

## BE (Computer Science)

### BE (CS) - I SEMESTER

THEORY			SESSIONAL		
CODE	TITLE	UNIT	CODE	TITLE	UNIT
HU 1101	Technical English	1.0	ME 1102	Engineering Graphics	1.0
PH 1101	Physics- I	1.0	CP 1202	Unix & C Programming	1.0
CH 1201	Engineering Chemistry	1.0	PH 1102/	Physics Lab./	
MA 1101	Mathematics- I	1.0	CH 1202	Chemistry Lab.	0.5
ME 1101	Engineering Mechanics	1.0	PE 1102	Work Shop Practice- I	0.5
			GA 1002	NCC/ NSS/ PT & Games/ Creative Arts	0.5

### BE (CS) - II SEMESTER

MA 2101	Mathematics- II	1.0	ME 2102	Computer Aided Drafting	1.0
EE 2101	Basic Electrical Engineering	1.0	CH 1202/	Chemistry Lab./	
CP 2101	Data Structure in C++	1.0	PH 1102	Physics Lab.	0.5
CH 2103	Environmental Science	1.0	ME 2104/	Engineering Mechanics Lab./	
PH 2103	Physics- II	1.0	EE 3102	Basic Electrical Engineering Lab.	0.5
			CP 2102	Data Structure Lab.	0.5
			PE 2102	Workshop Practice- II	0.5
			GA 2002	NCC/ NSS/ PT & Games/ Creative Arts	0.5

### BE (CS) - III SEMESTER

EC 3101	Basic Electronics	1.0	EC 3102	Basic Electronics Lab.	0.5
MA 3101	Mathematics- III	1.0	EE 3102/	Basic Electrical Engineering Lab./	
EE 3101	Introduction to System Theory	1.0	ME 2104	Engineering Mechanics Lab.	0.5
CP 3101	Java Programming & Web Technology	1.0	CP 3102	Java Programming Lab.	0.5
CP 3103	Digital Logic Design	1.0	CP 3104	Digital Logic Design Lab.	0.5
ME 3207	Principle of Mechanical Engineering	1.0	GA 3002	NCC/ NSS/ PT & Games/ Creative Arts	0.5

### BE (CS) - IV SEMESTER

CP 4101	Discrete Mathematical Structures	1.0	CP 4104	Scientific Computing Lab.	0.5
CP 4103	Scientific Computing	1.0	CP 4106	Database Management System Lab.	0.5
CP 4105	Database Management Systems	1.0	CP 4108	Operating Systems Lab.	0.5
CP 4107	Operating Systems	1.0	EC 4106	Integrated Circuits Lab.	0.5
CP 4109	Computer System Architecture	1.0			
EC 4105	Discrete and Integrated Analog Circuits	1.0			

### BE (CS) - V SEMESTER

CP 5101	Formal Languages and Automata Theory	1.0	CP5106	Soft Computing Lab.	0.5
CP 5103	Fundamentals of Data Communications	1.0	CP5108	Linux Programming Lab.	0.5
CP 5105	Soft Computing	1.0	EC5102	Microprocessor Application Lab.	0.5
EC 4107	Semiconductor Devices	1.0	EE5108	Digital Signal Processing Lab.	0.5
EC 5101	Microprocessor & Interfacing	1.0			
EE 5107	Digital Signal Processing	1.0			

### **BE (CS) - VI SEMESTER**

CP 6101	Design and Analysis of Computer Algorithms	1.0	CP 6106	Compiler Design Lab.	0.5
CP 6103	System Programming	1.0	CP 6108	Computer Networking Lab.	0.5
CP 6105	Compiler Design	1.0	CP 6110	Software Engineering Lab.	0.5
CP 6107	Computer Networks	1.0	EC 6112	VLSI Design Lab.	0.5
CP 6109	Software Engineering	1.0			
EC 6111	VLSI Design	1.0			

### **BE (CS) - VII SEMESTER**

CP 7101	Principles of Programming Languages	1.0	CP 7104	Computer Graphics Lab.	0.5
CP 7103	Computer Graphics	1.0	CP 7106	Parallel Computing Lab.	0.5
CP 7105	Parallel Computing	1.0	CP 7108	Digital Image Processing Lab.	0.5
CP 7107	Digital Image Processing	1.0	CP 7112	Project	0.5
	Elective – I	1.0			
	Elective – II	1.0			

#### **List of Elective**

CP 7111	Genetic Algorithms
CP 7113	Principles of Communication Systems
CP 7115	Neural Networks & Applications
CP 7117	Optimization Techniques
CP 7119	Advance Computer Architecture
CP 7121	Cryptography & Network Security
CP 7123	Bio- informatics
CP 7125	Object Oriented Analysis & Design
CP 7127	Software Project Management
EC 7113	Mobile & Cellular Communication

### **BE (CS) - VIII SEMESTER**

CP 8101	Artificial Intelligence & Expert Systems	1.0	CP 8104	Simulation & Modeling Lab.	0.5
CP 8103	Simulation & Modeling	1.0	CP 8110	Artificial Intelligence Lab.	0.5
CP 8105	Distributed Systems	1.0	CP 8112	Project	1.0
MB6001	Principles of Management	1.0			
	Elective – III	1.0			
	Elective – IV	1.0			

#### **List of Electives**

CP 8111	Natural Language Processing
CP 8113	Computational Geometry
CP 8115	Embedded System Design
CP 8117	Multimedia Computing & Communications
CP 8119	Advanced Computer Graphics
CP 8121	Pattern Recognition
CP 8123	Real Time Systems
CP 8125	Computer Vision
CP 8127	Computing & Complexity Theory
IT 8101	Data Mining & Warehousing

## FIRST SEMESTER

HU 1101

TECHNICAL ENGLISH

1.0

### MODULE – I

Single word substitution, Idioms and phrases, Pairs of words, Common errors, Précis, Comprehension, Expansion.

### MODULE – II

Official Correspondence - Memorandum, Notice, Agenda, Minutes, Circular letter, applying for a job, Resume, Demo-official letter.

### MODULE – III

Business Correspondence-Types, sales letters; Social Correspondence- Invitation to speak, Congratulations; etc.

### MODULE – IV

Report writing; general and technical report, Definition, Types, structure.

### MODULE – V

Technical proposals, Definitions, types and format.

### MODULE – VI

Research papers and articles.

### MODULE – VII

Mechanics of manuscript preparation.

### BOOKS FOR REFERENCE:

1. Blickle, Margaret D., and K.W.Houp.
2. Reports for Science and Industry, Henry Holt & Co. N.Y.
3. Duddy, E.A. & M.J. Freeman Written Communication in Business, Amercian book Co. N.Y.
4. Berry, Thomas Elliot, The most Common Mistakes in English Usage; Tata McGraw Hill.
5. Stevensin, B.W., J.R. Spicer and E.C. Ames, English in Business and Engineering. Prentice Hall, Eaglewood
6. Cliffs, N.J.
7. Raul, Asha, Effective Business Communication, Prentice Hall of India.
8. Singh B. Business Correspondence including Bank letters.
9. Singh B. Theory and Practice of Business Correspondence, HPJ Kapoor Publications.
10. Report Writing and Business Correspondence Mohan and Sharma, Tata McGraw Hill Publications, India.
11. Best, W.D. The Students companion, Rupa & Co. Publications.

**MODULE – I**

Waves and Oscillations: ( SS\* : Wave motion: longitudinal and transverse waves, plane waves, phase velocity). Wave packets and group velocity, wave equation, superposition of waves (RHK-Ch-18), equation of motion of simple harmonic oscillator and solutions, damped harmonic motion and forced oscillations(RHK 17.2-17.4,17.7,17.8)

[6]

**MODULE – II**

**Fields:** Vector and scalar fields, physical and mathematical concepts of gradient, divergence and curl (Cartesian coordinates only), Gauss's theorem and Stokes' theorem (Statements only, SAD-Ch.3).

[5]

**MODULE – III**

**Electromagnetic Theory:** Gauss's law in integral and differential form, electric potential and relation with E(SAD 4.5-4.8),( SS\*- capacitance(SAD-6.5) and electrostatic energy density (SAD 4.10)), dielectrics, three electric vectors, dielectric susceptibility boundary conditions on E and D(SAD 5.5-5.7, 5.9).

[5]

Ampere's law in integral and differential form, applications.( SAD 7.1-7.4), Hall effect (RHK-32.4), three magnetic vectors (SAD 7.5), magnetic permeability and susceptibility, boundary conditions on B and H ( SAD 8.5-8.7).

[5]

Faraday's law in integral and differential form( SAD 9.2-9.3), ( SS - Inductance, magnetic energy density (SAD 8.8, 8.9)), continuity equation for charge (SAD 5.8), displacement current ( SAD 9.4), Maxwell's equations in free space (SAD 9.5), electromagnetic wave equation for plane waves in dielectric medium and free space, relation between  $\vec{E}$ ,  $\vec{B}$  and  $\vec{k}$ , Poynting vector (SAD 10.3-10.7).

[5]

**MODULE – IV**

**Plasma Physics:** Plasma state, types of plasma, applications of plasma(FFC-Ch-1,2)

[4]

**MODULE – V****Physical Optics:**

**Interference:** Two-Beam Interference( AG 12.1-12.6), interference in thin films and wedge-shaped layers(AG 13.8-13.9), reflection and anti-reflection coatings( AG 13.2-13.4), applications of interferometry: Newton's rings(AG 13.10), Michelson' Interferometer (AG 13.11)

[5]

**Diffraction:** Fraunhofer diffraction by single slit( AG 16.1-16.3) , double slit and grating ( AG 16.6-16.8), limit of resolution, Rayleigh criterion(AG 16.5), Fresnel diffraction(Qualitative, AG 17.1-17.3)

[5]

**Polarization :** ( SS- Polarization of light, Malus's law, polarization by reflection, Brewster's law, Double refraction) Analysis of linearly and circularly polarized light( RHK 44.1-44.5), Fresnel's equations and their applications (AG 21.1-21.2)

[5]

**Text Books:**

1. Mathew N.O. Sadiku ( SAD), Elements of Electromagnetics, Oxford University Press
2. (2001)
3. A.Ghatak(AG), Optics, 3rd Edition, Tata McGraw Hill, 2005
4. Resnick, Halliday and Krane(RHK), Physics- Part-I & II, 5th Edition, John Wiley (
5. 2002)
6. F.F.Chen(FFC), Introduction to Plasma Physics, 2nd Edition, Plenum Press, 1994

**References:**

1. W.H.Hayt and J.A.Buck, Engineering Electromagnetics, Tata McGraw Hill ( 2006)
2. M.R.Srinivasan, Physics for Engineers, New Age International, 1996
3. S.N.Sen, Introduction to Plasma Physics, Pragati Prakasan, Meerut -1, India

**MODULE – I**

Chemical Bonding: Trends in periodic properties (ionization energy, electron affinity, electro negativity), VBT, VSEPR theory, MOT for diatomic molecules and polyatomic molecules, coordination complexes & ligands, CFT, colour and magnetism of coordination complexes, spectrochemical series

**MODULE –II**

Kinetics and catalysis: kinetics of chain reactions, parallel reactions, side reactions, fast reactions in solutions, flash photolysis, kinetics of catalytic action (acid base catalysis, biological catalysis), application of catalyst in industrially important processes (Haber's processes, Ostwald process, Bergius process)

**MODULE – III**

Thermo-chemistry and Fuels: Hess's law, entropy, enthalpy and combustion calculations, characterization and application of fossil fuels, solid fuel (carbonization & gassification), liquid fuels (refining, reforming, petrol & diesel, knocking characteristics, octane and cetane number) and gaseous fuels (water gas, producer gas, coal gas and biogas), lubricants and its properties

**MODULE –IV**

Electrochemistry and corrosion sciences: Redox process cell, potential and free energy, galvanic cells, electrolysis and Nernst's equation, Fuel cells, and its applications, chemical and electrochemical corrosion, general methods of corrosion prevention (with brief introduction to chemistry of paints, varnishes and enamel)

**MODULE –V**

Fundamentals of spectroscopic techniques: Basic principles of vibrational, rotational and Mossbauer spectroscopy

**MODULE – VI & VII**

Macromolecules: Classification, Addition and Condensation polymers, molecular weight of polymers ( $M_n$ ,  $M_w$ ,  $M_v$ ), glass transition temperature ( $T_g$ ), structure property relationship in polymers (chemical, electrical, optical and mechanical), examples and use of inorganic polymers, synthesis of some commercially important polymers and their use (Nylon 6, Nylon 6, 6, PE, PET, PS)

**MODULE – VI & VII**

An introduction to computational chemistry

**Text Book:**

1. Applied chemistry A text book for engineers and technologists, H. D. Gesser, Plenum publishers.
2. Inorganic chemistry: J. D. Lee.
3. Engineering chemistry: Sashi Chawla

**Reference:**

1. Fundamentals of molecular spectroscopy: C. N. Banwell, TMH publication
2. Computational chemistry: E. Lewars, Kluwer publication
3. Physical chemistry: P. W. Atkins

**Analytical Trigonometry:**

De-Moivre's Theorem and its applications. Expansion of  $\sin x$  and  $\cos x$  in powers of  $x$ . Complex arguments. Separation into real and imaginary parts Gregory's Result. Expansions. Summation of trigonometric Series. Hyperbolic functions.

(8L)

**Differential Calculus:**

Successive Differentiation. Leibnitz's Theorem. Rolle's Theorem. Lagrange's and Cauchy's Mean value Theorem. Generalised Mean value Theorem. Taylor's and Maclaurin's infinite series. Cartesian and polar subtangent and Subnormal. Pedal equations. Orthogonal intersection of curves. Curvature and radius of Curvature in case of Cartesian parametric, polar, pedal and tangential polar forms. Centre of curvature and evolute. Indeterminate forms L Hospital's Rule. Concavity, convexity and points of inflexion. Asymptotes (cartesian Co-ordinates only).

Functions of two variables. Partial derivatives. Euler's Theorem on Homogeneous functions. Its generalisation and extension. Total differential and derivatives. Errors and Approximations. Taylor's series in case of two variables. Maxima and Minima of two variables. Lagrange's method of Underdetermined multipliers in case of two and three variables. Jacobians. Envelope of curves. Tangent planes and Normal lines.

(22L)

**Integral Calculus:**

Reduction Formula. Beta and gamma functions. Area, length, volume and surface area without the use of multiple integrals.

(9L)

**Infinite series:**

Convergency and Divergency of infinite series. Tests for Convergence. Comparison Test, p series test, Cauchy's root test. D' Alembert's ratio test, Raabe's Test, Gauss's Test, Logarithmic and Higher logarithmic ratio test (No proof). Leibnitz's Rule for alternating series test.

(6L)

**Books Recommended:**

1. Higher Trigonometry. Das and Mukherjee (U.N. Dhur & Co.)
2. Differential Calculus. Pran Nath and Agarwal. Tara Publications, Varanasi
3. Integral Calculus. Das and Mukherjee (U.N. Dhur & Co.)
4. Engineering Mathematics. H.K. Dass
5. Higher Engineering Mathematics B.S. Grewal (Khanna Publishers)

**Equivalent Force System and Equilibrium:** Principles of statics, laws of mechanics, freebody diagram, coplanar, non-coplanar and spatial force system and conditions of equilibrium, vector representation and analysis of forces and moments, Varignon's theorem.

**Structural Mechanics:** Analysis of simple plane truss by method of sections and methods of joints, analysis of frames and parabolic cables, cantilever and simply supported beams with concentrated, distributed and moment loads, shear force and bending moment diagrams, concept of stress and strain.

**Interfacial Friction:** Friction and impending motion, static, kinetic and rolling friction, application to inclined planes, wedges, screws jacks and belts.

**Kinematics and Kinetics of Particle and Rigid Bodies:** Conceptual framework and vector representation of displacement, velocity, acceleration, linear and angular momentum, rectilinear and curvilinear motion in two dimensions, centroidal and non-centroidal rotation, general plane motion, Newton's laws of motion, D'Alembert's principle, equilibrium of dynamic forces.

**Work and Energy:** Translation and rotation of rigid body about a fixed axis, conservation of energy, energy and work equations in translation and rotational motion, virtual work.

**Impulse and Momentum:** Impulse force and momentum, conservation of momentum, coefficient of restitution, momentum equation. Vibrating Systems: Inertia, features of a vibrating system, free vibration, systems with single degree of freedom.

**Books Recommended:**

1. Kumar, Engineering Mechanics
2. Shames, Engineering Mechanics



## SECOND SEMESTER SEMESTER

MA 2101

MATHEMATICS- II

1.0

### **Integral Calculus:**

Operations under the sign of integration, Multiple integrals, change of order of integration, Transformation of Co-ordinates, Area, Volume and Surface area of solids using multiple integrals.

(8L)

### **Ordinary Differential Equations:**

Linear differential equations: Bernoulli's from Exact equations, Nonlinear equations, Clairaut's form, Higher order equations with constant coefficients. Cauchy's and Legendre's differential equations. Solution of higher order equation by the change of independent variable, Method of variation of Parameters in Simple cases, Applications to Engineering problems.

Series solution of Differential equations by the method of Frobenius. (Roots differing by non integer and equal roots).

(14L)

### **Algebra of Matrices:**

Rank of a matrix. Consistency and inconsistency of a system of linear equations. Eigen values and eigen vectors. Cayley Hamilton Theorem.

(3L)

### **Vector spaces:**

Definition, examples and some simple properties. Subspaces, linear combination, linear dependence and independence, Basis and dimension. Norm of a vector, Inner Product. Cauchy-schwartz inequality, orthogonal sets. Gram-schmidt process of construction of orthogonal sets. Parallelogram law and Pythagorean theorem.

(8L)

### **Vector Calculus and Tensor Analysis:**

Differentiation of vectors, Radial and transverse, tangential and normal acceleration of a particle moving on a plane curve. Directional derivatives, Gradient, Divergence and Curl. Expansion Identities. Vector integration. Conservative system of forces. Solenoidal and Irrotational vectors. Theorems of Green, Stoke and Gauss and their applications, Tensors, transformation of Co-ordinates, contravariant and covariant vectors and Tensors. Rank of a tensor. Addition and multiplication of tensors. Mixed tensors Contraction.

(10L)

### **Books Recommended:**

1. Advanced Engineering Mathematics by E. Kreyszig
2. Advanced Mathematics for Engineers By Chandrika Prasad (Prasad Mudranalaya)
3. Advanced Engineering Mathematics By H.K. Das.

**MODULE – I**

**Introduction:** Importance of Electrical Engineering in day-to-day life. Electrical elements and their classification. KCL and KVL equations. Loop current and Node voltage method. D.C. Circuits: Steady state analysis with independent and dependent sources; Series and Parallel circuits; Star-Delta conversion. D.C. Circuit Theorems: Superposition theorem; Thevenin's & Norton's theorem; Maximum Power Transfer theorem.

(12)

**MODULE – II**

**A.C. Single-phase Series Circuits:** Common signals and their waveforms. RMS and Average value. Form factor & Peak factor of sinusoidal waveform. Impedance of Series circuits. Phasor diagram. Power. Power factor. Power triangle.

(5)

**MODULE – III**

**A.C. Single-phase Parallel Circuits:** Admittance method, Phasor diagram. Power. Power factor. Power triangle.

(5)

**MODULE – IV**

**Resonance and Q-factor, A.C. Circuit Theorems:** Superposition theorem; Thevenin's & Norton's theorem; Maximum Power Transfer theorem.

(7)

**MODULE – V**

**Three Phase Circuits:** Line and Phase relation for Star and Delta connection. Power relations. Analysis of balanced and unbalanced 3 phase circuits.

(7)

**MODULE – VI**

**Magnetic Circuits:** Introduction. Series-parallel magnetic circuits. Analysis of Linear and Non-linear magnetic circuits. Energy storage. A.C. excitation. Eddy currents and Hysteresis losses.

(5)

**MODULE – VII**

Coupled Circuits (Dot rule), Self and mutual inductances, Coefficient of coupling.  
**Basic Indicating Instruments:** Moving coil and moving iron type instruments.

(4)

**Books Recommended:**

1. Nagrath and Grabel, Basic Electrical Engineering
2. Fitzerald and Higinbotham, Basic Electrical Engineering

**MODULE – I & II**

**Introduction to C++ and algorithm analysis:** C++ classes, C++ details, Using matrices, Mathematical background for algorithm analysis, model and what to analyze, Running Time calculations.

**MODULE – III**

**Lists, Stacks and Queues:** Abstract Data Types, The list ADT, The Stack ADT, The Queue ADT

**MODULE – IV**

**Trees:** Preliminaries, Binary Trees, The Search Tree ADT – Binary Search Trees, AVL Trees, Splay Trees, Tree Traversals, B-Trees.

**MODULE – V**

**Hashing and Priority Queues:** Model and Simple implementations, Binary Heap, Applications of Priority Queues, d-Heaps, Leftist and Skew Heaps.

**MODULE – VI**

**Sorting:** Preliminaries, Insertion sort, A Lower Bound for Simple Sorting Algorithms, Shell sort, Heap sort, Merge sort, and Quick sort.

**MODULE – VII**

**Graph Algorithms:** Definitions, Topological Sort, Shortest Path Algorithms, Network Flow Problems and Minimum Spanning Tree.

**Text Books:**

1. Mark A. Weiss – Data Structures & Algorithm Analysis in C++, 2<sup>nd</sup> Edition, Pearson Education, New Delhi – 2002.

**Reference:**

1. Gregory L. Heilean – Data Structures Algorithms, and Object Programming, Tata McGraw Hill, New Delhi – 2002.
2. Adam Drozdek – Data Structures and Algorithms in C++, Thomson Learning (Vikas Publishing House) New Delhi – 2001.
3. John R. Hubbard – Data Structures with C++, Tata McGraw Hill, New Delhi, 2004

**MODULE– I**

**Environmental Awareness:** Multidisciplinary nature of environmental Science, Definition, scope , importance and need for public awareness.

(2)

**MODULE– II**

**Ecology and Environment:** concept of an ecosystem ,structure and function of an ecosystem, producer ,consumer and decomposer, energy and nutrient flow biogeochemical cycles, food chain ,food web, ecological pyramid.

(3)

**MODULE– III**

**Environmental Pollution :** Segments of environment, sources, pathways and fate of environmental pollutants, causes of environmental pollution , physical ,chemical and biological transformation of pollutants , population explosion, environment and human health, human rights, value education ,women and child welfare.

(5)

**MODULE– IV**

**Air Pollution:** various segments of atmosphere and their significance,classification of air pollutants, toxic effects, sampling and analysis, stationary and mobile emission, sources and their control, photochemical smog ,sulphurous smog, green house effect, global warming, ozone depletion, Air (prevention and control of pollution ) Act.

(10)

**MODULE– V**

**Water Pollution:** Water resources ,sources of water pollution ,various pollutants, their toxic effect, potability of water , municipal water supply , disinfection, characteristics of waste water, primary and secondary waste water treatment, BOD and COD measurement and their significance ,rain water harvesting ,water shed management,Water ( pollution and control ) Act.

(12)

**MODULE– VI**

**Natural Resources and Biodiversity:** Renewable and non renewable resources, Forest resource, consequences of deforestation, floods and draughts, equitable use of resources for sustainable development, Dams benefits and problems, Biodiversity: ecosystem diversity , threats to biodiversity, conservation of biodiversity.

(4)

**MODULE– VII**

A brief introduction to Noise Pollution, Soil Pollution, Solid Waste Management.

(4)

**Books Recommended:**

1. Sharma and Kaur, Environmental Pollution
2. De, Environment Chemistry

**MODULE – I****Special Theory Of Relativity**

Postulates, Galilean transformations, Lorentz transformations, length contraction, time dilation, velocity addition, mass change and Einstein's mass energy relation. (AB: 1.1,1.2,1.4,1.7,1.8,1.9, and Appendix to chapter-1

[6]

**MODULE – II****Quantum Mechanics:**

Planck's theory of black-body radiation (AB: 2.2, 9.5, 9.6), Compton effect (AB: 2.7), wave particle duality, De Broglie waves, Davisson and Germer's experiment (AB: 2.4, 3.1, 3.2, 3.3, 3.4, 3.5), uncertainty principle (AB: 3.7, 3.8, 3.9), physical interpretation of wave function and its normalization (AB: 3.2), expectation value (AB: 5.4).

[8]

Schrodinger equation in one dimension (AB: 5.2), solutions of time-independent Schrodinger equation for free particle (AB: 3.6, 5.5, 5.6), particle in an infinite square well, potential barrier and tunneling (AB: 5.7, 5.8), hydrogen atom (qualitative) (HRW: 40-8).

[8]

**MODULE – III****Statistical Physics And Thermodynamics:**

Elementary ideas, comparison of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics (AB: 9.1, 9.2, 9.3, 9.4).

[4]

Zeroth law, first law, second law, entropy, heat transfer, steady state one-dimensional heat conduction [(HRW: 19-2, 19-9, 21-3, 19-11), (SS: 14.2, 14.7)].

[6]

**MODULE – IV****Lasers And Applications:**

Emission of light by atoms, spontaneous and stimulated emission (AB: 4.9, and AG: 23.1), Einstein's A and B coefficients, laser: population-inversion (AG: 23.4), properties of laser radiation, Ruby & He-Ne lasers, applications of lasers (AB: 4.9) and AG: 23.1), elementary ideas of holography (AG: 18.1) and fiber optics (AG: 24.1-24.3).

[8]

**MODULE – IV****Nuclear Physics:**

Nuclear forces, binding energy, liquid drop model (AB: 11.1-11.6), fission, nuclear reactors, fusion, energy processes in stars, controlled thermonuclear reactions (AB: 12.9-12.12).

[5]

**Text Books:**

1. Arthur Beiser, Concepts of Modern Physics, 5<sup>th</sup> edition, Tata McGraw Hill, 1997.
2. Ajoy Ghatak, Optics, 2<sup>nd</sup> edition, Tata McGraw Hill, 1997.

**Reference Books:**

1. Jasprit Singh, Modern Physics for Engineers, John Wiley & Sons, 1999.
2. Kenneth Krane, Modern Physics, 2<sup>nd</sup> edition, John Wiley & Sons, 1998.
3. Wehr, Richards and Adair, Physics of the Atom, 4<sup>th</sup> edition, Addison Wesley.

## THIRD SEMESTER

EC 3101

BASIC ELECTRONICS

1.0

### MODULE – I

**Introduction:** Importance of Electrical Engineering in day-to-day life. Electrical elements and their classification. KCL and KVL equations. Loop current and Node voltage method. D.C. Circuits: Steady state analysis with independent and dependent sources; Series and Parallel circuits; Star-Delta conversion. D.C. Circuit Theorems: Superposition theorem; Thevenin's & Norton's theorem; Maximum Power Transfer theorem.

(12)

### MODULE – II

**A.C. Single-phase Series Circuits:** Common signals and their waveforms. RMS and Average value. Form factor & Peak factor of sinusoidal waveform. Impedance of Series circuits. Phasor diagram. Power. Power factor. Power triangle.

(5)

### MODULE – III

**A.C. Single-phase Parallel Circuits:** Admittance method, Phasor diagram. Power. Power factor. Power triangle.

(5)

### MODULE – IV

**Resonance and Q-factor, A.C. Circuit Theorems:** Superposition theorem; Thevenin's & Norton's theorem; Maximum Power Transfer theorem.

(7)

### MODULE – V

**Three Phase Circuits:** Line and Phase relation for Star and Delta connection. Power relations. Analysis of balanced and unbalanced 3 phase circuits.

(7)

### MODULE – VI

**Magnetic Circuits:** Introduction. Series-parallel magnetic circuits. Analysis of Linear and Non-linear magnetic circuits. Energy storage. A.C. excitation. Eddy currents and Hysteresis losses.

(5)

### MODULE – VII

Coupled Circuits (Dot rule), Self and mutual inductances, Coefficient of coupling.

**Basic Indicating Instruments:** Moving coil and moving iron type instruments.

(4)

### Text Books:

1. Basic Electrical Engineering, Fitzgerald, Hinginbotham
2. Basic Electrical Engineering I.J. Nagrath and D.P. Kothari, 2<sup>nd</sup> Edition, TMH, Delhi.

### Reference Books:

1. Electric circuits- Schaum Series
2. Electrical Engineering- Del Toro.
3. Basic Electrical Engineering- Mittle.

**Special Functions:**

Bessel's equation: solution and Bessel's function of the first kind, Recurrence relations. Orthogonality of Bessel's Functions. Generating function and Bessel's integral. Legendre's equation: solution and Legendre's polynomials, Rodrigue's Formula. Orthogonarity relations. Generating function and recurrence relation. Definition of Hankekl's function. Elliptic Integral of the first and second kind. Jacobi's form of elliptic integrals.

(8L)

**Complex Variables:**

Continuity, differentiability and analyticity of a function of a complex variable, Cauchy Riemann differential equations in Cartesian and polar forms. Harmonic functions, Bilinear and conformal transformations. Complex integration, Cauchy's integral theorem and formula. Derivatives. Taylor's and Laurent's Series. Poles and Singularities. Cauchy's Residue Theorem. Contour integration (Poles on real axis excluded)

(13L)

**Partial differential equations:**

Formation of partial differential equations. Lagrange's first order linear equations. Non linear equations. Higher order differential equations with constant Co-efficients. Non homogeneous equations: solution by separation of variables. Boundary value Problems. wave equation in one dimension and its solution. Derivation of one dimensional heat equation and its solution.

(10L)

**Fourier Series and Fourier Transform:**

Periodic functions Existence conditions Euler's formulae. Half range series. Fourier series of functions with arbitrary period.

Fourier Integral Formula, Fourier Transform, Inversion Theorem, Fourier sine and cosine transforms and inversion formulae, Linearity property, Convolution or Faltung theorem. Relationship between Fourier and Laplace transform. Finite Fourier Transforms. Heaviside, Unit step function and Dirac Delta Function

(10L)

**Statistics:**

Mean and variance. Moments. Concept of Random variable. Probability density and Distribution functions Problems, Elements of error analysis

(4L)

**Books Recommended:**

1. Engineering Mathematics – E. Kreyszig
2. Advanced Engineering Mathematics – C. Prasad
3. Fourier Transforms – I.N. Sneddon

**MODULE – I**

**Introduction to signals and systems:** Definition, Basis of classification, Representation of common signals and their properties, System modeling

(4)

**MODULE – II**

**Analogous System:** Introduction, D Alembert's Principle, Force-voltage and force-current analogies, Electrical analogue of mechanical, Hydraulic and thermal systems.

(5)

**MODULE – III**

**Fourier Transform Method:** Introduction, Fourier transform pair, Amplitude spectrum and phase spectrum of signals, Sinusoidal transfer function.

(3)

**MODULE – IV**

**Laplace Transform Method:** Introduction, Laplace transform pair, Laplace transformation of common functions, Gate function, Step function and impulse function, Laplace theorems shifting, initial value, final value and convolution theorems.

Inverse Laplace transform by partial fraction expansion and convolution integral method.

(12)

**MODULE – V**

**System Analysis:** System Analysis by Laplace Transform method, System response. Natural, forced, transient and steady state responses. Transfer function and characteristic equation, Superposition integral, Concept of poles and zeros, Nature of system response from poles and zeros.

(6)

**MODULE – VI**

**System Stability:** Concept of stability, Types, Necessary and sufficient conditions, Routh Hurwitz stability criterion, Limitations and its applications to closed loop systems.

(4)

**MODULE – VII**

**State-Space Concept:** Introduction, Definition: State, State variable, State vector and state space, State space representation, Derivation of State model from transfer function, Bush form and diagonal canonical form of state model, Non-uniqueness of state model, Derivation of transfer function from state model, Transition matrix and its properties, Solution of time invariant state equation.

(6)

**Text Books:**

1. Analysis of Linear Systems – D.K.Cheng.
2. Control System Engineering – Nagrath & Gopal
3. Control System – A. Anand Kumar

**Reference Books:**

1. Networks and Systems – D. Roy Choudhury
2. Signals and Systems - Basu & Natarajan



**MODULE – I**

Introduction to Java Applications, Memory Concepts, Arithmetic, Decision making, Equality and Relational Operators. Introduction to Java Applets, Drawing strings and lines.

**Control Statements:** if, if ... else, selection statements, while statement, compound assignment operators, increment decrement operators, for ... statement, do .... while, switch, break and continue, labeled break and continue, logical operators.

**Methods in java:** declarations, argument promotions, scope of declarations, method overloading, Recursion.

**Arrays:** declaring and creating references and reference parameters, passing arrays to methods, multi dimensional arrays.

**MODULE – II**

Object based programming, classes, class scope, controlling access to members, this keyword and its use, constructors, overloading constructors, composition, garbage collection, static class members, final instance variables, crating packages, package access, Data abstraction and encapsulation.

**MODULE – III**

**Inheritance and polymorphism:** super class and subclass, protected members, Relation ship between super and sub class. Inheritance hierarchy, abstract classes and methods, final methods and classes, nested classes, Type wrappers.

**MODULE – IV**

**Exception handling:** Java exception hierarchy, rethrowing an exception, finally clause, stack unwinding, chained exception, Declaring new exception types.

**Multithreading:** Life cycle of a thread, priorities and scheduling, creating and executing threads synchronization.

**MODULE – V**

Files and streams, hierarchy, files and streams, File class, Sequential access file manipulation, random access file handling, Introduction to String class and its members.

**MODULE – VI**

World Wide Web, Client / Server architecture, Web browser, Web server, creating a web site and mark up languages, HTML, document structuring tags in HTML, Special tags in HTML.

**MODULE – VII**

**Introduction to DHTML, scripting languages, java script:** objects, methods, events & event handling, Document object model.

**Text Book:**

1. Dietel,Dietel - Java How to program , 5<sup>th</sup> edition; Pearson Education , New Delhi.
2. S. Raj Kamal – Internet and Web Technology, Tata McGraw Hill, New Delhi, 2002.

**Reference:**

1. C. Horstmann, G. Cornell - Core Java 2 Vol I & Vol II; Pearson Education, New Delhi.
2. Balagurusamy -Programming in Java, 2<sup>nd</sup> Edition; Tata McGraw Hill Publication; New Delhi.
3. Patrick Naghton & H. Schildt – The Complete Reference Java 2, Tata McGraw Hill Publication, New Delhi.

**MODULE – I**

**Number Systems and codes:** Binary to Decimal Conversions, Decimal to Binary Conversions, Octal Number System, Hexadecimal Number System, BCD Code, Alphanumeric Codes, Parity Method for Error Detection.

**Logic Gates and Boolean Algebra:** Boolean Constants and Variables, Truth Tables, OR, AND, and NOT Operations, Description, Evaluation and Implementation of Logic Circuits, NOR and NAND gates and their universality, Boolean and DeMorgan's Theorem, Logic Gate Representations.

**MODULE - II**

**Combinational logic circuits:** Sum of Products From, Simplifying and Designing Logic Circuits, Karnaugh map Method Executive – OR and Excluxre NOR Circuits , Parity Generators and Checker Enable/Disable Circuits , Basic Characteristics of Digital ICS, Programmable Logic Devices

**MODULE – III**

**Sequential Logic Circuits:** Latches and Flip-flops, Asynchronous Inputs, Flip-flops Timing Considerations, Potential Timing Problem in FF Circuits, Flip-flop Applications and Synchronization, Data Storage and Transfer, Shift Registers, Schmitt – Trigger Devices.

**MODULE – IV**

**Digital Arithmetic:** Binary Addition, Subtraction, Multiplication and Division, BCD Addition, Hexadecimal Arithmetic, Arithmetic Circuits, Full Adder, Parallel Adder, ALU Integrated Circuits.

**MODULE - V**

**Counter and Registers:** Different Asynchronous and Synchronous Counters, Pre settable Counters, The 74AL S193/HC193, Decoding a Counter, Decoding Glitches, Cascading BCD Counters, Shift – Registers, Counters, Counter Applications, Integrated Circuit Registers, Parallel In / Parallel Out , Serial In /Serial Out, Parallel In/ Serial Out, Serial In / Parallel Out.

**MODULE – VI**

**Integrated – Circuit Logic Families:** Digital IC Terminology, TTL Logic Family and Data Sheets, TTL Characteristics, TTL Loading and Fan – Out, MOS Technology, Digital MOSFET Circuits, Complementary MOS Logic, CMOS Series Characteristics. Tristate Logic Outputs.

**MODULE – VII**

**MSI Logic Circuits:** Decoders, BCD – to – 7 Segment Decoders, Encoders, Multiplexes and Demultiplexers, Magnitude Comparator. Memory Devices : Memory Terminology and General Operation, ROM and its Architecture, Timing, Types and Applications of ROM, Semiconductor RAM and RAM Architecture, Static and Dynamic RAM.

**Text Book:**

1. Ronald J. Tocci and Neal S. Widmer - Digital Systems : Principles and Applications  
Pearson Education, 8<sup>th</sup> Edn. New Delhi, 2002

**Reference Books:**

1. M. Morris Mano- Digital Logic and Computer Design, PHI (Reprint). New Delhi 2004.
2. A.B. Marcovitz- Introduction to Logic Design, TMH, New Delhi - 2002.
3. S.P. Dondamudi- Fundamentals of Computer Organization and Design Springer (India)  
Pvt. Ltd. New Delhi – 2004

## FOURTH SEMESTER

CP 4101

DISCRETE MATHEMATICAL STRUCTURES

1.0

### MODULE – I & II

**Logic and Mathematical Reasoning:** Logic, Propositional Equivalences, Predicates and Quantifiers, Methods of Proof, Mathematical Induction, Recursive Definition and Algorithms, Program Correctness.

### MODULE – III & IV

**Functions and Relations:** Functions, Sequences and Summations, The Growth Functions, Relations and Their Properties, Non- array Relations & Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

### MODULE – V

**Graphs:** Introduction to Graphs, Graph Terminology and Representation, Connectivity, Euler and Hamiltonian Paths, Shortest Path Programs.

### MODULE – VI

**Trees:** Introduction and applications of trees, Tree Traversal, Spanning Trees, Minimum Spanning trees.

### MODULE –VII

**Semigroups, Groups and Coding:** Binary Operations, Semigroups, Products and Quotients of Semigroups, Groups, Product and Quotients of Groups, Coding of Binary Information and Error Correction, Decoding and Error Correction.

### Text Books:

1. B.Kolman et.al- Discrete mathematical Structures, 5<sup>th</sup> Ed<sup>n</sup>, Pearson Education, New Delhi - 2004.
2. K.H. Rosen – Discrete Mathematics and Its Applications – 4<sup>th</sup> Ed<sup>n</sup>, Tata McGraw Hill, New Delhi - 2001

### Reference Books:

1. J.P. Tremblay et.al – Discrete Mathematical Structures with Applications to Computer Science, TMH, New Delhi – 2004.

**A – NUMERICAL COMPUTING****MODULE - I**

**High Speed Computation:** Introduction, Computer Arithmetic, Errors, Machine Computation.

**Transcendental and Polynomial Equations:** Introduction, Bisection Method, Iterative Methods, Rate of Convergence, Methods for Complex Roots, Polynomial Equations.

**MODULE - II**

**System of Linear Algebraic Equations and Eigenvalue Problems:** Introduction, Direct Methods, Error analysis, Iteration Methods, Eigenvalues and Eigen Vectors.

**Interpolation and Approximation:** Introduction to Lagrange and Newton Interpolations, Finite difference operators, Interpolating polynomial using finite differences, Hermite interpolations, Piecewise and spline interpolation.

**MODULE - III**

**Differentiation and Integration:** Introduction, Numerical differentiation, Numerical integration, Methods based on interpolation.

**Ordinary Differential Equations:** Introduction, Euler methods, Single and Multistep methods, Predictor-corrector methods.

**B – STATISTICAL COMPUTING****MODULE - IV**

**Empirical and Probability Distributions:** Basic Concepts, The Mean Variance, and Standard Deviation, Continuous-Type Data, Exploratory Data Analysis, Graphical Comparisons of Data Sets, Probability Density and Mass Functions.

**Probability:** Properties of Probability, Methods of Enumeration, Conditional Probability, Independent Events, Bayes Theorem.

**MODULE – V & VI**

**Discrete, Continuous & Multivariable Distributions:** Random Variables of the Discrete Type, Mathematical Expectation, Bernoulli Trials and the Binomial Distribution, The Moment-Generating Function, The Poisson Distribution, Random Variables of the Continuous Type, The Uniform and Exponential Distributions, The Gamma and Chi-Square Distributions, The Normal Distribution, Distributions of Functions of a Random Variable, Distributions of Two Random Variables.

**Sampling Distribution Theory:** Independent Random Variables, Distributions of Sums of Independent Random Variables, Random Functions Associated with Normal Distributions, The Central Limit Theorem, Approximations for Discrete Distributions, The t and F Distributions.

**MODULE - VII**

**Estimation & Tests of Statistical Hypotheses:** Point Estimation, Confidence Intervals for Means, Confidence Intervals for Difference of Two Means, Sample Size, Tests About Proportions, Tests of the Equality of Two Normal Distributions, Chi-Square Goodness of Fit Tests, Contingency Tables, Tests of the Equality of Several Means.

**Text Books:**

1. Jain, M.K., et al : Numerical Methods for Scientific and Engineering Computation, 3<sup>rd</sup> Edn. New Age Publication, New Delhi, 1999
2. Hogg, R.V. & Tanis E. A. : Probability and Statistical Inference, 6<sup>th</sup> Edn., Pearson Education, New Delhi , 2004.

**Reference Books:**

1. Sastry, S.S. – Introductory Methods of Numerical Analysis, 4<sup>th</sup> Edn., PHI, New Delhi, 2005
2. Hines, W.W. et al – Probability and Statistics in Engineering, 4<sup>th</sup> edn., John Wiley, Singapore (Indian Reprint), 2003.
3. Veerarajan, T. – Probability, Statistics and Random Processes, 2<sup>nd</sup> Edn., TMH, New Delhi, 2003.

**MODULE – I**

**Introduction:** Purpose of Database System; View of Data, Data Models, Database Languages, Transaction Management, Storage Management, Database Users Administrator, History of Database Systems.

**MODULE – II**

**Database Design and Entity - Relational Model:** Overview of design process, E-R model, Constraints, E – R Diagram, Weak Entity Sets, Extended E – R Features, Reduction to E – R Schemas.

**MODULE – III**

**Relational Model:** Structure of Relational Database, Fundamental Relational Algebra Operations, Additional Relational Algebra Operations, Domain Relational Calculus, Tuple Relational calculus, Query by Examples.

**MODULE – IV**

**SQL & Advanced SQL:** Data definition, Basic structure of SQL queries, Set Operations, Aggregate Functions, Null Values, Nested Sub Queries, complex queries, views, modification of database, SQL data types & schemas, Integrity constraints, authorization, Embedded SQL.

**MODULE – V**

**Relational Database Design:** Atomic domains & first normal form, Decomposition using functional dependencies, Functional dependency theory, Decomposition using functional dependencies, Decomposition using multivalued dependencies, more normal forms.

**MODULE – VI**

**Query Processing:** Measure of Query Cost, Selection Operation, Evaluation of Expressions.

**MODULE – VII**

**Transaction & Concurrency Control:** Transaction Concepts & ACID Properties, Transaction States, Concurrent Executions, Serializability & Its Testing, Recoverability, Introduction to Concurrency Control, Locked Base Protocol & Deadlock Handling.

**Text Book:**

1. A.Silberschatz et.al - Database System Concepts, 5<sup>th</sup> Ed<sup>n</sup>, Tata Mc-Graw Hill, New Delhi – 2000.

**Reference Books:**

1. Date C.J.- An Introduction to Database System, Pearson Education, New Delhi- 2005
2. R. Elmasri, Fundamentals of Database Systems, Pearson Education, New Delhi, 2005.



**MODULE – I**

**Introduction:** What is an Operating System? Simple Monitor, Performance, Multiprogramming, time-sharing, Real Time systems, Protection.

(5)

**File Systems:** File Concept and support, Access and allocation methods, directory systems, File protection.

(3)

**MODULE – II**

**CPU Scheduling:** Scheduling concepts and algorithms, Algorithms evaluation, and Multiple processor scheduling.

(6)

**MODULE – III**

**Memory Management:** Preliminaries, Bare Machine, Resident Monitor, Swapping, Multiple partitions, Paging, Segmentation, Combined systems.

(8)

**MODULE – IV**

**Virtual Memory:** Overlays, Demand paging, Performance of demand paging, Page replacement, Virtual memory concepts, Page replacement algorithms, Allocation algorithms, and Thrashing.

(8)

**MODULE – V**

**Disk Scheduling:** Physical characterization, Disk Management, Swap-Space Management, RAID structure, FCFS scheduling and Shortest-Seek-Time-First.

(6)

**MODULE – VI**

**Deadlocks:** The deadlock problem, Deadlock characterization, Deadlock prevention, Deadlock avoidance; Deadlock detection, Recovery from deadlock, and Combined approach to deadlock handling.

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**MODULE – VII**

**Process Synchronization:** Semaphors, OS Synchronization, Atomic Transaction.

**Security:** The Security Problem, User Authentication, Cryptography.

**Text Book:**

1. Silver Schatz, A and Galvin, P.B. 'Operating System Concepts', 5<sup>th</sup> Edn. John Wiley, New York, 2000

**Reference Books:**

1. Deitel H.M., 'An Introduction to Operating System', Addison Wesley, Inc., London, 1995.
2. Mandinck S.E., 'Operating System' McGraw Hill., London, 1993.

**MODULE- I**

**Design Methodology:** System Design System Representation, Design Process, the Gate level The Register Level, Register- Level Components, Programmable Logic Devices, Register- Level Devices.

The Processor Level Processor- level Components, Processor-level Design

**MODULE- II**

**Processor Basics:** CPU Organization Fundamentals, Additional Floating-Point Numbers Data Representation Basic Format, Fixed-Point Numbers, Floating-Point Numbers Instruction Sets Instruction Formats and Types

**MODULE- III**

**Datapath Design:** Fixed-Point Arithmetic Addition, Subtraction, Multiplication and Division Arithmetic Logic Units Combinational ALUs, Sequential ALUs

**MODULE- IV**

**Control Design:** Basic Concepts Introduction, Hardwired Control Microprogrammed Basic Concepts, Multiplier Control Unit Control Pipeline Control Instruction Pipeline, Arithmetic Pipeline

**MODULE - V**

**Memory Organization:** Memory Technology Memory Device Characteristics, Random Access Memories, Serial Access Memories Memory Systems Multilevel Memories, Address Translation, Memory Allocation Cache Main Features, Address Mapping

**MODULE- VI**

**System Organization:** Communication Methods Basic concepts Bus Control System Control DMA and Interrupts

**MODULE- VII**

**Advanced Topics:** Pipeline Processing, Parallel Processing

**Text Book:**

1. Hayes, J.P., "Computer Architecture and Organization", 3<sup>rd</sup> ed McGraw-Hill, London, 2000

**Reference Books:**

1. Mano, M.M., "Computer System Architecture" , Prentice Hall of India, New Delhi, 1995
2. Heuring V.P., etal., " Computer System Design and Architecture", Addison Wesley Indian Reprint, 2000
3. Hamacher.V., etal, (Computer Organization" ,4<sup>th</sup> edition, McGraw Hill, Singapore, 1996
4. Ram. B."Computer Fundamentals: Architecture and Organization",3<sup>rd</sup> ed New Age International Publication, New Delhi, 2000

**MODULE – I**

**RC Filters:** RC loss pass and high pass filters and their response to sinusoidal, step, pulse, square wave and ramp inputs.

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**MODULE – II**

**Transistors at high frequencies:** Hybrid  $\pi$  model, Amplifier response at high frequencies, Gain- Bandwidth product, FET at high frequencies.

(5)

**MODULE – III**

Low frequency response of RC coupled stage and Multistage amplifiers, Single tuned amplifier, Cascode (CE-CB pair) amplifier.

(6)

**MODULE – IV**

**Feedback amplifiers:** Classification of amplifiers, Voltage series, Voltage shunt, Current series, Current shunt feedback.

(12)

**MODULE – V**

**OP-Amp based Oscillators:** Barkhausen criterion, Phase shift and Wein bridge oscillators, Hartley and Colpitt's oscillators, Crystal oscillators, Frequency stability.

(5)

**MODULE – VI**

**Voltage and current time base generators:** Exponential sweep, UJT as a negative resistances switch in sawtooth generators, Miller and Bootstrap time base generators, A simple current sweep, Linearity correction through adjustment of driving waveforms, A transistor current time-base generator.

**MODULE – VII**

**A/D and D/A Converters:** D/A converters – Binary Weighted D/A Converter, Ladder type D/A converters, Specifications for D/A Converters, A/D Converters – Simultaneous A/D converter, Counter type A/D converter, Successive approximation type A/D converter, Dual slope converter, Comparison of converter types.

**Text Book:**

1. "Digital Integrated Electronics". Taub & Schilling, TMH.
2. "Pulse Digital and Switching Waveforms", Millman & Taub, TMH.
3. "Integrated Electronics", Millman & Halkias, McGraw Hill.

**Reference Books:**

1. "Electronics Circuits: Discrete and Integrated", D. Schilling and C. Belove, McGraw ill.
2. "Modern Digital Electroncis", R. P. Jain, TMH
3. "Digital Principles & Application", Malvino & Leach, TMH.

## FIFTH SEMESTER

CP 5101

FORMAL LANGUAGES AND AUTOMATA THEORY

1.0

### MODULE - I

**Introduction to Automata:** Study and Central concepts of automata theory, An informal picture of finite automata, deterministic and non-deterministic finite automatas, applications of finite automata, finite automata with epsilon – transitions.

### MODULE - II

**Regular expression and languages:** Regular expressions, finite automata and regular expressions, applications of regular expressions, algebraic laws of regular expressions.

### MODULE - III

**Properties of Regular Languages:** Proving languages not to be regular, closure properties of regular languages, equivalence and minimization of automata.

### MODULE - IV

**Context-free Grammars and Languages:** Parse trees, Applications of context free grammars, Ambiguity in grammars and languages.

### MODULE - V

**Pushdown Automata:** Pushdown automation (PDA), the language of PDA, equivalence of PDA's and CFG's, Deterministic Pushdown Automata.

### MODULE - VI

**Properties of Context- Free Languages:** Normal forms of context free grammars, pumping lemma for context free languages, close properties of context free languages.

### MODULE - VII

**Introduction to Turing Machine:** The Turing machine, programming techniques for Turing machine, extensions to the basic Turing machine, restricted Turing Machines, Turing Machines and Computers.

### Text Books:

1. J.E. Hopcroft, et.al. - Introduction to Automata Theory, Languages and Computation, 2<sup>nd</sup> Edn. Pearson Education, New Delhi 2001

### Reference Books:

1. K.L.P. Misra – et.al. - Theory of Computer Science, 2<sup>nd</sup> Edn. PHI, New Delhi, 2000
2. J.C. Martin - Introduction to Languages and the Theory of Computation 2<sup>nd</sup> Edn, TMH, New Delhi, 2000.

**MODULE - I**

**Data Communications and Networking Overview:** A Communications Model, Data Communications, Data Communication Networking.

**Protocol Architecture:** The Need for a Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture

**MODULE - II**

**Data Transmission:** Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity.

**Guided and Wireless Transmission:** Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission.

**MODULE - III**

**Signal Encoding Techniques:** Digital Data Digital Signals, Digital Data Analog Signals, Analog Data Digital Signals, Analog Data Analog Signals.

**MODULE - IV**

**Digital Data Communication Techniques:** Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations, Interfacing.

**MODULE - V**

**Data Link Control:** Flow Control, Error Control, High-Level Data Link Control (HDLC).

**Multiplexing:** Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing.

**MODULE - VI**

**Circuit Switching and Packet Switching:** Switching Networks, Circuit-Switching Networks, Circuit-Switching Concepts, Control Signaling, Softswitch Architecture, Packet-Switching Principles, X.25, Frame Relay.

**MODULE - VII**

**Asynchronous Transfer Model:** Protocol Architecture, ATM Logical Connections, ATM Cells, Transmission of ATM Cells, ATM Service Categories, ATM Adaptation Layer.

**Routing in Switched Networks:** Routing in Circuit-Switching Networks, Routing in Packet-Switching Networks, Least-Cost Algorithms

**Text Book:**

1. W. Stallings - Data and Computer Communications, 7<sup>th</sup> Edn., Pearson Edn./ PHI, New Delhi, 2006

**Reference Books:**

1. B. A. Forouzan - Data Communications and Networking, 4<sup>th</sup> Edn. TMH, New Delhi 2006
2. P.C. Gupta – Data Communications and Computer Networks, PHI, New Delhi 2006

## I FUZZY LOGIC

### MODULE -I

**Fuzzy Set Theory:** Basic Definition and Terminology, Set Theoretic Operations, MF Formulation and Parameterization, MF of two dimension, Fuzzy Union, Intersection and Complement.

### MODULE -II

**Fuzzy Rules and Fuzzy Reasoning:** Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Fuzzy Reasoning.

### MODULE -III

**Fuzzy Inference System:** Introduction, Mamdani Fuzzy Models, Other Variants, Sugeno Fuzzy Models, Takamoto Fuzzy Models.

GENETIC ALGORITHMS

### MODULE -IV

**Fundamentals of Genetic Algorithms:** Basic Concepts Creation, Offsprings Encoding, Fitness functions, Reproduction, Genetic Modelling: Inheritance Operators, Cross over, Inversion and detection, Mutation operator, Bitwise operators.

ARTIFICIAL NEURAL NETWORKS:

### MODULE -V

Introduction, Architecture, Back Propagation and feed Forward Networks, Offline Learning, Online Learning.

### MODULE -VI

**Supervised Learning of Neural Networks:** Introduction, Perceptrons, Adaline, Back Propagation Multilayer Perceptrons, Back Propagation Learning Rules, Methods of Speeding. Radical Basis Function Networks, Functional Expansion Networks.

### MODULE -VII

**Unsupervised Learning:** Competitive Learning Networks, Kohonen self-organising networks, Hebbian Learning, The Hopfield Network

### Text Book:

1. J.S.R. Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing" PHI/Pearson Education, New Delhi 2004.
2. S. Rajasekaran & G.A. Vijayalakshmi Pai, PHI, New Delhi 2003

### Reference Books:

1. T. J. Ross, " Fuzzy Logic with Engineering Applications." TMH, New York, 1997.

**MODULE – I**

**Carrier Concentrations:** The Fermi level, Electron and Hole concentration at equilibrium, Direct and Indirect recombination of electrons and holes, Hall effect, Steady-state carrier generation, Quasi-Fermi levels.

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**Text Books:**

1. "Solid State Electronic Devices" – B. G. Streetman, PHI
2. "Semiconductor Devices"- Jusprit Singh, Jhon Wiley Eastern.
3. "Physics of Semiconductor Devices" – S. M. Sze.

**MODULE – II**

**Transport Phenomena:** Drift and Diffusion of Carriers, Recombination, Continuity and Diffusion equations, Hynes-Shockley experiment.

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**Text Books:**

1. "Solid State Electronic Devices" – B. G. Streetman, PHI
2. "Semiconductor Devices"- Jusprit Singh, Jhon Wiley Eastern
3. "Physics of Semiconductor Devices" – S. M. Sze.

**MODULE – III**

**P-N Junctions:** The Contact Potential, Space Charge at a junction, Steady state condition, Current at a junction, Carrier injection, Junction breakdown, Time variation of stored charge, P-N junction capacitance, Graded junction.

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**Text Books:**

1. "Solid State Electronic Devices" – B. G. Streetman, PHI
2. "Semiconductor Devices"- Jusprit Singh, John Wiley Eastern

**MODULE – IV**

**Junction Diodes:** Varactor Diode, Concept of negative resistance, Tunnel Diode, Current and Voltage in an illuminated junction, Photo Diode, Photo detector, Solar Cells, Light Emitting Diode, Metal Semiconductor Junction.

Principle of PIN photo detector and Avalanche photodiode, Noise in photo detectors, Detector response time, Photodiode materials.

(8)

**Text Books:**

1. "Solid State Electronic Devices" – B. G. Streetman, PHI
2. "Optical Fibre Communications" – G.Keiser, 3/e, McGraw Hill.

**MODULE – V**

**Bipolar Junction Transistor (BJT):** Charge transport and current in a BJT, Current transfer ratio, Terminal currents, Generalised biasing, Charge control analysis, BJT switching, Turn-on and Turn-off transients, Base narrowing, Frequency limitations of a transistor.

(5)

**Text Books:**

1. "Solid State Electronic Devices" – B. G. Streetman, PHI
2. "Physics of Semiconductor Devices" – S. M. Sze.

**MODULE – VI**

**FET, MOSFET:** Principle of Operation and I-V Characteristics of FET, MESFET, MOSFET, MOS Capacitor, Threshold voltage in MOSFET.

(6)

**Text Book:**

1. "Solid State Electronic Devices" – B. G. Streetman, PHI

**MODULE – VI**

**CCD & Fabrication:** The basic CCD, Improved CCD p-n junction fabrication.

(3)

**Text Books:**

1. "Solid State Electronic Devices" – B. G. Streetman, PHI
2. "Integrated Electronics" – Millman & Halkies, Tata McGraw.



**MODULE – I**

Revision of logic circuits with emphasis on control lines, SAP concepts with stress on timing diagrams, Microinstructions, Microprogramming, Variable machine cycle, Architecture of 8085 Processor, Functions of all signals, Bus concepts, Multiplexed and De-multiplexed Bus, Minimum system.

**Text Books:**

1. "Digital Computer Electronics", 2/e. by A. P. Malvino.
2. "Microprocessor Architecture, Programming and Applications with 8085" by R. S. Gaonkar.

**MODULE – II**

Instruction set, Addressing modes, Stack operation, Timing diagrams, Programming examples like Time delay, Looping, Sorting, Code conversions like BCD to Binary, Binary to BCD, HEX to ASCII, ASCII to HEX, BCD Arithmetic etc.

**Text Books:**

1. "Digital Computer Electronics", 2/e. by A. P. Malvino.
2. "Microprocessor Architecture, Programming and Applications with 8085" by R. S. Gaonkar.

**MODULE – III**

8085 based Microcomputer system, Memory Organization, Memory Interfacing, Memory Mapped I/O, I/O Mapped I/O, Interrupts, Hardware and Software Interrupts, Interrupt instructions, Programmed I/O, Interrupt driven I/O, DMA.

**Text Books:**

1. "Digital Computer Electronics", 2/e. by A. P. Malvino.
2. "Microprocessor Architecture, Programming and Applications with 8085" by R. S. Gaonkar.

**MODULE – IV**

Architecture of 8255 I/O peripheral chip, Modes of operation, Hand shake mode operation, BSR mode, ADC 0801 and ADC 0808 Interfacing with microprocessor, Analogue multiplexed ADC, DAC 0808 specifications, DAC Interfacing, Programming examples for Generation of square wave, positive and negatives ramps, triangular and sine waves, Sample and Hold circuit, LF 398 and its applications in Data Acquisition.

**Text Books:**

1. "Digital Computer Electronics", 2/e. by A. P. Malvino.
2. "Microprocessor Architecture, Programming and Applications with 8085". by R. S. Gaonkar.
3. "Microprocessor and Interfacing, Programming of Hardware" by Douglas Hall.
4. "Microprocessor and Peripherals" by S. P. Chowdhury and Sunetra Chowdhury.

## **MODULE – V**

8253 timer, Modes of operation, Applications, 8279 Keyboard/Display Interface, Different modes of operation, Interfacing, Programming examples, 8237 DMA Controller.

### **Text Books:**

1. "Microprocessor and Interfacing, Programming of Hardware" by Douglas Hall.
2. "Microprocessor and Peripherals" by S. P. Chowdhury and Sunetra Chowdhury.
3. "The INTEL 8086/8088 Microprocessor, Architecture, Programming, Design and Interfacing", 3/e. by Bhupendra Singh Chhabra.

## **MODULE – VI**

Evolution of Microprocessors, Introduction (Architecture and Instruction set only) of 8086 and 8088, Evolutionary steps and Additional features of 80186, 80286, 80386, 80486 and Pentium Processors, Concept of CISC and RISC processors.

### **Text Books:**

1. "Microprocessor, Microcomputer and their Applications", 2/e. by A. K. Mukhopadhyay.
2. "Advanced Microprocessor" by Y. Rajasree.
3. "The INTEL 8086/8088 Microprocessor, Architecture, Programming, Design and Interfacing", 3/e. by Bhupendra Singh Chhabra.

## **MODULE – VII**

Introduction to Microcontrollers, 8051 Microcontroller, Memory Organization, Programming techniques, Addressing modes, Instruction set, Interrupt structure, Port structure, Different modes of operation, Programming examples.

### **Text Books:**

1. "Advanced Microprocessors and Microcontrollers" by S. K. Venkata Ram.
2. "Microprocessor, Microcomputer and their Applications", 2/e. by A. K. Mukhopadhyay.
3. "Advanced Microprocessors" by Y. Rajasree.
4. "Microprocessor and Peripherals" by S. P. Chowdhury and Sunetra Chowdhury.

**MODULE – I**

**Introduction:** Discrete-Time Signals, Shannon's sampling theorem, Difference equation description, characteristics of digital filters and time domain analysis, properties of discrete time system (linearity, time-variance, convolution), BIBO stability, Z-transformation and their application in solving difference equations, Relationship between Laplace and Z-transforms

(7)

**Text Books:**

1. "Digital Signal Processing, Principles, Algorithms and Applications" ,John G. Proakis, Dimitris G. Mamalakis,
2. "Digital Signal Processing", Alan V. Oppenheim Ronald W. Schafer, PHI, India.

**MODULE – II**

**Frequency Domain Analysis:** Discrete Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT), Periodic convolution, Direct evaluation of DFT, FFT algorithms- decimation in time and frequency, Relationship between Fourier and Z-transforms

(8)

**Text Books:**

1. "Digital Signal Processing, Principles, Algorithms and Applications" ,John G. Proakis, Dimitris G. Mamalakis,
2. "Digital Signal Processing", Alan V. Oppenheim Ronald W. Schafer, PHI, India.

**MODULE – III**

**Digital Filter Structures:** Direct form I&II, cascade, parallel and ladder realizations.

(5)

**Text Books:**

1. "Digital Signal Processing, Principles, Algorithms and Applications" ,John G. Proakis, Dimitris G. Mamalakis,
2. "Digital Signal Processing", Alan V. Oppenheim Ronald W. Schafer, PHI, India.

**MODULE – IV**

**Filter Function Approximations and Transformations.**

Review of approximations of ideal analog filter response, Butterworth filter, Chebyshev Type I & II.

(6)

**Text Books:**

1. "Digital Signal Processing, Principles, Algorithms and Applications" ,John G. Proakis, Dimitris G. Mamalakis,
2. "Digital Signal Processing", Alan V. Oppenheim Ronald W. Schafer, PHI, India.

**MODULE – V**

**Frequency Transformations:** Frequency transformation in analog domain, frequency transformation in digital domain.

(4)

**Text Books:**

1. "Digital Signal Processing, Principles, Algorithms and Applications" ,John G. Proakis, Dimitris G. Mamalakis,
2. "Digital Signal Processing", Alan V. Oppenheim Ronald W. Schafer, PHI, India.

## **MODULE – VI**

**Design of IIR Filter:** Design based on analog filter approximations, Impulse invariance method, Matched Z-transformation, Bilinear transformation.

(7)

### **Text Books:**

1. "Digital Signal Processing, Principles, Algorithms and Applications" ,John G. Proakis, Dimitris G. Mamalakis,
2. "Digital Signal Processing", Alan V. Oppenheim Ronald W. Schafer, PHI, India.

## **MODULE – VII**

**Design of FIR filters:** Symmetric and antisymmetric FIR filters, design of linear phase FIR filters using windows and frequency – sampling methods, design of optimum equiripple linear phase FIR filters, comparison of FIR and IIR filters.

(8)

### **Text Books:**

1. "Digital Signal Processing, Principles, Algorithms and Applications" ,John G. Proakis, Dimitris G. Mamalakis,
2. "Digital Signal Processing", Alan V. Oppenheim Ronald W. Schafer, PHI, India.

### **Reference Book:**

1. "Digital Filter Design", Antonious, Mc-Graw-Hill International Editions.

## SIXTH SEMSTER

CP 6101

DESIGN AND ANALYSIS OF COMPUTER ALGORITHMS

1.0

### MODULE -I

**Basic Tools on Designing Algorithms:** What is an algorithm? Algorithm specification and performance analysis, randomized algorithms.

### MODULE –II

**Divide-and-Conquer:** The general method, application to binary search, finding the maximum and minimum, merge sort, quick sort, the problem of selection and Strassen's matrix multiplication.

### MODULE -III

**The Greedy Method :** The general method, application to optimal storage on tapes, job sequencing with deadlines, optimal merge patterns and minimum weight spanning trees.

### MODULE –IV & V

**Dynamic Programming:** The general method, application to multistage graphs, all pairs shortest paths, optimal binary search trees, 0/1-Knapsack and traveling salesman problem, Flow shop scheduling

**Backtracking:** The general method, application to 8- puzzle problem, 8- queen problem and sum of subsets.

### MODULE -VI

**Branch and Bound:** The method, application to 0/1 Knapsack traveling salesman problems, and efficiency considerations.

### MODULE -VII

**NP- Hard and NP-Complete Problems:** Introduction and basic concepts, non-deterministic turing machine, the classes of P and NP, NP-hard graph problems, NP- completeness of the satisfiability problem, and polynomial- space-bounded problem.

### Text Book:

1. E. Horowitz. et.al., Fundamentals of computer Algorithms, Galgotia Publication Pvt. Ltd., New Delhi, 2004

### Reference Books:

1. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006
2. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi, 2005
3. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005
4. S.Dasgupta et.al. – Algorithms, TMH, New Delhi - 2007

**MODULE – I**

**Background:** Introduction, System Software and Machine Architecture, The Simplified Instructional Computer (SIC), Traditional (CISC) machines, RISC Machines.

**MODULE – II & III**

**Assemblers:** Basic Assembler Functions, Machine – Dependent Assembler Features, Machine – Independent Assembler Features, Assembler Design Options, Implementation Examples.

**MODULE – IV & V**

**Loaders and Linkers:** Basic Loader Functions, Machine - Dependent Loader Features, Machine – Independent Loader Features, Loader Design Options, Implementation Examples.

**MODULE – VI**

**Macro Processors:** Basic Macro Processor Functions, Machine – Independent Macro Processor Features, Macro Processor Design Options, Implementation Examples.

**MODULE – VII**

**Software Engineering Issues:** Introduction to Software Engineering Concepts, System Specifications, Procedural System Design, Object – Oriented Design, System Testing Strategies.

**Text Book:**

1. L. L. Beck – System Software – An Introduction to Systems Programming, 3<sup>rd</sup> Edn., Pearson Education, New Delhi, 2004

**Reference Book:**

1. J.J. Donovan – System Programming, McGraw Hill , New Delhi, 1993.
2. D.M. Dhamdhare – System Programming and Operating Systems, 2<sup>nd</sup> Edn., Tata McGraw Hill , New Delhi, 2000

**MODULE -I**

**Introduction to Compiling:** Compilers, Analysis of the source program. The phase of a compiler, Cousins of the compiler, The grouping of phases, Compiler-constructions tools.

**MODULE -II**

**A Simple One-Pass Compiler:** Syntax definition, Syntax-directed translation, Parsing, A translator for simple expressions, Lexical analysis, Incorporating a symbol table, Abstract stack machines.

**Lexical Analysis:** The role of the lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, A language of specifying lexical analyzers, Design of a lexical analyzer generator.

**MODULE -III & IV**

**Syntax Analysis:** The role of the parser, Writing a grammar, Top-down parsing, Bottom-up parsing, Operator-precedence parsing, LR parsers, Using ambiguous grammars, Parser generators.

**MODULE - V & VI**

**Syntax-Directed Translation:** Syntax-direct definitions, Construction of syntax trees, Bottom-up evaluation of S-attributed definitions, L-attributed definitions, Top-down translation.

**Type Checking:** Type systems, Specification of a simple type checker.

**Run-Time Environments:** Source language issues, Storage organization, Storage-allocation strategies, Access to nonlocal names, Parameter passing, Symbol tables, Language facilities for dynamic storage allocation, Dynamic storage allocation techniques.

**MODULE - VII**

**Intermediate Code Generation:** Intermediate languages, Declarations, Assignment statements, Boolean expressions.

**Code Generation:** Issues in the design of a code generator, Target machine, Run-time storage management, Basic blocks and flow graphs.

**Code Optimization:** Introduction, The Principle sources of optimization

**Text Book:**

1. A.V.Aho, R. Sethi et.al.- Compilers Principles, Techniques, and Tools, 2<sup>nd</sup> Edition, Pearson Education, New Delhi, 2006

**Reference Books:**

1. A.I.Holub -Compiler Design in C, Prentice Hall of India, New Delhi, 1995
2. J.P. Tremblay - The Theory and Practical of Compiler Writing, McGraw Hill, Singapore, 1993.
3. K.C. Loudon- Compiler Construction: Principles and Practice, Thomson Learning, New Delhi, 2005.

**MODULE -I**

**Foundation:** Applications, Requirements, Network Architecture, Implementing Network Software, Performance.

**MODULE –II & III**

**Direct Link Networks:** Hardware Building Blocks, Encoding (NRZ, NRZI, Manchester, 4B/5B), Framing, Error Detection, Reliable Detection, Reliable Transmission, Ethernet (802.3), Token Rings (802.5, FDDI), Wireless (802.11), Network adaptors.

**MODULE –IV & V**

**Internetworking:** Simple Internetworking (IP), Routing, Global Internet, Multicast, Multiprotocol Label Switching (MPLS).

**MODULE -VI**

**End-to-End Protocols:** Simple Demultiplexer (UDP), Reliable Byte Stream (TCP), Remote Procedure Call.

**MODULE -VII**

**Congestion Control and Resource Allocation:** Issues in Resource Allocation, Queuing Disciplines, TCP Congestion Control, Congestion-Avoidance Mechanisms, Quality of Service.

**Text Book:**

1. L.L. Peterson & B.S. Davie- Computer Networks: A Systems Approach, 3<sup>rd</sup> Edition, Morgan Kaufman Publication, New Delhi, 2006

**Reference Books:**

1. A. Forouzan- Data communications and Networking, 4<sup>th</sup> Edn., TMH, New Delhi, 2006
2. P.C. Gupta- Data Communications and Computer Networks, PHI, New Delhi, 2006



**MODULE – I**

**Introduction:** Some Definitions, FAQs about software engineering, The evolving role of software, Software characteristics, SW applications

**Software Processes:** Software process models, Walifull model, the prototyping model, spiral model, RAD and Incremental model.

**MODULE – II**

**Project Management:** Management activities, Project planning, Project scheduling, Risk Management.

**MODULE – III**

**Software Requirements:** Functional and non functional requirements, User requirements, System requirements, The software requirements document. IEEE standard of SRS, Quality of good SRS.

**Requirement Engineering Process:** Feasibility study, Requirements elicitation and analysis, Requirements validation, Requirement management.

**MODULE – IV**

**Software Design:** Design Concepts and Principles, Architectural Design, Object oriented Design, User interface design

**UML:** Class diagram, Sequence diagram, Collaboration diagram

**MODULE – V**

**Verification and Validation:** Verification and Validation Planning, S/W inspection, static analysis.

**Software Testing:** Testing functions, Test care design, White Box testing, Black box testing, Unit testing, Integration Testing, System testing, Reliability.

**MODULE – VI**

**Management: SW cost estimation:** Estimation techniques, Algorithmic cost modelling, Project duration and staffing.

**Quality Management:** Quality assurance and standards, Quality planning, Quality control.

**MODULE – VII**

**Software Change:** Program Evolution Dynamic, S/W Maintance in detail.

**Text Book:**

1. I. Sommerville: Software Engineering, Pearson Education Publication, 7<sup>th</sup> ed.

**Reference Book:**

1. R. S. Pressman: Software Engineering: A Practiioners Approach, 5<sup>th</sup> Edn., TMA, New Delhi.
2. J. F. Peters & W. Pedrycz– Software Engineering, John Wiley & Sons, Inc. 2000
3. A.Behforooz & F.J. Hudson– Software Engineering Fundamentals, Oxford Univ. Press, New York, 2000.

**MODULE – I**

**Circuits and System Representation:** Behavioural, structural and physical representation, Example of a triangular waveform generator and its behavioural, Structural and physical description.

(6)

**Text Book:**

1. "Principle of CMOS VLSI Design A System Perspective", Weste Neil H E & Eshraghian K, Pearson Education, 1993 Chapter 1 (1.6-1.7)

**MODULE – II**

**Basic CMOS Technology:** Basic n-well CMOS Process, P-well process, Twin-tub process, Silicon on insulator, CMOS process enhancements, Metal interconnect, Polysilicon/ refractory metal interconnect, Local interconnect, Circuit elements like resistors, Capacitors, EAROM, Bipolar transistors and thin film transistor.

(7)

**Text Book:**

1. "Principle of CMOS VLSI Design A System Perspective", Weste Neil H E & Eshraghian K, Pearson Education, 1993 Chapter 3 (3.2-3.3)

**MODULE – III**

**Layout Design Rules:** Layer representations, CMOS n-well rules, Design rule backgrounder, Layer assignment, Latch-up problem, Latch-up triggering, Internal latch-up prevention techniques, Resistance estimation, and Capacitance estimation.

(6)

**Text Book:**

1. "Principle of CMOS VLSI Design A System Perspective", Weste Neil H E & Eshraghian K, Pearson Education, 1993 Chapter 3 (3.4-3.5.4); Chapter 4 (4.2-4.3.2)

**MODULE – IV**

**Basic Physical Design of Simple Logic Gates:** Invertor, NAND and NOR gates, Complex logic gates layout, CMOS standard cell design, Gate array layout, Sea-of-gates layout, General CMOS logic gate layout guidelines, Layout optimisation for performance, Transmission gate layout consideration, 2-input multiplexers, I/O structures,  $V_{DD}$  and  $V_{SS}$  pads, Output & input pads, Tri-state and bi-directional pads, Miscellaneous pads.

(7)

**Text Book:**

1. "Principle of CMOS VLSI Design A System Perspective", Weste Neil H E & Eshraghian K, Pearson Education, 1993 Chapter 5(5.3.1-5.3.10; 5.6.1-5.6.7)

**MODULE – V**

**CMOS Analogue Design Method:** Op amp design, OP amp as a comparator, Sample and hold, Analogue layout considerations, Transistor layouts, Centroid design, Capacitor matching, rResistor layout, Noise consideration.

(6)

**Text Book:**

"Analogue Integrated Circuits Design", Johns D and Martin K, John Wiley & Sons, 1997. Chapters 2.4; 5.1; 7.1-7.2; 8.1-8.2

## **MODULE – VI**

**CMOS Digital Design Methods:** Structured design strategies, Hierarchy, Regularity, Modularity, Locality, Design options like PL, Re-programmable gate arrays, Standard Cell design, Behavioural synthesis, RTL synthesis, Logic optimisation, Structural to layout synthesis, Placement, Routing.

(7)

### **Text Book:**

1. "Principle of CMOS VLSI Design A System Perspective", Weste Neil H E & Eshraghian K, Pearson Education, 1993 Chapter 6 (6.2; 6.3.1;6.3.4; 6.3.6;6.4)

## **MODULE – VII**

**CMOS Subsystem Design:** Single bit address, Bit parallel adder, Transmission gate adder, Asynchronous counter, Synchronous counter, RAM, Finite state machines, Multilevel logic.

### **Text Book:**

1. "Principle of CMOS VLSI Design A System Perspective", Weste Neil H E & Eshraghian K, Pearson Education, 1993 Chapter 8 (8.2.1;8.2.5;8.3;8.4.1)

## SEVENTH SEMESTER

CP 7101

PRINCIPLES OF PROGRAMMING LANGUAGES

1.0

### MODULE-I

**Introduction:** Programming Linguistics, Historical Development.

**Data Abstraction:** Program units, packages, and encapsulation, Abstract types, Objects and classes, Implementation notes.

### MODULE -II

**Generic Abstraction:** Generic units and instantiation, Type and class parameters, Implementation notes.

**Type Systems:** Inclusion polymorphism, Parametric polymorphism, Overloading, Type conversions, Implementation notes.

### MODULE -III & IV

**Control Flow:** Sequencers, Jumps, Escapes, Exceptions, Implementation notes

**Concurrency:** Why concurrency, Programs and processes, Problems with concurrency, Process interactions, Concurrency primitives, Concurrent control abstractions.

**Imperative Programming:** Imperative programming: Key concepts, Pragmatics, Case study: C, Case study: ADA.

### MODULE -V

**Object-Oriented Programming:** Key concepts, Pragmatics, Case study: C++, Case study: JAVA, Case study: ADA95.

### MODULE -VI +VII

**Concurrent Programming:** Key concepts, Pragmatics, Case study: ADA95, Case study: JAVA, Implementation notes.

**Functional Programming:** Key concepts, Pragmatics, Case study: HASKELL.

**Logic Programming:** Key concepts, Pragmatics, Case study: PROLOG

**Scripting:** Pragmatics Key concepts, Case study: PYTHON.

### Text Book:

1. David A. Watt – Programming Language Design Concepts, John Wiley, India Edition, 2004.

### Reference Books:

1. R. Sethi and K.V. Viswanatha – Programming Languages: Concepts & Constructs, 2/e, New Delhi-2007.
2. D.Appleby & J.J.Vanda Kopple – Programming Languages: Paradigm and Practice 2/e, TMH, New Delhi – 2005.
3. K.C. Louden – Programming Languages: Principles and Practice, 2/e, Thomson Learning India Edition, 2005.

**MODULE-I**

**Introduction and Overview of Graphics Systems:** Use of Computer graphics, Video Display Devices, Refresh Cathode-Ray Tubes, Raster and Random Scan Displays, Color CRT Monitors, Direct View Storage Tubes, Flat Panel Displays, Three-Dimensional Viewing Devices, Stereoscopic & Virtual Reality Systems, Raster and Random Scan Systems, Different Input and Hard Copy Devices, Graphics Softwares.

**MODULE-II**

**Output Primitives:** Points and Lines, Line Drawing Algorithms (DDA & Bresenham's), Circle and Ellipse Generating Algorithms, Conic Sections.

**MODULE-III**

**Two-Dimensional Geometric Transformations:** Different types of transformations and their matrix representations, Homogeneous Coordinates, Composite Transformations, transformations between Coordinate Systems, Affine transformations, Window-to-Viewport Coordinate transformation, Clipping-Point, Line, Polygon, Curve and Text Clipping.

**MODULE-IV**

**Three-Dimensional Concepts and Object Representation:-** Three Dimensional Display Methods, Polygon Surfaces, Curved Lines & Surfaces, Quadric Surfaces, Spline Representations, Cubic Spline interpolation methods, Bezier Curves and Surfaces.

**MODULE-V**

**Three Dimensional Transformations and Viewing:** Translation, Rotation, Scaling, Reflection, Shears, Composite Transformations, Projections- Parallel and Perspective, Projection Transformations, Clipping.

**MODULE-VI**

**Visible Surface Detection Methods:** Classification of Visible Surface Detection Algorithms, Back Face Detection, Depth Buffer Method, A-Buffer Method, Scan-Line Method, Depth Sorting Method, BSP-Tree Method & Area Subdivision Method.

**MODULE-VII**

**Illumination Models and Surface Rendering:** Light Sources, Basic Illumination Models, Polygon- Rendering Methods.

**Text Book:**

1. D. Hearn & M.P. Baker - Computer Graphics, 2/e , Pearson Education, New Delhi, 2005

**Reference Books:**

1. W.M. Newman. et. al.- Principle of Interactive Computer Graphics, Mc Graw Hill Publication, New Delhi, 1995.
2. S. Harrington -Computer Graphics- A Programming Approach ,Mc Graw Hill Publication, New Delhi, 1994.
3. J.D. Foley et. al- A Fundamental of Computer Graphics Addition Wesley, London, 1993.

**MODULE – I**

**Introduction:** Computational Demand of Modern Science, Advent of Practical Processing, Parallel Processing Terminology – Contrasting Pipelining and Data Parallelism, Control Parallelism, Scalability, Control-Parallel Approach, Data Parallel Approach, Data-Parallel Approach with I/O.

**MODULE – II**

**PARAM Algorithm:** A Model of Serial Computation, The PRAM Model of Parallel Computation, PARAM Algorithm – Parallel Reduction, Prefix Sums, List Ranking, Preorder Tree Traversal, Merging Two Sorted Lists, Graph Colouring. Problem Defining Fast Solutions on PRAMS.

**MODULE – III**

**Processor Array, Multiprocessors and Multicomputers:** Processor Organisation, Processor Arrays, Multiprocessors, Multicomputers, Flynn's Taxonomy, Speedup, Scaled Speedup, and Parallelizability, Problems Defying Fast solutions on PRAMS.

**MODULE – IV**

**Mapping and Scheduling:** Mapping Data to Processors on Processor Arrays Multicomputers, Dynamic Load Balancing on Multicomputers, Static Scheduling on UMA Multiprocessors, Deadlock,

**MODULE – V**

**Elementary Parallel Algorithm:** Classifying MIMD Algorithm, Reduction.

**Matrix Multiplication:** Sequential Matrix Multiplication, Algorithms for Processor Array, Algorithms for Multiprocessors, Algorithms for Multiprocessors.

**MODULE – VI**

**Solving Linear Systems:** Terminology, Back Substitution, ODD-EVEN Reduction, Gaussian Elimination, The JACOBI Algorithm, The Gauss-Seidel Algorithm, Jacobi Overrelaxation and Successive Overrelaxation, Multigrid Methods, Conjugate Gradient.

**MODULE – VII**

**Sorting:** Enumeration Sort, Lower Bounds on Parallel Sorting, BITONIC Merge, Quicksort Based Algorithms,

**Graph Algorithms:** Searching A Graph, Connected Components, All Pairs Shortest Path, Single-Source Shortest Path, Minimum-Cost Spanning Tree.

**Text Book:**

1. M.J. Quinn- Parallel Computing – Theory and Practice 2/e Ed. McGraw Hill Inc. , New York.

**Reference Books:**

2. A. Grama, et.al. Introduction to Parallel Computing, 2/e TMH, New Delhi, 2006
3. K. Hwang & F.A. Briggs-Computer architecture and Parallel Processing, TMH, New Delhi, 2004
4. K. A. Barman & J. L. Paul – Sequential and Parallel Algorithms, Thomson Learning, India Edition, 2003

**MODULE - I**

**Introduction:** Background, Digital Image Representation, Fundamental Steps in Image Processing, Elements of a Digital Image Processing System.

**Digital Image Fundamentals:** Elements of Visual Perception, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels, Imaging Geometry.

**MODULE - II**

**Image Transforms:** Introduction to the Fourier Transform, The Discrete Fourier Transform, Some Properties of the Two-Dimensional Fourier Transform, Other Separable Image Transforms.

**MODULE - III**

**Image Enhancement :** Spatial Domain Methods, Frequency Domain Methods, Some Simple Intensity Transformations, Histogram Processing, Image Subtraction, Image Averaging, Background, Smoothing Filters, Sharpening Filters, Lowpass Filtering, Highpass Filtering, Generation of Spatial Masks from Frequency Domain Specifications.

**MODULE – IV + V**

**Image Restoring:** Degradations Model - Definitions, Degradation Model for Continuous Functions, Diagonalization of Circulant and Block-Circulant Matrices, Circulant Matrices, Block Circulant Matrices, Effects of Diagonalization on the Degradation Model, Algebraic Approach to Restoration, Unconstrained Restoration, Constrained Restoration, Inverse Filtering – Formulation, Removal of Blur Caused by Uniform Linear Motion, Restoration in the Spatial Domain, Geometric Transformation.

**MODULE – VI + VII**

**Image Compression:** Fundamentals – Coding Redundancy, Interpixel Redundancy, Psychovisual Redundancy, Fidelity Criteria. Image Compression Models – The Source Encoder and Decoder, The Channel Encoder and Decoder. Elements of Information Theory – Measuring Information, The Information Channel, Fundamental Coding Theorems, Using Information Theory. Error-Free Compression – Variable-Length Coding, Bit-Plane Coding, Lossless Predictive Coding. Lossy Compression – Lossy Predictive Coding, Transform Coding.

**Text Book:**

1. Rafael. C. Gonzalez & Richard E.Woods.- Digital Image Processing, 2/e Pearson Education, New Delhi - 2006

**Reference Books:**

1. W.K.Pratt.-Digital Image Processing ,3/e Edn., John Wiley & sons, Inc. 2006
2. M. Sonka et.al Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.

**MODULE – I**

Introduction to Genetic Algorithm, Genetic Algorithms, Traditional and Search Methods and their Differences, A Simple Genetic Algorithm.

**MODULE - II**

**Genetic Algorithms Revisited:** The Fundamental Theorem, Schema Processing.

**MODULE - III**

Two & k-Armed Bandit Problem, Hypothesis, Schemata and Revisited.

**MODULE – IV + V**

**Computer Implementation of A Genetic Algorithm:** Data Structures, Reproduction, Crossover and Mutation, A Time to Reproduce, A Time to Cross, How Well Does It Work, Mapping Objective Functions to Fitness Form, Fitness Scaling, Coding, A Multiparameter Mapped, Fixed-Point Coding, Discretization, Constraints.

**MODULE – VI + VII**

**Applications of Genetic Algorithms:** The Rise of Genetic Algorithms, Genetic Algorithm Applications of Historical Interest, De Jong and Function Optimization, Improvements in Basic Technique, Current Applications of Genetic Algorithms.  
Genetics-Based Machine Learning, Whence It Came, What is Classifier System, Rule and Message, Genetic Algorithm.

**Text Book:**

1. D.E. Goldberg -Genetic Algorithms in Search Optimization and Machine Learning, Pearson Education, New Delhi, 2005.

**Reference Books:**

1. M. D. Vose – The Simple Genetic Algorithm, PHI, New Delhi, 2004.



**MODULE - I**

**Analog Signal Transmission and Reception:** Introduction to Modulation, Amplitude Modulation (AM), Angle Modulation.

**MODULE - II**

**Random Processes:** Probability and Random Variables, Random Processes: Basic Concepts, Random Processes in the Frequency Domain, Gaussian and White Processes, Bandlimited Processes and Sampling

**MODULE – III + IV**

**Effect of Noise on Analog Communication Systems:** Effect of Noise on Linear- Modulation Systems, Carrier-Phase Estimation with a Phase-Locked Loop (PLL), Effect of Noise on Angle Modulation, Comparison of Analog-Modulation Systems, Effects of Transmission Losses and Noise in Analog Communication Systems, Quantization, Waveform Coding, Analysis-Synthesis Techniques, Digital Audio Transmission and Digital Audio Recording.

**MODULE - V**

**Digital Transmission through the Additive White Gaussian Noise Channel:** Geometric Representation of Signal Waveforms, Pulse Amplitude Modulation, Two-dimensional Signal Waveforms, Multidimensional Signal Waveforms, Optimum Receiver for Digitally Modulated Signals in Additive White Gaussian Noise, Probability of Error for Signal Detection in Additive White Gaussian Noise.

**MODULE - VI**

**Digital Transmission through Bandlimited Awgn Channels:** Digital Transmission through Bandlimited Channels, The Power Spectrum of Digitally Modulated Signals, Signal Design for Bandlimited Channels, Probability of Error in Detection of Digital PAM.

**MODULE - VII**

**Channel Capacity and Coding:** Modeling of Communication Channels, Channel Capacity, Bounds on Communication, Coding for Reliable Communication, coding for Reliable communication.

**Text Book:**

1. J.G.Proakis and M.Salehi – Communication System Engineering 2/e, Pearson Education, New Delhi, 2005

**Reference Book:**

1. H.Taub and D.L. Schilling – Principles of Communication Systems, 2/e TMH, New Delhi , 2000.
2. S.Haykin – Communication Systems 4/e, John Wiley, New Delhi, 2002.

**MODULE - I**

**Recurrent Networks And Temporal Feedforward Networks:** Introduction, Overview of Recurrent Neural Networks, Hopfield Associative Memory , Simulated Annealing, Boltzmann Machine , Overview of Temporal Feedforward Networks, Simple Recurrent Network, Time-Delay Neural Networks, Distributed Time-Lagged Feedforward Neural

**MODULE - II**

**Neural Networks For Optimization Problems:** Introduction, Neural Networks for Linear Programming Problems, Neural Networks for Quadratic Programming Problems, Neural Networks for Nonlinear Continuous Constrained Optimization Problems.

**MODULE - III**

**Solving Matrix Algebra Problems With Neural Networks:** Introduction, Inverse and Pseudoinverse of a Matrix, LU Decomposition, QR Factorization, Schur Decomposition, Spectral Factorization- Eigenvalue Decomposition (EVD) (Symmetric Eigenvalue Problem), Neural Network Approach for the Symmetric Eigenvalue Problem.

**MODULE – IV+V**

**Solution Of Linear Algebraic Equations Using Neural Networks:** Introduction, Systems of Simultaneous Linear Algebraic Equations, Least-Squares Neurocomputing Approach for Solving Systems of Linear Equations, Conjugate Gradient Learning Rule for Solving Systems of Linear Equations, A Generalized Robust Approach for Solving Systems of Linear Equations Corrupted with Noise, Regularization Methods for Ill-Posed Problems with Ill-Determined Numerical Rank, Matrix Splittings for Iterative Discrete-Time Methods for Solving Linear Equations.

**MODULE - VI**

**Statistical Methods Using Neural Networks:** Introduction, Principal-Component Analysis, Learning Algorithms for Neural Network Adaptive Estimation of Principal Components, Principal- Component Regression, Partial Least-Squares Regression, A Neural Network Approach for Partial Least-Squares Regression.

**MODULE - VII**

**Identification, Control, And Estimation Using Neural Networks:** Introduction, Linear System Representation, Autoregressive Moving Average Models , Identification of Linear Systems with ARMA Models, Parametric System Identification of Linear Systems Using PLSNET, Nonlinear System Representation, Identification and Control of Nonlinear Dynamical.

**Text Book:**

1. M. Ham & I. Kostanic – Principles of Neurocomputing for Science & Engineering, TMH, New Delhi, 2002.

**MODULE -I**

**Introduction to Linear Programming:** Prototype Example, The Linear Programming Model, Assumptions of Linear Programming, Additional Examples, Some Classic Case Studies.

**Solving Linear Programming Problems- The Simplex Method:** The Essence of the Simplex Method, Setting Up the Simplex Method, The Algebra of the Simplex Method, The Simplex Method in Tabular Form, Tie Breaking in the Simplex Method, Adapting to Other Model Forms, Postoptimality Analysis.

**MODULE -II**

**The Theory of The Simplex Method:** Foundations of the Simplex Method, The revised Simplex Method, A Fundamental Insight.

**Duality Theory And Sensitivity Analysis:** The Essence of Duality Theory, Economic Interpretation of Duality, Primal-Dual relationships, Adapting to Other Primal Forms, The Role of Duality Theory in Sensitivity Analysis.

**MODULE -III**

**Other Algorithms for Linear Programming:** The Dual Simplex Method, Parametric Linear Programming, The Upper Bound Techniques, An Interior-Point Algorithm.

**Network Optimization Models:** Prototype Example, The Terminology of Networks, The Shortest-Path Problem, The Minimum Spanning Tree Problem, The Maximum Flow Problem, The Minimum Cost flow Problem, The Network Simplex Method.

**MODULE -IV**

**Dynamic Programming:** A Prototype Example for Dynamic Programming, Characteristics of Dynamic Programming Problems, Deterministic Dynamic Programming, Probabilistic Dynamic Programming.

**MODULE -V**

**Integer Programming:** Prototype Example, Some BIP Applications, Innovative Uses of Binary Variables in Model Formulation, Some Formulation examples, Some Perspectives on Solving Integer Programming Problems, The Branch-and-Bound Technique and Its Application to Binary Integer Programming, A Branch-and-Bound Algorithm for Mixed Integer.

**MODULE -VI**

**Nonlinear Programming:** Sample Applications, Graphical Illustration of Nonlinear Programming Problems, Types of Nonlinear Programming Problems, One-Variable Unconstrained Optimization, Multivariable Unconstrained Optimization, The Karush-Kuhn-Tucker (KKT) Conditions for Constrained Optimization, Quadratic Programming, Separable Programming, Convex Programming.

**MODULE -VII**

**Queueing Theory:** Prototype Example, Basic Structure of queueing Models, Examples of Real Queueing Systems, The role of the Exponential Distribution, The Birth-and-Death Process, Queueing Models Based on the Birth-and Death Process, Queueing Models Involving Nonexponential Distributions.

**Text Book:**

1. S. Hiller & G.J. Lieberman – Operations Research, 8<sup>th</sup> Edn, TMH, New Delhi – 2006.

**Reference Books:**

1. H.A.Taha – Operations Research, 8/e, Pearson Education, New Delhi-2007.
2. J.K. Sharma – Operations Research, 3/e, Mcmillan, India Ltd, 2007.

**MODULE - I**

**Computational Models:** The concepts of a computational model, Basic Computational models. The Van Neumann Computational model, Key concepts,

**MODULE - II**

**Introduction to Parallel Processing:** Basic Concepts, Types and Levels of Parallelism, Classification of Architectures, Basic parallel techniques. Relationship between languages and parallel architectures.

**MODULE - III**

**Instruction to Data – Parallel Architecture:** Introduction, connectivity Alternative architectural class.

**SIMD Architecture:** Introduction, Design Space, Fiver-grained SIMD architectures, Coarse-grained SIMD architectures.

**MODULE - IV**

**Data – Parallel Pipelined and Systolic Architectures:** Introduction, Pipelines, Systolic architecture.

**Vector Architecture:** Introduction, word length, Vectorization, pipelining parallel computing streams, Technology.

**MODULE - V**

**MIMD and Multi-threaded Architectures:** Introduction, Computational models, Dataflow architectures, Hybrid multithread architecture.

**MODULE - VI**

**Distributed memory architectures :** Introduction, Direct interconnect networks, Fine medium, Grain systems, coarse – grain multicomputers.

**MODULE - VII**

**Shared Memory MMD Architecture:** Introduction, Dynamic interconnection, networks, cache coherence synchronization and event ordering in multiprocessor.

**Text Book:**

1. D. Sima, T. Fountain & P. Kacsuk. Advanced Computer Architectures, Pearson Education, New Delhi – 2006.

**Reference Books:**

1. K. Hwang & F. A. Briggs – Computer Architecture and Parallel Processing, TMH, New Delhi 2004.
2. K. A. Parthasarathy et.al – Advanced Computer Architecture, 2/e, Thomson Learning, Indian Edition, 2006.

**MODULE - I**

Security Services, Mechanisms and Attacks, The OSI Security Architecture, A Model for Network Security. Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.

**MODULE - II**

Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.

**MODULE - III**

**Finite Fields and Confidentiality:** Groups, Rings, and Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields of the Form  $GF(p)$ , Polynomial arithmetic, Finite Fields of the Form  $GF(2^n)$ , Placement of Encryption Function, Traffic Confidentially, Key Distribution, Random Number Generation.

**MODULE – IV**

**Encryption Standard and Ciphers:** Evaluation criteria for AES, AES cipher, Multiple encryption and Triple DES, Block cipher Modes of operation, Stream ciphers and RCG.

**MODULE - V**

**Number Theory and Public-Key Cryptography:** Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Principles of Public-Key Cryptosystems, The RSA Algorithm,

**MODULE – VI + VII**

**Message Authentication, Function, Algorithms and Digital System:** Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs, Secure Hash Algorithm, HMAC, Digital Signatures, Authentication Protocols.

**Text Book:**

1. W.Stallings : Cryptography and Network Security : Principles and Practice, 4/e Pearson Education, New Delhi, 2006.

**Reference Books:**

1. B.A. Forouzan – Cryptography and Network Security, TMH, New Delhi, 2007
2. B. Schneier – Applied Cryptography, John Wiley, Indian Edition, 2006.

**MODULE – I**

**Molecular Biology and Biological Chemistry:** The Generic Material: Nucleotides, Orientation, Base Pairing, The Central Dogma of Molecular Biology, Gene Structure and Information Content: Promoter Sequences, The Genetic Code, Open Reading Frames, Introns and Exons, Protein Structure and Function: Primary Structure, Secondary, Tertiary, and Quaternary Structure, The Nature of Chemical Bonds: Anatomy of an Atom, Valence, Electronegativity, Hydrophilicity and Hydrophobicity, Molecular Biology Tools: Restriction Enzyme Digests, Gel Electrophoresis, Blotting and Hybridization, Cloning, Polymerase Chain Reaction, DNA Sequencing, Genomic Information Content: C-Value Paradox, Reassociation Kinetics.

**MODULE – II**

**Data Searches and Pairwise Alignments:** Dot Plots, Simple Alignments, Gaps: Simple Gap Penalties, Origination and Length Penalties, Scoring Matrices, Dynamic Programming: The Needleman and Wunsch Algorithm, Global and Local Alignments: Semiglobal Alignments, The Smith-Waterman algorithm, Database Searches: BLAST and Its Relatives, FASTA and Related Algorithms, Alignment Scores and Statistical Significance of Database Searches, Multiple Sequence Alignments.

**MODULE – III**

**Substitution Patterns:** Estimating Substitution Numbers: Jukes-Cantor Model, Transitions and Transversions, Kimura's Two-Parameter Model, Models With Even More Parameters, Substitutions Between Protein Sequences, Variations in Evolutionary Rates Between Genes.

**MODULE –IV**

**History of Molecular Phylogenetics:** Advantages to Molecular Phylogenies, Phylogenetic Trees: Terminology of Tree Reconstruction, Rooted and Unrooted Trees, Gene vs. Species Trees, Character and Distance Data, Distance Matrix Methods: UPGMA, Estimation of Branch Lengths, Transformed Distance Method, Neighbor's Relation Method, Neighbor-Joining Methods, Maximum Likelihood Approaches, Multiple Sequence Alignments.

**MODULE –V**

**Character – Based Methods of Phylogenetics:** Parsimony: Informative and Uninformative Sites, Unweighted Parsimony, Weighted Parsimony, Inferred Ancestral Sequences, Strategies for Faster Searches: Branch and Bound, Heuristic Searches, Consensus Trees, Tree Confidence: Bootstrapping, Parametric Tests, Comparison of Phylogenetic Methods, Molecular Phylogenies: The Tree of life, Human Origins.

**MODULE –VI**

**Genomics and Gene Recognition:** Prokaryotic Genomes, Prokaryotic Gene Structure: Promoter Elements, Open Reading Frames, Conceptual Translation, Termination Sequences, GC Content in Prokaryotic Genomes, Prokaryotic Gene Density, Eukaryotic Genomes, Eukaryotic Gene Structure: Promoter Elements, Regulatory Protein Binding Sites, Open Reading Frames: Introns and Exons, Alternative Splicing, GC Content in Eukaryotic Genomes: CpG Islands, Isochores, Codon Usage Bias, Gene Expression: cDNAs and ESTs, Serial Analysis of Gene Expression, Microarrays.

**MODULE -VII**

**Protein and RNA Structure Prediction:** Amino Acids, Polypeptide Composition, Secondary Structure: Backbone Flexibility, Accuracy of Predictions, The Chou-Fasman and GOR Methods, Tertiary and Quaternary Structure: Hydrophobicity, Disulfide Bonds, Active Structures vs. Most Stable Structures, Algorithms for Modeling Protein Folding: Lattice Models, Off-Lattice Models, Energy Functions and Optimization, Structure Prediction: Comparative Modeling, Threading: Reverse Protein Folding, Predicting RNA Secondary Structures.

**Text Book:**

1. D.E. Krane & M.L. Raymer - Fundamental Concepts of Bioinformatics, Pearson Education, New Delhi-2003.

**Reference Books:**

1. S.C. Rastogi et.al.- Bioinformatics: Methods and Applications, PHI, New Delhi-2005.
2. V.R. Srinivas - Bioinformatics: A Modern Approach, PHI, New Delhi-2005.
3. A.M. Lesk – Introduction to Bioinformatics, Oxford (Indian Edn), New Delhi-2004.

**MODULE-I**

**What Is Object-Orientation:** Introduction, Basic Concepts, The Origins of Object-Oriented languages Today.

**Modelling Concepts:** Introduction, Models and diagrams, Drawing Activity Diagrams.

**MODULE -II + III**

**Requirements Capture:** Introduction, User Requirements, Fact Finding Techniques, User Involvement, Documenting Requirements, Use Cases, Requirements Capture and Modelling.

**Requirements Analysis:** Introduction, What Must a Requirements Model Do, Use Case Realization, The Class Diagram, Drawing a Class Diagram, CRC (Class Responsibility Collaboration) Cards, Assembling the Analysis Class Diagram.

**Refining The Requirements Model:** Introduction, Component-based Development, Adding Further Structure, Software Development Patterns.

**MODULE -IV**

**Object Interaction:** Introduction, Object Interaction and Collaboration, Interaction Sequence Diagrams, Collaboration Diagrams, Model Consistency.

**Specifying Operations:** Introduction, The Role of Operation Specifications, Contracts, Describing Operation Logic, Object Constraint Language, Creating an Operation Specification.

**MODULE -V**

**Specifying Control:** Introduction, States and Events, Basic Notation, Further Notation, Preparing a Statechart, Consistency Checking, Quality Guidelines, Summary.

**Moving Into Design:** Introduction, How is Design Different from Analysis, Logical and Physical Design, System Design and Detailed Design, Qualities and Objectives of Analysis and Design, Measurable Objectives of Analysis and Design, Measurable Objectives in Design, Planning for Design.

**MODULE -VI**

**System Design:** Introduction, The Major Elements of System Design, Software Architecture Concurrency, Processor Allocation, Data Management Issues, Development Standards, Prioritizing Design Trade-offs, Design for Implementation.

**OBJECT DESIGN:** Introduction, Class Specification, Interfaces, Criteria for Good Design, Designing Associations, Integrity Constraints, Designing Operations, Normalization.

**MODULE -VII**

**Design Patterns:** Introduction, Software Development Patterns, Documenting Patterns-Pattern Templates, Design Patterns, How to Use Design Patterns, Benefits and Dangers of Using Patterns.

**Designing Boundary Classes:** Introduction, The Architecture of the Presentation Layer, Prototyping the User Interface, Designing Classes, Designing Interaction with Sequence Diagrams, The Class Diagram Revisited, User Interface Design Patterns, Modelling the Interface Using Statecharts.



**Text Books:**

1. S.Bennett, S.Mc Robb and R.Farmer – Object- Oriented Systems Analysis and Design Using UML 2<sup>nd</sup> edn, TMH, New Delhi – 2007.

**Reference Book:**

1. M.Blaha and J.Runbangh – Object- Oriented Modeling and Design with UML 2./e, Pearson Education, New Delhi,2007.
2. J.W. Satzinger, B.R. Jackson and S.D. Burd – Object –Oriented Analysis and Design, Thomson Learning, India Edition, 2007.
3. G. Booch – Object Oriented Analysis and Design with Applications,2/e, CA;Benjamin/Cumming,1994.

**MODULE – I**

**Managing Software Project:** Process & Project Management, Project Management and the CMM, Project Management at Infosys, Introduction to CMMI, PCMM.

**The Project Planning Infrastructure:** The process data base, The process capability Baseline, Process Assets and the Body of Knowledge System.

**MODULE – II**

**Process Planning:** The Infosys Development Process, Requirement Change Management

**Effort Estimation & Scheduling:** Estimation and Scheduling Concepts, Effort – Estimation, Scheduling.

**MODULE – III**

**Quality Planning:** Quality Concepts, Quantitative quality Management Planning, Defect Prevention Planning.

**Risk Management:** Concepts of Risks and Risk Management, Risk Assessment, Risk Control, Examples.

**MODULE – IV**

**Measurement and Tracking Planning:** Concepts in measurement, Measurements, Project tracking.

**Project Management Plan:** Team Management, Customer Communication and Issue Resolution, Structure of the Project Management Plan.

**MODULE – V**

**Configuration Plan:** Concepts in Configuration Management, Configuration Management Process.

**Reviews:** The Reviews, Review process Data Collection, Monitoring & Control, Introduction of Reviews & the NAH Syndrome.

**MODULE – VI**

**Project Monitoring & Control:** Project tracing, Milestone Analysis, Activity Level Analysis using SPC, Defect Analysis & Prevention Process Monitoring & audit.

**MODULE – VII**

**Project Closure:** Project closure Analysis.

**Text Book:**

1. Pankaj Jalote – Software Project Management in Practice, Pearson Education, New Delhi, 2002

**Reference Books:**

1. B.Huges and M.Cotterell – Software Project Management, 3/e, Tata Mcgraw Hill, New Delhi, 2004.
2. Pankaj Jalote – CMM in Practice, Pearson Education, New Delhi, 2002
3. W. Humphrey – Managing the Software Process, Addison – Wesley, 1989.

**MODULE – I**

Wireless Communication Systems & Standards: Evolution of Mobile Radio Communications, Different generations (1G to 4G) of Cellular Networks, GSM, UMTS, GPRS, EDGE, Cellular telephone systems, WLAN, WLL, Bluetooth, PAN.

**Text Books:**

1. T. S. Rappaport - Wireless Communications: Principles and, Prentice Hall.
2. Roy Blake - Wireless Communication Technology, Thomson – Delmar.

**MODULE – II**

Propagation & Fading: Propagation path loss, Free-space propagation model, Outdoor propagation models (Okumura model & Hata model), Indoor propagation models (Partition Losses in the same floor and between floors), Multipath fading, time dispersive and frequency dispersive channels, delay spread and coherence bandwidth, LCR and ADF.

**Text Books:**

1. T.S. Rappaport- Wireless Communication: Principles & Practice, Prentice Hall.
2. W. C. Y. Lee- Mobile Cellular Telecommunications Systems.

**MODULE – III**

Diversity & Combining Techniques: Diversity Schemes (Space, frequency, field and polarization diversities) and combining techniques.

**Text Book:**

1. T.S. Rappaport - Wireless Communications: Principles and Practice, Prentice Hall.

**MODULE – IV**

Mobile Radio Interferences & System Capacity: Co-channel Interference and System Capacity, Channel planning for Wireless Systems, Adjacent channel interferences, Power control for reducing interference, Near-end-to-far-end interference, Inter-symbol and Simulcast interference, False alarm rate and word error rate.

**Text Books:**

1. T. S. Rappaport - Wireless Communication: Principles & Practice, Prentice Hall.
2. W. C. Y. Lee - Mobile Cellular Telecommunications Systems.

**MODULE – V**

The Cellular Concept: Frequency Assignment and Channel Assignment, Frequency Reuse, Handoff, Sectoring, Repeaters for range extension, Microcell zone, Spectral efficiency, DS-SS, FH-SS.

**Text Books:**

1. T.S. Rappaport- Wireless Communication: Principles & Practice, Prentice Hall.
2. W. C. Y. Lee- Mobile Cellular Telecommunications Systems.

**MODULE – VI**

**Antenna Design Parameters:** Antennas used for Mobile Communications, Radiation patterns, Smart antenna (basic concept), Antenna location, Spacing and height in the base station and at the mobile unit.

**Text Books:**

1. Roy Blake - Wireless Communication Technology, Thomson-Delmar.
2. W. C. Y. Lee - Mobile Cellular Telecommunications Systems.

## **MODULE – VII**

**Multiple Access Techniques:** FDMA, TDMA, CDMA, SDMA, OFDM, DS-SS, FH-SS, TH-SS, Capacity of Cellular Systems, Capacity of Cellular CDMA, WCDMA.

### **Text Books:**

1. T.S. Rappaport- Wireless Communication: Principles & Practice, Prentice Hall.
2. W. C. Y. Lee- Mobile Cellular Telecommunications Systems.

## EIGHTH SEMESTER

CP 8101

Artificial Intelligence & Expert Systems

1.0

### MODULE – I

**Overview of Artificial Intelligence:** Definition & Importance of AI.

**Knowledge: General Concepts:** Introduction, Definition and Importance of Knowledge, Knowledge-Based Systems, Representation of Knowledge, Knowledge Organization, Knowledge Manipulation, Acquisition of Knowledge.

### MODULE – II

**LISP and Other AI Programming Languages :** Introduction to LISP : Syntax and Numeric Function, Basic List Manipulation Functions in LISP, Functions, Predicates and Conditionals, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, PROLOG and Other AI Programming Languages.

### MODULE – III

**Knowledge Representation :** Introduction, Syntax and Semantics for Propositional logic, Syntax and Semantics for FOPL, Properties of Wffs, Conversion to Clausal Form, Inference Rules, The Resolution Principle, No deductive Inference Methods, Representations Using Rules.

### MODULE – IV

**Dealing With Inconsistencies and Uncertainties:** Introduction, Truth Maintenance Systems, Default Reasoning and the Closed World Assumption, Predicate Completion and Circumscription, Modal and Temporal Logics.

**Probabilistic Reasoning :** Introduction, Bayesian Probabilistic Inference, Possible World Representations, Dumpster-Shafer Theory, Ad-Hoc Methods.

### MODULE – V

**Structured Knowledge:** Graphs, Frames and Related Structures: Introduction, Associative Networks, Frame Structures, Conceptual Dependencies and Scripts.

**Object-Oriented Representations:** Introduction, Overview of Objects, Classes, Messages and Methods, Simulation Example using an OOS Program.

### MODULE – VI

**Search and Control Strategies:** Introduction, Preliminary Concepts, Examples of Search Problems, Uninformed or Blind Search, Informed Search, Searching And-Or Graphs.

**Matching Techniques:** Introduction, Structures Used in Matching, Measures for Matching, Matching Like Patterns, Partial Matching.

### MODULE – VII

**Knowledge Organization and Management:** Introduction, Indexing and Retrieval Techniques, Integrating Knowledge in Memory, Memory Organization Systems.

**Expert Systems Architectures:** Introduction, Rule Based System Architecture, Non-Production System Architecture, Dealing with uncertainty, Knowledge Acquisition and Validation, Knowledge System Building Tools.

### Text Book :

1. Dan W. Patterson - Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.

### Reference Books:

1. E. Rich & K. Knight - Artificial Intelligence, 2/e, TMH, New Delhi, 2005.
2. P.H. Winston - Artificial Intelligence, 3/e, Pearson Edition, New Delhi, 2006.
3. D.W. Rolston,- Principles of AI & Expert System Development, TMH, New Delhi.

**MODULE-I**

**Basic Simulation Modeling:-** The nature of Simulation, Systems, Models, and Simulation, Discrete- Event Simulation, Simulation of a Single-Server Queueing System, Simulation of an Inventory System, Alternative Approaches to Modeling and Coding Simulations, Steps in a Sound Simulation Study, Other Types of Simulation, Advantages, Disadvantages, and Pitfalls of Simulation.

**MODULE -II**

**Modeling Complex Systems:-** List Processing in Simulation, Single-Server Queueing Simulation with Simlib, Time-Shared Computer Model, Multiteller Bank with Jockeying, Job-Shop Model, Efficient Event-List Manipulation.

**MODULE -III**

**Simulation Software:-** Introduction, Comparison of Simulation Packages with Programming Languages, Classification of Simulation Software, Desirable Software Features, General-Purpose Simulation Packages, Object-Oriented Simulation.

**MODULE -IV**

**Building Valid, Credible, and Appropriately Detailed Simulation Models:-** Introduction and Definitions, Guidelines for Determining the Level of Model Detail, Verification of Simulation Computer Programs, Techniques for Increasing Model Validity and Credibility.

**MODULE -V**

**Selecting Input Probability Distribution:-** Introduction, Useful Probability Distributions, Techniques for Assessing Sample Independence, Activity I: Hypothesizing Families of Distributions, Activity II: Estimation of Parameters, Activity III: Determining How Representative the Fitted Distributions Are.

**MODULE -VI**

**Random- Number Generators:-** Linear Congruential Generators, Other Kinds of Generators, Testing Random-Number Generators.

**MODULE -VII**

**Generating Random Variates:-** Introduction, General Approaches to Generating Random Variates, Generating Continuous Random Variates, Generating Discrete Random Variates.

**Text Book:**

1. A.M.Law & W.D. Kelton- Simulation Modeling and Analysis, 4/e, Tata McGraw Hill, New Delhi, 2006.

**Reference Books :**

1. J. Banks et.al. Discrete – Event System Simulation, 4/e, Pearson Education, New Delhi, 2007.
2. A.F. Seila et.al. Applied Simulation Modeling, Thomson Learning, India Edition, 2004.
3. G. Gordon – System Simulation, PHI, New Delhi, 2006.

**MODULE-I**

**Characterization of Distributed Systems:** Introduction, Examples of distributed systems, Resource sharing and the Web, Challenges.

**System Models:** Introduction, Architectural models, Fundamental models, Summary.

**MODULE -II**

**Networking and Internetworking:** Introduction, Types of network, Network Principles, Internet protocols, Case studies: Ethernet, WiFi, Bluetooth and ATM.

**MODULE -III**

**Interprocess Communication:** Introduction, The API for the Internet protocols, External data representation and marshalling, Client-server communication, Group communication, Case study : interprocess communication in UNIX.

**MODULE -IV**

**Time and Global States:** Introduction, Clocks, events and process states, Synchronizing physical clocks, Logical time and logical clocks, Global states, Distributed debugging.

**Coordination and Agreement:** Introduction, Distributed mutual exclusion, Elections, Multicast communication.

**MODULE -V**

**Transactions and Concurrency Control:** Introduction, Transactions, Nested transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

**MODULE -VI**

**Distributed Transactions :** Introduction, Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions. Distributed deadlocks, Transactions recovery.

**MODULE -VII**

**Replication:** Introduction, System model and group communication, Fault-tolerant services, Case studies of highly available services: the gossip architecture, Bayou and Coda, Transaction with replicated data.

**Text Book:**

1. G. Coulouris et. al. - Distributed Systems: concepts and Design, 4/e, Pearson Education, New Delhi.

**MODULE-I**

**Introduction:** Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought, and Understanding, The State of the Art and the Near-Term Future.

**Regular Expressions and Automata:-** Regular Expressions, Finite-State Automata, Regular Languages and FSAs.

**MODULE -II**

**Word Classes and Part-of –Speech Tagging:** (Mostly) English Word Classes, Tagsets for English, Part-of –Speech Tagging, Rule-Based Part-of –Speech Tagging, Stochastic Part-of –Speech Tagging, Transformation-Based Tagging, Other Issues.

**MODULE -III**

**Context-Free Grammars for English:-** Constituency, Context-Free Rules and Trees, Sentences-Level Constructions, The Noun Phrase, Coordination, Agreement, The Verb Phrase and Subcategorization, Auxiliaries, Spoken Language Syntax, Grammar Equivalence and Normal Form, Finite-State and Context- Free Grammars, Grammars and Human Processing.

**MODULE -IV**

**Parsing with Context-Free Grammars:-** Parsing as Search, A Basic Top-Down Parser, Problems with the Basic Top-Down Parser, The Early Algorithm, Finite – State Parsing Methods.

**MODULE - V**

**Features and Unification:-** Feature Structures, Unification of Features Structures, Features Structures in the Grammar, Implementing Unification, Parsing with Unification Constraints, Types and Inheritance.

**MODULE -VI**

**Representing Meaning:-** Computational Desiderata for Representations, Meaning Structure of Language, First Order Predicate Calculus, Some Linguistically Relevant Concepts.

**Semantic Analysis:-** Syntax-Driven Semantic Analysis, Attachments for a Fragment of English, Integrating Semantic Analysis into the Early Parser, Idioms and Compositionality, Robust Semantic Analysis.

**MODULE -VII**

**Discourse:-** Reference Resolution, Text Coherence, Discourse Structure, Psycholinguistic Studies of Reference and Coherence.

**Natural Language Generation:-** Introduction to Language Generation , An Architecture for Generation , Surface Realization, Discourse Planning, Other Issues.

**Text Book:**

- 1 D.Jurafsky & J.H.Martin- Speech and Language Processing, 4<sup>th</sup> Edn, Pearson Education, 2005.

**Reference Book :**

- 1 J. Allen – Natural Language Understanding, Pearson Education, New Delhi, 2006.



**MODULE-I**

**Geometric Data Structures:** Points, Polygons, Edges, Geometric objects in space, Finding intersection of a line and a triangle.

**MODULE -II + III**

**Incremental Insertion:** Finding star shaped polygons, finding convex hulls, point enclosure: The ray – shooting and the signed angle method, line clipping, polygon clipping, triangulating monotone polygons.

**MODULE -IV**

**Incremental selection:** Different methods for finding convex hulls, Removing hidden surfaces, intersection of convex polygons, Finding Delaney triangulations.

**MODULE -V**

**Plane – sweep algorithms:** Finding the intersections of line segments, finding convex hulls, contour of the union of rectangles, Decomposing polygons into monotone pieces.

**MODULE -VI**

**Divide and conquer Algorithms:** Computing the intersection of half planes, Finding the kernel of polygon, finding voronoi regions, Merge Hull, closest points, polygon triangulation.

**MODULE -VII**

**Spatial subdivision Methods:** The Grid method, quad trees, Two-dimensional search tree, Removing hidden surfaces.

Text Book :

1. Michael J. Laszlo - Computational Geometry and computer graphics in C++, PHI, New Delhi, 1999.

**MODULE-I**

**Embedded Computing:** Introduction, Complex systems and Microprocessors, The embedded system design process, Formalization for system design.

**MODULE -II+III**

**Instruction Sets CPUs:** Instruction and preliminaries ARM and SHARC Processors, Programming I/O CPU performance and Power consumption.

**MODULE -IV + V**

**The embedded Computing Platform and program design:** Introduction, the CPU bus, Component interfacing, designing with microprocessors, development and debugging.

**MODULE -VI + VII**

**Program Design and Analysis:** Introduction program design, Assembly, Linking, Basic compilation techniques, Analysis optimisation of executive time.

**Text Book :**

1. Wayner Wolf., "Computers as components – Principle of Embedded Computing System Design", Morgan Kaufmann/ Hercourt India Pvt. Ltd.

**Reference Books :**

1. Raj Kamal - Embedded Systems, TMH, New Delhi 2004.
2. F. Vahid & T. Givargis- Embedded system Design, John Wiley, India Edition, 2005.

**MODULE-I +II**

**Introduction:** Branch-overlapping Aspects of Multimedia, Content, Global Structure.

**Media and Data Streams:** Medium, Main properties of a multimedia stream, Multimedia System Definition, combination of media, Independence, Computer-supported Integration, communication system.

**MODULE -III**

**Multimedia:** Traditional Data Streams Characteristics, Data stream Characteristics for continuous media.

**Sound/Audio:** Basic Sound Concepts, Speech.

**MODULE -IV**

**Images and Graphics:** Basic concepts, Computer Image processing.

**Video and Animation:** Basic concepts, Television, Computer-based Animation, Data compression.

**MODULE -V**

**Data Compression:** Storage space, Coding Requirement, Basic Compression Techniques JPEG.

**MODULE -VI**

**Multimedia Operating System:** Introduction, Real time, Resource Management, Process management, File system, Additional operating System Issues.

**MODULE -VII**

**Multimedia Communication System:** Application subsystem, Transport Subsystem, quality of Service and Resource Management.

**Text Book:**

1. Ralf Steinmetz and Klara Nahrstedt.m Multimedia: Computing, Communications Applicatios, Pearson Education, New Delhi 2006.

**Reference Books:**

1. P.K. Andleigh – Multimedia Systems Design, PHI, New Delhi-2005.
2. R. Parekh – Principles of Multimedia, TMH, New Delhi -2006.

**MODULE-I**

**Representing Curves and Surfaces:** Polygon Meshes, Parametric Cubic Curves, Parametric Bicubic Surfaces, Quadratic Surfaces.

**MODULE -II**

**Achromatic and Colored Light Achromatic** Light, Chromatic Color, Color Models for Raster Graphics, Reproducing color, Using Color in Computer Graphics.

**MODULE -III**

**The Quest for Visual Realism** Why Realism, Fundamental Difficulties, Rendering Techniques for Line Drawings, Rendering Techniques for Shaded Images, Improved Object Model, Dynamics, Stereopsis, Improved Displays, Interacting with Our Other Senses, Aliasing and Antialiasing.

**MODULE -VI**

**Visible-Surface Determination:** Functions of Two Variables, Techniques for Efficient Visible-Surface Algorithms, Algorithms for Visible-Line Determination, The z-Buffer Algorithm, List Priority Algorithms, Scan-Line Algorithms, Area-Subdivision Algorithms, Algorithms for Octrees, Algorithms for Curved Surfaces, Visible-Surface Ray Tracing.

**MODULE -V**

**Illumination and Shading :** Illumination Models, Shading Models for Polygons, Surface Detail, Shadows, Transparency, Interobject Reflections, Physically Based Illumination Models, Extended Light Sources, Spectral Sampling.

**MODULE -VI**

**Advanced Raster Graphics Architecture:** Simply Raster-Display System, Display-Processor Systems, Standard Graphics Pipeline, Introduction to Multiprocessing, Pipeline Front-End Architectures, Parallel Front-End Architectures, Multiprocessor Rasterization Architectures.

**MODULE -VII**

**Advanced Geometric and Raster Algorithms:** Clipping, Scan-Converting Primitives, Antialiasing, The Special Problems of Text, Filling Algorithms, Making copyPixel Fast, The Shape Data Structure and Shape Algebra.

**Text Book:**

1. J.D. Foley et. al. – Computer Graphics Principles & Practical 2/e , Pearson Education, New Delhi, 2004.

**MODULE – I**

**Pattern Recognition Overview:** Overview, Pattern Recognition, Classification and Description, Patterns and Feature Extraction, Training and Learning in PR Systems, Pattern Recognition Approaches.

**MODULE – II**

**Statistical Pattern Recognition:** Introduction, The Gaussian case and Class Dependence Discriminate Functions, Extensions, Classifier Performance, RISK and Errors.

**MODULE – III**

**Supervised Learning:** Parametric Estimation and Supervised Learning, Maximum Likelihood Estimation Approach, Bayesian Parameter Estimation Approach, Non – Parametric Approaches, Parzen Windows, K-nn Non-Parametric Estimation. Nearest Neighbour Rule.

**MODULE – IV**

**Linear Discriminate Functions and The Discrete and Binary Feature Cases :** Introduction, Discrete and Binary Classification Problems, Techniques to Directly Obtain Linear Classifiers.

**MODULE – V + VI**

**Syntactic Pattern Recognition:** Overview Quantifying Structure in Pattern Description and Recognitions, Grammar Based Approach and Application, String Generation as Pattern Description.

Recognition by String Matching and Parsing. The Cocke-Younger Kasami ((ck) parsing algorithm.

**MODULE – VII**

**Neural Pattern Recognition :** Introduction to Neural Networks, Neural Network Structure from Pattern Recognition Applications. Physical Neural Network. The Artificial Neural Network Model, Neural Network Based Pattern Associators.

**Text Book:**

1. Robert Salkoff - Pattern Recognition, Statistical, Structural and Neural Approach, John Wiley, Indian Edition, 200.

**Reference Books :**

1. R. U. Duda – Pattern Classification, John Wiley, Indian Edition, 2006.

**MODULE-I**

**Basic Real-Time Concepts:** Terminology, Real-Time System Design Issues, Example Real-Time Systems, Common Misconceptions, Brief History.

**MODULE -II**

**Hardware Considerations:** Basic Architecture, Hardware Interfacing, Central Processing Unit, Memory, Input/Output, Enhancing Performance, Other Special Devices, Non-von-Neumann Architectures.

**MODULE -III**

**Real-Time Operating Systems:** Real-Time Kernels, Theoretical Foundations of Real-Time Operating Systems, Intertask Communication and Synchronization, Memory Management, Case Study: POSIX.

**MODULE -IV**

**Software Requirements Engineering:** Requirements-Engineering Process, Types of Requirements, Requirements Specification for Real-Time Systems, Formal Methods in Software Specification, Structured Analysis and Design, Object-Oriented Analysis and the Unified Modeling Language, Organizing the Requirements Document, Organizing and Writing Requirements, Requirements Validation and Review.

**MODULE -V**

**Software System Design:** Properties of Software, Basic Software Engineering Principles, The Design Activity, Procedural-Oriented Design, Object-Oriented Design, Appendix: Case Study in Software Requirements Specification for Four-Way Traffic Intersection Traffic Light Controller System.

**MODULE -VI**

**Programming Languages And The Software Production Process:** Introduction, Assembly Language, Procedural Languages, Object-Oriented Languages.

**MODULE -VII**

**Performance Analysis And Optimization:** Theoretical Preliminaries, Performance Analysis, Application of Queuing Theory, I/O Performance, Performance Optimization.

**Text Book:**

1. Phillip A. Laplante- Real-Time Systems: Design and Analysis, John Wiley- India Edition, 2006.

**Reference Books:**

1. Rajib Mall- Real Time Systems; Theory and Practice, Pearson Edition, New Delhi- 2007.
2. J.W.S.Liu – Real Time Systems, Pearson Education, New Delhi – 2004.
3. C.M.Krishna & K.G. Shiv – Real Time Systems, Mc Graw Hill – 1997.

**MODULE-I**

**Cameras:** Pinhole Cameras, Cameras with Lenses, The Human Eye, Sensing.

**Radiometry- Measuring Light:** Light in Space, Light at Surfaces, Important Special Cases, Notes.

**MODULE -II**

**Sources, Shadows, and Shading:** Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models.

**MODULE -III**

**Color:** The Physics of color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

**MODULE -IV**

**Linear Filters:** Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates.

**Edge Detection:** Noise, Estimating Derivatives, Detecting Edges.

**MODULE -V**

**Segmentation by Clustering:** What Is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering.

**MODULE -VI**

**Segmentation by Fitting a Model:** The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem.

**MODULE -VII**

**Tracking With Linear Dynamic Models:** Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association.

**Text Book:**

1. D.A. Forsyth & J. Ponce – Computer Vision: A Modern Approach, Pearson Education, New Delhi- 2003.

**MODULE - I**

**The Church- Turing Thesis:** Turing Machines- Formal definition of a Turing machine, Examples of Turing machines; Variants of Turing Machines- Multitape Turing machines, Nondeterministic Turing machines, Enumerators, Equivalence with other models; The Definition of Algorithm- Hilbert's problems, Terminology for describing Turing machines.

**MODULE - II**

**Decidability:** Decidable Languages- Decidable problems concerning regular languages, Decidable problems concerning context-free languages; The Halting Problem- The diagonalization method, The halting problem is undecidable.

**MODULE - III**

**Reducibility:** Undecidable Problems from Language Theory- Reductions via computation histories; A Simple Undecidable Problem; Mapping Reducibility-Computable functions, formal definition of mapping reducibility.

**MODULE - IV**

**Advanced Topics In Computability Theory:**- The Recursion Theorem, Self-reference, Terminology for the recursion theorem, applications; Decidability of logical theories- A decidable theory, An undecidable theory; Turing Reducibility; A Definition of Information- Minimal length descriptions, Incompressible strings and randomness.

**MODULE – V+VI**

**Time Complexity:** Measuring Complexity- Big-O and small-o notation, Analyzing algorithms, Complexity relationships among models; The Class P- Polynomial time, Examples of problems in P; The Class NP- Examples of problems in NP, The P versus NP question; NP-completeness- Polynomial time reducibility, Definition of NP-completeness, The Cook-Levin Theorem; Additional NP-complete Problems- The vertex cover problem, The Hamiltonian path problem, The subset sum problem.

**MODULE - VII**

**Space Complexity:** Savitch's Theorem, The Class PSPACE, PSPACE-completeness – The TQBF problem, Winning strategies for games, Generalized geography; The Classes L and NL, NL-completeness- Searching in graphs; NL equals coNL.

**Intractability:** Hierarchy Theorems- Exponential space completeness; Relativization - Limits of the diagonalization method; Circuit Complexity.

**Text Book:**

1. Michael Sipser – Introduction to the Theory of Computation, 2/e, Thomson Learning – India Edition 2006.

**Reference Books:**

- 1 R.G.Taylor – Models of Computation and Formal Languages, Oxford University New York, 1998.
2. B.M. Moret – The Theory of Computation , Pearson Education, New Delhi – 2002.



**MODULE - I**

**Data Mining:** Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.

**MODULE - II**

**Data Warehouse:** Introduction, A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data warehousing to Data Mining.

**MODULE - III**

**Data Processing:** Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and concept Hierarchy Generation.

**Data Mining Primitives, Languages and System Architecture:** Data Mining Primitives, DMQL, Architectures of Data Mining Systems.

**MODULE – IV**

**Concept Description:** Data Generalization & Summarization – Based Characterization, Analytical Characterization, Mining class Comparisons, Mining Descriptive Statistical Measures in Large Databases.

**MODULE - V**

**Mining Association Rules in Large Databases :** Association Rule Mining, Single – Dimensional Boolean Association Rules, Multilevel Association Rules from Transaction Databases, Multi Dimensional Association Rules from Relational Databases, From Association Mining to Correlation Analysis, Constraint – Based Association Mining.

**MODULE - VI**

**Classification and Prediction:** Classification & Prediction, Issues Regarding Classification & Prediction, Classification by decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts & Association Rule, Other Classification, Prediction, Classification Accuracy.

**MODULE - VII**

**Cluster Analysis:** Types of Data in Cluster Analysis, Partitioning methods, Hierarchical methods, Density – Based Methods, Grid – Based Methods, Model – Based Clustering Methods, Outlier Analysis.

**Mining Complex Types of Data.**

**Text Books:**

1. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques  
Publisher Harcout India. Private Limited.

**Reference Books:**

1. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi – 2006.
2. A. Berson & S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004
3. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi, 2006.