Signals- Complex exponentials- Singularity functions (impulse and step functions). Linear Time-Invariant Systems: Differential equation representation- convolution Integral. Discrete form of special functions. Discrete convolution and its properties. Realization of LTI system (differential and difference equations).

**Module 2**

Fourier Analysis of Continuous Time Signals and Systems - Fourier Series- Fourier Transform and properties- Parseval's theorem- Frequency response of LTI systems. Sampling Theorem.

**Module 3**

Fourier Analysis of Discrete Time Signals & Systems - Discrete-Time Fourier series- Discrete-Time Fourier Transform (including DFT) and properties. Frequency response of discrete time LTI systems.

**Module 4**

Laplace Transform - Laplace Transform and its inverse: Definition- existence conditions- Region of Convergence and properties- Application of Laplace transform for the analysis of continuous time LTI system (stability etc.) Significance of poles & zeros- Z-Transform - Z-Transform and its inverse: Definition- existence- Region of convergence and properties- Application of Z-Transform for the analysis of Discrete time LTI systems- Significance of poles and zeros.

**Module 5**

Random Signals - Introduction to probability. Bayes Theorem- concept of random variable- probability density and distribution functions- function of a random variable. Moments- Independence of a random variable. Introduction to random process. Auto and cross correlation. wide-sense stationarity- power spectral density White noise- Random processes through LTI systems.

**References**


1. Signals and Systems: Oppenheim Alan- V- Willsky Alan. S- Pearson Edn.
2. Communication Systems: Haykin Simon- John Wiley.
3. Signals and Systems: I J Nagrarth- Tata Mc Graw Hill.
4. Signals and Systems: Farooq Husain- Umesh pub.
5. Adaptive signal processing: W Bernad- Pearson Edn.

## RELIABILITY AND HUMANITIES

**LA 406** **2+1+0**

**Module 1**

Concepts of reliability: Definition of reliability- failure- classification of failures- measures of reliability- failure rate- mean time between failures (MTBF)- mean time to failure (MTTF).

**Module 2**

Failure pattern and fitting curves: Graphical plots- Bath tub curves- Hazard models- Constant hazard models- Linearly increasing hazard model- Weibull model.

**Module 3**

Manufacture for Quality and reliability: The need for prototype tests- the quality standard- planning to achieve required quality- basic concepts of sequencing.

**Module 4**

Control charts in statistical quality control: statistical quality control advantages- types of control charts- X and R chart- P chart- C chart- Re-engineering- Zero defects.

**Module 5**

Human relations: Human Behavior- Scope of Industrial psychology-Theories of Motivation-Handling of workers grievances-Workers participation in management-Industrial discipline-Industrial disputes-Industrial fatigue-Wages and incentives.

**References**


1. Reliability Engineering: L S Sreenath.
2. Reliability Engineering: A K Govil.
3. Industrial Engineering & Management: Banga and Sharma.


## ELECTRONIC CIRCUITS LAB

**LA 407** **0+0+4**

**List of experiments**

1. Power amplifiers: Design of class A and class AB push pull stage – verification of power output.
2. IC power amplifier.
3. Oscillators: Design of RC phase shift, Hartley & Colpitts oscillators.

4. Design of Mono-stable and bi-stable multi-vibrators.
5. Design of bootstrap sweep generator.
6. Schmitt trigger.
7. SCR, Triac firing circuits.
8. Feedback amplifier, design of two stage RC coupled amplifier.
9. Tuned amplifiers.
10. Design and testing of DC regulated power supplies (Fixed and variable).
11. Simulation of above circuits using PSPICE.

**Note**

New experiments may be added in accordance with subject LA 404

## COMPUTER PRORAMMING LAB

**LA 408** **0+0+4**

### Part 1

1. Computer hardware familiarization.
2. Familiarization of MS-DOS commands, Microsoft Windows.
3. Familiarization of Microsoft Word, Adobe Acrobat Reader.

### Part 2

Programming Experiments in C/C++: Programming experiments in C/C++ to cover control structures, functions, arrays, structures, pointers and files, classes, operator & function overloading, inheritance, polymorphism.

# FIFTH SEMESTER

## ENGINEERING MATHEMATICS -IV

**CMELPA501** **3+1+0**

**Module 1**

Complex Integration: Line Integral –Cauchy's integral theorem- Cauchy's integral formula-Taylor's series-Laurent's series- zeros and singularities-Residues- residue theorem-Evaluation of real integrals using contour integration involving unit circle and semicircle.

**Module 2**

Numerical solution of algebraic and transcendental equations: Successive bisection method-Regula falsi method - Newton –Raphson method – solution of system of linear equations by Jacobi's iteration method and Gauss-Siedel method.

**Module 3**

Numerical solution of ordinary differential equation: Taylor's series method-Euler's method –Modified Eulers method - Runge – Kutta method (IV order)-Milne's predictor corrector method.

**Module 4**

Z – Transforms: Definition of Z transform- properties –Z transform of polynomial functions – trigonometric functions, shifting property, convolution property-inverse transform – solution of $1^{st}$ & $2^{nd}$ order difference equations with constant coefficients using Z transforms.

**Module 5**

Linear programming: graphical solution – solution using simplex method (non – degenerate case only) – Big-M method,two phase method- Duality in L.P.P.-Balanced T.P. – Vogels approximation method – Modi method.

**References**


1. Advanced Engineering Mathematics – Ervin Kreyszig, Wiley Eastern limited.
2. Numerical methods in Engineering & Science – Dr. B.S.Grewal, Kanna Publishers.
3. Higher Engineering Mathematics - Dr. B.S.Grewal, Kanna Publishers.
4. Numerical methods in Science & Engineering - Dr. M.K.Venkitaraman, National Publishing company.
5. Quantitative techniques Theory & Problems - P.C.Tulsian, Vishal Pandey, Pearson Education Asia.
6. Complex variables and applications - Churchill and Brown, McGraw-Hill.
7. Operations research - Panneer Selvam, PHI.
8. Engineering Mathematics Vol. III -S Arumugam, A.T.Isaac, A.Somasundaram, Scitech publications
9. Advanced Mathematics for Engg.students Vol. III- S.Narayanan, T.K.M.Pillay, G.Ramanaigh, S.Vishwananthan printers & publishers.

## POWER ELECTRONICS

**LA 502** **2+1+0**

**Module 1**

Power semiconductor Devices - History of development of Power Electronic devices- Constructional features- Characteristics- rating and specification- gate/base drive circuits-protection including cooling and application consideration of diodes- SCRS, GTO, BJTS, MCT, MOSFET and IGBT. Series and parallel operations of SCR- Electromagnetic interference.

**Module 2**

AC to DC Converters - Operation and analysis of Single phase and multi-phase uncontrolled and controlled rectifiers with R, RL and back EMF load- effect of source inductance- free wheeling effect- power factor improvement methods for phase Controlled rectifiers- filters. PWM chips: SG3524 and TL 494- Block schematic.

**Module 3**

AC to AC Voltage Converter - Operation and analysis of single phase integral cycle and phase controlled converters- Configuration of three phase controllers.

**Module 4**

DC to DC Converters - Chopper classification- Step down- step up and four quadrant converters operation- analysis and control with R, RL and EMF load- current and voltage Commutation circuits.

**Module 5**

DC to AC Converters - Single phase and three phase bridge inverters- VSI and CSI- voltage control - PWM & Square wave operation- Harmonics and their reduction techniques.

**References**


1. Power Electronics: Rashid Muhammad, Pearson Edn.
2. Power Electronics: Harish C Ray, Galgotia Pub.
3. Thyristors and Applications: Ramamoorthy.
4. Power Electronics: Converter, Applications and Design, Mohan Ned, John Wiley,
5. Power Semiconductor Circuits: Dewan, S.B. and Satrughan A, John Wiley & Sons, 1975.
6. Thyristorised Power Controllers: Dubey, G.K., Doradlla, S. R., Wiley Eastern, 1987.

## APPLIED ELECTROMAGNETIC THEORY

**L 503** **3+1+0**

**Module 1**

**Review of vector analysis**: Cartesian, Cylindrical and Spherical co-ordinates systems- Co-ordinate transformations. Static electric field: Coulomb's Law of point charges- Electric flux-Gauss's Law- Electrical scalar potential- different types of potential distribution- Potential gradient- Boundary conditions Capacitance: Capacitance of isolated sphere- capacitance between two concentric sphere shells- capacitance between coaxial cylinders- capacitance between parallel wires. Vector fields: Divergence and curl- Divergence theorem- Stokes theorem.

**Module 2**

**Magnetic field**: Steady current and current density in a conductor- Biot-Savarts Law- Ampere's Law- Helmholtz theorems- Faraday's law of electromagnetic induction- Solenoid, toroid, inductance of transmission line- Mutual inductance energy stored in magnetic fields- Magnetic dipole- Electric and Magnetic boundary conditions- vector magnetic potential.

**Module 3**

**Maxwell's equations and travelling waves**: conduction current and displacement current- Maxwell's equations- Plane waves- Poynting theorem and Poynting vector- Plane electromagnetic waves- Solution for free space condition- Uniform plane wave-wave equation for conducting medium- Wave polarization- Poisson's and Laplace equations.

**Module 4**

Guided waves between parallel planes- transverse electric and transverse magnetic waves and its characteristics- Rectangular wave guides- modes of propagation.

**Module 5**

Transmission lines -Transmission line equations- transmission line parameters- Skin effect- VSWR- Characteristic impedance- Stub matching- Smith chart - Phase velocity and group velocity.

**References**


1. Engineering Electromagnetics: W. H. Hayt, Mc Graw Hill Publications.
2. Electromagnetics: J. D. Kraus, Mc Graw Hill Publications.
3. Engineering electromagnetics: E. C. Jordan.
4. Field & Wave Electromagnetic: Cheng, Pearson Education.
5. Electromagnetics: Edminister, Schaum series, 2 Edn.
6. Electromagnetic Theory: B. Premlet.
7. Electromagnetic Theory: Sadiku, Oxford University Press.

## COMPUTER ORGANISATION AND ARCHITECTURE

**LA 504** **2+1+0**

**Module 1**

Basic structure of computer hardware and software- addressing methods and machine programming sequencing- different addressing modes- instruction sets- computer arithmetic logic design- fast adders- multiplication- Booth's algorithm- fast multiplication- integer division- floating point numbers.

**Module 2**

Control unit- instruction execution cycle- sequencing of control signals- hardwired control- PLAs- micro programmed controls- control signals- micro instructions - Micro program sequencing- branch address modification- pre fetching of micro instructions.

**Module 3**

Memory organization- semi conductor RAM memories- internal organization- bipolar and MOS devices- dynamic memories- multiple memory modules and interleaving- cache memories -mapping functions - replacement algorithms- virtual memories- address translation-page tables - memory management units- secondary memories- disk drives- standards.

**Module 4**

Input-Output organization- accessing I/O devices- direct memory access (DMA)- interrupts and interrupt handling- handling multiple devices- device identification- vectored interrupts- interrupt nesting- daisy chaining- I/O interfaces- serial and parallel standards- buses-scheduling- bus arbitrations- printers- plotters- VDUs.

**Module 5**

Introduction to parallel processing and architecture- classification- array processors- pipeline architecture- interconnection- networks- multistage networks- message passing architecture.

**References**


1. Computer organization – Hamacher C V, Mc Graw Hill.
2. Computer Systems and Architecture – Vincent P Heuring, H F Jordan, Pearson Edn.
3. Computer organization and Design – Pal Choudhary
4. Computer organization and Architecture – Hayes J P
5. Computer Org. & Architecture: Stallings, Pearson Education.

## LINEAR INTEGRATED CIRCUITS

**LA 505** **3+1+0**

**Module 1**

Introduction to operational amplifiers – Basic differential amplifier - dual input balanced output and unbalanced output- Internal block schematic of op amp - Pin identification- power supply requirements - typical data sheet - Op-amp parameters - ideal op amp - transfer curve - equivalent circuit- open loop configurations - frequency response of op amps - compensating networks - slew rate and its effect.

**Module 2**

Op amp in closed loop configuration: Different feed back configurations- Voltage series feedback and voltage shunt feedback - concept of virtual ground- voltage follower - V/I converters and its applications - Differential amplifiers with one op amp and 3 op amps- Use of offset minimizing resistor ($R_{OM}$) and its design.

**Module 3**

Op amp applications- Summer- Subtractor- Log amplifier- Antilog amplifier- Comparators: zero crossing- using voltage reference- regenerative (Schmitt trigger) comparators- Astable and monostable multivibrators- Triangular and sawtooth wave generators- Integrator and differentiator- RC phase shift and Wien bridge oscillators-Sample and hold circuit- Peak detector circuit.

**Module 4**

Filters and timers: LPF- HPF- BPF- Notch and all pass filters- I order and II order filters- Switched capacitor filter- Switched capacitor integrator. 555 timers – Functional block diagram- Astable multivibrator, monostable multivibrator and its applications.

**Module 5**

Specialized ICs and applications: Voltage regulator ICs – 78XX and 79XX series- 317 variable regulators- 1723 switching regulators- 566 VCO chip- Phase locked loop(PLL) - capture and lock range- 565 PLL - PLL applications: Frequency multiplication and division- AM demodulation- FM detection- FSK demodulation - LM 380 power amplifier - intercom using LM 380- 8038 Function generator chip - applications.

**References**


1. Op amps and Linear Integrated circuits: Ramakand Gaykwad- PHI publications.
2. Op amps and Linear Integrated circuits: R F Coughlin- Pearson Education.
3. Op amps and Linear Integrated circuits: Ravi Raj Dudeja- Umesh Publications.
4. Linear Integrated circuits: Roy Choudhary & Jain- Wiely Eastern Publications.
5. Integrated circuits: K R Botkar

## MICROPROCESSORS AND MICROCONTROLLERS

**L506** **3+1+0**

**Module1**

Introduction to microprocessors and microcomputers: Function of microprocessors- architecture of 8085- pin configuration and functions – tristate bus concept - generation of control signals - bus timings – de-multiplexing $AD_0$-$AD_7$ – flags - memory decoding - interfacing of RAM and EPROM - I/O addressing - I/O mapped I/O - and memory mapped I/O schemes - instruction execution - fetch/execute cycle - instruction timings and operation status.

**Module 2**

Atmel AT89C51 microcontroller – features - pin configurations - internal block schematic - pin descriptions - PORT0, PORT1, PORT2, PORT3, idle & power down mode - power control register - program protection modes - flash programming & verification.

**Module 3**

Memory organization - program memory - data memory - direct & indirect addressing area - Program status word - register banks - addressing modes - instruction set – arithmetic - logical and data transfer instructions - Boolean instructions - program branching instructions - Programming examples.

**Module 4**

Machine cycles – interrupts - interrupt sources - interrupt enable register - interrupt priority - interrupt control system - interrupt handling - single step operation - port bit latches and buffers - port structures and operation - accessing external memory – programming examples.

**Module 5**

Timer0 & Timer1 - TMOD SFR - mode0, mode1, mode2, mode3 - TCON SFR - serial interface - SCON SFR - mode0, mode1, mode2, mode3- block schematics- baud rates- power on reset circuit- ONCE mode- on chip oscillator- external program & data memory timing diagrams- I/O port timings – programming examples.

**References**


1. The 8051 Microcontroller: Muhammad Ali Mazidi, Pearson Education.
2. The 8051 Microcontroller: Kenneth J Ayala, Penram International
3. Microprocessors and Architecture: Ramesh S Goankar
4. Microcomputers and Microprocessors: John Uffenbeck, PHI
5. Web site of Atmel - www.atmel.com

## DIGITAL IC LAB

**LA 507** **0+0+4**

**List of experiments**

1. TTL & CMOS characteristics (7400, CD4001)
2. Interfacing of TTL & electromagnetic relay using transistor, opto coupler (4N33) & Darlington arrays (ULN2803).
3. Logic family interconnection (TTL to CMOS & CMOS to TTL)
4. Design of half adder & full adder using gates.
5. Design and testing of ripple & synchronous counters using JK flip flops (7473, 7476)
6. Counters using shift registers (Ring counter & Johnson counter).
7. Study of counter ICs (7490, 74190).
8. Design of astable & mono-stable multi-vibrators using gates.
9. Design of mono-shots using dedicated ICs (74123).
10. Logic design using multiplexers (74150).
11. Logic design using decoders (74138).
12. Adders, Subtractors, multipliers.
13. Design of 7 segment display circuits-static/dynamic (7447, FND542).
14. PRBS generator.
15. Digital circuit simulation using electronic work bench/ similar working tools.

**Note**

Any experiment related to LA402 may be added to the above list.

## COMMUNICATION - I LAB

**L 508** **0+0+4**

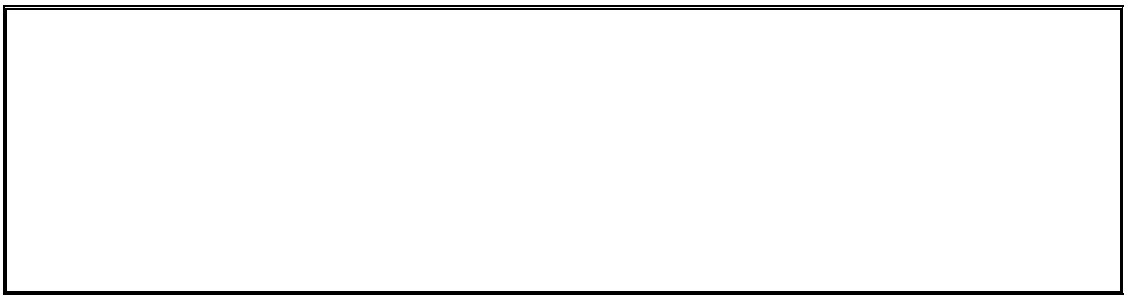
**List of experiments**

1. Passive filters – constant K and M derived.
2. Amplitude modulation.
3. Frequency modulation.
4. PWM using SG3525.
5. 555 Applications
6. 566 Applications
7. Study of 565 and its applications
8. Crystal oscillator
9. Oscillators using OP-AMP
10. Colpitts & Hartley oscillator.
11. Multiplexing using analog multiplexer IC’s.

**Note**

Any other experiments may be added to the above list related to LA403.

# SIXTH SEMESTER



## INDUSTRIAL MANAGEMENT & ECONOMICS

**LA 601** **3+2+0**

## PART A: INDUSTRIAL MANAGEMENT

**Module 1**

Modern concept of Management: Scientific management-Functions of management-Planning-Organising- Staffing-Directing- Motivating-Communicating- Co-ordinating- Controlling-Organisational structures- Line, Line and staff and Functional relationships- Span of control- Delegation- Management by Objectives.

**Module 2**

Personnel management: Objectives and functions of personnel management-Recruitment-Selection and training of workers- Labour Welfare- Industrial Fatigue- Industrial disputes-Trade Unions- Quality circles. Formation of companies: Proprietory-Partnership-Joint stock companies- Public sector- Joint sector and Co-operative sector.

**Module 3**

Marketing Management: Pricing- Promotion- Channels of distribution- Market research-Advertising. Production Management: Batch and mass production-Inventory control- EOQ-Project planning by PERT/CPM- Construction of Network (Basic ideas only).

## PART B: ECONOMICS

**Module 4**

Theory of demand and supply- Price mechanism- Factors of production- Land, labour, capital and organization- National income- Difficulties in estimation-Taxation- Direct and indirect taxes- Progressive and regressive- Black money-Inflation-Causes and consequences.

**Module 5**

Indian financial system- Reserve bank of India: Functions- Commercial banking system-Development financial institutions- IDBI- ICICI- SIDBI- IRBI-NABARD- Investment institutions-UTI- Insurance companies- Indian capital market- Stock market- Functions- Role of the public sector- Privatisation-Multinational corporations and their impact on the Indian economy.

**References**


1. Industrial Management - O P Khanna, Dhanpat Rai Pub.
2. Industrial Management - K.K. Ahuja, Khanna Pub.
3. Marketing Management - Philip Kotler, PHI
4. Indian economy - A.N. Agarwal, Wishwa Prakashan
5. Modern economic theory - K.K Dewett, Shyam Lal charitable trust.

## DIGITAL COMMUNICATION TECHNIQUES

**L 602** **3+1+0**

**Module 1**

**Random Signal Theory:** Review of discrete and continuous random variables- Gaussian probability function- properties- error function- complementary error function. Base band data transmission: - Base band binary data transmission system- Inter symbol interference- Nyquist pulse shaping criteria- Optimum transmitting- Receiving filters.

**Module 2**

**Correlative coding:** -Duobinary Base band PAM system- Use of controlled ISI- M-ary signaling scheme (no analysis)- Binary versus M-ary signaling schemes- pre coding- Bipolar coding- Manchester coding- HDB coding- Equalization- Adaptive equalization- Eye pattern- Scrambler- Unscrambler.

**Module 3**

**Digital transmission:** - BPSK- DPSK- M-ary PSK- QPSK- BFSK- M-ary FSK- MSK- comparison.

**Module 4**

**Digital transmission of Analog signals**: - Sampling - Quantizing uniform non-uniform quantization -Companding- A law μ law PCM system- DPCM delta modulation system- slope over loading- ADM- CVSD- Quantization noise.

**Module 5**

**Noise in communication system**: - Noise types- SNR- Probability of error- Effective Noise temperature- Noise figure- Detection of binary signals in Gaussian noise: -Maximum likelihood Receiver structure- Matched filter- Correlation realization of matched filter- optimizing error performance- error probability performance of binary transmission system.

**References**


1. Digital Communications: Sklar,Pearson Education
2. Digital and Analog Communication System: K Sam Shanmugam.
3. Principles of Communication System: Taub & Shilling, TMH.
4. Digital Communication- Siman Haykin.
5. Communication Systems Engineering: Proakis, Pearson Education.
6. Digital & Analog Communication System- Leon W Couch, Pearson Education.

## DIGITAL SIGNAL PROCESSING

**LTA 603** **3+1+0**

**Module1**

**Review of signals and systems:** Introduction - advantages and limitations of Digital Signal Processing. Infinite Impulse Response (IIR) Filters - Signal Flowgraph- Basic Network structure for IIR filter- Direct- Cascade- Parallel Forms. Design of IIR Digital filters from analog filters- Butterworth design- Chebyshev design- design based on numerical solutions of differential equations- Impulse Invariant Transformation.

**Module 2**

**Finite Impulse Response (FIR) Filters:** Linear phase FIR filters- Frequency response of linear phase FIR filters - Location of the zeros of linear phase FIR filters. Realization of FIR- cascade - lattice design-Fourier Series method- using windows-rectangular- triangular or Barlett windows- Hanning- Hamming- Blackman- Kaiser windows.

**Module 3**

**Discrete fourier Transform**: Properties-Circular convolution- Linear Convolution using DFT- relation between Z- Transform and DFT- Fast Fourier Transform; decimation – in time and Frequency - FFT algorithms – General Computation using Radix 2 algorithm.

**Module 4**

**Finite word length effects in digital filters**: Introduction- Number Representation - Fixed Point- Sign-Magnitude - One's-complement- Two's - complement forms -Addition of two fixed point numbers- Multiplication in Fixed Point arithmetic - Floating point numbers- Block floating point numbers- quantization - truncation- rounding - effects due to truncation and rounding- Input quantization error - Product quantization error - Co-efficient quantization error- zero-input limit cycle Oscillations - Overflow limit cycle Oscillations - Scaling- Quantization in Floating Point realization IIR digital filters - Finite Word Length Effects in FIR Digital Filters- Quantization effects in the Computation of the DFT- quantization errors in FFT algorithms.

**Module 5**

**Applications of digital signal processing**: Speech Processing- speech analysis- speech coding- sub band coding- channel vecoder- homomorphic vecoder- digital processing of audio signals- Radar signal processing- DSP based measurements systems. Equi ripple FIR design- PCM DSP chips- a general study.

**References**


1. Digital signal processing: Ifechor- Pearson edn.
2. Desecrate time signal processing: Oppenhiem- Pearson edn.
3. Digital signal processing: Oppenhiem and Sheffer- PHI

4. Introduction to Digital signal processing: Johny R Johnson
5. Digital signal processing: Proakis and Manolakis.
6. Digital signal processing: P Ramesh Babu- Scitech Pub.

## RADIATION & PROPAGATION

**L 604** **2+1+0**

**Module1**

**Retarded potentials:** Radiation from an A.C current element monopoles and dipoles-power radiated from a dipole isotropic radiators- radiation pattern-radiation intensity-directive gain-power antenna efficiency-effective area-effective length and aperture-Reciprocity theorem-radiation resistance-antenna beam width.

**Module 2**

**Antenna array:** Classifications-Broad-side, End-fire arrays, Array of n- point, two point sources, multiplication of patterns -binomial array-stacked array folded dipole- reflector-Basic principles of antenna-parabolic reflector different methods-Chebyshev arrays- super directive arrays.

**Module 3**

VLF and LF transmitting antennas-effects of ground on antenna-performance-grounded antennas-effects of antenna height and effective height of antenna-medium frequency antennas-dipole antennas-V and inverted V antennas-Rhombic antenna-traveling wave antennas-folded dipole, Yagi-Uda antenna-Basic principles of radio direction finding-loop antennas, Microstrip antennas.

**Module 4**

**Factors involved in the propagation of radio waves**: the ground wave-Reflection of radio waves by the surface of the earth-space wave propagation-considerations in space wave propagation-atmospheric effects in space wave propagation-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 5**

**Antenna measurements**: Input impedance- SWR method- radiation pattern measurements- beam width measurements-gain measurements-measurements of radiation resistance -radiation efficiency.

**References**

1. Antennas and wave propagation - K. D. Prasad
2. Antennas - John Krauss, Mc Graw Hill
3. Antenna theory and design- A. Ballanis
4. Radio Engg - F E Terman, Mc Graw Hill.

## ELECTRONIC INSTRUMENTATION

**L 605** **3+1+0**

**Module 1**

Objectives of engineering measurement-Basic measuring system-block diagram and description-Performance characteristics of instruments-static and dynamic. Types of data-static-dynamic-transient-rise time, response time & settling time. Analog and digital information-comparison. Error -classification of measurement errors--sources of measurement errors.

**Module 2**

Transducers-parameters of electrical transducers-types-active and passive-analogue and digital types of transducers. Electromechanical type-potentiometric, inductive (self generating and non self generating type), capacitive, piezo electric, strain gauge, ionization and mechano electronic type. Opto electrical type-photo emissive, photo conductive and photo voltaic type. Frequency generating type-digital encoders-selection criteria for transducers.

**Module 3**

Intermediate elements-instrumentation amplifier, isolation amplifier. Data transmission elements-block diagram of telemetering system-classification of telemetering systern-Electrical telemetering system--voltage, current and position type-RF telemetery-pulse telemetery (analog and digital)-pulse amplitude, pulse frequency, pulse duration and pulse position modulation.

**Module 4**

Bridge measurements - Wheatstone bridge - guarded Wheatstone bridge. AC bridges - Owen's bridge - Shering Bridge - Wein Bridge - Wagner ground connection. Recording techniques-strip chart recorders-basic principles of digital recording. Basic principles of Signal Analyzers-Distortion analyzer wave analyzer, spectrum analyzer.

**Module 5**

Basic measurements - Strain measurement - Pressure measurement - Flow measurement - Temperature measurement - Force & torque measurement. Multiplexing - D/A multiplexing and A/D multiplexing.

**References**


1. Measurement Systems - Doeblin, MGH.
2. Instrumentation-devices and systems - Rangan, Sarma & Mani, TMH.
3. Principles of Measurement & Instrumentation – Morris, PHI.
4. Transducers & Instrumentation – D.U. S Murthy, PHI.

## CONTROL SYSTEMS

**L 606** **3+1+0**

**Module 1**

Introduction to control system – Basic idea of control systems and their classifications – transfer function – transfer function of electrical, mechanical and electromechanical system – block diagram – signal flow graph – Mason's gain formula.

**Module 2**

Time domain Analysis – Type and order of a system – typical test signals for the time response of control system – impulse and step response of first and second order systems – steady state error – static and dynamic error coefficients – concepts of stability – Routh Hurwitz criterion – basic ideas of proportional, derivative and integral controllers.

**Module 3**

Frequency domain analysis – frequency response – frequency domain specifications – Bode Plot – Nicol's chart – Nyquist stability criterion – relative stability – gain margin – phase margin.

**Module 4**

Root Locus technique – basic theory and properties of root loci – procedure for construction of root loci – error detectors – servo motor – tacho generator – magnetic amplifier.

**Module 5**

State variable analysis and compensation techniques – introduction to state variable concepts – state variable description of linear dynamic systems – state equations – state transition matrix – representaion of state equations – lag compensator – lead compensator – lag lead compensator (design of compensators is not needed).

**References**


1. Modern control engineering – Katsuhiko Ogata, Pearson Edn
2. Control systems principles and design: M. Gopal, TMH.
3. Automatic control system – B.C. Kuo, PHI.
4. Control system design: Graham C Goodwin, PHI.
5. Modern Control Systems: Dorf, Pearson Education.


## LINEAR IC LAB

**L 607** **0+0+3**

**List of Experiments**

1. Measurement of op amp parameters.
2. Active filters: LPF, HPF, BPF, All pass & notch filters.
3. Square wave, Triangular, Saw tooth generation using op amp.
4. Logarithmic amplifiers.
5. Precision rectifiers.
6. Switched capacitor filter.
7. Sample and hold circuit.
8. 8038 function generators.
9. Analog to digital converters.
10. Digital to analog converters.

**Note**

Any experiment related to L505 may be added to the above list.

## MINI PROJECT

**L 608** **0+0+3**

The mini project will involve the design, construction, and debugging of an electronic system approved by the department. There will be several projects such as intercom, SMPS, burglar alarm, UPS, inverter, voting machine etc. The schematic and PCB design should be done using any of the standard schematic capture & PCB design software. Each student may choose to buy, for his convenience, his own components and accessories. Each student must keep a project notebook. The notebooks will be checked periodically throughout the semester, as part of the project grade.

In addition to this, the following laboratory experiments should also be done in the lab.

1. Astable and mono stable multi-vibrators using 555
2. Light activated alarm circuit
3. Speed control of electric fan using triac
4. Illumination control circuits
5. Touch control circuits
6. Sound operated circuits.
7. Schematic capture software (OrCAD or similar) familiarization.
8. PCB design software (OrCAD Layout or similar) familiarization.

A demonstration and oral examination on the mini project also should be done at the end of the semester. The university examination will consist of two parts. One of the lab experiments will be given for examination to be completed within 60 to 90 minutes with a maximum of 30% marks. 70% marks will be allotted for the demonstration and viva voce on the mini project.

# SEVENTH SEMESTER

## MICRO-CONTROLLER BASED SYSTEM DESIGN

**LA701** **2+1+0**

**Module 1**

Various logic families - features – comparison – PLA – PAL- GAL -comparison – combinational PAL – PAL with flip-flops – study of 16L8, 22V10 GAL – dual port RAM – FIFO - FPGA - gate arrays.

**Module 2**

Embedded C compiler – advantages – memory models – interrupt functions – code optimization - 89C2051 micro-controller- architecture-comparison with 89C51- design of a simple trainer circuit using 89C51/89C2051 μC – interfacing of DIP switch, LED, 7 segment display, alphanumeric LCD – relay interface – design of a traffic light control system - interfacing programs using C and assembly language.

**Module 3**

Analog to digital converters- single slope, dual slope, successive approximation, sigma delta, flash – comparison - typical ICs - A/D interface – digital to analog converters – different types – D/A interface - optically isolated triac interface- design of a temperature control system- interfacing programs using C and assembly language.

**Module 4**

Serial bus standards - $I^2C$ bus, SPI bus – operation – timing diagrams – 2 wire serial EEPROM – 24C04 – 3wire serial EEPROM – 93C46 - interfacing - serial communication standards - RS232, RS422, RS485 – comparison – MAX232 line driver/ receiver - interfacing – interfacing programs using C and assembly language - low voltage differential signaling – PC printer port – registers – interfacing - universal serial bus – PCI bus.

**Module 5**

Matrix key board interface - AT keyboard – commands – keyboard response codes - watch dog timers - DS1232 watch dog timer – real time clocks – DS1302 RTC – interfacing - measurement of frequency - phase angle - power factor – stepper motor interface - dc motor speed control – L293 motor driver - design of a position control system - interfacing programs using C and assembly language.

**References**


1. The 8051 Microcontroller: Muhammad Ali Mazidi, Pearson Education.
2. The 8051 Microcontroller: Kenneth J Ayala, Penram International.
3. Digital fundamentals: Floyd, Pearson Education.
4. Programming and customizing the 8051 μC: Myke Predko, TMH
5. Programming with ANSI C and turbo C: Kamthane, Pearson Education.
6. Microcomputers and Microprocessors: John Uffenbeck, PHI.
7. Web site of Atmel semiconductors - www.atmel.com

## VLSI TECHNOLOGY

**LA 702** **3+1+0**

**Module 1**

**Process steps in IC fabrication**: Crystal growth and wafer preparation- Czochralski process- apparatus- silicon shaping, slicing and polishing- Diffusion of impurities- physical mechanism- Fick's I and II law of diffusion- Diffusion profiles- complementary (erfc) error function- Gaussian profile- Ion implantation- Annealing process- Oxidation process- Lithography- Photolithography, Fine line lithography, electron beam and x-ray lithography- Chemical vapour deposition (CVD)- epitaxial growth- reactors- metallisation- patterning- wire bonding and packaging.

**Module 2**

**Monolithic components**: Isolation of components- junction isolation and dielectric isolation- Transistor fabrication- buried layer- impurity profile- parasitic effects- monolithic diodes- schottky diodes and transistors- FET structures- JFET- MOSFET- PMOS and NMOS, control of threshold voltage ($V_{th}$)- silicon gate technology- Monolithic resistors- sheet resistance and resistor design- resistors in diffused regions- MOS resistors- monolithic capacitors- junction and MOS structures- IC crossovers and vias.

**Module 3**

**CMOS technology**: Metal gate and silicon gate- oxide isolation- Twin well process- Latch up- BiCMOS technology- fabrication steps- circuit design process- stick diagrams- design rules- Capacitance of layers- Delay- Driving large capacitance loads- Wiring capacitance- Basic circuit concepts- scaling of MOS structures- scaling factors- effects of miniaturization.

**Module 4**

Subsystem design and layout- Simple logic circuits- inverter, NAND gates, BiCMOS circuit, NOR gates, CMOS logic systems – bus lines- arrangements- power dissipation- power supply rail distribution- subsystem design process- design of a 4 bit shifter.

**Module 5**

**Gallium Arsenide Technology**: Sub-micro CMOS technology- Crystal structure- Doping process- Channeling effect- MESFET- GaAs fabrication- Device modeling.

**References**


1. Modern VLSI design: Wolf, Pearson Education.
2. VLSI technology: S M Sze, Mc Graw Hill pub.
3. Basic VLSI design: Douglas Pucknell, PHI.
4. Principles of CMOS VLSI Design: H E Weste, Pearson Edn.
5. Integrated Circuits: K R Botkar, Khanna Pub.
6. CMOS circuit design layout and simulation: Barter, IEEE press.

7. Introduction to VLSI: Conway, Addison weslay.

## MICROWAVE AND RADAR ENGINEERING

**L703** **3+1+0**

**Module 1**

Introduction to Microwaves- Characteristic features- advantages and applications- Wave guides- basic concepts and properties. Scattering matrix- Concept of N port scattering matrix representation- Properties of S matrix- S matrix formulation of two-port junction. Passive microwave devices- T junctions- H plane, E plane and EH plane Tee junctions, its S matrix and properties- Applications of Hybrid junction. Directional coupler-Termination- Gyrator- Isolator- Circulator- Phase changer- Attenuator.

**Module 2**

Microwave measurements- frequency- power- VSWR- impedance. Microwave tubes- High frequency limitations- Magnetron- Multicavity Klystron- Reflex Klystron- Traveling Wave Tube- principle of operation. Microwave Communication: Basic Principles of Microwave Links – Microwave relay Systems – block schematic of terminal transmitters and receivers – repeaters – basic principles of design of a microwave links.

**Module 3**

Microwave semiconductor devices- Principle of operation of Transistors and FETs. Transferred Electron Devices- Gunn diode- Gunn diode as an Oscillator and an amplifier- InP diode- Tunnel diode- principle of operation. Avalanche Transit time devices- IMPATT and TRAPATT devices- principle of operation.

**Module 4**

Radar range equation- Block schematic of pulse radar- Radar frequencies- Applications of radar- CW radar- applications of CW radar- CW radar with nonzero IF- FM CW radar-FM CW altimeter- MTI and Pulse Doppler radar.

**Module 5**

Direction finders- Instrument Landing System- Radio ranges. Navigation- Hyperbolic navigation- LORAN. Satellite navigation- Doppler navigation - Global positioning system- Different types of microwave antennas-basic principles.

**References**


1. Microwave devices and circuit: Samuel Liao, PHI.
2. Microwave and radar — A K Maini, Khanna Publishers.
3. Microwave and Radar Engg. — M Kulkarni.
4. Introduction to radar systems — Merrill I Skolnik, McGraw Hill.
5. Radar systems and radio aids to navigation — A K Sen & A B Bhattacharya.

## OPTICAL FIBRE COMMUNICATION SYSTEMS

**L704** **2+1+0**

**Module 1**

Recollection of basic principles of optics: ray theory- reflections at boundary- critical angle- total internal reflection - Optical wave guides - Propagation in fibre- expression for acceptance angle-acceptance cone – numerical aperture- V number - Index profile-effect of index profile on propagation.

**Module 2**

SI fibre and GI fibre - Brief description of modes in SI fibre and GI fibre- Pulse dispersion and Band Width limitation- Mode coupling – Attenuation in single mode and multimode fibres- Optic fibre cables- characteristics of cables- Optic fibre couplers: types of coupling – fibre to fibre joints- splicing techniques- optical fibre connectors.

**Module 3**

Optical sources- LEDs, LASER diodes- operating characteristics- photo-detectors-principles of photo detection – PIN diode – APD – operating principles – photo-multiplier tubes- source to fibre power launching – lensing schemes- modulation circuits.

**Module 4**

Basic optical communication systems- point-to-point link- rise time budget- protection techniques- WDM – transceiver requirements-TDM- optical amplifiers- SOAs – EDFAs- optical receivers- Introduction to optical fibre networks.

**Module 5**

OTDR - Measurements- numerical aperture- dispersion measurements- refractive index profile measurements- band width measurements- fibre attenuation measurements- cutoff wave length measurements- applications of fibre optic systems- future developments

**References**


1. Fibre optic communication technology: Djafer K Mynbaev, Pearson Education.
2. Electronic communication: Dennis Roddy & John coolen, PHI.
3. Optic fibre communication: John M senior, PHI.
4. Telecommunication principle circuits Systems and experiments: S.Ramabhadran, Khanna.
5. Optical communication system: John Gower, PHI
6. Fibre optics in telecommunication: Sharma, Mc Graw Hill
7. Optical fibre and fibre optic communication: Subir Kumar Sarkar, S Chand & co. Ltd
8. Optical communication: M Mukund Rao , Universities press.
9. Fiber Optic Communication: Palais, Pearson Education.

10. Digital Communication system with Satellites & Fibre Optics Applications: Kolimbris, Pearson Education.
11. Optical Networks - 3rd Generation Transport systems: Black, Pearson Education.

## INFORMATION THEORY AND CODING

**L705** **3+1+0**

**Module 1**

Information theory: - Concept of amount of information -units, Entropy - marginal, conditional and joint entropies -relation among entropies Mutual information, information rate, channel capacity, redundancy and efficiency of channels.

**Module 2**

Discrete channels: - Symmetric channels, Binary Symmetric Channel, Binary Erasure Channel, Cascaded channels, repetition of symbols, Binary unsymmetric channel, Shannon theorem. Continuous channels: - Capacity of band limited Gaussian channels, Shannon-Hartley theorem, Trade off between band width and signal to noise ratio, Capacity of a channel with infinite band width, Optimum modulation system.

**Module 3**

Source coding: - Encoding techniques, Purpose of encoding, Instantaneous codes, Construction of instantaneous codes, Kraft's inequality, Coding efficiency and redundancy, Noiseless coding theorem. Construction of basic source codes: - Shannon-Fano algorithm, Huffman coding, Arithmetic coding, ZIP coding.

**Module 4**

Codes for error detection and correction: - Parity check coding, Linear block codes, Error detecting and correcting capabilities, Generator and Parity check matrices, Standard array and 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, BCH codes, RS codes, Burst error correction.

**Module 5**

Convolutional codes: - Encoding- State, Tree and Trellis diagrams, Maximum likelihood decoding of convolutional codes -Viterby algorithm, Sequential decoding -Stack algorithm. Interleaving techniques: - Block and convolutional interleaving, Coding and interleaving applied to CD digital audio system -CIRC encoding and decoding, interpolation and muting. ARQ: - Types of ARQ, Performance of ARQ, Probability of error and throughput.

**References**

1. Communication Systems: Simon Haykin, John Wiley & Sons. Pvt. Ltd.
2. Principles of Communication Systems: Taub & Schilling, Tata McGraw-Hill

3. Principles of Digital Communication: Das, Mullick & Chatterjee, Wiley Eastern Ltd.
4. Error Control Coding Fundamentals and Applications: Shu Lin & Daniel J. Costello Jr., Prentice Hall Inc.
5. Digital Communications Fundamentals and Applications: Bernard Sklar, Person Education Asia

## OPTIMIZATION TECHNIQUES (ELECTIVE - I)

**CMELRTA 706.1** **3+1+0**

**Module1 Classical optimization techniques**

Single variable optimization – Multivariable optimization with no constraints – Hessian matrix – Multivariable saddle point – Optimization with equality constraints – Lagrange multiplier method - Multivariable optimization with inequality constraints – Kuhn-Tucker conditions.

**Module 2 One-dimensional unconstrained minimization**

Elimination methods – unrestricted search method – Fibonacci method – Interpolation methods – Quadratic interpolation and cubic interpolation methods.

**Module 3 Unconstrained minimization**

Gradient of a function – Steepest descent method – Newton's method – Powells method – Hooke and Jeeve's method.

**Module 4 Integer – Linear programming problem**

Gomory's cutting plane method – Gomory's method for all integer programming problems, mixed integer programming problems.

**Module 5 Network Techniques**

Shortest path model – Dijkstra`s Algorithm – Floyd`s Algorithm – minimum spanning tree problem – PRIM algorithm – Maximal Flow Problem algorithm.

**References**

1. Optimization theory and application: S.S. Rao, New Age International P. Ltd.
2. Optimization Concepts and applications in Engineering: A. D. Belegundu, T.R. Chandrupatla, Pearson Education Asia.
3. Principles of Operations Research for Management: F. S. Budnick, D. McLeavey, R. Mojena, Richard D. Irwin, INC.
4. Operation Research an introduction: H. A. Taha, Eastern Economy Edition.
5. Operations Research: R. Panneerselvam, PHI

## OBJECT ORIENTED PROGRAMMING IN C++ (ELECTIVE - I)

**LA706-2** **3+1+0**

**Module 1**

**Introduction to loops**: Evolution of object oriented languages - Support for experiments and structure - process of language translation – Need of objects - Definition of Object - Oriented Language.

**Module 2**

**Encapsulation & Inheritance**: Building classes - Declaring objects Member functions - constructors and destructors members access control.

**Module 3**

**POLYMORPHISM** - Virtual functions - Defining virtual functions – Usage of virtual functions - Abstract classes - simulation using abstract classes.

**Module 4**

**OVERLOADING**: Overloading functions - Overloading operators to provide new meaning - Selecting Friend or Member Functions for Operator Overloading.

**Module 5**

**DYNAMIC OBJECTS**: Dynamic object allocation - Using references with dynamic memory allocation - Inline functions outside class definitions - Friend functions, Applications - Object oriented databases case study – some language (Simula, Smalltalk, C++, Ada) features.

**References**


1. Data abstraction & OOP in C++: Gordenkeeth, Wiley Eastern.
2. Object oriented programming usig C++: Pohl, Pearson Education.
3. Object oriented programming with C++: E. Balaguruswamy, TMH.
4. C++ Programming language: Strostroup, Pearson Education.
5. Object Oriented Programming in C++: Nabajyoti Bjarne.


## NEURAL NETWORKS (ELECTIVE - I)

**L706-3** **3+1+0**

**Module 1**

Introduction - Principles - artificial neuron - activation functions - Single layer & multi-layer networks - Training artificial neural networks - Perception - Representation - Linear separability - Learning - Training algorithms.

**Module 2**

Back Propagation - Training algorithm - Applications - network configurations - Network paralysis - Local minima - temporal instability.

**Module 3**

Counter Propagation networks: Kebenon layer - Training the cohenen layer - Pre initializing the wright vectors - statistical properties - Training the Grosbery layer - Full counter propagation network - Application.

**Module 4**

Statistical methods- Boltzmann’s Training - Cauche training - Artificial specific heat methods - Applications to general non-linear optimization problems.

**Module 5**

Hopfield nets - Recurrent networks - stability - Associative memory - applications - Thermo dynamic systems - Statistical Hopfield networks – Bi-directional associative memories - Continuous BAM - Adaptive resonance theory - Architecture classification - Implementation.

**Text Book**

Neural Computing Theory & Practice - Philip D. Wasserman.

**References**


1. Neural Networks - Simon Haykins, Pearson Education.
2. Adaptive Pattern Recognition & Neural Networks - Pay Y.H.
3. An Introduction to neural computing - Chapman & Hall
4. Artificial Neural Networks - Robert J. Schalkoff, McGraw Hill
5. Artificial Neural Networks - B.Yegnanarayana, PHI


## BIOMEDICAL ENGINEERING (ELECTIVE - I)

**L 706-4** **3+1+0**

**Module 1**

Biometrics- Biomedical instruments- parameters- Man-instrument system- components- physiological systems of human body- cardiovascular system- The heart- Respiratory system- blood purification- The Kidney- Nervous system- Bioelectric potentials- Resting and Action potentials- propagation- bio-potential electrodes- Transducers- ECG-EEG-EMG.

**Module 2**

**Biomedical measurements**: ECG measurement- electrodes and leads- ECG recorder- different recorders. Blood pressure measurements- indirect measurement- sphygmomanometer- direct measurement techniques. Respiratory measurements- Lung volume and capacities- Spirometer- Gas exchange measurements. Clinical measurements: Blood cells- tests on blood cells- chemical tests- colorimeter- spectro photometer- continuous flow analyzer.

**Module 3**

**Ultrasonic measurements:** Characteristics of Ultrasound- Attenuation- Doppler effect- basic modes of transmission- pulsed, continuous, pulsed Doppler- Ultrasonic imaging- Block schematic of A mode, B mode, M mode instruments- Electronic scanners: Linear and Phased array- Applications of Ultrasound: Gynecology and obstetrics- blood flow measurements- cardiac imaging- echocardiography- echoencephalography.

**Module 4**

**X ray imaging and measurements**: x ray generation- x ray machine- C arm machine- image intensifiers- x ray films- photographic imaging- Fluoroscopy- computed tomography- CAT scan: block schematic- Gantry- detectors.

**Module 5**

**Bio-telemetry:** components in telemetry system- transmitter-receiver- pulse modulators- implantable units- applications. Intensive care unit: Planning and location of different instruments- Bedside monitors- Prosthetic instruments- artificial heart- pump oxygenators- hemodialysis- artificial kidney- different dialysers. Electrical safety: Physiological effects of electric current- let go current- shock hazards- need of grounding- isolation of patients- isolated power distribution system.

**References**


1. Introduction to biomedical technology: Joseph J Carr, Pearson Edn.
2. Biomedical Instrumentation & Measurements: Leslie Cromwell, PHI.
3. Biomedical Instrumentation: John G Webster, Houghton Mifflin Company.
4. A handbook to biomedical instrumentation: R S Khandpur, Tata Mc Graw Hill Pub.


## PRINCIPLES OF REAL TIME SYSTEMS (ELECTIVE - I)

**LA 706-5** **3+1+0**

**Module 1**

Introduction to Real Time Systems – Structure of real time systems, real time computer, task classes – Periodic, Aperiodic, critical, Non-critical, definition of real time systems – real time systems, embedded systems - Hard real time systems, soft real time systems, real time design issues.

**Module 2**

Real time kernel – polled loop systems, co-routines, interrupt driven systems – sporadic, fixed rate systems, hybrid systems, task control block - task status, scheduling – uni-processor scheduling – traditional rate monotonic, rate monotonic deferred server, EDF, IRIS tasks – multiprocessor scheduling – utilization balancing algorithm, next-fit, bin- packing algorithm, myopic offline, buddy strategy (no need of proofs) fault tolerant scheduling.

**Module 3**

Communication – Communication Media and message sending topologies, network architecture issues, protocols – contention – based, token - based, stop and go multi-loop, polled bus, hierarchal, round robin, fault tolerant routing – clocks and synchronization – fault tolerant synchronization in hardware, synchronization in software.

**Module 4**

Fault tolerance – definition, cause of failure, fault types, fault detection and containment, redundancy – hardware, software, time, information, integrated failure handling – reliability – parameter values – series – parallel systems, NMR clusters, combinational model, master chain model, fault latency, transient faults, software error models.

**Module 5**

Programming Languages – Desired language characteristics, Real time databases, characteristics, main memory databases, Transaction, Disk schedule algorithms, Databases for hard real time systems, maintaining serialization constituency.

**Text Book**

Real Time Systems - C.M Krishna, Kang G. Shini (McGraw Hill)

**References**

1. Real Time Systems, Design & Analysis - Philip Laplante (IEEE)
2. Real Time Systems - Krishna, Tata McGraw Hill

## MICROPROCESSOR AND MICROCONTROLLER LAB

**LA707** **0+0+3**

1. Familiarization of 8085 trainer kit, manual code entry, simple examples.
2. Design and construction of a simple flash programmer for 89C51/89C2051 μC.
3. Study of Intel Hex file format.
4. Computer aided assembly language program development for 89C51/89C2051.
5. Use of assembler, linker and simulator for 89C51/89C2051.
6. Programming examples. Sorting, arithmetic operations (Using assembler, simulator).
7. Programming examples using Embedded 'C' compiler for 89C51/89C2051.
8. Programming examples using timer, external interrupts.
9. Design and construction of the following interfacing modules.
   a) A/D converter.
   b) D/A converter.
   c) Alphanumeric LCD display.
   d) Matrix keyboard interface.
   e) Seven segment display.
   f) Extending I/O port using shift registers(74HC595, 74HC165).
   g) Stepper motor.
   h) Infra red transmission and reception.
   i) Opto isolated I/P and O/P.
   j) Serial EEPROM.
   k) Real time clock.
   l) Interfacing using RS 232 and printer port.

**Note**

Any other embedded processor with similar or better capability may be used instead of 89C51/89C2051.

## COMMUNICATION II LAB

**L708** **0+0+3**

1. Microwave measurements - VSWR, wavelength, Attenuation, Impedance.
2. Antenna Measurements - Gain, Directivity, Radiation Pattern of various types antennae.
3. Characteristics of Klystron.
4. Wave-guide Measurements.
5. Study of optical fibers and optical communication systems.
6. Delta modulation, PCM, PAM, PPM, PWM, ASK, PSK.
7. Experiments of Satellite communication system.
8. Display systems.
9. Study of PLC's.
10. Familiarization of Digital modulation and demodulation Trainer Kit.

# EIGHTH SEMESTER

## COMPUTER NETWORKS

**LA 801** **3+1+0**

**Module 1**

Network goals -topologies- configurations-concept of internet- ISO-OSI 7 Layer Standard -peer processes-Functions of each layer-TCP/IP reference model - Transmission media -description and characteristics - base band and broad band transmission-synchronous and asynchronous -full duplex, half duplex links-Concepts of WAP technology.

**Module 2**

MODEMS-serial communication standards - X-21 digital interface- Need for data link layer-stop and wait and sliding window protocol-HDLC-terminal handling-polling-multiplexing- concentration-virtual circuit and data-grams - routing - congestion control.

**Module 3**

LAN- base band and broad band Lan's - carrier sense networks-CSMA/CD -ring network- shared memory -IEEE802 standards-introduction to X-25. Transport layer- design issues- establishing and releasing connection - flow control – buffering - crash recovery - a simple transport protocol on X-25.

**Module 4**

Session layer- design issues -data exchange - dialogue management - synchronization- remote procedure call-client server model - Presentation layer-data presentation-compression- network security-privacy- cryptography-presentation layer in ARPANET.

**Module 5**

Application layer - virtual terminal - file transfer protocol-E-mail-introduction to distributed system - ATM-protocol architecture -ATM logical connections -ATM cells -cell transmission- ATM adaptation layer -AAL protocols -basic principles of SDH and SONET.

**References**


1. Computer Networks: Andrew S Tannenbaum, Pearson Education.
2. An Engineering Approach to Computer Networking: Keshav, Pearson Education.
3. Computer Networking: A Top Down Approach: Kurose Pearson Education.
4. Computer Network & Internet: Comer, Pearson Education.
5. Data communication: Hausly
6. Computer Networks, protocols standards & interfaces, Uyless Balack
7. Local Area Networks: William Stallings, Pearson Education.
8. Understanding Data Communication and networks- 2nd ed-William A Shay (Vikas Thomson Learning)

## ADVANCED COMMUNICATION SYSTEMS

**L802** **3+1+0**

**Module1**

Satellite Communication - Satellite orbits – Geo synchronous orbit –orbital velocity – Round trip time delay - Antenna look angles - Satellite classifications - spacing - frequency allocation- System parameters analysis - link equations- Link Budget - Spacecraft subsystem (block schematic). Tracking and telecommand - Earth stations – Antenna systems – receiver subsystems (block) - functioning LNA – LNB - down converter - channel filters - demodulators- INTELSAT/INMARSAT –Overview of INSAT.

**Module 2**

Types of satellite communication system-FSS, DSS-Direct broadcasting and community broadcast - Multiple Access Techniques– Introduction- FDM-FM-FDMA, PSK-TDMA, SSMA, CDMA - Switching techniques – circuit – message - packet switching- Packet satellite network-domestic satellite system.

**Module 3**

The cellular concept – Introduction - Frequency reuse –channel assignment – Hand off strategies – prioritizing handoff –practical handoff – Co-channel interface and system capacity – channel planning – adjacent channel interference –Cell splitting – sectoring – repeaters – micro-cell concept- Blue tooth technology- Fundamentals and Applications.

**Module 4**

Wireless communication system-paging-cordless & cellular system –comparison-Second generation cellular networks-third generation cellular networks - Global System for Mobile – services and features – Architecture – Radio subsystem – channel types – frame structure - Global positioning Systems - basic concepts-system block - positioning – Applications.

**Module 5**

Spread spectrum Techniques and remote sensing- Pseudo noise sequences –time hopping-frequency Hopping – Robustness – Fast and Slow hopping – Hybrid & Chirp spread spectrum- Synchronization – acquisition – Tracking - Concepts of Jamming -Analysis of DS/SS – Analysis of avoidance-generation of signals-detection –Applications.

**References**


1. Electronic communication system fundamentals: Wayne Tomasi, Pearson Education.
2. Wireless communication principles and practice: T S Rappaport, Pearson Education.
3. Satellite communication: Gagliardi.
4. Digital Communication Fundamentals and Applications: B Sklar, Pearson Education.

5. Digital communication: Simon Haykin, John Wiley&Sons.
6. Space communication System: Filipowasky, McGrawHill.

## ADVANCED MICROPROCESORS

**LA803** **3+1+0**

**Module 1**

Intel 8086 Microprocessor - Internal architecture – Block diagram – Minimum and maximum mode operation – Interrupt and Interrupt applications – DMA data transfer – 8087 math coprocessor. 8086 memory organization – even and odd memory banks – segment registers – logical and physical address – advantages and disadvantages of physical memory.

**Module 2**

Addressing modes used in 80x86 family - Data addressing mode – register addressing, immediate addressing, direct addressing, register indirect addressing, base plus index addressing, register relative addressing, base relative plus index addressing, scaled addressing. Program memory addressing modes - direct program memory addressing, relative program memory addressing. Stack memory addressing mode.

**Module 3**

Intel 80286 Microprocessor - 80286 Architecture, system connection – Real address mode operation – Protected mode operation

**Module 4**

Intel 80386 Microprocessor - 80386 Architecture and system connection – Real operating mode – 386 protected mode operation – segmentation and virtual memory – segment privilege levels and protection – call gates – I/O privilege levels – Interrupts and exception handling – task switching – paging mode – 80386 virtual 86 mode operation.

**Module 5**

Advanced Intel Microprocessors - 80486 – Processor model – Reduced Instruction cycle – five stage instruction pipe line – Integrated coprocessor – On board cache – Burst Bus mode. Pentium – super scalar architecture – u-v pipe line – branch prediction logic – cache structure – BIST (built in self test) – Introduction to MMX technology.

**References**

1. The Microprocessors 6th Edition Barry B. Brey Pearson Edu.
2. Microprocessor and Interfacing 2nd Edition Douglous V. Hall TMH
3. The 80x86 family John Uffenbeck

## TELEVISION ENGINEERING

**L 804** **3+1+0**

**Module 1**

**Elements of Television system**: Basic block schematic of television transmitter and receiver, Analysis of Television pictures, Scanning, human factor consideration, flicker, interlaced scanning, number of scanning lines, Horizontal and vertical resolution, maximum video frequency, Colour resolution and bandwidth, Composite video signal, video signal dimensions, vertical and horizontal synchronization signal dimensions, channel bandwidth, vestigial side band transmission, channel bandwidth and allocations for colour transmission.

**Module 2**

**Television camera and transmitters**: Photoelectric effects, Working principle of image orthicon, vidicon, plumbicon, CCD, structure of CCD and its working, Monochrome and Colour television camera: block schematic explanation, TV transmitters: Positive and negative modulation and its comparison, high level and low level modulation and its comparison. Colour TV picture tubes: purity and convergence, Delta gun, PIL, Trinitron tubes, LCD screens.

**Module 3**

**Monochrome and colour reception, Monochrome receiver**: Detailed block schematic, Yagi antenna, BALUN transformers, RF tuner, electronic tuning, SAW filters, IF conversion, VSB reception and correction, video detector, AGC: delayed AGC and Keyed AGC, video amplifier, cathode and grid modulation, sync separation, horizontal and vertical deflection circuits and wave forms, sound separation. Power supplies: SMPS and block schematic explanation, EHT generation and its wave form description, Typical ICs in different stages.

**Module 4**

**Colour Television**: Compatibility consideration, Colour response of human eye, Three colour theory, additive mixing of colours, chromaticity diagram, Luminance and chrominance, colour difference signal and its generation, Polarity of colour difference signal, Frequency interleaving and Colour burst signal, delay lines, Basic colour television systems: PAL and NTSC, Block schematic explanation.

**Module 5**

**Television applications**: CCTV and its functional block schematic, Cable television: converters, cable connections, Satellite television: Dish antenna, LNB, Down converters, Video discs: VCD and DVD, Digital recording, LASER source, High definition television.

**References**

1. Monochrome and colour television: R R Gulati, Wiley Eastern.

2. Colour Television, Theory and Practice: S P Bali, Tata Mc Graw Hill.
3. Television engineering: A M Dhake, Tata Mc Graw Hill
4. Basic Television Engineering: Bernad Grob, Mc Graw Hill.

## ADVANCED MATHEMATICS (ELECTIVE - II)

**CMELRT 805-1** **3+1+0**

**Module 1 Green's Function**

Heavisides, unit step function – Derivative of unit step function – Dirac delta function – properties of delta function – Derivatives of delta function – testing functions – symbolic function – symbolic derivatives – inverse of differential operator – Green's function – initial value problems – boundary value problems – simple cases only

**Module 2 Integral Equations**

Definition of Volterra and Fredholm Integral equations – conversion of a linear differential equation into an integral equation – conversion of boundary value problem into an integral equation using Green's function – solution of Fredhlom integral equation with separable Kernels – Integral equations of convolution type – Neumann series solution.

**Module 3 Gamma, Beta functions**

Gamma function, Beta function – Relation between them – their transformations – use of them in the evaluation certain integrals – Dirichlet's integral – Liouville's extension of Dirichlet's theorem – Elliptic integral – Error function.

**Module 4 Power Series solution of differential equation**

The power series method – Legendre's Equation – Legendre's polynomial – Rodrigues formula – generating function – Bessel's equation – Bessel's function of the first kind – Orthogonality of Legendre's Polynomials and Bessel's functions.

**Module 5 Numerical solution of partial differential equations.**

Classification of second order equations- Finite difference approximations to partial derivatives – solution of Laplace and Poisson's equations by finite difference method – solution of one dimensional heat equation by Crank – Nicolson method – solution one dimensional wave equation.

**References**

1. Linear Integral Equation: Ram P.Kanwal, Academic Press, New York
2. A Course on Integral Equations: Allen C.Pipkin, Springer, Verlag
3. Advanced Engg. Mathematics: H.K.Dass, S.Chand
4. Advanced Engg. Mathematics: Michael D.Greenberge, Pearson Edn. Asia
5. Numrical methods in Engg.&science: B.S.Grewal, Khanna Publishers
6. Generalized functions: R.F. Hoskins, John Wiley and Sons.
7. Principles and Techniques of: Bernard Friedman, John Wiley and sons Applied Mathematics
8. Principles of Applied Mathematics: James P.Keener, Addison Wesley.

9. Numerical methods: P.Kandasamy,K.Thilagavathy,K.Gunavathy, S.Chand & co

## VHDL (ELECTIVE - II)

**LA805-2** **3+1+0**

**Module 1**

**Introduction:** Hardware Abstraction- Basic Terminology- Entity Declaration- Architecture Body- Configuration Declaration- Package Declaration- Package Body- Model Analysis- Simulation- Basic Language Elements –Identifiers- Data Objects- Data Types- Operators.

**Module 2**

**Behavioural Modelling:** Entity Declaration- Architecture Body-Process Statement- Variable Assignment Statement- Signal Assignment Statement- Wait Statement- If Statement - Case Statement- Null Statement- Loop Statement- Exit Statement- Next Statement- Assertion Statement- Report Statement- Other Sequential Statements- Multiple Processes- Postponed Processes - Dataflow Modelling: Concurrent Signal Assignment Statement- Concurrent versus Sequential Signal Assignment- Delta Delay Revisited- Multiple Drivers- Conditional Signal Assignment Statement- Selected Signal Assignment Statement- the UNAFFECTED Value- Block Statement- Concurrent Assertion Statement- Value of a Signal

**Module 3**

**Structural Modelling:** Component Declaration- Component Instantiation- Resolving Signal Values - Generics and Configurations: Generics- Configurations- Configuration Specification- Configuration Declaration- Default Rules - Conversion Functions - Direct Instantiation- Incremental Binding.

**Module 4**

**Subprograms and Overloading:** Subprograms- Subprogram Overloading- Operator Overloading- Signatures- Default Values for Parameters - Packages and Libraries: Package Declaration- Package Body-Design File- Design Libraries- Order of Analysis- Implicit Visibility- Explicit Visibility.

**Module 5**

**Advanced Features:** Entity Statements- Generate Statements- Aliases- Qualified Expressions- Type Conversions- Guarded Signals- Attributes- Aggregate Targets- Shared Variables- Groups - Model Simulation: Simulation- Writing a Test Bench- Converting Real and Integer to Time- Dumping Results into a Text Fi1e- Reading Vectors from a Text File- A Test Bench Example- Initialising a Memory- Variable File Names- Hardware Modelling Examples: Modelling Entity interfaces- Modelling Simple Elements- - Different Styles of Modelling- Modelling Regular Structures- Modelling Delays- Modelling Conditional Operations- Modelling Synchronous Logic- State Machine Modelling- Interacting State Machines- Modelling a Moore FSM- Modelling a Mealy FSM- A Generic

Priority Encoder- A Simplified Blackjack Program- A Clock Divider- A Generic Binary Multiplier- A Pulse Counter- A Barrel Shifter- Hierarchy in Design.

**Text Book**

VHDL Primer Third editions: J. Bhasker, Pearson Education Asia.

**References**

1. Introducing VHDL from simulation to synthesis: Sudhakar Yalamanchilli, Pearson Education Asia

## MEDICAL ELECTRONICS (ELECTIVE - II)

**L 805-3** **3+1+0**

**Module 1**

Bioelectric potentials Human cell – action potential – ECG waveform – relation with heart action- bio-potentials from brain- excitation and inhibition potentials- Electroencephalogram- muscle action- EMG- muscular servo mechanism. Bio-potential electrodes: Half cell potential- equivalent circuit between electrodes and skin – electrodes types- stimulating electrodes- biomedical transducers- classification- selection.

**Module 2**

Biomedical amplifiers – op amps- differential amplifiers- OPA 111: FET input op amp- data sheet- high impedance 50 Hz reject filter with gain- instrumentation amplifier – INA 101- pH probe amplifiers- pH probe electrometer- Bridge amplifiers- input protection- isolation amplifiers- basic design- carrier type isolation amplifier- synchronous demodulator- opto isolators- optical coupling- Transformer coupled isolation amplifiers- ISO212- Fiber optic isolation amplifier- chopper stabilized amplifier- differential chopper amplifier- input guarding- shield driver.

**Module 3**

ECG wave form- The standard lead system- Einthoven triangle- ECG preamplifier- Right leg drive circuit- shield drive- Typical ECG amplifier circuit- QRS complex detection- ECG digitization- improvement in resolution- ECG machine- mechanism- patient cables- ECG machine maintenance. Blood pressure measurements- Pressure transducers- Amplifiers- dc amplifiers- isolated dc amplifier- pulsed excitation amplifier- ac carrier amplifier- systolic, diastolic and mean detector circuit plethysmography- blood flow measurements- electromagnetic flow meter.

**Module 4**

EEG- Instrumentation requirements- Neuron membrane potential- EEG electrodes- Frequency bands- multi-channel EEG recording systems- preamplifiers- circuits- EEG telemetry systems. ICU monitoring system- intensive care equipments- cardio tachometers- lead fault indicator- central monitoring consoles- telemetry system.

**Module 5**

Medical Imaging: Computed tomography- basic principle - data accumulation- scanning motions – x ray tubes- collimators- detectors- image reconstruction- algorithms- display – resolution. Nuclear Magnetic Resonance- nuclear structure and angular momentum- magnetic dipole moment- alignment- Larmor frequency- RF magnetic field- Free Induction decay- Instrumentation- Imaging system.

**References**


1. Introduction to Biomedical equipment technology: J J Carr, Pearson Education.
2. Biomedical Instrumentation: John G Webster, Mifflin Hougton Co.
3. Medical Electronics: C Raja Rao, University Press.
4. Biomedical Instrumentation: R S Khandpur, TMH


## ADVANCED MICRO-CONTROLLERS (ELECTIVE - II)

**LA805-4** **3+1+0**

**Module 1**

Low pin count controllers – Atmel AVR family – ATTiny15L controller - architecture – pin descriptions – features – addressing modes – I/O space – reset and interrupt handling – reset sources - Tunable internal oscillator.

**Module 2**

Timers – Watch dog timer – EEPROM – preventing data corruption – Analog comparator – A/D converter – conversion timing – ADC noise reduction – PortB – alternate functions – memory programming – fuse bits – high voltage serial programming – algorithm.

**Module 3**

National semiconductor COP8 family - COP8CBR9 processor – features – electrical characteristics – pin descriptions – memory organization –EEPROM - security – brownout reset – in system programming – boot ROM. Idle timer – Timer1, Timer2, Timer3 -operating modes – PWM mode – event capture mode

**Module 4**

Power saving modes – Dual clock operation – Multi input wake up – USART – framing formats – baud rate generation – A/D conversion – operating modes – prescaler – Interrupts – interrupt vector table – Watch dog – service window – Micro-wire interface – waveforms.

**Module 5**

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

**References**


1. Design with PIC micro-controllers: John B Peatman, Pearson Education.

2. DS101374: National Semiconductor reference manual.
3. National semiconductor web site – www.national.com
4. 1187D: Atmel semiconductor reference manual.
5. Atmel semiconductor web site – www.atmel.com
6. DS30292B: Microchip reference manual.
7. Microchip semiconductor web site – www.microchip.com

## E-COMMERCE (ELECTIVE - II)

**LA805-5** **3+1+0**

**Module1**

Introduction to Electronic Commerce - E-Commerce Framework- Anatomy of E-Commerce Applications - E-Commerce Consumer & Organization Applications- E- Commerce and World Wide Web - Internet Service Providers - Architectural Framework for Electronic Commerce - WWW as the Architecture- Hypertext publishing.

**Module 2**

Network Security - Client-Server Network Security - CS Security Threats – Firewalls - Data & Message Security - Encrypted Documents - Security on the Web.

**Module 3**

Electronic Payment Systems - Types of Electronic Payment Systems - Digital Token Based Electronic Payment System - Smart Cards - Credit Cards - Risk in Electronic Payment Systems - Designing Electronic Payment Systems.

**Module 4**

Electronic Data Interchange - EDI Application in Business- EDI-Legal - Security and Privacy Issues - EDI standardization - EDI Envelope for Message Transport - Internet based EDI - Internal Information System- Work-flow Automation and Coordination- Supply Chain Management- Document Library- Types of Digital Documents- Corporate Data Warehouses.

**Module 5**

Recent Trends in E-Commerce - Multimedia in E-Commerce- Video Conferencing with Digital Videos- Broad Band Telecommunication- Frame & Cell Relays- Switched Multimegabit Data Service (SMDS)- Asynchronous Transfer Mode- Mobile Computing and Wireless Computing.

**Text Book**

Frontiers of Electronic Commerce: Ravi Kalakota & Andrew B Whinston, Pearson Education.

**References**

1. Global Electronic Commerce: J Christopher Westland & Theodore H K Clark.

2. E- Commerce The cutting edge of Business: Kamlesh K Bajaj & Debjani Nag.
3. E-Commerce: Strategy Technologies and Applications, TMH.

## ADVANCED DIGITAL SIGNAL PROCESSING (ELECTIVE - III)

**LA806-1** **3+1+0**

**Module 1**

Introduction to Multi-rate Digital Signal Processing – Sample rate reduction - decimation by integer factors- sampling rate increase – interpolation by integer facto - Design of practical sampling rate converters: Filter Specification- filter requirement for individual stages - Determining the number of stages and decimation factors - Sampling rate conversion using poly-phase filter structure – poly-phase implementation of interpolators.

**Module 2**

Adaptive Signal Processing – Adaptive filters – Concepts- Adaptive filter as a Noise Canceller - Other configurations of the adaptive filter - Main components of the adaptive filter – Basic Wiener filter theory – The basic LMS adaptive algorithm – Practical limitations of the basic LMS algorithm - Recursive Least Square Algorithm – Limitations - Factorization Algorithm.

**Module 3**

Introduction to two dimensional signal and systems - 2D – DFT Transforms - Properties and applications - Discrete Hilbert Transform and Discrete Cosine Transform – Properties and Applications - Short term Fourier Transform - Gabor Transform - Properties and Applications.

**Module 4**

Wavelets – Wavelet Analysis – The Continuous Wavelet Transform - scaling - shifting - scale and frequency - The Discrete Wavelet Transform - One Stage filtering - Approximation and Details - Filter bank analysis – Multilevel Decomposition – Number of levels – Wavelet reconstruction – Reconstruction filter- Reconstructing Approximations and details- Multilevel Reconstruction - Wavelet packet synthesis- Typical Applications.

**Module 5**

General and special purpose DSP Processors - Computer Architecture for signal processing – Havard Architecture - Pipelining - Hardware Multiply and Accumulate – Special Instructions - Replication - On-chip Memory Cache - Extended Parallelism - SIMD – VLIW and static super-scalar Processing - Brief study of TMS320C4X and ADSP 2106 processors.

**References**

1. Digital Signal Processing: Emmanuel C Ifeachor, Barrie W Jrevis, Pearson Education.
2. Theory and Applications of DSP: L.R Rabiner and B gold
3. Electronic filter Desig Hand Book: A .B Williams and FT Taylor, McGraw Hill
4. Wavelets and Subband Coding: Valterli & Kovaceric, PHI.
5. Analog Devices & Texas Instruments Users Manuel of TMS320C4X and ADSP 2106x.

## MULTIMEDIA SYSTEMS (ELECTIVE - III)

**LA806-2** **3+1+0**

**Module 1**

**INTRODUCTION**: Definition of multimedia, multimedia, hardware, software applications and software environments - Media Types - Analog and digital video, digital audio, music and animation - Analog & Digital video - Memory storage - Basic tools - Authoring tools.

**Module 2**

**BUILDING BLOCKS**: Text - Hyper text - Sound - Sound cards - Standards - Image - Image types - Image compression, RLE, JPEG, MPEG - Fractal and Wavelet Compressions - Image file types - Animation - Capture and Playback techniques. (basic ideas only)

**Module 3**

**MULTIMEDIA ENVIRONMENTS**: The Compact Disc family, CD-interactive, Digital Video Interactive, QuickTime, Multimedia PC and Microsoft Multimedia Extensions.

**Module 4**

**MULTIMEDIA PROGRAMMING**: Framework: Overview, Media classes, Transform classes, Format classes and Component classes - Problems related to programming - Composition, Synchronisation, Interaction, Database integration.

**Module 5**

**ADVANCED MULTIMEDIA**: Moving pictures - Techniques realistic image synthesis, Virtual Reality - Full motion digital video - Video capture techniques - multimedia networks - Desktop video conferencing - Future multimedia.

**References**

1. Multimedia Programming Objects, Environments & Framework - Simon J. Gibbs, Dionysios C. Tsischritziz (Addison-Wesley Publishing Co.)
2. Multimedia- Making it work - Tay Van Ghan – Osborne Tata Mcgraw Hill
3. Authoring Interactive multimedia - Arch C Luther
4. Optimizing your Multimedia PC - L.J. Skibbe, Susan Lafe Meister - Comdex
5. Multimedia Bible - Winn L. Rosch, Sams
6. Multimedia Producers Bible- Ron Goldberg, Comdex

7. Multimedia Power Tools - Peter Jellam, Random house Electronic Pub.
8. Multimedia Computing - Mathew E. Hodger & Russel M. Sasnett, Addison wesley
9. Integrated Multimedia Systems - Palikom, The communication Wall Overview

## SYSTEM SOFTWARE (ELECTIVE - III)

**LA806-3** **3+1+0**

**Module1**

**Introduction:** Concept of system software, classification of system s/w. Assemblers: over view of assembly process, elementary ideas of macros & macro processors. Compilers: Overview of compilation process, Parsing- top down & bottom-up parsing, storage allocation. Interpreters: basic ideas only.

**Module2**

**Operating Systems**: types of OS, batch processing, multiprogramming, timesharing, real time OS. OS services UNIX OS –shells, Bourne Shell, C shell-visual editor.

**Module3**

**Information Management**: File system- directory structure, basic file system calls, file protection, allocation methods disk blocks and inodes in UNIX. Device management.

**Module4**

**Processor Management**: CPU scheduling - scheduling algorithms, Multiprocessor scheduling, Process management in UNIX, concurrent process-critical section, semaphores, synchronization, concurrent languages.

**Module5**

**Memory Management**: swapping, partitions,, paging, segmentation, virtual memory concepts, page replacement, dynamic linking, caching of secondary storage, memory management in UNIX, Deadlocks: cause, detection, prevention, avoidance, recovery, combined approach to deadlock handling.

**References**

1. System programming and Operating Systems – D M Dhamdhere
2. System Software – an introduction to system Programming – Leland L Beck, 3ed.
3. Operating System – Peterson & Silberschatz, Addison Wesley
4. Operating Systems – Dietal H M
5. Design of UNIX Operating System – Maurice J Bach
6. UNIX System Programming – Stevens.

## EMBEDDED SYSTEMS (ELECTIVE - III)

**LA806-4** **3+1+0**

**Module 1**

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

**Module 2**

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

**Module 3**

**Embedded Communication System**: Serial Communication, PC-to-PC Communication, Serial Communication with the 8051 Family of Micro-controllers, Protocol Converter, Voice-over-IP, Embedded Applications over Mobile Network example MP3 Sound Player.

**Module 4**

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

**Module 5**

**Java Applications & Future Trends in Embedded Systems**: Networked Java-Enabled Information Appliances, Embedded Process Control System, Mobile Java Applications, Appliance Control using Jini, System on a Chip (SOC), Smart Cards and the Cashless Society, Security in Embedded Systems.

**Text Book**

Programming for Embedded Systems- Dreamtech Software Team, Wiley Dreamtech

**Reference**

1. Fundamentals of Embedded Software where C and Assembly Meet – Daniel W Lewis.

## DIGITAL IMAGE PROCESSING (ELECTIVE - III)

**LA806-5** **3+1+0**

**Module 1**

Image representation and modeling - Characteristics of a digital image - Elements of digital image processing systems - Image digitizers & scanners - Elements of visual perception - Brightness & contrast - Image sampling & Quantisation - Two dimensional Sampling theorem - Reconstruction of image from its samples - Aliasing.

**Module 2**

Image Transforms - Two dimensional orthogonal & unitary transforms - Properties of unitary transforms - Two dimensional DFT & its properties – Cosine – Hadamard – Haar – Sine - KL Transforms & their properties.

**Module 3**

Image Enhancement - Point processing - Histogram modeling & Equalization - Spatial Filtering - Filtering in the frequency domain - color Image processing.

**Module 4**

Image Restoration - Degradation model - Inverse filtering - Wiener Filter - Interactive restoration - Image analysis & vision -basic principles only.

**Module 5**

Image Coding & Compression- basic principles - run length coding - variable length coding - bit plane coding - loss-less predictive coding - lossy predictive coding - Transform coding - Image compression standards.

**References**


1. Digital image Processing: I.Gonzalez Rafel C, Pearson Education.
2. Fundamentals of digital image processing: Jain Anil K, PHI.
3. Digital Image Processing: Pratt William K, John Wiley.


## SYSTEMS LAB

**L807** **0+0+3**

1. Experiments based on Matlab.
   a. To test linearity, causality & stability of LTI system.
   b. To find DFT of a given sequence using DIT & DIF FFT algorithms.
   c. To find IFFT of a given sequence using DIT & DIF FFT algorithms.
   d. Program to design IIR filter using Bilinear transformation impulse invariant methods.
   e. Control system simulation experiments.
   f. Programs to design filters using window techniques.
2. Digital signal processing based on DSP processors.
3. Familiarization of PAL assembler.
4. Realization of combinational and sequential circuits using PAL.
5. Realization of simple digital circuits using VHDL.
6. Familiarization of FPGA trainer kits.
7. Realization of digital circuits using FPGA.

**Note**

Any other experiments may be added in accordance with the electives offered.

**L 709 / 808** **PROJECT DESIGN AND SEMINAR** **0+0+2**

Each student is required to present a technical paper on a subject approved by the dept. The paper should in general reflect the state of the art. He / she shall submit a report on the paper presented to the department. In addition to the seminar he / she shall undertake a project work (as a team or individually) in the 7th semester itself in consultation with the guide (s), panel of staff members, and submit a report of the project work done to the department.

**VIVA – VOCE**

**L809**

A comprehensive Viva - voce examination will be conducted to assess the student's overall knowledge in the specified field of engineering. At the time of viva - voce, certified reports of seminar and project work are to be presented for evaluation.