# UNIVERSITY OF DELHI

## Syllabus

of

# B.E. Information Technology

at

# Delhi College of Engineering

Semester I
Semester II
Semester III
Semester IV
Semester V
Semester VI
Semester VII
Semester VIII

Syllabus applicable for students seeking admissions to the B.E.
(Information Technology Course)

Web Copy of Syllabus downloaded from DCE Website
(http://dce.ac.in)

# Guidelines for Practical

Courses of Proposed: B.E.-Information Technology

Semester-I

B.E. (Information Technology) I Year I Semester Practical Paper-I IT-106 Engineering Drawing
B.E. (Information Technology) I Year I Semester Practical Paper-II IT-107 Physics-I. Based on course work of Theory IT-103 Physics-I
B.E. (Information Technology) I Year I Semester Practical Paper-III IT-108. Based on course work of Theory IT-104 Chemistry
B.E. (Information Technology) I Year I Semester Practical Paper-IV IT-109 Workshop-I Based on course work of Theory IT-105 Manufacturing Process

## Semester-II

B.E. (Information Technology) I Year II Semester Practical Paper-I IT-116 Principals Electrical Science Lab. Based on course work of Theory IT- 111 Principals of Electrical Science Lab.

B.E. (Information Technology) I Year II Semester Practical Paper-II IT-117 Mechanical Science Lab. Based on course work of Theory IT-112 Mechanical Sciences

B.E. (Information Technology) I Year II Semester Practical Paper-III IT-118 Introduction to Programming Lab. Based on course work of Theory IT-114 Introduction to Programming

### Sessional

Paper IT-119 Linux/ Unix Programming Lab.

## Semester-III

B.E. (Information Technology) II Years III Semester Practical Paper-I IT-206 Data Structure Lab. Based on work of Theory IT-201 Data Structure

B.E. (Information Technology) II Year III Semester Practical Paper-II IT-208 Digital Circuits & Systems Lab. Based on Course work of Theory IT-202 Digital Circuits and Systems
B.E. (Information Technology) II Year III Semester Practical Paper-III IT-209 Analog Electronics Lab. Based on Course work of Theory IT-203 Analog Electronics

### Sessional

Paper-I IT-210 Programming-I

Based on C and C++

## Semester IV

B.E. (Information Technology) II Year IV Semester Practical Paper-I IT-216 System Analysis & Design Lab Based on course work of Theory IT-211 System Analysis & Design

B.E. (Information Technology) II Year IV Semester Practical Paper-II IT-217 Analog & Digital Communication s Lab. Based on Course work of Theory IT-212 Analog Digital & Communication

B.E. (Information Technology) II Year IV Semester practical Paper-III IT-218 Operating Systems Lab. Based on course work of Theory IT-213 Operating Systems

B.E. (Information Technology) II Year IV Semester Practical Paper-IV IT-219 Computer Graphics Lab. Based on course work of Theory IT-214 Computer Graphics

B.E. (Information Technology) II Year IV Semester Practical Paper-V IT-220 Computer System Architecture Lab. Based on course work of Theory IT 215 Computer System Architecture

## Semester-V

B.E. (Information Technology) III Year V Semester Practical Paper-I IT-307 Microprocessor Lab. Based on course work Theory etc Microprocessors and Applications

B.E. (Information Technology) III Year V Semester Practical Paper-II IT-308 RDBMS Lab. Based on course work of Theory IT-304 Relational Database Management System

B.E. (Information Technology) III Year V Semester Practical Paper-III IT-309 Networking Lab. Based on course work of Theory IT-305 Computer Networks

## Sessional

Paper-I IT-310 Technical and Business Communication

## Semester-VI

B.E. (Information Technology) III Year VI Semester Practical Paper-I IT-316 Multimedia Lab. Based on course worki of Theory IT-311 Multimedia & Applications

B.E. (Information Technology) III Year VI Semester Practical Paper-II IT-317 Software Engineering Lab. Based on course work of Theory IT-312 Software Engineering

ar : I

Credits & Type

emester : I

| I IT | TH<br>5 | PR<br>4 | VS | | |
|---|---|---|---|---|---|
| TH1 | IT 101 | | | Humanities | 4H |
| TH2 | IT 102 | | | Mathematics - I | 4H |
| TH3 | IT 103 | | | Physics – I | 4H |
| TH4 | IT 104 | | | Chemistry | 4H |
| TH5 | IT 105 | | | Manufacturing Processes | 4A |
| PR1 | IT 106 | | | Engineering Drawing T | 3C |
| PR2 | IT 107 | | | Physics I | 2H |
| PR3 | IT 108 | | | Chemistry | 2H |
| PR4 | IT 109 | | | Workshop I | 2A |
| | | | | Total Credits : 29 | |

Year : I

Credits & Type

Semester : II

| 2II | TH<br>5 | PR<br>3 | VS<br>1 | | |
|---|---|---|---|---|---|
| TH1 | IT 111 | | | Principles of Electrical Engineering | 4A |
| TH2 | IT 112 | | | Mechanical Sciences | 4A |
| TH3 | IT 113 | | | Engineering Mathematics -I | 4A |
| TH4 | IT 114 | | | Introduction to Programming | 4C |
| TH5 | IT 115 | | | Discrete Structures | 4A |
| PR1 | IT 116 | | | Principles of Electrical Science Lab | 2C |
| PR2 | IT 117 | | | Mechanical Sciences Lab | 2C |
| PR3 | IT 118 | | | Introduction to Programming Lab | 2C |
| VS1 | IT 119 | | | Linux /UNIX Lab | 2C |
| | | | | Total Credits : 28 | |

Year : II

Credits & Type

Semester : III

| 3IT | TH<br>5 | PR<br>4 | VS<br>1 | | |
|---|---|---|---|---|---|
| TH1 | IT 201 | | | Data Structures | 4C |
| TH2 | IT 202 | | | Digital Circuits & Systems | 4A |
| TH3 | IT 203 | | | Analog Electronics | 4A |
| TH4 | IT 204 | | | Engineering Mathematics –II | 4C |
| TH5 | IT 205 | | | Organizational Management | 4A |
| PR1 | IT 206 | | | Data Structure Lab | 2C |
| PR3 | IT 208 | | | Digital Circuits and Systems Lab | 2C |
| PR4 | IT 209 | | | Analog Electronics Lab | 2C |
| VS1 | IT 210 | | | Programming I Lab | 1C |
| | | | | Total Credits : 27 | |

Year : II

Credits & Type

Semester : IV

| 4IT | TH<br>5 | PR<br>4 | VS<br>1 | | |
|---|---|---|---|---|---|
| TH1 | IT 211 | | | System Analysis and Design | 4C |
| TH2 | IT 212 | | | Analog and Digital Communication | 4A |
| TH3 | IT 213 | | | Operating Systems | 4C |
| TH4 | IT 214 | | | Computer Graphics | 4C |
| TH5 | IT 215 | | | Computer System Architecture | 4C |
| PR1 | IT 216 | | | System Analysis and Design Lab | 2C |
| PR 2 | IT 217 | | | Analog & Digital Communication Lab | 2C |
| PR3 | IT 218 | | | Operating Systems Lab | 2C |
| PR4 | IT 219 | | | Computer Graphics Lab | 2C |
| PR5 | IT 220 | | | Computer System Architecture Lab | 2C |
| | | | | Total Credits : 30 | |

Year : III

Credits & Type

Semester : V

| 5IT | TH<br>5 | PR<br>4 | VS | | |
|---|---|---|---|---|---|
| TH1 | IT 301 | | | Design and Analysis of Algorithms | 4C |
| TH2 | IT 302 | | | Object Oriented Technology | 4A |
| TH3 | IT 303 | | | Microprocessors and Applications | 4C |
| TH4 | IT 304 | | | Relational Database Management System | 4C |
| TH5 | IT 305 | | | Computer networks | 4C |
| PR2 | IT 307 | | | Microprocessor Lab | 2C |
| PR3 | IT 308 | | | RDBMS Lab | 2C |
| PR4 | IT 309 | | | Networking Lab | 2C |
| VSI | IT 310 | | | Technical and Business Communication | 1C |
| | | | | Total Credits | : 27 |

* At the end of the examination students will go to industry for 8 weeks training.

Year : III

Credits & Type

Semester : VI

| 6IT | TH<br>5 | PR<br>4 | VS<br>1 | | |
|---|---|---|---|---|---|
| TH1 | IT 311 | | | Multimedia and Applications | 4C |
| TH2 | IT 312 | | | Software Engineering | 4C |
| TH3 | IT 313 | | | Information Theory and Coding Techniques | 4C |
| TH4 | IT 314 | | | Elective – I | 4C |
| TH5 | IT 315 | | | Microwave and Satellite Communication | 4A |
| PR1 | IT 316 | | | Multimedia Lab | 2C |
| PR2 | IT 317 | | | Software Engineering Lab | 2C |
| PR3 | IT 318 | | | Practical Training | 2C |
| PR4 | IT 319 | | | Microwave and satellite communication Lab | 2C |
| VS1 | IT 320 | | | Advanced Programming Lab | 1C |
| | | | | Total Credits | : 29 |

* At the end of the examination students will go to industry for 8 weeks training.

Year : IV

Credits & Type

**Semester : VII**

| 7IT | TH<br>5 | PR<br>4 | VS<br>1 | | | L T P |
|---|---|---|---|---|---|---|
| TH1 | IT 401 | | | Internet & Web Engineering | 4C | 3-1-0 |
| TH2 | IT 402 | | | Distributed Systems and Computing | 4C | 3-1-0 |
| TH3 | IT 403 | | | Compiler and Translator Design | 4C | 3-1-0 |
| TH4 | IT 404 | | | Elective –II | 4A | 3-1-0 |
| TH5 | IT 405 | | | Advances in Digital System Design | 4C | 3-1-0 |
| PR1 | IT 406 | | | Internet & Web Engineering Lab | 2C | 0-0-2 |
| PR2 | IT 407 | | | Distributed Systems and Computing Lab | 2C | 0-0-2 |
| PR3 | IT 408 | | | Elective II Lab | 2C | 0-0-2 |
| PR4 | IT 409 | | | Compiler & Translation Design Lab | 2C | 0-0-2 |
| PR4 | IT 410 | | | Practical Training | 4M | |
| VS1 | IT 411 | | | Minor Project | 2C | 0-0-3 |
| | | | | Total Credits: 34 | | 15-5-11 |

* Students are supposed to go for 8 weeks Industrial Training after the examinations.

Year : IV

Credits & Type

**Semester : VIII**

| 8IT | TH<br>3 | PR<br>3 | VS<br>1 | | | L T P |
|---|---|---|---|---|---|---|
| TH1 | IT 412 | | | Information Security | 4C | 3-1-0 |
| TH2 | IT 413 | | | Financial & Cost Management | 4C | 3-1-0 |
| TH3 | IT 414 | | | Elective – III | 4C | 3-1-0 |
| PR1 | IT 415 | | | Elective III Lab | 2C | 0-0-2 |
| PR2 | IT 416 | | | Major Project | 8M | 0-0-6 |
| PR3 | IT 417 | | | Practical Training | 4M | 0-0-1 |
| VS1 | IT 418 | | | Seminar Reports | 2C | |
| | | | | Total Credits : 28 | | 9-3-9 |

**Elective –I**

Theory of Computation
Optimization
Numerical Analysis & Scientific Computing
Modern Algebra
Differential Equations and Boundary Value Theorem
Control Engineering
Quantitative Techniques
Simulation & Modeling

| **Elective - II** | **Elective - III** |
|---|---|
| IT in Marketing Management | Expert Systems |
| Advancement in Database Management System | Advanced Microprocessor Architecture |
| Advanced topics in Software Engineering | Software Quality and Testing |
| Fault Tolerant Digital Systems & Robust Systems | Software Fault Tolerance |
| Real Time and Embedded Systems. | VLSI Technology |
| Digital Signal Processing | Image Processing |
| Total Quality Management | Intellectual Property Rights |
| Pattern Recognition | Computer Vision |
| Soft Computing & Neural Networks | Artificial Intelligence |
| Optical Communication | Mobile Computing |
| Robotics | Human Computing Interface |
| Advancements in Information Technology | Advancement in Web Technology |

**B.E. – INFORMATION TECHNOLOGY 1 Year 1 Semester**

Examination Theory
Paper-1 **IT-101 Humanities** (English)

(A) Text: Essay, Short Stories and One Act Plays; Editor R.K Kausnik & S.C. Bhatia, Published by Oxford University Press.

The following chapters are prescribed for study :

(i) Essays:

1. Nehru the Democrat by M. Chalapathi Rao.
2. Bores by E.V. Lucas
3. Freedom by George Bernard Shaw
4. What I reaquired from Life by J.B.S. Haldane
5. Student Mobs by J.B. Pristley

(ii) Short Stories:

1. The fortune – Teller by Karal Capek
2. Grief by Anton Chekov
3. The Doll's House by Katherine Mansfield

(iii) One Act Plays:

1. The Marriage proposal by Anton Chekov
2. The Boy comes Home by A.A. Milne

(B) ENGLISH LANGUAGE PRACTICE

Applied Grammer:

Common errors, Use of words, Synonymous and antonyms, Formation of Words-Prefixes and Suffixes.

Technical description of (i) simple objects, tools and appliances (ii) Processes and operations (iii) Scientific principles.

Composition:

Comprehension, Dialogues-conversational and colloquial idiom.

Spoken English:

Praqctice in self expression talks, Lectures and speeches.

Paper IT 102 **MATHEMATICS –I**

Algebra: Pratial fraction: Hyperbolic and inverse hyperbolic functions, De-Moiver's Theorem and its applications; Relations between circular and hyperbolic functions; Positive term infinite series and their convergence (Comparison and Ratio tests), Alternating series.

Differential Calculus: Derivatives of hyperbolic functions; successive differentiation and Leibnitz's theorem. Taylor's and Maclaurin's series, maxima and minima of functions of one variable; Curvature and radius of curvature, points of inflexion.

Integral Calculus: Integration by partial fractions, Integration of form 1, I/R where R=ax2 + bx +c; Properties of definite Integrals.

Reduction formulae: Application of integration to areas, length of arcs, surface and volume of solids of revolutions, Trapezoidal and Simpson's rules.

**IT 103 PHYSICS**

Relativity: Absolute and intertial frames of reference, Newtonian (Galilean) relativity; Galilean transformation, Michelson-Morely experiment and its implications, Lorentz Transformation Einstein's law of addition of velocities. Mass variation with velocity, concept of energy and momentum as four vector, Einstein's mass-energy relation.

Inverse Square Law of Force: Fundamental interactions, Electromagnetic and gravitational interactions, Force and potentials, Central Force.

Invariance and Symmetry principles: Invariance of a Physical quantity, laws of conservation of mementum, energy and charges, Concept of symmetry and its implications.

Wave Oscillations. Free damped and forced oscillatory motions, Resonant vibrations with applications, sharpness of resonance, quality factor.

Formation of wave in strings, rods and air, Acoustic waves, Acoustic impedance. Transmission through partitions, Ultrasonics and its applications.

Interference of Light, Wave theory of light, superposition principle, Double lit experiment, Bi-prism and Newton's rings. Theory of interference in thin films, Interference filters, Michelson's interferometer.

Diffraction of Light: Fresnel and Fraunhofer class of diffraction. Diffraction at straight edge, Cornics spiral, Fraunhofer diffraction at a slit and its extension for

number of slits Diffraction gratings. Resolving power of optical instrument. telescope, prism and grating.

Polarization of Light: Elementary aspects of E.M. theory of light, Polarization, Reflection and Transmission, Brewster law, Polarization due to pile of plates and double refraction, Elliptically and circularly polarized light, Nicol prism, quarter and half-wage plates.

Polarimeters. Half Shade & Pi=quartz.

Optical Instruments. Cardinal points of a co-axial lens system, Defects in the images, Spherical and Chromatic aberrations, Nodal slide assembly, Eye pieces.

**Paver IV IT 104** **CHEMISTRY**

Chemical Kinetics:
Rate constant, order and molecularity of a reaction, 1st, 2nd , 3rd order reactions, Methods of determining order of reactions, Effect of catalyst on reactions rate, Activating energy, Industrial applications of catalysts.

Electro-Chemistry:

Transport number, Galvanic cells, E.M.F. and its measurements, Nearnst equation of electrode potentials; Reference and Indicator electrodes at measurements, Solar energy.

Phase diagrams and phase transformations in Pb-Ag and Cu-Ni systems.

Thermal Methods of Analysis:

Elementary discussions of thermograviometric analysis, Differential thermal analysis and differential scanning calorimetry.

Metals and Non-Metals of Elements:

S and P block elements, Bonding in complexes, Molecular explations for magnetic properties and colour, extraction and technical applications of Titanium, Vanadium, Ziroconium, Tungsten and Uranium.

Alloys classification:

Necessity for making alloys, composition, properties and uses of following alloys, Brass Bronze, Gun metal, Duralumin, Effect of alloying elements like C, Ni, Mn, Si, V Mo, W and Co on the properities of steel.

Electronic –Effects:

Inductive effect, Conjugation and resonance and their effect on physical and chemical properties of molecules, carbanion and carboniumious and free radicals.

Organic Polymers:

Polymerisation, Effect or polymer structure on properties, production, Properties and technicai applications of some important theromolastics and thermosetting resins, natural rubber and elastomers (SNR, GR-P Polyurethane and silicon) Molecular weights.

Oils, Fats, Waxes and Detegents:

Ptroduction and Physico-Chemical properties of fatty acids and Glycerides, Manufacture of edible fats, soap, glycerine, waxes, essential oils, perfumes and cosmetics.

## IT 105 MANUFACTURING PROCESSES

Materials:

Compositions, Properties and uses of Wrought iron, Pig iron, Cast iron, Malleable iron, S.G. Iron carbon and alloy steels, Copper, Aluminimum, Lead, Brass Bronze, Duralumin, bearing metals, high temperature metals, cutting tool materials.

Casting Processes :

Principles of metal casting: Pattern materials, types and allowance; Study of moulding, sand moulding, tools, moulding materials, classification of moulds, description and operation of cupola: special casting processes e.g. diecasting, permanen: mould casting, centrifugal casting, investment casting.

Smithy and Forging:

Basic operations e.g. upsetting, fullering, flattening, drawing, swaging, tools and appliances; drop forging, press forging.

Metal joining:

Welding principles, classification of welding techniques; Oxy acetylene Gas welding, equipment and field of application, Arc welding, metal arc, Carbon arc, submerged arc and atomic hydrogen arc welding, Electric resistance welding: spot, seam, butt, butt seam and percussion welding; Flux; composition, properties and function, Electrodes;

Types of joints and edge preparation.

Brazing and soldering,

Sheet Metal work:

Common processes, tools and equipments; metals used for sheets, standard specification for sheets.

Bench work and Fitting:

Fitting, sawing, chipping, thread cutting (die), tapping; Study of hand tools, Marking and marking tools.

**IT - 111: Principles of Electrical Engineering**

Circuit Analysis, DC & AC Circuits, resonant circuits, time domain representation of signals. Application of Laplace Transforms in circuit analysis.

Driving point & transfer functions steps impulse response of circuits, steady state analysis . Poles & zeros & stability.

Network Theorems: Thevenin's, Norton's Millman's, Millar, super position & Max power transfer two port parameters & interconnection of networks.

Three Phase circuits

Transformers: Principle equivalent circuit & phaser diagrams

Rotating M/Cs: Working principles of DC motors & generators introduction to synchronous & induction m/cs.

Measurements: Wheat stone bridge, and other methods for RLC measurement. Measurement of voltage & currents, power & energy, DVM, oscilloscope.

**IT-112 : Mechanical Sciences**

**Applied Mechanics**

Basic Laws:

Force, Moment of a force, couple, equivalent force system, equation of equilibrium, solution of simple plane trusses by analytical and graphical methods, frictional force, first moment and second moment of area.

Simple Stresses and Strains:

Description of tensile, compressive shear and volumetric stresses and strains complementary shear stress, lateral strain and Poison's ratio.

Bending Moment and Shear Force Diagrams:

Cantilevers and simply supported beams carrying various types of loads.

Theory of Simple Bending: Determination of bending stresses: deflection of beams.

**Fluid Mechanics:**

Fluid and flow, fluid properties. Pressure variation in a static fluid, hydrosta forces on plane and curved surfaces. Stability of submerged and floating bodies.

General description of fluid motion, stream lines, contiuity equation, parti acceleration, velocity gradient, rotation and rate of strain.

**Thermodynamics**

Concepts of system, properties, equilibrium, Zeroth law, heat and work, First l of thermodynamics, non flow and steady flow energy equations, second law thermodynamics, reversibility, entropy.

Properties of ideal gases, various themodynamic processes. Properties of vapou Steam Tables and Mollier dagram. Properties of air water vapour mixtures, introducti to psychromety.

I.C. Engines: working of four stroke and two stroke I.C. engines,

**IT-113: Engineering Mathematics –I**

*Differential Calculus:* Partial Differentiation, Total Differentiation, Taylor's series for functions of two variables, Maxima and Minima of functions of two or more variables.

*Integral Calculus:* Double and Triple integration, change of order of integration, Volumes of simple solids.

*Vector Analysis*: The operators gradient, divergence and curl and their geometrical significance. Integration of vectors, Work done in vector fields, Green's, Stokes and Gauss divergenc theorem.

*Differential Equations*: General linear differential equations with constant coefficients, Operator D, Complementary function, particular integral, Wronskian, Simultaneous linear differential equations, Solution of differential equations in power series, Frobenius method.

*Fourier Series and Fourier Transform*: Fourier Series, Euler's Formula, Even and odd-function functions having arbitrary periods, half range expansions, Harmonic Analysis, Fourier Transform.

*Laplace Transform*: Laplace Transformation, Inverse Laplace Transformation, Convolution Theorem, Application to Linear differential equations with constant coefficient, Unit step function, Impulse function, Periodic function.

*Functions of Complex Variable:* Analytic Functions, Harmonic Conjugate, Conformal Mapping, Cauchy's Integral theorem, Cauchy's Integral Formula, Residue Theorem, Evaluation of real integrals.

## IT 114: Introduction to Programming

Introduction : Why study Programming languages, Features of a good programming language
Describing Syntax and semantics . (formal methods of describing syntax, recursive descent parsing, attribute grammars, dynamic semantics )
Type of languages: Machine, Assembly , high level languages.
Introduction to number of systems: binary, Octal, Hexadecimal.
Techniques in Problem Solving: Flowcharting, Pseudocoding.
Overview of Structured Programming: Top down and bottom up approach
Elementary data types and their implementations in C/C++
Structured Data types and their implementations in C/C++
Sub Programs and Programmer defined Data types and their implementation in C/C++.
Control structures and sequencing
Selection and iteration
Simple I/o and file processing in C
Introduction to Object Orientation concepts

## IT- 115: Discrete Structures

Introduction and Preliminaries.
Mathematical Logic, Propositions, Truth Tables, and Logical inferences,
Predicates and quantifiers, Methods of Proof.
Elements of Set Theory ,Primitives of set theory, Introduction to infinity and Natural numbers.
Mathematical induction and proof by induction, Groups & Rings
Binary Relations, Binary Relation and its Representation, Type of Binary Relations
Equivalence relations and partitions.
Functions, Types of functions, Pigeon hole principle
Counting and analysis of algorithms , Permutations , Combinations, Asymptotic behavior of algorithms
Recurrence relation.
Graph Theory, Elementary Graph theory, Eulerian paths and circuits, Hamilton paths and circuits,
Shortest paths, Spanning trees.
Introduction to Finite state Machines, Formal grammars Non deterministic machines

## IT 201 DATA STRUCTURES

Arrays, Stacks and Queues: Fundamentals and Representations, Applications of Arrays, Stacks and Queues, Sparse Matrices
Linked lists: Singly/Linear Linked lists, Linked Stacks and Queues, Doubly and Circular Linked Lists, Applications. Heyn
Trees: Binary Trees, B-Trees, N-ary Trees, $B^*$-Trees, Tree Traversals and Tries, Storage of Trees, Threaded trees, Trees Applications, Hashing.
Graphs: Types, Terminology and Representations, Graph Traversals, Applications of Graphs.
Searching and Sorting: Sequential and Binary Searching, Search trees, Sorting Techniques.

## IT 202: Digital Circuits & Systems

Binary System & Codes
Boolean Algebra, Venn diagram, switching function and minimization of switching functions with don't care terms etc. (Karnaugh's Map Method & Tabulation Techniques )
Introduction Logic Gates, Logic Families TTL, Tristate Logic, ECL, CMOS and $T^2$ L Logic, Logic parameters etc.
Bistable, Monostable, Astable and Schmitt trigger circuit.
Gated memories, M/S flipflops, Shift Registers Serial & Parallel Counters, Ring counters, Up Down counters.
Designing of combinational circuits like code converter, address, comparators, etc.
Introduction to semiconductor memories: ROM, PROM, EPROM, STATIC & DYNAMIC RAM.
Introduction to Encoders, Decoders, Multiplexer, demultiplexer, Designing combinational circuits with multiplexers and other digital logic blocks, PROM.
Concept of Digital to Analog Conversion Ladder Networks, and Concept of Analog to Digital conversion: Dual slope method, V-F conversion, stair-case Ramp-method/counter method, successive approximation type of A/D converters etc.
Introduction to design of synchronous & asynchronous sequential circuit flow table realization from verbal description, ASM charts, minimization of flow-table and concept of state assignments.

## IT-203 : Analog Electronics

Electronics : Review of p-n junction diode, clipping clamping ckts, rectifier ckts. Power supply filters, zener diode, & zener regulators. Bipolar jn. Transistor, operation, characteristics, and equations.
Transistor biasing.
CB, CC,CE amplifiers.
MOSFET operation & characteristics, MOSFET amplifiers.
Differential amplifier,
Analysis of BJT & MOS amplifiers, frequency response, various feedback arrangements & stability, oscillators.
Ideal op-amp and its applications -: Integrators, differentiators summers;
Basic binding blocks of analog ICs.
Active filters and oscillators;
Non-linear applications of op-amp-op-amp as comparator.
Astable multi-vibrator, mono-stable multi-vibrator, square & triangular wave generators.

Applications of other analog ICs : timer 555, voltage reglators, PLL and function generators.

## IT- 204: Engineering Mathematics –II

*Basic Abstract Algebra:* Group, Ring, Integral Domain, Field, Vector Space, Linear Dependence and Linear Independence, Linear Transformation, Matrix Representation, Rank & Nullity of a Transformation, Eigen values and Eigen vectors,

*Statistics and Probability Theory*: Random Processes, random variables, mean, variance expectation, Various distributions, Binomial, Poisson, Hypergeometric, Gaussian, Autocorrelation and covariance functions, ergodicity, Several random variables, co- relations. Central Limit Theorem,Theory of sampling and sampling distributions, Probability Generating Function, Linear Regression, Chi-square Estimation.

**IT: 205 Organizational Management**

Introduction : production functions types of manufacturing systems, productivity and quality management, ISO-9000 systems, CMM System.
Management concepts – development of management principles, scientific management, human relations aspects.
Industrial psychology, personnel management, and labour relations, methods of remuneration.
Plant organization : organization, principles of organization, organization structure – line and staf organizations.
Plant location, layout : process layout, product layout and combination layout – methods of layout economics of layout.
Production planning and control : types of products, demand, demand forecasting, marketing strategie: Scheduling and control of scheduling; production control.
Work and method study : definition and concepts; method study-procedures, symbols, advantages. Flo process charts. Motion study-micromotion , SIMO charts, procedures system concepts value and AB analysis: system concepts, classification, analysis, techniques.
Industrial maintenance – types ,organization of maintenance department. Breakdown and preventiv maintenance.
Inventory control and replacement analysis : Introduction, replacement policy and methods adopted
Project Management – CPM and PERT
CAM, Group Technology

**IT 211 : System Analysis and Design**

Software Life cycle
Types of Systems
Different Views of modeling
Software Process models: Waterfall model, Spiral model, Prototyping model, V model, Incremental model etc.
Role of System Analyst in Software Life cycle.
Project Planning and Scheduling.
Cost estimation Models
Analysis Concepts and Principles
Data Modeling : ER Model
Functional Modeling : SASD, Data flow Diagram, Data Dictionary, Process Specifications, Decision Tables, Structured English
Modern Structured Analysis by Yourdan
Environmental and Behavioral model
Behavioral Oriented Modeling, Types of events, State Transition diagrams

Software Design Concepts: Modularity, Coupling, Cohesion, Structure Charts, Effective modular Design
Design Methods: Transform Mapping, Transaction Mapping
Software Testing Methods : White box Testing, Black Box testing
Evolution of MIS, Need of MIS, Distinction between data and information, Various hierarchies in decisions making in an organization and their information needs, strategic, tactical and operational needs.

**IT- 212: Analog & Digital Communication**

Analog Modulation:Introduction to AM, FM & PM

Amplitude Modulation Generation & Demodulation of AM waves, DSBSC waves, Coherent Detection of DSBSC Signal, Quadrature-Carrier Multiplexing, Generation of SSB waves, Demodulation of SSB waves.

Angle Modulation: Frequency & phase Modulation, narrow & Wide-Band FM, BW of FM waves, Generation & Demodulation of FM waves,, S/N ratio, Comparison of AM, FM & PM.

power spectral density, response of linear systems to random signals, Noise in wave modulation system, Noise effects in AM,FM & PM systems.

Pulse analog Modulation: Sampling theorem, Sampling of Low Pass and band pass signals, aliasing, Aperture effect, PAM, PWM and PPM generation and demodulation, TDM, Cross talk, Spectral analysis of PAM, PWM and PPM waves, S/N ration for different pulse modulation.

Pulse Digital Modulation: Pulse code modulation signal to quantization noise ratio, probability of error for PCM in AWGN channel, DPCM, DM and ADM modulators and demodulators, Prediction Filter, line coding, Inter symbol Interference.

Digital Transmission through Carrier Modulation Amplitude, Frequency and phase shift keying, Differential phase shift keying, CPFSK, MSK QPSK and QAM modulation & detection, probability of error calculation, Matched.

Digital Pass band transmission and reception, coherent phase shift keying PSK, frequency – shift keying (FSK) and quadri phase –shift keying (QPSK), non-coherent FSK, quadrature amplitude modulation (QAM), Application to Digital Cellular phones and high-speed modems. Effects of noise on baseband digital comm.. systems. Error probability in digital systems.

Introduction to special spectrum modulations, frequency- hopping and direct sequence, code-division multiplexing (CDM). Application to CDMA wireless comm. systems.

**IT-213 OPERATING SYSTEMS**

Operating System Overview, Memory Management techniques, Processor Management, Deadlock management, Device management, File management, Concurrent process, Management of Networ functions, Security and protection mechanisms, System performance monitoring, Case studies.

**IT - 214: COMPUTER GRAPHICS**

Output Devices
Graphical Display Devices,
Raster scan Displays: mechanism and working principle, with concepts like refreshing, flickering, interlacing, over scanning, pixel size.
Direct View Storage Tube Displays: Mechanism and working principle

Vector Displays: Mechanism and working principle,

Color Monitors/Displays: mechanism and working principle with concepts like Right handed and left handed coordinate system (RHCS & LHCS), resolution, video mode, video memory, video adapter, and display processor.

Graphical Printing Devices:

Mechanism and working principle of dot-matrix, Inkjet, laser printers, and flat-bed and drum plotters.

Input Devices

Graphical Input Devices :

Mechanism and working principle of mouse , Light pen, Scanners, Digitizing camera, Trackball, Tablets, and Joystick etc.

Graphical Input Techniques:

Positioning techniques: Modular constraints, Directional constraints, Gravity field effect, scales and guidelines, rubber band technique, Dragging etc.

Scan Conversion, Point generation: Representation of an image.

Line – drawing: symmetric DDA, Simple DDA, Bresenham's algorithm.

Circle Drawing: General methods, symmetric DDA, Bresenham's algorithm.

Ellipse – Drawing methods Polygon filling

Antialiasing: weighted & Un-weighted area sampling, Gupta – Sproul algo.

Two Dimensional Transformations

Geometric transformation and coordinate system transformation, composite transformations. Homogeneous coordinates.

Viewing transformations: world coordinate system (WCS), screen coordinate system (SCS), Window, Viewport, Aspect ratio.

Two –Dimensional Clipping

Point clipping line clipping: Sutherland Cohen algorithm, Mid-point subdivision algorithm, Cyrus-beck algorithm and other methods for clipping line against rectangular and non –rectangular windows. Polygon clipping : Sutherland –Hodgmann algorithm, curve clipping, and text clipping.

Three –Dimensional

3 Dimensional object representation: point, line polygon, curve and surfaces.

3-D Transformations: Translation, Rotation, Scaling, Mirror Reflection etc.

Representation of 3 –D object on 2 – D screen: 3-D WCS, 3-D Viewing volume, 3 –D point clipping, 3-D line clipping, parallel and perspective projection, perspective depth.

Need of 3-D screen coordinate system.

Hidden Surface Elimination: Z-buffer, scan line algo.

Curves & Surfaces : Shape description requirements, Parametric curves, Beizer & B- Spline methods.

Illumination & Shading :Reflection, Phong & Gourond Models.

Color Models: Achromatic light RGB, CMY, YIQ, HSV, and HLS color models.

Rendering , Animation Techniques,

**IT: 215 Computer System Architecture**

Von Newman architecture, Instruction set architecture, data-path organization, ALU desigr Control Path

Microprogrammed Control, CISC and RISC architectures

Input-output organization, Serial communication, Interrupts, DMA
Memory-Organization, Cache, organization, virtual memory, content addressable memory
Arithmetic-design, binary and BCD arithmetic, floating-point arithmetic.
Advanced architectures: concepts, classification and application
Concept of pipelined, SIMD and MIMD architectures

**IT 301: Design and Analysis of Algorithms**

Fundamental design methodologies and their implementations: Dynamic Programming: matrix chain product, longest common subsequence, memoization, Greedy algorithms: the fractional knapsack problem, Huffman codes; Divide and Conquer: divide and conquer recurrences, integer multiplication, matrix multiplication; Algorithms for set manipulations, their implementations and applications; Union-Find, Priority Queues; Graph Algorithms with implementation issues: Depth-First search and its applications, Minimum Spanning Trees and Shortest Paths; String matching; KMP and Boyer Moore algorithms, Algorithms relating to number theory and cryptography: Euclid's GCD algorithm, modular arithmetic including exponentiation and multiplicative inverses, primality testing, Cryptographic compution including the RSA cryptosystem; Fast Fourier Transform and its application on multiplying big integers; NP-Completeness and Reductions.

**IT 302: Object Oriented Technology**

Principles of Object-orientation: Encapsulation, information/implementating hiding, object identity, messages, classes, inheritance, polymorphism, genericity etc.
Object-oriented analysis methods. Object Model –Evolution and Elements of an object model, Classes & Objects – Nature of an object, relationships among Objects. Nature of a class relationship among classes, Classification, Key Abstractions and mechanisms, Notation-Class diagrams, State Transition diagrams, Object diagrams, Interaction diagrams, module diagrams. Process diagrams.
Object oriented design: OO design by Booch, Hierarchical OO design, object modeling technique by Rambangh, Unifed Modeling Language.
Object oriented construction: OO Language, Object –Oriented programming, OO databases management systems, Components and their management.
Object oriented Testing: Unit, Integration and System testing, the testing process.
Parallel processing with O-O techniques.

**IT 303: Microprocessor and Applications**

Overview of 8085
8086 Processor – Its architecture, Timing diagrams & instruction set.
Numeric Data Processor – 8087
Interfacing Chips – 8251, 8253, 8255, 8257, 8259, 8279 and
interfacing with processor
Interfacing of Microprocessors with: Pushbutton, keyboards, LEDs, Seven
Segments, Printers, A/D Converters, D/A Converters and stepper motors

Memory Interfacing
Concepts of higher end processors (80386 onwards)
Assembler directives
Bus Standards
Micro-processor based design
Micro-controller: Basic Concepts

**IT-304: Relational Data Base Management System**

Introduction to database systems, Overview, File Systems Vs. a DBMS
Advantages of DBMS
Levels of Abstraction, Data Independence
Data Models and their comparison (Hierarchical, Network,
Relational Model)
Relational Data models
Structure of Relational Database
Integrity Constraints over relations
Enforcing Integrity Constraints
Relational Algebra and Calculus
Introduction to SQL
Database Design
Top down approach (ER Model)
Bottom up approach (Normalization)
Transformation of ER Schema to relational tables
Concurrency Control and Database Recovery
Database Security
Introduction to File System
File Organization
File Access Methods
File Storage Devices
Basic Architecture of MIS, Components of MIS –Reporting styles, frequency, targeted managerial level, software and Hardware. Targeted audience of MIS design and development of MIS for various functional areas: Marketing, finance, purchasing, production, distribution, human resource department, implementation aspects, implementation framework, basics, catalysts & change agents.

**T 305: Computer Networks**

ıtroduction to Computer Networks
)SI Reference Model: A Layered Approach
ıtroduction to TCPP/IP Protocol Suite
ıtroduction to Queuing Theory
ata Link Control
Error Detection and CRC Polynomial Codes
Stop & Wait, Sliding Window ARQ
Go-back-N, Selective Reject

Data Link Layer Protocols and Multiplexing
HDLC, LAP-B, ARPANET DLC '
Frequency and Time Division Multiplexing
AD&L, XDSL
Circuit Switching and Packet Switching
Digital Switching Concepts
Packet Switching Principles
Virtual Circuits and Datagrams, X.25 and associated standards.
Routing and Traffic Control Algorithm
Flow and Congestion Control
Frame and Cell Relay, ATM and ISDN
Frame Relay Call Control and Data Transfer
Frame Relay Congestion Control
ATM Cells & Logical Connections
ATM Standard
Local Area Network (LAN)
Recent Trends in networking
Topologies, Media, Medium Access Control
MAC Layer, IEEE 802.3, 802.5 Standards
Passive Components.
LAN Protocols and Performance
Token Ring vs. Ethernet FE, GE
HUB, Switches & Bridges,
STP, Router, Transport Protocols,OSI TCP, Credit Allocation, IP 4/6
TCP/IP and IP Addressing, Host to Host Flow Control, IEEE

**IT- 310: Technical and Business Communication**

Planning and Research: standards, research ethics & methodologies, copyright and plagiarism etc.
Writing : Technical documents and correspondence business documents and correspondence (clarity conciseness, organization)
Design and illustration, editing, Production, the internet based communication, websites, interpersona skills, interviewing, presentations.

**T: 311 Multimedia & Applications**

Overview of Multimedia, Standards, Graphical Image File formats, Vedeo Technology, Sto Media, Data Compression, MM Standards, Multimedia Document and Interchange forr synchronization, Multimedia Networking, Multimedia Databases, Multimedia Authoring T· Multimedia Information System, Quality of Service

**IT 312 : Software Engineering**

Introduction to object oriented modeling and design methods.
Modeling the applications using object oriented methods by Booch, Rambagh and Ur Modeling language(UML).

Software Quality assurance, Software quality metrics, software configuration management, Detailed Capability Maturity Model, Advance topics in requirements engineering. Different views of modeling with case studies, Software reuse and reengineering
Introduction to meta-modeling and its use.
Introduction to CASE tools and CASE shells, CASE Tool architectures
Latest topics in software engineering

**IT:313 Information Theory & Coding Techniques**

Source: Memory-less and Menkov. Information Entropy, Extended sources, Shanon's noiseless coding theorem. Source Coding. Mutual Information, Channel Capacity. BSC and other channels. Sharon's Channel capacity theorem. Coninous channels: Basis of detection theory. Comparison of Communication System based on Information Theory. Channel Coding: Block and convolutional block codes. Majority Logic decoding, Viterfi decoding algorithm, coding gains and performance.

**IT: 314 See ELECTIVE-I**

**IT: 315 Microwave & Satellite Communication**

Maxwell's equations
Reciprocity, uniquencess, equivalence, image and quality principles. TEM modes in a linear homogeneous isotropic medium, polarization, poynting vector and power flow. TEM waves incident on a boundary snell's laws, wave progapgation inside conductor, skin depth weakly depressive TEM modes, phase and group velocity.
Field analysis of of guided TEM modes (ransmission lines)
Characteristic impedance, voltage and current relationship impedance discontinuities and standing waves, impedance matching, smith chart, pulse propagation in transmission lines and lossy lines.
Field analysis of guided non TEM modes (rectangular and cylindrical waveguides) quantization of modes by boundary conditions. Mode cut off frequencies, dispersion relations, field patterns, power flow, orthogonality of modes, excitation of waveguides modes by coazial caoble, non-TEM modes in coaxial cables.
Electromagnnetic Radiation.
Inhomogeneous wave equation, solution by potential. retarded potentials. Radiation from small and long dipole. antenna parameters arrays: end fire and roadside study of horn, lens and micristripantenna.
Evolution and growth of Communication satellites, Kepler's law of motion, orbits, altitude control, satellite launch vehicle. Spectrum allocation and Bandwidth considerations, propagation characteristics. Satellite transponder. Analog and Digital link design. Multipurpose access technique. FDMA, TDMA, Interference in FDMA systems.

**IT 401 : Internet & Web Engineering**

Introduction to LAN, MAN & WAN

**IT 412: Financial & Cost Management**

Introduction, Objectives, Goals functions of financial Control, Risk and Return : Nature of risk, Inter-relationship in risk and return, effect of Tax on return, Capital market operation: Forms of Business Organizations, capital structure construction analysis and interpretation of standard financial statements, Working Capital : On line banking and working Capital Management, Financial Planning : Planning of profit and leverages (operating and financial),Capital Budgeting : Time value of money, cost of capital investment decisions and project appraisal,

Cost Accounting : Definition and scope of cost accountancy and costing methods, elements of cost, identification, recording and ascertainment of direct material and labour, costs overhead classification distribution and absorption, process costing, Uniform, Marginal and standard costing methods, Case studies.

Cost Management: Activity base costing, value chain analysis, Productivity measurement, cost vol. Profit analysis

**IT 414 (See Elective III)**

## Elective -I

### Theory of Computation

Intrdouction. BNF, Language, Grammars and automata, DFAs and their Implemnentation, NDFAs and their Implementation.
Regular Expressions Regular grammars dosure, Homomorphism, pigeonhole principle, pumping lemma.
Thurning Machines, Universal Turning Machines and LBAs.

### Optimization Techniques

Linear Programming: Problem formulation, Simplex & Revised Simplex Methods, Durability and Sensitivity, Case Studies Interior Point Method.
Nonlinear Programming: Problem formulation, Basic concepts from calculation of several variables. Least square optimization. Kuhn Tucker Theory.

### Numerical Methods and scientific computing

Numerical solutions of differential equations: Euler and Renge Kutter Methods, Multistep Methods, Predictor – Corrector Methods, Order of Convegance.

Finite differences, Difference Representation of Ordinary and Partial different equations, Introduction to the use of Irregular Meshes. Stability Considerations.

Boundary Methods for ODE's, Solution Methods for Porabolic, Hyperbolic and Eflitic Equations with Examples of the practical problems.

### Modern Algebra

Sets, Group, Subgroup, Honomorphism, Automorphism, Ring, Integral Field.
Introduction to Lie-groups, Infinitisemal, Transformations.

### Differential Equations and Boundary Value Theorem

Existence and Uniqueners Theory for ODE's Eigen-value problems, strum-Lioville Equations, Green's function technique. Initial and Bondary value problems.

Wave Equations: D'Alembert's solution, Green's function for wave equation, vibration of circular membrane.

Heat Equations : Variable Separable Method, Maximum principle, Green's function for Heat equation.

Potential Equation

Harmonic function, Laplace equation and its Application, Methods of Solutions.

**Control Engineering**

Mathematical Model: Transfer function concept, derivation of transfer function of physical systems, concept of feedback and its effect on the performance of a system, block diagram reduction, signal flow graphs.
Transient Response Analysis: Stanard inputs, response of first and second order systems, derivative and integral action, static and dynamic order coefficients.
Root Locus Techniques: root locus plot, general rules for constructing root loci, root locus analysis of control systems.
Frequency Response Methods: Logarithmic plots, experimental determination of transfer function, Polar plot, log magnitude versus phase plot, MN loci, Nichol's chart.
Stability: Concept of stability, Routh-Hurtwitz stability criterion, Nyquist stability criterion, relative stability analysis.
Control Components: synchro, D.C. Motor, Tachorgenerators, gyroscope, amplifiers, Stepper motor.

**Quantitative Techniques**

Introduction to OR. Historical development and nature of OR projects. Phases of OR study. Model building and various types of OR problems.
Linear deterministic optimization models Linear programming formulation. Duality in L.P. theory of convex sets. Simplex algorithm. Various complications in L.P. and their solution. Degeneracy. Assignment Transportation and trans-shipment models. Industrial Application of L.P. Post-optimality analysis in L.P. Nonlinear programming Quadratic, separable-convex programming integer L.P., mixed Integer L.P., Chance constrained programming. Case studies in L.P., Goal programming. Waiting line models, Single and multiple channel models. Priority queues. Application of waiting line theory to industrial and service sectors replacement and maintenance models zero-defect programs, quality control circles.

**Simulation & Modeling**

**Definition of system**

Simulation of queing system
Verification and validation
Simulation Languages
Applications

Introduction to CAME tools, CAME tool design techniques, CASE shell design techniques, familiarity with a CASE shell e.g. MetaEdit
Classification of Process models, Different Kinds of process models in detail.
Process Meta – models : NATURE etc.
Process Reengineering Techniques, Reuse and Reverse Engineering
Process Centered Environments, Process Guidance

Software Architectures, Latest trends in Software Engineering.

**Faults Tolerant Digital Systems**

Stuck at faults, bridging faults and stuck open faults and hazards, Byzantine faults.

Faults in digital circuits and test generation approach: Algebraic approaches like Boolean difference and SPOOF etc. CAD approaches like path sensitization, D-Algoritm, PODEM, FAN algorithm
Easily testable combinational circuit design techniques, Functional and Random testing concept,.
Concepts of Fault simulation: deductive concurrent and STAFAN method and simulation engines.
Error control codes, unidirectional error-detecting codes (Berger Codes, m-out-of-n codes), arithmetic codes, 2-rail codes, residue codes, parity codes.
Concepts of self-checking mechanism, The Totally-self-checking and Strongly self-checking circuits, the code-disjoint property, implementation of self checking circuits using different error-detecting/correcting codes

State Identification of sequential machines, machine identification and fault detection experiment. Augmented sequential machine design and easily testable/diagnosable sequential machine
Concept of controllability and observability, LSSD and BIDCO/BILBO signature analysis and transition counting etc
fault-tolerant computer architectures and fault tolerant multiprocessor system.
Concepts of Fault detection in memories and microprocessors and Introduction to self-checking circuits and fail-safe circuits, System Fault Tolerance

**Real Time and Embedded Systems**

Real Time systems introduction
Performance measures, estimation of timing parameters
Task assignment and scheduling: uni-processor scheduling techniques based on the imprecise computation model, adaptive scheduling techniques, task assignment, fault-tolerant scheduling
Programming languages and tools for Real Time systems: Language characteristic, package. Error handling techniques, Multitasking, Case-study of a real time programming language,

## Elective -II

### IT in Marketing Management

Module I : Introduction to Marketing function; genesis, the marketing concept. Marketing Management System: objectives, its interfaces with other functions in the organization. Environment of Marketing-Economic Environment, Market : market segmentation. Consumer-buyer behavior models. Socio-cultural environment. Legal Environment. Ethical issues in marketing.

Module II : Marketing Strategy-Marketing planning and Marketing programming. The concept of marketing mix, Product policy; the concept of product life cycle. New product decisions. Te marketing-pricing Management of distribution: channels of distribution. Advertising and production. The concept of Unique Selling Proposition.

Module III : Implementation and Control. The marketing organization – alternative organizatio structures; the concept of product management. Administration of the marketing programme: sales forecasting; marketing and sales budgeting; sales management; management of sales force Delphi methods, other simulation methods, Evaluation of marketing performance; sales analysis; control of marketing effort; marketing audit.

Module IV : Case Studies

### Advances in Database Management Systems

Introduction to Object oriented databases: Representation of Objects, Concurrency and Recove in O-O data bases, Integrity persistence, Constraints, DML and Query Languages for O-O databases

Introduction to Data mining and data ware housing.

Knowledge discovery tasks, Introduction to Knowledge Discovery paradigms like R Induction, Neural Networks, genetic algorithms etc.

Introduction to ERP, Vendors of ERP, BPS, Different components of ERP, Technolog client/server architecture, EDI introduction, EDI components, distributing process, workfl security, supply chain management & ERP, legal issues, case studies.

Overview of Knowledge discovery process, Decision-Tree Building, Overfitting, Data mir architectures.

Data-ware house concepts, Data Warehousing planning and strategy, Warehous architectures

Data-ware house implementation, schema design.

Introduction to Distributed Databases, Distributed DBMS Architectures, Distributed qu processing, Updating Distributed Data, Distributed Transactions and Concurrency Control.

### Advanced Topics in Software Engineering

Formal representation of methods, Meta data and activity models, Decision oriented meta mod

compiler, linker debugger, Real time databases: Concepts, transaction priorities. concurrency control, mechanisms, serialization consistency, databases for hard real time systems.
Real Time Communication: Communication media, network topologies, protocols.
Fault-Tolerant Techniques: Fault types Detection and Correction techniques in software and hardware
Real Time Operating System: Case Study
Topics related to State-of-the art development.

Embedded systems introduction
Qualitative requirements, formal description methods
Compiler techniques for embedded systems
Hardware-software co-design methodology
Co-synthesis Techniques and approaches.
Co-verification, Co-simulation and testing
Implementation strategies for hardware and software
CAN bus and its CORBA extensions
Techniques for reduction of power consumption in embedded systems
Embedded Internet application development
Topics on state-of-art development.

**Digital Signal Processing**

Revision Z Transform and Inverse Z-Tansform
Wavelet transforms
Stability analysis
Introduction to DSP
Analog filters
Digital filters
Discrte fourier tansform, FFT
Concepts of Digital Signal Processing
Wavelet Transforms, Karhunen-Loeve transform, Number theoretic transform, Mellin and Radon transforms, Applications to image processing.

**Total Quality Management**

Introduction quality. Quality planning and control. Economics of quality control. Specifications tolerances and process capability studies, Total quality control. Quality assurance, Quality system. Concepts in quality circles. Use of decision trees, OR models and simulation in process control. Quality incentives. TQM.
Process control. Statistical control charts for variables, Control charts for attributes. Othe variations of control charts. Demerits of quality rating plan. Multi characteristics control charts.
Sampling inspection single, double and sequential sampling plans. Design of sampling plans fo attributes and variables. Economics of sampling plan.
Product quality and reliability. Failure data analysis and life testing. Redundancy in design. Cas studies.
Motivation for quality assurance, Zero defect programs, Quality control Circles, ISO Systems, CMM Systems.

technology, Characteristic and modulation, Photo detectors, Principles technology, parameters. Characteristic and noise considerations. Receiver amplifiers, fibre-optic component and cables.

**Robotics**

Basic concepts of mechanism, Kinematics of manipulators, rotation translation and transformation, D-H representation, Direct and inverse Kinematics, Differential translation, rotation and transformation, Jacobian, Robotics motion trajectory design, Modeling using bond -graphs, Newton Euler equations and lagrange-Euler equations and Lagrange-Euler equation. Example, Motion control –open and closed loop; control of industrial robots, Force control, Sensor and vision systems, Real-time control and networking of robots.

Basic components of a robot system – The manipulator sensory devices, controller, power conversion unit computer consideration for robotic systems. Architectural consideration, H/W consideration, Robot Programming.

## Elective -III

### Expert System

Introduction to Expert System

Features, organization, difference from conventional programs, uses of expert system introduction to MYCIN, PROSPECTOR & AM

Expert System Tools

Knowledge representation- logic, frames, scripts, semantic nets, production rules, Inferen mechanism, development of expert system tools.

Building expert systems; tasks, selection of a tool, knowledge acquisition, difficulties in expe system development.

LISP and PROLOG Programming

Knowledge Engineering languages OPS5, EXPERT, EMYCIN, Object Oriented System.

### Advanced Microprocessor Architectures

Study of latest processors – 80486, Pentium, Pentium Pro. MMX Processors

RISC Processors, Bit Slice processors, Ultra Sparc processors, Digital Signal processors, Graphics Accelerators. Current trends

### Software Quality and Testing

Basis of measurement, Goal based framework for software measurement, Empiri Investigation, Software metrics data collection,

MCCall's quality model , Software metrics measurement, Software reliability

Introduction to Metrics Tools

Notion of Heuristics, Introduction to Computer Aided Quality Engineering (CAQE)

Introduction to ISO 9001 guidelines.

Discussion of different Software Testing Strategies in detail.

Latest Topics related to Software Quality and Testing

**Software Fault Toierance**

Types and Classification of software faults, operating system faults
Fault-tolerance concepts, Recovery in time and space, Fault detection techniques,
Performability measures, Modeling of Fault-tolerant systems, Byzantine failures
Time redundancy, Rollback mechanisms and check-pointing.
Modular Redundancy: N-Version & Modular redundancy, SIFT, Replicas, etc. Dynamics of replicas and alternatives.
Design diversity, data diversity
N-Block recovery, Certification trails, audit trails, time stamping
Fault tolerance in operating systems,
Handling Exceptions: Interrupts and Traps, Reaction to exceptions, exception handling models.
Consistency: Concurrency control, Atomicity and Transactions, Partitioning and Broadcasting solutions.
Safe Systems: Safety measures and safety aspects in Resiliency
Fault-Tolerant allocation: Definitions and formulation of problem, allocation algorithms.
Allocation in real-time systems, protocols for real-time communication, fault-tolerant time services, error handlers.
Case study of a fault tolerant system

**VLSI Technology**

Hardware Description Languages; Verifying behavior prior to system construction simulation and logic verification; Logic synthesis PLA based synthesis and Multilevel Logic synthesis; Logic Optimization; Logic simulation compiled and Event simulators. Relative advantages and disadvantages, Layout Algorithms Circuit Partitioning, Placement and Routing Algorithms, Circuit Extraction and Post-Layout Simulation; Automatic Test Program Generation: Combinational Testing D Algorithm and PDEM Algorithm; Scan based Testing of Sequential Circuits; Testability measures for circuits.

**Image Processing**

Introduction, Mathematical Preliminaries, Image Digitization, Visual perception, Representation of Data in Transform Domain, Data Compression, Image Enhancement with Histrogram Techniques and Frequency Domain techniques, Image restoration, Image segmentation and Feature detection, Morphological Processing and Image Analysis

**Intellectual Property Rights**

Module I: Definition, Applicability, Nature of Intellectual Property: Patents, Trademarks and copyright, Process of Patenting and Development: technological research, Innovation, patenting, development, International cooperation on Intellectual Properly, Procedure for grants of patents, Indian Patent Act and Article 27 of Trips of WTO

Module II: Scope of Patent Rights, government rules for licensing and transfer of technology within country, government rules for Licensing and transfer of technology from other country, Patent information and documentation. Legal framework. infringement actions and remedies.
Module III: Administration of Patent System, New development in IPR, IPR of Biological Systems, Computer Software, Machinery etc. Case Studies.

**Computer Vision**

Engineering Approach to pattern recognition. Relation ship of PR to other areas. Pattern Recognition application.
Pattern Recognition, Classification & Description
Abstract representation of pattern mappings. Structure of typical PR system.
Pattern & Feature Extraction
Patterns & Features, Pattern distortions, feature-extraction using generalized cylinders for 3-D object description and classification. Classifiers. Decision regions and boundaries and Discriminant function, Training & learning in PR System:
Using a prior knowledge or 'experience' learning curves, Training Approaches.
Pattern Recognition Approach: The syntactic, Neural & statistical pattern recognition approach, comparison of syntactic, neural & statistical pattern recognition approach. Black – box approach & reasoning driven pattern recognition.

**Artificial Intelligence**

Introduction
History, What is AI, Issues
Problem Solving
Problem space, State space, Heuristic search
Search Methods
Hill climbing, Depth first, Breadth first, Best first, back tracking, means end analysis, mini-max, Alpha-Beta.
Planning
Decomposition of problem, handling interactions among the subparts during problem solving process
Strips, Abstrips (Robot problem solving systems)
Knowledge Representation
Logic and resolution, implementation of semantic nets, frames, procedural and declarative knowledge etc.
Natural Languages Processing
Knowledge exploitation (Communication, language)
Semantic grammars, syntactic processing
Production System
Techniques, rules
Production rules
Learning and adaptation, Learning concepts and laws from examples

**Pattern Recognition**

Introduction: Introduction to statistical, synthetic and descriptive approaches, features and feature extraction, learning.
**Bayee Decision Theory**: Introduction Bayes Decision Theory – the continous case, Two-category classification, minimum-error rate classification, classifiers, Discriminent functions and Decision surfaces, Error probabilities and integrals, the normal density, Discriminant functions for the normal density.

**Parameter Estimation and supervised Learning**: Maximum likelihood Estimation, the Bayes classifier, learning the mean of a normal density, General Bayeslan learning.
**Nonparametric Techniques**: Introduction, density Estimation, Parzen windows, K-nearest Neighbour Estimation, Estimation of posteriori probabilities, the nearest-neighbour rule, the K-nearest-neighbour rule.

**Linear Discriminant functions;** Introduction, Linear Discriminant functions and decision surfaces, Generalised Linear Discriminant functions, the two-category Linearly-separable case. Non-separable behaviour, Linear programming procedures.

**Unsupervised Learning and Clustering**: Introduction, mixture densities and identifiability, maximum likelihood estimates, Application to normal mixtures, Unsupervised Bayesian Learning, Data Description and clustering, similarity measures, criterion functions for clustering.

**Synthetic Approach**: Introduction to pattern grammars and languages, Higher dimensional grammars-tree, graph, web, plex and shape grammars. Stochastic grammars, attributes grammars. Parsing techniques, Grammatical inference.

**Soft Computing & Neural Network**
Neural Machine Intelligence, neural system as function estimators. Intelligent behaviors as adaptive model force estimation.
Neural Dynamics: Activation & signals Signal Monotonicity, biological activations and signals, Neuronal dynamical systems. Common signal function, pulse coded signal functions.
Unsupervised & Supervised Learning:
Learning as encoding, change and quantization. Brownian motion and white noise. Probability spaces & random processes. Signal & differential Hebbian learning differential competetive learning. The back propagation algorithm.
Architecture & equilibria
Global equilibria , synaptic convergence to controides : Algorithms, global stability of Feedback Neural Networks.

**Optical Communication**
Principles of Light –wave Propagation through fibers. Materials and type of fibers. attenuation, Dispersion and pulse spreading, short and long wavelengths, Light sources: principles,