Course Structure & Syllabus

of

B.Tech Programme

in

Computer Science & Engineering

(From the Session 2015-16)

VSSUT, BURLA

FIRST YEAR

(COMMON TO ALL BRANCHES)

FIRST SEMESTER				SECOND SEMESTER			
Theory		**Contact Hrs.**	**CR**	**Theory**		**Contact Hrs.**	**CR**
Course Code	Subject	L .T .P		Course Code	Subject	L. T. P	
	Mathematics-I	3 - 1 - 0	4		Mathematics-II	3 - 1 - 0	4
	Physics/Chemistry	3 - 1 - 0	4		Chemistry/ Physics	3 - 1 - 0	4
/CS15-008	Engineering Mechanics/Computer Programming	3 - 1 - 0	4	CS15-008/	Computer Programming/Engineering Mechanics	3 - 1 - 0	4
	Basic Electrical Engineering/ Basic Electronics	3 - 1 - 0	4		Basic Electronics/Basic Electrical Engineering	3 - 1 - 0	4
	English/Environmental Studies	3 - 1 - 0	4		Environmental Studies/English	3 - 1 - 0	4
Sessionals				**Sessionals**			
	Physics Laboratory/ Chemistry Lab	0 - 0 - 3	2		Chemistry Lab/ Physics Laboratory	0 - 0 - 3	2
	Workshop-I/Engineering Drawing	0 - 0 - 3	2		Engineering Drawing/ Workshop-I	0 - 0 - 3	2
	Basic Electrical Engineering Lab/Basic Electronics Lab	0 - 0 - 3	2		Basic Electronics Lab/Basic Electrical Engineering Lab	0 - 0 - 3	2
/CS15-984	Business Communication and Presentation Skill/ Programming Lab	0 - 0 - 3	2	CS15-984/	Programming Lab/ Business Communication and Presentation Skill	0 - 0 - 3	2
	Total	**15-5-15**	**28**		**Total**	**15-5-15**	**28**

SECOND YEAR

THIRD SEMESTER				FOURTH SEMESTER			
Theory		**Contact Hrs.**	**CR**	**Theory**		**Contact Hrs.**	**CR**
Course Code	**Subject**	**L .T .P**		**Course Code**	**Subject**	**L. T. P**	
	Mathematics-III	3 - 1 - 0	4	CS15-007	Computer Organization and Architecture	3 - 1 - 0	4

	Digital Electronics Circuits	3 - 1 - 0	4	CS15-032	Theory of computation	3 - 1 - 0	4
CS15-011	Data Structure and Algorithms	3 - 1 - 0	4	CS15-013	Design and Analysis of Algorithms	3 - 1 - 0	4
CS15-025	Object Oriented Programming	3 - 1 - 0	4	CS15-012	Database management systems	3 - 1 - 0	4
	Engineering Economics	3 - 1 - 0	4		Organisational Behaviour	3 - 1 - 0	4
Sessionals				**Sessionals**			
	Digital Systems lab	0 - 0 - 3	2	CS15-993	Computer Organization and Architecture Lab	0 - 0 - 3	2
CS15-992	Data Structure Lab	0 - 0 - 3	2	CS15-990	Design and Analysis of Algorithms Lab	0 - 0 - 3	2
CS15-998	C++ Programming Lab	0 - 0 - 3	2	CS15-991	Database management systems Lab	0 - 0 - 3	2
IT15-996	Java Programming Lab	0 - 0 - 3	2	CS15-980	Theory of computation Lab	0 - 0 - 3	2
	Total	**15-5-15**	**28**		**Total**	**15-5-15**	**28**

THIRD YEAR

FIFTH SEMESTER				SIXTH SEMESTER			
Theory		**Contact Hrs.**	**CR**	**Theory**		**Contact Hrs.**	**CR**
Course Code	Subject	L .T .P		Course Code	Subject	L. T. P	
CS15-026	Operating Systems	3 - 1 - 0	4	CS15-004	Compiler Design	3 - 1 - 0	4
CS15-031	Software Engineering and OOAD	3 - 1 - 0	4	CS15-010	Data Communication and Computer Network	3 - 1 - 0	4
CS15-021	Microprocessor and Micro controller	3 - 1 - 0	4	CS15-029	Simulation & Modeling	3 - 1 - 0	4
CS15-019	Graph Theory	3 - 1 - 0	4	CS15-005	Computer Graphics	3 - 1 - 0	4
IT15-002	Cryptography and Network Security	3 - 1 - 0	4		Core Elective-I	3 - 1 - 0	4
Sessionals				**Sessionals**			

CS15-985	Operating Systems Lab	0 - 0 - 3	2	CS15-997	Compiler Design Lab	0 - 0 - 3	2
CS15-999	Advanced Computing Lab	0 - 0 - 3	2	CS15-994	Computer Network Lab	0 - 0 - 3	2
CS15-986	MP & MC Lab	0 - 0 - 3	2	CS15-982	Simulation and Modeling Lab	0 - 0 - 3	2
CS15-981	Software Engg. Lab	0 - 0 - 3	2	CS15-995	Computer Graphics Lab	0 - 0 - 3	2
	Total	**15-5-15**	**28**		**Total**	**15-5-15**	**28**

FOURTH YEAR

SEVENTH SEMESTER				EIGHTH SEMESTER			
Theory		**Contact Hrs.**	**CR**	**Theory**		**Contact Hrs.**	**CR**
Course Code	Subject	L .T .P		Course Code	Subject	L. T. P	
CS15-001	Advanced Computer Architecture	3 - 1 - 0	4	CS15-022	Mobile Computing	3 - 1 - 0	4
IT15-006	Internet and Web Programming	3 - 1 - 0	4	CS15-027	Parallel and Distributed Systems	3 - 1 - 0	4
CS15-017	Embedded and Real-Time System	3 - 1 - 0	4		Open Elective-II	3 - 1 - 0	4
	Core Elective-II	3 - 1 - 0	4				
	Open Elective-I	3 - 1 - 0	4				
Sessionals				**Sessionals**			
CS15-987	Minor Project	0 - 0 - 3	2	CS15-983	Seminar	0 - 0 - 0	2
IT15-997	Internet Web Programming Lab	0 - 0 - 3	2	CS15-996	Comprehensive Viva	0 - 0 - 0	2
				CS15-988	Major Project	0 - 0 - 6	8
	Total	**15-5-6**	**24**		**Total**	**9-3-6**	**24**

Core Electives-I

CS15-015	Distributed Computing Systems
IT15-002	Information Security
CS15-024	Object Oriented Analysis and Design
CS15-006	Computer Graphics and Visualization
CS15-030	Soft Computing
CS15-028	Pattern Recognition
CS15-014	Digital Image Processing
CS15-002	AI and Robotics
IT15-009	Software Testing
CS15-034	Wireless Sensor Network

Core Electives-II

CS15-033	VLSI Algorithms
IT15-005	Information Retrieval
IT15-007	Software Architecture
IT15-003	Data mining
CS15-018	Game Theory
CS15-003	Combinatorial optimization
CS15-009	Computer Vision
IT15-008	Software Project Management
CS15-020	Human Computer Interface
IT15-001	Cloud Computing

Open Electives-I

Entrepreneurship (Mechanical)
Energy Management (EEE)
Mobile Computing (El &TC)
Industrial Management and Operation Research (Production)
Numerical Methods in Engineering (Civil)

Open Electives-II

Project Management (Civil)
Remote Sensing and GIS (Civil)
Alternative Energy Sources (Electrical)
Digital Image Processing (EEE)
Digital Switching and Telecommunication Networking (El &TC)

SYLLABUS

FIRST & SECOND SEMESTER

(COMMON TO ALL BRANCHES)

PHYSICS – I (3 – 1 – 0)

Module I (10 Hours)

Interference

Superposition of waves - coherent and incoherent superposition, Intensity distribution.

Two source interference theory, Interference in thin films. Newton's Rings, Determination of wavelength of light and refractive index of liquid.

Diffraction

Diffraction: Introduction, Types of diffraction , Fraunhofer diffraction at a single slit, Plane Diffraction grating, Diffraction spectra, Determination of wavelength of light, angular dispersion, resolving power of grating.

Polarization

Polarization: Introduction, Types of Polarization, Production of polarized light(elementary idea) Brewster's law, Malu's law, Double refraction(only statement, explanation), Construction and working of :Nicol prism, Half wave plate and Quarter wave plate, Application of polarization (Polarimeter: Construction, Principle,Working).

Module II (10 Hours)

Electromagnetism

Vector Calculus : Gradient, Divergence, Curl of vector field, Gauss divergence theorem. Stoke's theorem, Green's theorem, Maxwell's electromagnetic equation in differential form and integral form , Electromagnetic wave equation: in vacuum and conducting medium. Pyonting vector ,Pyonting theorem, preliminary ideas about waveguides.

Module III (10 Hours)

Quantum mechanics

Need for Quantum Physics, wave particle duality, Davisson Germer experiment, Schroedinger wave equation (time dependent and time independent), properties of wave functions, Operators , eigen value , eigen function, expectation value, probability density, Simple applications: particle in a box, finite well, step potential and tunneling

Module IV (10 Hours)

Lasers

Introduction, Characteristics of lasers, Einstein's coefficients & Relation between them, Lasing action, Population inversion, Different types of Lasers (Ruby Laser,He-Ne Laser), Three and Four level pumping schemes, Applications of LASER(elementary ideas)

Fiber optics

Introduction, Principle of wave propagation in Optical Fiber, Structure of Optical Fiber,Types of Optical Fibers, Acceptance angle and acceptance cone, Numerical aperture, Applications of optical fibers in communications

Nanomaterials

Introduction, Classification, Physical characteristics and applications (fundamentals)

Text books:

1. Optics – A.K.Ghatak
2. Concepts of Modern Physics – A. Beiser

Reference Books:

1. Electricity & Magnetism – D. Griffiths
2. Quantum Mechanics – Gascirowicz
3. Lasers, theory and applications - K. Thyagarajan and A.K. Ghatak, New York : Plenum Press.
4. Quantum Mechanics – M. Das and P.K Jena
5. An Introduction to Fiber Optics - A.Ghatak, K.Thyagarajan: Cambridge University Press.
6. .Nano Materials by B.Viswanathan,Narosa Book Distributer

List of Experiments

1. To Determine the Young's Modulus (Y) of the material of a Wire by Searle's Method.
2. Determination of Surface Tension of water by Capillary rise method.
3. Determination of Acceleration due to gravity by using a Bar Pendulum.
4. To determine thermal conductivity of a bad conductor by using Lee's Apparatus.
5. Determination of Wavelength of monochromatic light with the help of a Newton's Ring Apparatus.
6. Determination of Grating element of a Diffraction grating using spectrometer.
7. To verify the laws of transverse vibration of string by using sonometer.
8. To determine the Rigidity modulus of the material of a wire by using Barton's apparatus.
9. To draw the characteristics of a Bipolar Junction Transistor.
10. To draw the V-I characteristics of a P. N Junction diode.

CHEMISTRY – I **(3 – 1 – 0)**

Module–I 10 Hours

Failure of Classical Mechanics, Schrodinger's Wave Equation (Need not be Derived), Energy for 1-D Potential Box, Interaction of Wave with Matter
Fundamental of Microwave, IR, UV-Vis Spectroscopy:
Basic Concept of Spectroscopy, Selection Rule, Numericals, Frank-Condon Principle,

Module – II 10 Hours

Thermodynamics of Chemical Processes: 05 Hours
Concept of Entropy, Chemical Potential, Equilibrium Conditions for Closed Systems, Phase and Reaction Equilibria, Maxwell Relations
Definition of Terms: Phase, Components, Degree of Freedom, Phase Rule Equation. Phase Diagrams: One Component Systems – Water and Sulphur, Two Component System – Lead-Silver, Cooling Curves, Iron-Carbon Phase Diagram

Module–III 10 Hours

Electrode Potentials and its Relevance to Oxidation and Reduction, Measurement of EMF, Determination of pH, Hydrogen, Glass, Quinhydrone Electrodes, Dry Cells, Fuel Cells and Corrosion: Concept, Galvanic Corrosion

Module–IV 10 Hours

Kinetics of Chemical Reactions: 05 Hours
Reversible, Consecutive and Parallel Reactions, Steady State Approximation, Chain
Engineering application of materials: 05 Hours
Organometallics and Nanomaterials

1) P. W. Atkins, Elements of Physical Chemistry, 4th Edition, Oxford University Press
2) C. N. Banwell and E. M. MacCash, Fundamentals of Molecular Spectroscopy, 5th Edition,
3) P. K. Kar, S. Dash and B. Mishra, B.Tech. Chemistry Vol. I, Kalyani Publications

Chemistry Laboratory

(Any ten Experiments)

1. Determination of amount of sodium hydroxide and sodium carbonate in a Mixture.
2. Determination of Total hardness of water by EDTA method.
3. Estimation of calcium present in the limestone.
4. Preparation of aspirin.
5. Standardization of $KMnO_4$ using sodium oxalate.
6. Determination of ferrous iron in Mohr's salt by potassium permanganate.
7. Determination of Rate constant of acid catalyzed hydrolysis of ester.
8. Determination of dissolved oxygen in a sample of water.
9. Determination of Viscosity of lubricating oil by red wood Viscometer.
10. Determination of Flash point of given oil by Pensky Marten's Flash point Apparatus.
11. Determination of available chlorine in bleaching powder.

Reference Book: B.Tech practical Chemistry-Kalyani publisher

MATHEMATICS - I

Subject – Mathematics I (Calculus, Linear Algebra and Numerical Method) (3-1-0)

Module 1: (10 Lectures)

Open sets, Closed sets, Limit points of a set, Limits, Continuous functions, Functions continuous on closed intervals, The derivative, Increasing and decreasing functions, Statement and applications of Darboux's theorem, Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Extremum values; Riemann integral: Definition and existence of the integral, Integral as a limit of sums, some integrable functions, Fundamental theorem of calculus, Mean value theorems for integral calculus.

Module 2: (10 Lectures)

Matrices, Vectors: Addition and Scalar Multiplication, Matrix Multiplication, Linear Systems of Equations, Gauss Elimination, Linear Independence, Rank of a Matrix, Vector Space, Solutions of Linear Systems: Existence, Uniqueness, Determinants, Cramer's Rule, Gauss-Jordan Elimination, Vector Spaces, Inner Product Spaces,

Module 3: (10 Lectures)

Eigenvalues, Eigenvectors, Some Applications of Eigenvalue Problems, Symmetric, Skew-Symmetric, and Orthogonal Matrices, Eigenbases, Diagonalization, Quadratic Forms, Complex Matrices and Forms, IncIusion of Matrix Eigenvalues, Power Method for Eigenvalues

Module 4: (10 Lectures)

Numerical methods in general, Introduction, Solution of Equations by Iteration, Interpolation, Numerical Integration and Differentiation

Text Books:

1) S.C. Malik and S. Arora, Mathematical Analysis, New Age International
2) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd

Chapters: S.C. Malik - 2(2.1- 2.3), 5(5.1-5.3), 6(6.1, 6.3-6.7), 7(7.1), 9(9.1, 9.6, 9.7, 9.9,9.10)
E. Kreyszig - 7(7.1-7.5, 7.7, 7.8,7.9), 8, 20 (20.7, 20.8), 19(19.1, 19.2, 19.3, 19.5) 9th Edition

Reference Books:

1) George B. Thomas , Jr. and Ross L. Finney, Calculus and Analytic Geometry, Addison Wesley Publishing Company
2) R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Taylor & Francis
3) K.A. Stroud, Advanced Engineering Mathematics, Industrial Press

MATHEMATICS - II

Differential Equations (3-1-0)

Module 1: (10 Lectures)

Basic Concepts, Modeling, Separable ODEs, Modeling, Exact ODEs, Integrating Factors, Linear ODEs, Bernoulli Equation, Population Dynamics, Existence and Uniqueness of Solutions. Homogeneous Linear ODEs of Second Order, Homogeneous Linear ODEs with Constant Coefficients, Euler-Cauchy Equations, Existence and Uniqueness of Solutions, Wronskian, Nonhomogeneous ODEs, Solution by Variation of Parameters.

Module 2: (10 Lectures)

General linear differential equations of order n, Differential Operators, Homogeneous Linear ODEs, Homogeneous Linear ODEs with Constant Coefficients, Nonhomogeneous Linear ODEs, Conversion of an nth-Order ODE to a System, Basic Theory of Systems of ODEs.

Power Series Method, Theory of the Power Series Method, Frobenius Method, Sturm-Liouville Problems, Orthogonal Functions.

Module 3: (10 Lectures)

Laplace Transforms, Laplace Transform, Inverse Transform, Linearity. s-Shifting, Transforms of Derivatives and Integrals, ODEs, Unit Step Function, t-Shifting, Short Impulses, Dirac's Delta Function, Partial Fractions, Convolution, Integral Equations, Differentiation and Integration of Transforms.

Module 4: (10 Lectures)

Partial differential equations, Basic Concepts, Modeling: Vibrating String, Wave Equation Solution by Separating Variables, Use of Fourier Series, D' Alembert's Solution of the Wave Equation. Characteristics, Heat Equation: Solution by Fourier Series, Solution of PDEs by Laplace Transforms.

Text Book:

1) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd, 9th edition.

Chapters: 1(1.1-1.5, 1.7), 2(except 2.4, 2.8, 2.9), 3, 4(4.1, 4.2), 5(5.1, 5.2, 5.4), 6(6.1-6.5), 12(12.1-12.5, 12.11)

Reference Books:

1) R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Taylor & Francis
2) K.A. Stroud, Advanced Engineering Mathematics, Industrial Press

3) J. Sinha Roy and S. Padhy, Ordinary and Partial Differential Equation, Kalyani Publisher.
4) Richard Bronsan and Gabriel Costa, Scahum's Outline of Differential Equations, McGraw Hill
5) Paul Duchateau and D.W. Zachmann, Scahum's Outline of Partial Differential Equations, McGraw Hill
6) B.V. Ramana, Higher Engineering Mathematics, McGraw Hill

English for Communication

(Credit: 4-0-0)

Objective- For developing the ability to communicate effectively in professional environment by enhancing their skills in communication.

Module 1:Fundamentals of Communication (10 Hours)

- Communication: Process, pattern and stages of communication, channels and types of communication and Barriers to Communication.
- Functions of language: Descriptive, Expressive and Social Functions.
- Formal and Informal English
- Plain English (Cross cultural communication)
- Bias free language

Module 2: Communicative Grammar (10 Hours)

- Time, Tense and Aspects
- Verbs of State and Events
- Use of Modal Verbs
- Passive and Active Voice
- Conditionals

Module 3: Sounds of English (10 Hours)

- The Speech Mechanism and Organs of Speech
- Consonant Sounds of English
- Vowel Sounds of English
- Stress Pattern: Syllable, Stress and Intonation.
- Problem sounds for Indian Speakers

Module 4: Business and Official Writing (10 Hours)

- Paragraph writing and Sentence Linker
- Business and Official Letters
- Report and Proposal writing,
- Notice, Circular and Memo writing
- Résumé (CV) Writing.

Text Books:

1. Effective Technical Communication by M Ashraf Rizvi (Tata McGraw Hill)
2. Better English Pronunciations By J. D.O Conner (Cambridge University Press)
3. A Communicative Grammar of English by G.N. Leech and Jan Svartik (OUP)

Reference Books: "Business communication" by Ramachandran, Lakshmi and Krishna (Macmillan)

ENGLISH COMMUNICATION SKILLS (Credit: 0-0-2)

Objective: For enhancing corporate readiness among students by inculcating several skills of communication through activities.

Laboratory Activities:

1. **Giving Introduction (Self and others)**
2. **Group Discussion**
3. **Interviews**
4. **Role Play**
5. **Listening skill Development**
6. **Reading skill Development**
7. **Writing skill Development**
8. **Speaking skill Development**
9. **Meeting**
10. **Presentation**

Books Recommended:

1. Soft Skills – By Dr K Alex (S Chand)

ENGINEERING MECHANICS

Module – I (10 Hours)

1. **Concurrent forces on a plane**: Composition, resolution and equilibrium of concurrent coplanar forces, method of moment, friction (chapter 1). (7)
2. **Parallel forces on a plane**: General case of parallel forces, center of parallel forces and center of gravity, centroid of composite plane figure and curves(chapter 2.1 to 2.4) (4)

Module - II (10 Hours)

3. **General case of forces on a plane**: Composition and equilibrium of forces in a plane, plane trusses, method of joints and method of sections, plane frame, principle of virtual work, equilibrium of ideal systems.(8)
4. **Moments of inertia**: Plane figure with respect to an axis in its plane and perpendicular to the plane, parallel axis theorem(chapter 3.1 to3.4, 5.1, appendix A.1 to A.3) (3)

Module - III (10 Hours)

5. **Rectilinear translation:** Kinematics, principle of dynamics, D Alembert's Principle, momentum and impulse, work and energy, impact (chapter 6). (11)

Module – IV (10 Hours)

6. **Curvilinear translation:** Kinematics, equation of motion, projectile, D Alembert's principle of curvilinear motion. (4)
7. **Kinematics** of rotation of rigid body (Chapter 9.1) (3)

Text book:

1. Engineering Mechanics: S Timoshenko & Young; 4th Edition (International Edition) Mc Graw Hill.

Reference books:

1. Fundamental of Engineering mechanics (2nd Edition):
S Rajesekharan & G Shankara Subramanium; Vikas Pub. House Pvt ltd.

2. Engineering mechanics: K.L. Kumar; Tata MC Graw Hill.

SESSIONAL

Workshop -I

(Consists of 3 sections) **:**

1. Carpentry Section: Wooden rack/bench/chair/stool (any one)
2. Fitting Section: Paper Wt., Square or Rectangular joint (male and female joint) (any one)
3. Black Smith Section : Weeding hook/Hexagonal headed bolt blank (any one)

COMPUTER PROGRAMMING

L-T-P: 3-1-0 **Cr.-4**

Module I: (10 Hours)

Introduction to computing- Block architecture of a computer, bit, bytes, memory, representation of numbers in memory. Introduction to problem solving- Basic concepts of an algorithm, program design methods, flowcharts.C Language Fundamentals- Character set, Identifiers, Keywords, Data Types, Constant and Variables, Statements. Input &Output - Input & Output Assignments, Formatted Outputs. Operatorsand Expressions-Operators, Precedence of operators.

Module II: (10 Hours)

Decision Control Structure, Loop Control Structure and Case Control Structure.Functions- Monolithic vs Modular programs, User defined vs standard functions, formal vs Actualarguments, Functions category, function prototypes, parameter passing, Recursion.Arrays- 1D Array, 2D Array & Multi-Dimensional Array. Strings- Declaration &Initialization,String Handling Functions.

Module III: (10 Hours)

Pointers- Pointer variable and its importance, Pointer Arithmetic, Passing parameters, pointer to pointer, pointer to function.Dynamic Memory Allocation.Structure- Nested Structure, Array of Structures, Pointer to Structure, Structure & Functions, typedef, Enumerated Data Type, Bit Fields. Union- Array of Union Variables, Union inside Structure.Storage Class.

Module IV: (10 Hours)

Preprocessor Directives- Types, Pragma Directives, Conditional Directives.Files- Reading data from Files, Reading data from Files, Writing data to Files, Error Handling during File Operations.Advanced Issues in Input & Output – using *argc*&*argv*.Operation on Bits.

Text Books:

1. C: The Complete Reference: Herbert Schildt
2. Computer Fundamentals &Programming in C: ReemaThareja, Oxford University Press.

Reference Books:

1. Let us C- Y.Kanetkar, BPB Publications.
2. Programming with ANSI and Turbo C- Kamthane, A.N. Pearson Education

3. C How to Program- Deitel and Deitel, Pearson Education.
4. The C programming Language- Brian W. Kernighan and Dennis M. Ritchie,Prentice-Hall.

PROGRAMMING LAB (CS15-984)

L-T-P: (0-0-3) **Cr:** 2

Introduction to OS : Linux/Unix, Dos, Windows, Vi editor, File Handling, Directory Structure, File Permissions, Creating and editing simple c programs, Compilation and Execution

C programming on variables and expression assignment, simple arithmetic loops, If-else, Case statements, Break, Continue, Go to

Single and Multidimensional arrays

Functions, Recursion, File handling in C

Pointers, address operator, Declaring pointers and operators on pointers, Address of an array, Structures, Pointer to structure, Dynamic memory allocation

Fundamental Programs on Data Structures (Stack, Queue, Linked lists, Trees, Graphs)

(EL15-002) BASIC ELECTRICAL ENGINEERING (3-1-0)

MODULE-I (10 HOURS)

DC Networks: Kirchhoff's laws, node and mesh analysis, Delta-star and star-delta transformations. Superposition, Thevenin's and Norton's theorem. Transients, in R-L, R-C and R-L-C circuits with DC. Excitation.

Single Phase AC Circuits: Single phase EMF generation, average and effective values of sinusoids, j- operations, complex representation of impedances, phasor diagrams, power factor, power in complex notation, solution of series and parallel circuits. Introduction to resonance in series RLC circuit.

Three Phase AC Circuit: Three phase EMF generation, delta and star connection, Line and Phase quantities. Solutions of 3-phase circuits with balanced load. Power in 3-phase balanced circuits.

MODULE-II (10 HOURS)

Magnetic Circuits: B-H Curve, Hysteresis, Permeability and reluctance, solution of simple magnetic circuits, Hysteresis and Eddy current losses.

DC Generator: Different types, Principle of Operation of DC generator, EMF equation, methods of excitation. DC Motor: Back e.m.f., speed and torque of a DC Motor, Conditions for maximum Power. Speed control of DC shunt motor.

Transformers: Construction and Principle of operation of single-phase transformer, EMF equation, Single-phase autotransformer.

MODULE-III (10 HOURS)

Three phase Induction Motor: Construction and principle of operation, types; Slip-torque characteristics.

Synchronous Machines: Construction & principle of operation of Synchronous generator and motor. EMF equation, Voltage regulation, Applications and starting of Synchronous motor.

Introduction to single-phase induction Motor.

MODULE-IV (10 HOURS)

Measuring Instruments: DC PMMC instruments, Extension of range by shunts and multipliers. Moving iron ammeters and voltmeters, Dynamometer type Watt meters, Induction type Energy Meter.

Power supply systems: Principle of generation - thermal, hydel and nuclear. Transmission and distribution of electric energy. Introduction to Electric Heating & Welding.

TEXT BOOKS

[1]. Edward Hughes (revised by Ian McKenzie Smith), "Electrical & Electronics Technology", Pearson Education Limited. Indian Reprint 2002, 10th Edition.

[2]. D.Kulshreshtha, " Basic Electrical Engineering" TMH, 1st Edition.

REFERENCE BOOKS

[3]. H.Cotton, "Advanced Electrical Technology", CBS Publishers, New Delhi, 7th Edition.

[4]. C.L. Wadhwa, "Electrical Engineering", New Age International Publishers, 2nd Edition.

[5]. S. Parker Smith, "Problems in Electrical Engineering", Asia Publications, 10th Edition.

(EL15-003) BASIC ELECTRICAL ENGINEERING LAB (0-0-3)

1. Preliminary: Preparation of symbol chart for various systems & components as per ISS, To study the constructional & operational features for Voltmeter, Ammeter, Wattmeter, Frequency meter, multi-meter and Rheostat, Study of safety rules as per ISS
2. Measurement of the armature & field resistance of D.C. Machine by volt-amp method. & Starting and speed control of a D.C. shunt motor
3. Study of BH Curve
4. Determination of open circuit characteristics (O.C.C) of D.C shunt generator when separately excited at different speeds.
5. Measurement of earth resistance and insulation resistance
6. Starting of Induction motor and measurement of three phase power & power factor by 2-wattmeter method.
7. Calibration of a single phase Energy Meter by directed loading & Phantom loading

BASIC ELECTRONICS (3-1-0)

UNIT-1 **(10 Hours)**

Introduction to Electronics: Signals, Frequency Spectrum of Signals, Analog and Digital Signals, Linear Wave Shaping Circuits: RC LPF, Integrator, RC HPF, Differentiator.
Properties of Semiconductors: Intrinsic, Extrinsic Semiconductors, Current Flow in Semiconductors, Diodes: p-n junction theory, Current-Voltage characteristics, Analysis of Diode circuits, Rectifiers, Clippers, Clampers, Special diodes- LED, Photo diode, Zener Diode.

UNIT-II **(14 Hours)**

Bipolar junction Transistor (BJTs): Device Structure and Operation, Current-Voltage Characteristics, BJT as an Amplifier and as a Switch, Introduction to Power Amplifiers, A,B and C types.
JFET: Physical Structure, Operation and Characteristics MOSFET: Physical Structure, Operation and Characteristics, Feedback Amplifiers & Oscillators: General Feedback Structure, Properties of Negative Feedback, Four Basic Feedback Topologies (block diagram only), Basic Principles of Sinusoidal Oscillators(Crystal, Hartley & Collpit).
Operational Amplifiers (OP-AMPs): The Ideal OP-AMP, Inverting Configuration, Non-Inverting Configuration. OP-AMP Applications (Adder, Subtractor, Integrator, Differentiator).

UNIT-III **(10 Hours)**

Digital Fundamentals: Binary Numbers, Signed-binary numbers, Decimal-to-Binary & Binary-to-Decimal Conversion, Binary Addition, Subtraction, Multiplication and Division, Hexadecimal Number Systems, Logic Gates, Boolean Algebra, De Morgan's Theorems, Laws of Boolean Algebra, RS Flip flop, JK Flip flop.

UNIT-IV **(10 Hours)**

Introduction to Electronic Instruments: CRO: CRT, Waveform Display, Applications of CRO, Electronic Multimeter, Audio Signal Generator: Block diagram, Front Panel Controls.
Principles of Communication: Fundamentals of AM & FM, Block diagram of Transmitters & Receivers.

TEXT BOOKS:

1. Microelectronics Circuits, A.S Sedra, K.C. Smith, Oxford University Press. Selected portions from chapters 1 to 3, 5, 8, 13.
2. Electronics Fundamentals and Applications, D Chattopadhyay and P.C. Rakshit, NewAge International Publications. Selected portions from chapters 4 to 12,14, 16 to 18,20,21.

REFERENCE BOOKS:

1. Integrated Electronics, Millman and Halkias, TMH Publications.
2. Electronic Devices & Circuit Theory, R.L Boylestad and L. Nashelsky, Pearson Education.

BASIC ELECTRONICS LAB

LIST OF EXPERIMENTS

1. Familiarity with electronic components and devices(Testing of semiconductor diode, Transistor, IC Pins connection) Digital multimeter should be used.
2. Study and use of CRO to view waveforms and measure its Amplitude and Frequency.
3. V-I Characteristics of a Semiconductor Diode. Determining DC and AC resistance.
4. Clipper and Clamper Circuit.
5. Half Wave and Full Wave Rectifier without Capacitor filter. Record of Waveforms, Measurement of Average and RMS value.
6. V-I (Output) Characteristics of N-P-N Transistor in CE Configuration.
7. OP-AMP: Inverting and Non-Inverting Configuration. Record of Waveforms.
8. Verification of Truth table of Logic gates (AND, OR,NOT, NAND, NOR, EX-OR)

CE 15001: ENVIRONMENTAL SCIENCE & ENGINEERING (3-1-0) CR-04

Module – I **(6 Hours)**

Components of Earth System: Lithosphere, Cryosphere, Atmosphere, Hydrosphere, Biosphere and Outer space.
Ecological concepts and natural Resources: Ecological perspective and value of environment, Environmental auditing, Biotic components, Levels of organizations in environment Ecosystem Process: Energy, Food chain, Environmental gradients, Tolerance levels of environmental factor.
Natural Resources covering Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative).
Hydrological cycle, water balance, energy budget, precipitation, infiltration, evaporation and evapotranspiration.

Module – II **(15 Hours)**

Environmental Pollution: Definition, Causes, effects and control measures of: Water pollution, Air pollution, Noise pollution, Soil pollution, Marine pollution, Thermal pollution, Nuclear hazards
Environmental Issues: Climate change, Global warming, Acid rain, Ozone layer depletion, Sustainable development, Bio gas, Natural gas, Biodiversity, Urban problems related to energy, water scarcity, Water conservation, rain water harvesting, artificial recharge, watershed management, carbon trading, carbon foot print
National Ambient Air quality Standards, Noise standards, Vehicle emission standards

Module – III **(12 Hours)**

Drinking water standard (IS 10500), Water Quality Criteria and wastewater effluent standards
Water treatment: Water sources and their quality, Lay out of a water treatment plant and working of each unit/ principles of each process i.e. Screening, Aeration, Sedimentation, coagulation, flocculation, Filtration, Disinfection. Miscellaneous treatment: Removal of color, tastes and odour control, removal of iron and manganese, fluoridation and defloridation. Advanced water treatment: Ion exchange, electro-dialysis, RO, desalination

Working principles of ready-made water filter/purification system commercially available
Lay out of a wastewater treatment plant and working of each unit.

Module – IV **(7 Hours)**

Solid waste management: Source, classification and composition of MSW, Storage and transport of MSW, MSW management, Waste minimization of MSW, Reuse and recycling, Biological & thermal treatment (principles only), land fill

Biomedical Waste management – sources, treatment (principles only) and disposal

Hazardous Waste Management- Introduction, Sources, Classification, treatment (principles only)
Introduction to e-waste management.
Environmental impact Assessment: Project screening for EIA, Scoping studies
Environmental policies and acts (Air, Noise, Water, Forest, E-waste, Hazardous waste acts).

Text Book:

1 Environmental Engineering, G. Kiely, TMH, 2007

Reference Books:

1 Environmental Engineering, H.S. Peavy, D.R.Rowe and G. Tchobanoglous, McGraw Hill, 1985.
2 Introduction to Environmental Engineering, M. L. Davis and D. A Cornwell, McGraw Hill International, 2005.

CE 15002: ENGINEERING DRAWING (0-0-3) CR-02

(Minimum 8 sheets and 2 Auto Cad classes)

Introduction to Engineering Drawing: Drawing instruments, lines, lettering and dimensioning.

Scales: Plain, Diagonal and Vernier Scales.

Curves: Parabola, Ellipse, Hyperbola, Cycloid, Epicycloid, Hypocycloid and Involute.

Orthographic Projections: Concepts, Orthographic projections of points, Lines, Planes and Solids.

Sections of solids; Development of surfaces

Isometric Projections: Principles, Isometric Scale, Isometric Views, Isometric Views of lines, Planes, Simple and compound Solids,

Introduction to Auto-Cad:

Curves: Parabola, Ellipse, Hyperbola, Cycloid, Epicycloid, Hypocycloid and Involute.

Text Book:

1 Engineering drawing by N.D. Bhatt and V.M Panchal, Charotar Publishing House, Anand.

Reference Books:

1. Engineering Drawing by Venugopal, New Age publisher.

THIRD SEMESTER
MATHEMATICS - III

(Multivariable Calculus and Special Functions) (3-1-0)

Module 1: (10 Lectures)
Vector and Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field; Line Integrals, Path Independence of Line Integrals, Double Integrals, Green's Theorem in the Plane, Surfaces for Surface Integrals, Surface Integrals, Triple Integrals, Divergence Theorem of Gauss, Further Applications of the Divergence Theorem, Stokes's Theorem.

Module 2: (10 Lectures)
Fourier series and integral, Dirichlet criterion, Parseval's identity, the convolution theorem.

Module 3: (10 Lectures)
Orthogonal curvilinear coordinates, Jacobians, gradient, divergence, curl and Laplacian in curvilinear coordinates, Special curvilinear coordinates.

Module 4: (10 Lectures)
Gama function, The Beta function – Dirichlet integral; Other special functions– Error function, exponential integral, sine and cosine integrals, Bessel's Equation, Bessel Functions $J_{\square}(x)$, Bessel Functions of the Second Kind $Y_{\square}(x)$, Legendre's Equation, Legendre Polynomials $P_n(x)$.

Text Books:

1) Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd. - 9th Edition
   Chapters: 5(5.3, 5.5, 5.6), 9(9.4, 9.7, 9.8, 9.9), 10, 11(11.1-11.3, 11.6, 11.7), A3.4, A3.1

Reference Books:

1) S.C. Mallik and S. Arora, Mathematical Analysis, New Age International
2) Milton Abramowitz and Irene A. Stegun, *Handbook of Mathematical Functions*, National Bureau of Standards, Applied Mathematics Series - 55
3) **Yury A. Brychkov, Handbook of Special Functions: Derivatives, Integrals, Series and Other Formulas, CRC Press**
4) R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Taylor & Francis
5) K.A. Stroud, Advanced Engineering Mathematics, Industrial Press

DIGITAL ELECTRONICS CIRCUITS: (3-1-0)

Module-I **(12 Hours)**

Binary addition and subtraction using 2's complements and 1's complements, Binary codes-BCD codes, Gray codes, Excess-3 code, ASCII Character Code

Gate level Minimization: Boolean functions, Canonical & standard form; min terms & max term, Digital Logic Gates for Multiple inputs. The Map Method, K Map for two, three, four, five input variables, Product of Sum (POS), Sum of product (SOP) simplification, Don't care conditions. NAND & NOR Implementation, AND-OR invert, OR-AND invert implementation, Ex-OR Function

Module-II **(8 Hours)**

Combinational Logic: Combinational Circuits, Analysis & Design of Binary Half Adder & Full Adder circuit, Half and Full-subtractor circuit, Binary Multiplier, Magnitude comparator, Decoders, Encoders, Multiplexers, Error detection& correction: Parity Generator and Checker Circuit

Module-III **(12 Hours)**

Synchronous Sequential Logic: Sequential Circuit, Latches, Flip-flop (S-R, J-K, D, T, M/S), Analysis of Clocked Sequential circuits, State Reduction & Assignment, Design procedure.

Register &Counters: Shift Register, Synchronous Counter, Modulo-n Counters, Up-Down Counter, Asynchronous Counter, Ripple Counters, Ring Counters

Module-IV **(8 Hours)**

Memory & Programmable Logic: Read only Memory (ROM), Random Access Memory (RAM), Memory Decoding, Programmable Logic Array (PLA), Programmable Array Logic (PAL), Sequential Programmable Devices.

Register Transfer Levels: Register transfer Level (RTL) notation, Algorithmic State machine, Design Example. Digital Integrated logic Circuits: RTL, DTL, TTL, ECL, MOS & C-MOS Logic circuits

Text books:

1. Digital Design, 4th edition by M. Morris Mano, M. D. Ciletti, Pearson Education.

Reference Books:

2. Digital Fundamentals – Floyd & Jain, Pearson education
3. Switching Theory & Digital Electronics – V. K. Jain, Khanna Publishers.
4. Digital Principles & Applications – Malvino, Leach & Saha, 6th Edition, Tata Mc Graw Hill

DATA STRUCURES AND ALGORITHMS (CS15-011)

L-T-P: 3-1-0 **Cr.-4**

MODULE – I Preliminaries and Linear Data Structures (12 lectures)

Introduction to Data Structures and Algorithms, Analysis of Algorithms, Asymptotic notations, Time and space trade-off, ADT.

Arrays and Lists, Strings, Row/Column major representation of Arrays, Sparse matrix.

Linked List: Singly linked list, circular linked list, doubly linked list, operations on linked list.

Stack: Push; Pop, stack representation using array and linked list, Applications of Stack, Recursion.

Queue: Representation using array and linked list, Insertion and deletion operations, circular queue, Dequeue, priority queue.

MODULE – II Non-Linear Data Structures (12 lectures)

Tree : General tree; Binary tree - definitions and properties; binary tree traversal algorithms with and without recursion. Binary Search Tree - creation, insertion and deletion operations, Threaded tree (One way and Two way); AVL tree balancing; B-tree; Application of trees, Heaps.

Graph : Representation, Traversals-BFS and DFS, Minimum Spanning Tree – Kruskal and Prim's Algorithms , Shortest Path, All pairs Shortest Path, Dijkshtra Algorithm, Transitive Closure.

MODULE – III Sorting, Searching (8 lectures)

Internal sorting algorithms and Complexities: Insertion, Selection, Bubble, Quick, Heap sort, Radix, Multi way merge sort, External sorting,

Searching : Linear, Binary Search, Search trees traversal, Digital Search trees, Tries.

MODULE – IV Hashing (8 Lectures)

Hashing techniques, Hash function, Address calculation techniques- common hashing functions

Collision resolution, Linear probing, quadratic probing, Double hashing, Bucket addressing. Rehashing

Text Books :

1. Data Structures Using C – A.M. Tenenbaum (PHI)
2. Introduction to Data Structures with Applications by J. Tremblay and P. G. Sorenson (TMH)

Reference Books :

1. Data Structures and algorithm Analysis in C – M. A. Weiss (Pearson Education)
2. Data Structures using C++ - E. Horowich, S. Sahni

OBJECT ORIENTED PROGRAMMING (CS15-025)

L-T-P: 3-1-0 **Cr.-4**

Module – I **(10 Lectures)**

Introduction to object oriented programming, user-defined types, polymorphism, and encapsulation. Getting started with C++ syntax, data-type, type conversions, functions, exceptions and statement, namespaces, exceptions, explicit and mutable, operators, flow control, functions, recursion. Arrays, pointers, this pointer, generic pointer and structures.

Module – II **(10 Lectures)**

Abstraction mechanisms: Classes, private, public construction, member functions, static members, references etc. class hierarchy, derived classes. Inheritance: simple inheritance, polymorphism, aggregation, object slicing, base initialization virtual functions.

Module – III **(12 Lectures)**

Prototypes, linkages, operator overloading, ambiguity, friends, member operators, operator function, I/O operator etc. Memory management: new delete, object copying copy constructors, assignment operator, this input/output. Exception handling: Exceptions and derived classes, function exception declarations, Unexpected exceptions, Exceptions when handling exceptions, resource capture and release etc.

Module – IV **(08 Lectures)**

Templates and standard Template library: template classes, declaration, template functions, containers, algorithms, iterators, manipulating string objects, hashes, iostreams and other type.
Projects design and development using C++.

Text Books:

1. Ashok N. Kamthane- Object oriented programming with ANSI & Turbo C ++.,Pearson Education.
2. E. Balguru Swamy – C ++, TMH publication.

Reference Books:

1. Programming with ANSI C++, 2/e, Bhushan Trivedi, Oxford University Press
2. H. Schildt – C++, The Complete Reference, TMH.
3. Robort Lafore-Object-oriented programming in Microsoft C ++

4. The C++ Programming Language (4th Edition), Bjarne Stroustrup, Addison-Wesley Publications.
5. Object-Oriented Programming Using C++, 4/e, Farrell Joyce, CENGAGE Publications.

HUM01 ENGINEERING ECONOMICS (4-0-0)

MODULE- 1

Theory of Demand- Modern Utility Theory, The Neumann- Morgenstern approach, The Friedman-Savage Hypothesis, Uncertainty and Consumer Behaviour, Expected value of Perfect Information, Revealed Preference Theory, Intertemporal Choice- Slutsky equation, Annual Economic Worth, Present Value, Discount rate IRR and NPV

MODULE- 2

Profit Maximisation: Theory of Production- Laws of Production, Returns to scale and variable proportions, Equilibrium of firm, and Choice of optimal combination of factors, Cost Minimisation- Calculus analysis of cost minimisation, Algebric approach to cost minimisation, average and marginal costs- the short run Cobb- Douglas cost function, constant returns to scale and cost functions, Long run and short run curves- factor prices and cost functions , The envelop theorem for constrained optimisation , Cost control techniques, Critique of the principle of profit maximisation and Modern theories of firms- Baumol's sales maximisation hypothesis, Morris Model of Managerial Enterprise, Hall and Hitch Report and the full cost pricing principle, Bain's limit pricing theory

MODULE- 3

Analysis of Public Projects: Benefit cost analysis, Public goods, Common Property, Free Rider Problem, market failure and externalities, private and social cost, Social Welfare Functions- Welfare maximisation and pare to optimality, market responses to externalities- Mergers, social conventions, property right and bargaining case theorem

MODULE- 4

Linear models: simple regression model -the problem and estimation, classical normal linear regression model, Two- Variable regression- Internal estimation and hypothesis testing, Multiple Regression analysis- The problem of estimation, Dummy Variable Regression Models, Multiple parameter sensitivity analysis, linear Programming- graphic and simplex method; Game theory- the pay off matrix of game, Nash Equilibrium, the mixed strategies and the prisoner's dilemma

READING LIST

1. Varian, H.R. (1992). Introduction to Micro Economic Analysis, Norton and company, New York
2. Woolridge, J.M. (2009). Introductory Econometrics- A Modern Approach, South Western CENGAGE learning

3. Pearce, D.W. and Turner.(1990). Economics of Environment and Natural Resources, Harvester Wheatsheaf. New York
4. Koutsoyiannis, A.(1979). Modern Micro Economics, Macmillan, London
5. Damodaran, S. (2012). Managerial Economics, second Edition, OUP
6. Gujrati and Sangeeta. (2007). Basic Econometrics, TMH, New Delhi
7. Kolstad, C.D. (2000). Environmental Economics, OUP

DATA STRUCTURE LABORATORY (CS15-992)

L-T-P: (0-0-3) **Cr:** 2

1. (a) Write a C Program to create a stack using an array and perform – i) Push operation, ii) Pop operation

(b) Write a C Program to create a queue and perform – i) Push, ii) Pop, iii) Traversal

2. Write a C Program that uses Stack Operations to perform the following :-
   i) Converting an infix expression into postfix expression
   ii) Evaluating the postfix expression

(a) Write a C Program that uses functions to perform the following operations on a single linked list : Creation, ii) Insertion, iii) Deletion, iv) Traversal

(b) Write a C Program that uses functions to perform the following operations on a double linked list : Creation, ii) Insertion, iii) Deletion

- Write a C Program that uses functions to perform the following operations on a Binary Tree : i) Creation, ii) Insertion, iii) Deletion
- Write a C Program to construct an AVL-Tree and delete the selective nodes.
- C Programs on : i) Bubble sort, ii) Selection sort, iii) Insertion sort, iv) Quick sort, v) Radix sort vi) Heap sort, vii) 2 Way Merge Sort

C Programs on : i) Sequential Search, ii) Binary Search

C++ PROGRAMMING LABORATORY (CS15-998)

L-T-P: (0-0-3) **Cr:** 2

Programs on concepts of class and objects (1 class)
Programs using Inheritance (1 class)
Programs using Polymorphism (1 class)
Programs on use of Operator overloading (1 class)
Programs on use of memory management (1 class)
Programs on exception handling and use of templates (1 class)
Programs on file handling in C++ (1 class)
Design a problem on stock and accounting of a small organization, railway reservation, payroll preparation and optimization problem (3 classes)

JAVA PROGRAMMING LABORATORY (IT15-996)

L-T-P: (0-0-3) **Cr:** 2

1. Introduction, Compiling & executing a java program.
2. Data types & variables, decision control structures: if, nested if etc.
3. Loop control structures: do, while, for etc.
4. Classes and objects.
5. Data abstraction & data hiding, inheritance, polymorphism.

6. Threads, exception handlings and applet programs
7. Interfaces and inner classes, wrapper classes, generics
8. Developing a simple paint like program using applet
9. Developing a scientific calculator
10. Develop a multi threaded producer consumer Application
11. Generating prime numbers and Fibonacci series
12. Multithreaded GUI application

FOURTH SEMESTER

COMPUTER ORGANIZATION AND ARCHITECTURE(CS15-007)

L-T-P: 3-1-0 **Cr.-4**

Module-I (10 Period)

Introduction:

Basic Organization of Computers, Classification Micro, Mini, Mainframe and Super Computer. System Bus and Interconnection: Single and multi-bus, Computer FunctionVon-Neumann M/c: Structure of IAS.

Computer Arithmatic:

Data Representation:Fixed Point Representation,Floating Point Representation. Addition and Substraction, Multiplication (Booth Algorithm), Division Algorithm, Floating Point Arithmatic Operation, Decimal Arithmatic Operation.

Module-II (10 Period)

Instruction Set Architecture:

Instruction Format: Three Address, Two Address, One Address and Zero Address Instruction, Addressing Modes: Types of Addressing modes, Numerical Examples, Program Relocation, Compaction, Data Transfer & Manipulation: Data transfer, Data Manipulation, Arithmetic, Logical & Bit Manipulation Instruction, Program Control: Conditional Branch Instruction,

CPU Organization:

Fundamental Concepts: Instruction-cycle, Fetching and storing a word in Memory, Register Transfer, Performing an Arithmetic & Logic Operation, Branching. Control word, Stack Organisation, Register Stack, Memory Stack, RPN, Ecaluation of Arithmetic Expression using RPN, Subroutine,Control Unit Operation: Hardware Control & Micro Programmed Control.

Module-III (10 Period)

Memory Organization:

Computers Memory System Overview, Characteristics of Memory System, The Memory Hierarchy, Semi Conductor Main Memory types, Organisation, Memory cell Operation. Cache Memory: Cache Principles, Elements of Cache Design, Cache Size, Cache Mapping function, Replacement Algorithm, LRU, FIFO, LFU, Write policy. Number of Caches: Single versus two level caches, Pentium Cache Organisation. Associative Memory: Hardware Organisation, Match Logic. Read Operation, Write Operation, Auxiliary Memory: Magnetic Disks, Magnetic Tape. Virtual Memory: Paging, Paging h/w, Address Mapping using pages, Segmentation h/w, Demand Paging, Memory Management h/w.

Module-IV (10 Period)

Input/Output Organization:

Peripheral Devices, Input – output Interface, I/O Bus, Interface Module, Asynchronous Data Transfer, Strobe Control, Handshaking, Asynchronous Serial Transfer, Asynchronous Communication Interface,

Modes of Transfer: Programmed I/O, Interrupt Driven I/O, Direct Memory Access (DMA), DMA Controller, I/O Channel & Processor.

Interrupt:
Class of interrupt, Priority Interrupt: Daisy Chaining Priority, Parallel Priority Interrupt. Program Interrupt, Types of Interrupt, RISC & CISC Characteristic.

Parallel Processing:
Flynn's Classification, Introduction to Pipelining and hazards, Speedup, Efficiency, Throughput.

Text Books:

1.Computer Organization & Architecture – William Stallings, 7th Edition, PHI
2. Computer Organization – by V.Carl Hamacher, Z.G.Vranesic, and S.G.Zaky, 5th Edition. McGraw Hill.

Reference Books:

1. Computer System Architecture : Morris Mano, 3rd Edition, PHI
2. Computer Architecture and Organization, by - John P. Hayes, 3rd Edition, Mc Graw Hill International Editions.
3. Computer Organization & Design, (3rd Edition) by – D.A.Patterson & J.L.Hennessy – Morgan Kaufmann Publishers (Elseviers).

THEORY OF COMPUTATION (CS15-032)

L-T-P: 3-1-0 **Cr.-4**

Module I: Fundamentals& Finite Automata: **10 Hours:**

Alphabet,Strings, Language, Operations, Mathematical proving techniques, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, Deterministic Finite Automaton (DFA) and Non deterministic Finite Automaton (NFA), transition diagrams and Language recognizers.Equivalence of DFA and NFA, NFA to DFA conversion,NFA with e - transitions - Significance, acceptance of languages. Equivalence between NFA with and without e - transitions, minimisation of FSM, Finite Automata with output- Moore and Mealy machines and conversion of Mealy to Moore and vice-versa.

Module II: Regular Expression and Languages: **10 Hours:**

Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Regular grammars-right linear and left linear grammars, conversion of right linear grammar to left linear and vice-versa, equivalence between regular grammar, regular expression and FA, Pumping lemma of regular sets, closure properties of regular sets.

Module III: Context Free Grammars and Push Down Automata: **10 Hours:**

Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings.Ambiguity in context free grammars. Reduction of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL.Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFG and PDA, interconversion. Introduction to DCFL and DPDA. DPDA Vs NPDA.

Module IV: Turing Machine and its Computational Complexity: **10 Hours:**

Chomsky hierarchy of languages, Context sensitive language, Context sensitive grammar,Turing Machine, definition, model, design of TM, Variants of TM, linear bounded automata,Computable functions, recursively enumerable languages. Church's hypothesis. Decidable, Undecidable and reducible problems, Efficiency of computation, Turing Machine and complexity, Language family and complexity classes, the complexity classes P and NP.

TEXT BOOKS:

1. "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson Education
2. Introduction to Theory of Computation –Sipser 2nd edition Thomson

REFERENCE BOOKS:

1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
2. Introduction to languages and the Theory of Computation ,John C Martin, TM
3. "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson PHI.
4. Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI
5. "An introduction to Formal Languages and Automata", Peter Linz, Narosa.
6. Formal Language and automata theory- H.S. Behera, J. Nayak and H. Pattnayak, Vikas Publishing House Pvt. Ltd.

DESIGN AND ANALYSIS OF ALGORITHMS (CS15-013)

L-T-P: 3-1-0 **Cr.-4**

MODULE – I

Introduction to Design and analysis of algorithms, Growth of Functions (Asymptotic notations), Recurrences, Solution of Recurrences by substitution, Recursion tree method, Master Method, Analysis of Searching and Sorting Techniques: Brute Force Technique, Divide and Conquer Algorithms, Decrease and Conquer, Heaps and Heap sort, Lower Bounds for Sorting.

MODULE -II

Dynamic Programming algorithms: Matrix Chain Multiplication, Elements of Dynamic Programming, Longest Common Subsequence, Greedy Algorithms: Activity Selection Problem, Elements of Greedy Strategy, Fractional Knapsack Problem, Huffman Codes, Data Structure for Disjoint Sets, Disjoint Set Operations, Linked list Representation, Graph Algorithm - BFS and DFS, Minimum Spanning Trees, Kruskal algorithm, Prim's Algorithm, Single Source Shortest paths, Bellmen Ford Algorithm, Dijkstra's Algorithm.

MODULE -III

Polynomial Evaluation and Interpolation, Fast Fourier Transform, Strassen's Matrix multiplication, String matching, Convolution, Rabin-Karp Algorithm, KMP Algorithms, Boyer- Moore Algorithm, Computational Geometry: Properties of Line segments, Convex Hull

MODULE -IV

NP-Completeness, Polynomial time verification, Reducibility, Proof of NP-Completeness (NCDP, CDP, CNDP, Hamiltonian cycle), Approximation Algorithms, Traveling Salesman Problem

Text Books

1. M.R.Kabat "Design and Analysis of Algorithms", PHI Learning (p) Ltd
2. T.H.Coreman et.al. "Introduction to Algorithms" Pearson Education

Reference Books

1. S. Sridhar ""Design and Analysis of Algorithms", Oxford University Press
2. A.V.Aho et.al., "The Design and Analysis of Algorithms" Pearson Education, NewDelhi
3. K, Louden " Mastering Algorithms", O' Reily Media Inc

DATABASE MANAGEMENT SYSTEMS (CS15-012)

L-T-P: 3-1-0 **Cr.-4**

Module – I (10 Lectures)

Database System Architecture–Introduction to Database Systems, Data Abstraction, Data Independence, Three-Schema Architecture, Data Definitionsand Data Manipulation Languages.
Data Models -Hierarchical, Network, Relational Model and Object Oriented Data models, Entity-Relationship (E-R) Model, Mapping E-R Model to Relational Model.

Module – II (10 Lectures)

Relation Query Languages: Relational Algebra, SQL, Integrity Constraints, Tuple and Domain Relational Calculusand QBE.
Relational Database Design: Functional dependencies, Armstrong's Axioms,Dependency Preservation, Lossless design, Normal Forms: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.

Module – III (12 Lectures)

Query processing and Optimization: Evaluation of Relational Algebra Expression, QueryEquivalence, Join strategies, Query optimization Algorithms.
Transaction Processing: Transaction concept, Transaction state, Concurrent executions, Serializability.
Concurrency Control and Recovery: Concurrency control, Locking and Time-stampbased schedules, Multi-version and Optimistic Concurrency control schemes, Recovery System.

Module – IV (08 Lectures)
Advanced Topics: (Introduction to concepts only)Object- Oriented and object Relational databases, Temporal Data Base, Spatial Data Base, Logical Database,Web databases, Distributed Databases, Data Mining and Warehousing, Semantic Web and Ontology.

Text Books:
1. Elmaski & Navathe- Fundamentals of Database systems, 4thEdition, Pearson Education
2. A. Silberschatz, H. F. Korth, S. Sudarshan-Database System Concepts, 5th Edition, McGraw Hill International Edition.

Reference Books:
1. Bipin Desai- An introduction to Database System, Galgotia publication.
2. G.W.Hansen and J.V.Hansen, Database Management and Design, 2ndEdition, PHI

ORGANISATIONAL BEHAVIOUR

Module-1

OB: Learning objectives, Definition & Meaning, Why to study OB, An OB model, New challenges for OB Manager

LEARNING: Nature of learning, How learning occurs, Learning & OB

Case Study Analysis

Module-2

PERSONALITY: Meaning & Definition, Determinants of Personality, Personality Traits, Personality & OB

PERCEPTION: Meaning & Definition, Perceptual process, Importance of Perception in OB

MOTIVATION: Nature & Importance, Herzberg's Two Factor theory, Maslow's Need Hierarchy theory, Alderfer's ERG theory

Case Study Analysis

Module-3

COMMUNICATION: Importance, Types, Barriers to communication, Communication as a tool for improving Interpersonal Effectiveness

GROUPS IN ORGANISATION: Nature, Types, Why do people join groups, Group Cohesiveness & Group Decision Making- managerial Implications, Effective Team Building

LEADERSHIP: Leadership & management, Theories of leadership- Trait theory, Behavioural Theory, Contingency Theory, Leadership & Followership, How to be an Effective Leader

CONFLICT: Nature of Conflict & Conflict Resolution

TRANSACTIONALANALYSIS: An Introduction to Transactional Analysis

Case Study Analysis

Module-4

ORGANISATIONAL CULTURE: Meaning & Definition, Culture &Organisational Effectiveness

HUMAN RESOURCE MANAGEMENT: Introduction to HRM, Selection,Orientation,Training& Development, Performance Appraisal, Incentives

ORGANISATIONAL CHANGE: Importance of Change, Planned Change & OB Techniques

INTERNATIONAL OB: An Introduction to Individual & Interpersonal Behaviour in Global Perspectives

Case Study Analysis

COMPUTER ORGANIZATION AND ARCHITECTURE LAB (CS15-993)

L-T-P: (0-0-3) **Cr:** 2

Simulation and design of Fast Multiplication and Division Programs.

Some experiments using hardware training kits for floppy drive, dot matrix printer etc.

Dismantling and Assembling a PC along with study of connections, ports, chipsets, SMPS etc. Draw a block diagram of motherboard and other board.

A Study Project on some hardware technologies(memory, serial bus, parallel bus, microprocessor, i/o devices, motherboard etc.)

DESIGN AND ANALYSIS OF ALGORITHMS LAB (CS15-990)

L-T-P: (0-0-3) **Cr:** 2

Elementary Problems

1. Implement polynomial addition using a single linked list.
2. Implement insertion routine in an AVL tree using rotation .
3. Implement heap sort using a max heap.
4. Implement DFS/BFS routine in a connected graph.

Divide and Conquer Algorithm

1. write a quick sort routine,run it for a different input sizes and calculate the time of running . Plot a graph input size vs time.
2. Implement two way merge sort and calculate the time of sorting .

Greedy Algorithm :

1. Given a set of weights,form a Huffman tree from the weight and also find out the code corresponding to each weight .
2. Take a weighted graph as an input ,find out one MST using Kruskal/Prim's algorithm .

Dynamic Programming :

1. Find out a solution for 0/1 Knapsack problem .
2. Given two sequences of character, find out their longest common subsequence using dynamic programming.

NP complete and NP hard problems :

1. Find out a solution to graph colorability problem of an input graph.
2. Find out a solution to sum of subset problems .

DATABASE MANAGEMENT SYSTEMS LAB (CS15-991)

L-T-P: (0-0-3) **Cr:** 2

- Use of SQL Syntax for creation, insertion, updation, and deletion operation.
- Use of SQL for Single table retrieval and group by clauses.
- Use of SQL for sub-queries, set operations, and date manipulations.
- Use of SQL for multiple table retrieval using join.
- Use of Creation and Manipulation of SQL Views.
- Programming approach using PL/SQL.
- Use of PL/SQL Cursors(implicit, explicit, and parameterized).
- Concurrency control using LOCK.
- Data Redundancy using ROLLBACK, SAVEPOINT, and COMMIT
- Use of Package (ORACLE)

THEORY OF COMPUTATION LABORATORY (CS15-980)

L-T-P: (0-0-3) **Cr:** 2

- Implementation of Type 3 automaton(DFA, NFA, Regular expression)
- Conversion of NFA to DFA
- Conversion of RE to Regular Grammar and Vice versa
- Implementation of Type 2 automaton (PDA, CFG)
- Implementation of Type 0 automaton (TM)

FIFTH SEMESTER

OPERATING SYSTEMS (CS15-026)

L-T-P: 3-1-0 **Cr.-4**

Module – I

Introduction: What is and Operating Systems.

Simple Batch Systems, Multiprogramming and Time-Sharing systems. Personal Computer Systems, Parallel Systems, Distributed systems and Real time Systems.

Operating Systems structures: systems components, protection system, O.S. Services, system calls.

Process Management: Process concept, process scheduling, Operation on process, Cooperating Processes, Inter process communication. Threads CPU Scheduling: Basic concepts, scheduling algorithms.

Module - II

Deadlocks: System model, Deadlock Characterization Methods for Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection, recovery from Deadlock.

Memory management: Background, Logical versus Physical Address space, swapping, contiguous Allocation. Paging, Segmentation.

Virtual memory: Background, Demand paging, performance of Demand paging, Page Replacement, page Replacement Algorithms. Allocation of frames, Thrashing, Demand Segmentation.

Module - III

File – system Interface : file concept, Access Methods Directory implementation, Recovery.

Module - IV

I/O systems: Overview, I/O Hardware, Application of I/O interface, Kernel I/O – subsystem Transforming I/O requests to Hardware operations. Secondary storage Structure: Disk Structure. Disk scheduling, Disk management, Swap space management, Disk Reliability, Case Studies LINUX, WINDOW NT.

TEXT BOOK

1. Operating System Concepts: Abraham Silberschatz and Peter Bear Galvin, Addison Wesley, Chapter – 1, Chapter –3 (3.1,3.2,3.3), Chapter – 4, chapter – 5 (5.1, 5.2, 5.3) , Chapter –7 (7.1,-

7.7), Chapter-8, chapter – 8, Chapter – 9, Chapter-10, Chapter- 11, Chapter-12, (12.1-12.5), Chapter-13(13.1-1.35)

Reference Book :

1. Operating System, McGraw Hill, Madnik & Donovan.
2. Operating Systems and system progamming, SCITECH, P. Blkeiahn Prasad.
3. Moswen O.S. – PHI, Andrew, S. Tannenbaum

SOFTWARE ENGINEERING & OOAD (CS15-031)

L-T-P: 3-1-0 **Cr.-4**

Module -I

INTRODUCTION – Evolution & Impacts, Motivation for Software Engineering, Programs vs Software products, Emergence of Software Engineering, Recent trends in software development practices.

SOFTWARE LIFE CYCLE MODELS – Reasons behind using Life Cycle models, Study of various Life Cycle Models – Classical Waterfall, Iterative Waterfall, Prototyping, Evolutionary, Spiral, etc. Comparison of various Life Cycle Models.

Module-II

SOFTWARE PROJECT MANAGEMENT – Responsibilities, Planning, Project & Empirical Estimation Techniques, COCOMO, Software Science, Staffing, Scheduling, Team Structure, Risk Management, Configuration Management.

REQUIREMENT ANALYSIS & SPECIFICATION – Gathering Requirements & Analysis, SRS, Formal System Development Techniques, Axiomatic & Algebraic Specification.

Module-III

SOFTWARE DESIGN & MODELLING – Cohesion & Coupling, Software Design Approaches, Object Oriented Design vs. Function Oriented Design, Function Oriented Software Design (SA/SD Methodology, Structured Analysis, DFDs, Structured & Detailed Design), Object Oriented Software Development (Design Patterns & Generalized Process), Object Modelling using UML (UML Concepts, UML Diagrams, USE Case Model; Class, Interaction, Activity & State Chart Diagrams)

USER INTERFACE DESIGN – Basic concepts & its types, Component based GUI Development, User Interface Design Methodology

Module-IV

CODING & TESTING – Coding & Code Review, Testing – Unit, Black box & White box, Debugging, Program Analysis Tools, Integration &System Testing, General issues related to testing.

SOFTWARE RELIABILITY & QUALITY MANAGEMENT – Software Reliability & Quality, Statistical Testing, Quality Management System, ISO 9000, SEI CMM, PSP.

CASE – Environment & scope, Support in SDLC, Characteristics & Future Scope of CASE Tools, Architecture of a CASE Environment.

SOFTWARE MAINTAINANCE – Characteristics, Reverse Engg., Maintenance Process Models, Estimation of Maintenance Cost.

SOFTWARE REUSE – Basic Issues, Refuse Approach, Reuse at Organizational Level.

Text Book:

1. Rajib Mall, “Fundamental of Software Engineering”, PHI
2. Roger S. Pressman, “Software Engineering A Practitioners Approach”. Mc-Graw Hill Publication.

Reference Book:

1. Richard Farley, “Software Engineering Concepts”. Mc-Graw Hill Publication.

MICROPROCESSORS AND MICROCONTROLLERS (CS15-021)

L-T-P: 3-1-0 **Cr.-4**

Module I: Architecture of Microprocessors

General definitions of mini computers, microprocessors, micro controllers and digital signal processors.Overview of 8085 microprocessor.Overview of 8086 microprocessor. Signals and pins of 8086 microprocessor

Module II: Assembly language of 8086

Description of Instructions.Assembly directives. Assembly software programs with algorithms, Interfacing with RAMs, ROMs along with the explanation of timing diagrams. Interfacing with peripheral ICs like 8255 etc.Interfacing with key boards, LEDs, LCDs, ADCs, and DACs etc.

Module III: Architecture of Micro controllers

Overview of the architecture of 8051 microcontroller.Overview of the architecture of 8096 16 bit microcontroller.Description of Instructions.Assembly directives. Assembly software programs with Algorithms.

Module IV: Interfacing with 8051

Interfacing with keyboards, LEDs, 7 segment LEDs, LCDs, Interfacing with ADCs.Interfacing with DACs, etc.

TEXT BOOK:

1. Krishna Kant, “Microprocessors and Microcontrollers Architecture, programming and system design using 8085, 8086, 8051 and 8096”. PHI 2007.
2. Douglas V Hall, “Microprocessors and Interfacing, Programming and Hardware” TMH, 2006.

REFERENCES:

1. Muhammad Ali Mazidi, Janice GillispieMazidi, RolinD.MCKinlay The 8051 Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008.
2. Kenneth J. Ayala, “The 8086 Microprocessor: Programming & Interfacing The PC”, Delmar Publishers, 2007.
3. A K Ray, K M Bhurchandi, Advanced Microprocessors and Peripherals, TMH, 2007.
4. Ajit Pal, “Microprocessors Principles and Applications”, TMH, 2005

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GRAPH THEORY (CS15-019)

L-T-P: 3-1-0 **Cr.-4**

Module-I (9 lectures)

Fundamental Concepts : Graphs, Paths, Cycles, Trails, Vertex Degrees, Counting, directed graphs.
Trees and Distance : Basic Properties, Spanning Trees and Enumeration, Optimization and Trees.
Ramsey's Theorem Graph isomorphism,special graphs, decomposition,Connection.
Characterizing bipartite graphs Hamiltonian cycles: Dirac's Theorem

Module-II(9 lectures)

Eulerian circuits: characterization of Eulerian graphs Cut vertices, edges.
Trees: equivalent conditions for trees, and related results.
Vertex and edge connectivity : Whitney's inequality, cubic graphs, expansion.
2 and 3-connected graphs: Whitney's theorem in Testing Center, Thomassen's 3-connectivity theorem
Menger's theorem with applications.

Module-III (9 lectures)

Introduction to matchings : Berge's theorem.
Bipartite matching: Hall's Theorem, Konig-Egervary theorem.
General matchings: Tutte's theorem, Berge-Tutte formula, Petersen's 1-factor theorem, Petersen's 2-factor theorem

Module-IV (9 lectures)

Vertex-coloring, chromatic number, constructions of Mycielski and Zykov,Brooks' theorem.
Turan's Theorem. Edge-coloring, chromatic index of bipartite graphs, Vizing's Theorem.
List coloring, Kernel lemma and Galvin's Theorem.
Plnarity : Planar and plane graphs, Euler's Formula, Kuratowski graphs, Kuratowski's Theorem
List coloring of planar graphs: Thomassen's Theorem, planar duals
Lower bound for Ramsey's Theorem.

Module-V (4 Lectures)

Advanced Topics: Connectivity; spanning trees; Cut vertices & edges; covering; matching; independent sets; Colouring; Planarity; Isomorphism.

Text Book –

1. Introduction to Graph Theory – Douglas B. West, PHI.

CRYPTOGRAPHY AND NETWORK SECURITY(IT15-002)

L-T-P: 3-1-0 **Cr.-4**

Module I **(12 LECTURES)**

Introduction to the Concepts of Security: The need for security, Security Approaches, Principles of Security, Types of Attacks. Cryptographic Techniques: Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography, Key Range and Key Size, Possible Types of Attacks.

Module II **(8 LECTURES)**

Computer-based Symmetric Key Cryptographic Algorithms: Algorithm Types and Modes,
An overview of Symmetric Key Cryptography, DES, International Data Encryption Algorithm (IDEA), RC5, Blowfish, AES, Differential and Linear Cryptanalysis.

Module III **(8 LECTURES)**

Computer-based Asymmetric Key Cryptography: Brief History of Asymmetric Key Cryptography, An overview of Asymmetric Key Cryptography, The RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm, Some other Algorithms.

Module IV **(12 LECTURES)**

Public Key Infrastructure: Digital Certificates, Private Key Management, The PKIX Model, Public Key Cryptography Standards, XML, PKI and Security. Internet Security Protocols: Basic Concepts, Secure Socket Layer, SHTTP, Time Stamping Protocol, Secure Electronic Transaction, SSL versus SET, 3-D Secure Protocol, Electronic Money, E-mail Security, Wireless Application Protocol (WAP) Security, Security in GSM.

Text Books:

1. Cryptography and Network Security – by Atul Kahate – TMH.
2. Data Communications and Networking- by Behourz A Forouzan

Reference Book:

1. Cyber Security Operations Handbook – by J.W. Rittiaghouse and William M.Hancok – Elseviers.

OPERATING SYSTEMS LAB (CS15-985)

L-T-P: (0-0-3) **Cr:** 2

- Study of Unix/Linux Commands.(2 classes)
- Write a program to allocate blocks of memory.
- Write a program to implement best fit algorithm in paging memory.
- Write a program to implement the bit vector for free space management.
- Write a program to implement first fit algorithm in paging memory.
- Write a program to implement worst fit algorithm in paging memory.
- Write a program to create a unique file name by the user or by the system.
- Write a program to implement DEKKERS ALGORITHM for mutual exclusion problem.
- Write a program to implement DINING PHILOSOPHER problem.
- Write a program for FCFS cpu scheduling algorithm.
- Write a program for FIFO page replacement algorithm.
- Write a program for LRU page replacement algorithm.
- Write a program for Optimal page replacement algorithm.
- Write a program to implement paging scheme.
- Write a program for ROUND ROBIN cpu scheduling algorithm.
- Write a program for SJF cpu scheduling algorithm.
- Write a program to implement producer-consumer problem of IPC.
- Write a program for to create two processes and wait for them to complete.
- Write a program to make packaging and sending as in IPC.
- Write a program to illustrate the function of a dispatcher.

ADVANCE COMPUTING LAB (CS15-999)

L-T-P: (0-0-3) **Cr:** 2

1. Client-server application programming in C using TCP/IP (like a chatting application) and UDP Protocols. (2 classes)
2. Script program to monitor network traffic like pinging and log the messages.
3. Study and analysis of network packet filter tools like tcpdump
4. Program in C++ to monitor network traffic and display the necessary messages.
5. Client side programming using HTML/Java Script and Server side Programming using Perl.
6. VBScript programming
7. C# . Net Programming

MP&MC LAB (CS15-986)

L-T-P: (0-0-3) **Cr:** 2

1. Addition of two 8-bit numbers, sum 8 bits
2. Subtraction of two 8-bit numbers, difference 8 bits
3. Addition of two 8-bit numbers, sum 16 bits.
4. Decimal addition of two 8-bit numbers, sum 16 bits.
5. Addition of two 16-bit numbers, sum 16 bits or more.
6. Find one's complement of an 8-bit number and 16-bit number.
7. Find two's complement of an 8-bit number and 16-bit number.
8. Find multiplication of two numbers using multiple addition.
9. Find division of two numbers using repeated subtraction.
10. Find square from lookup table.

11. Find the largest number in a data array.
12. To arrange a series of numbers in ascending or descending order.
13. Sum of a series of two 8-bit numbers, sum 8 bits
14. Sum of a series of two 8-bit numbers, sum 16 bits
15. 8-bit multiplication, product 16 bit
16. Programs on multibyte addition, subtractions etc.
17. To find the square root of a number.

SOFTWARE ENGINEERING LAB (CS15-981)

L-T-P: (0-0-3) **Cr:** 2

1. Time management software of a company
2. Hotel automation software
3. Judiciary information system software
4. Restaurant automation software
5. Supermarket automation software
6. Newspaper agency automation software
7. Medicine shop software
8. Bookshop automation software
9. Road tax information management system
10. Railway reservation system
11. Electricity billing system
12. Inventory control system
13. Library management system
14. Payroll management system
15. Banking system

SIXTH SEMESTER

COMPILER DESIGN (CS15-004)

L-T-P: 3-1-0 **Cr.-4**

Module – I: Compiler Overview and Lexical Analysis **8 Hours:**

Overview of language processing: preprocessors, compiler, assembler, interpreters, linkers, Bootstrap loaders and cross compiler. Structure of a compiler: phases of a compiler. Lexical Analysis: Role of Lexical Analysis, Input buffering, Regular Expressions, NFA, DFA, Minimization of DFA, Transition diagram for tokens, reserved words and identifiers. Lexical error and its recovery, LEX.

Module – II: Syntax Analysis **12 Hours:**

Role of a parser, Top down parsing, derivation, ambiguity, left recursion, left factoring, backtracking parsing, recursive decent parsing, predictive parsing, LL(1) Grammars. Bottom up parsing, Shift Reduce Parsing, handle, handle pruning, Operator precedence parser, precedence function, LR Parsers, Construction of SLR, CLR, LALR Parsing tables, parser conflicts, Dangling ELSE Ambiguity, Error recovery in Parsing. YACC.

Module – III : Semantic Analysis and Intermediate code generation **10 Hours:**

Semantic analysis, SDD and SDTS, evaluation of semantic rules, implementation of S-attributed and L-attributed definition. Type analysis and type checking. Intermediate code, three address code, quadraples, triples, indirect triplet, abstract syntax trees, Declarations, Assignment statements, Boolean expressions, Case statements, Back patching, Procedure calls. Symbol tables, use of symbol tables. Runtime Environment: storage organization, stack allocation, access to non-local data, heap management, parameter passing mechanisms.

Module – IV: Optimization and Code generation **10 Hours:**

Machine independent code optimization: Common sub expression elimination, constant folding, copy propagation, dead code elimination, strength reduction, loop optimization, basic blocks, data flow analysis. Code generation: Issues in the design of code generation, The target machine, A simple code generator, DAG representation of basic blocks. Machine dependent code optimization: Peephole optimization, register allocation, instruction scheduling, inter procedural optimization, garbage collection via reference counting.

Text books:

1. Compilers, Principles Techniques and Tools- Alfred V Aho, Monical S Lam, Ravi Sethi, Jeffrey D. Ullman,2nd ed, Pearson,2007.
2. Principles of compiler design, V. Raghavan, 2nd ed, TMH, 2011.

Reference books:

1. Compiler construction, Principles and Practice, Kenneth C Louden, CENGAGE
2. Compiler Design, O. G. Kakde, University Science Press.
3. Compiler Design, K. Muneeswaram, Oxford University Press.

4. Allen I. Holub “Compiler Design in C”, Prentice Hall of India, 2003

DATA COMMUNICATION & COMPUTER NETWORKS (CS15-010)

L-T-P: 3-1-0 **Cr.-4**

Module – I(12 Lectures)

Overview of Data Communications and Networking.
Physical Layer : Analog and Digital, Analog Signals, Digital Signals, Analog versus Digital, Data Rate Limits, Transmission Impairment, More about signals.
Digital Transmission: Line coding, Block coding, Sampling, Transmission mode.
Analog Transmission: Modulation of Digital Data; Telephone modems, modulation of Analog signals.
Multiplexing : FDM , WDM , TDM ,
Transmission Media: Guided Media, Unguided media (wireless)
Circuit switching and Telephone Network: Circuit switching, Telephone network.

Module –II(12 Lectures)
Data Link Layer
Error Detection and correction: Types of Errors, Detection, Error Correction
Data Link Control and Protocols:
Flow and Error Control, Stop-and-wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ,
HDLC, Point –to- Point Protocol, Multiple Access, Random Access, Controlled Access, Channelization.
Local area Network: Ethernet, Traditional Ethernet, Fast Ethernet, Gigabit Ethernet.
Wireless LANs: IEEE 802.11, Bluetooth virtual circuits: Frame Relay and ATM.

Module – III(8 Lectures)
Network Layer:
Host to Host Delivery: Internetworking, addressing, Routing.
Network Layer Protocols: ARP, RARP, NAT, BOOTP, DHCP, IPV4, ICMP, IPV6, ICMPV6 and Unicast routing protocols
Transport Layer: Process to Process Delivery: UDP, TCP, congestion control and Quality of service.

Module-IV(8 Lectures)
Application Layer :
Client Server Model, Peer to peer network, Domain Name System (DNS): Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW.

Text Books:

1. Data Communications and Networking: Behrouz A. Forouzan, Tata McGraw-Hill, 4th Ed
2. Computer Networks: A. S. Tannenbum, D. Wetherall, Prentice Hall, Imprint of Pearson 5th Ed

Reference Book : .

1. Computer Networks:A system Approach:Larry L, Peterson and Bruce S. Davie,Elsevier, 4th Ed
2. Computer Networks: Natalia Olifer, Victor Olifer, Willey India
3. Data and Computer Communications: William Stallings, Prentice Hall, Imprint of Pearson, 9th Ed.
4. Data communication & Computer Networks: Gupta, Prentice Hall of India
5. Network for Computer Scientists & Engineers: Zheng, Oxford University Press

6. Data Communications and Networking: White, Cengage Learning

SIMULATION AND MODELING (CS15-029)

L-T-P: 3-1-0 **Cr.-4**

Module I (10 hrs)

Introduction: Definition, Advantages and Disadvantages of Simulation, Areas of application, Concept of a System, Environment, Components of a system, Continuous and discrete systems, Modeling, Types of models, Monte Carlo Method, Comparison of Simulation and Analytical Methods. Discrete and continuous models.

Module II (10 hrs)

Probability Concepts in Simulation: Discrete and Continuous Probability Functions, Random Number Generators – Linear Congruential Generator, Mid Square Method, rejection Method, Testing of random Numbers, Generation of Stochastic variates in Arrival Patterns and Service times.

Module III (10 hrs)

Discrete System Simulation: Discrete Events, Representation of Time, generation of arrival patterns, fixed time step versus next event simulation, Simulation of a Telephone System, delayed calls.

Computer model of queuing and scheduling systems, Design and Evaluation of simulation Experiments: Length of simulation runs, validation, variance reduction techniques, analysis of simulation output.

Module IV (10 hrs)

Simulation Languages: Introduction to GPSS: Creating and moving transactions, queues, facilities and storages, gathering statistics, conditional transfers, program control statements, priorities and parameters, standard numerical attributes, functions, gates, logic switches and tests, Variables, Select and Count, Continuous and discrete systems languages,

Text Book:

1. System Simulation – Geoffrey Gordon, 2nd Edition, PHI
2. System Simulation with Digital computer – Narsingh Deo, PHI

Reference Book:

1. Discrete-Event System Simulation-Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol, P. Shahabudeen

COMPUTER GRAPHICS (CS15-005)

L-T-P: 3-1-0 **Cr.-4**

Module I **(10 Lectures)**

Application of Computer Graphics:
Computer Aided Design, Presentation Graphics, Computer art, Entertainment, Education and Training, Visualization, Image Processing, Graphical User Interface.

Graphics Hardware: Display Devices, Raster-Scan and Random Scan Displays, Direct View Storage Tube, Flat Panel Displays, Input Devices, Hard Copy Devices.

Output Primitives: Points and Lines, Line Drawing Algorithms, Circle Drawing Algorithms, Ellipse Drawing Algorithms, Region Filling Algorithms, Side Effects of Scan Conversion, Antialiasing.

Module II **(10 Lectures)**

Two-Dimensional Geometric Transformations: Basic Transformations (Translation, Rotation, Scaling), Matrix Representation and Homogeneous coordinates, Composite Transformation, Reflection, Shear, Transformation between coordinate system.

Two-Dimensional Viewing: Viewing Pipeline, Window-to-viewport Coordinate Transformation.

Two-Dimensional Clipping: Point Clipping, Line Clipping (Cohen-Sutherland Algorithm) and Polygon Clipping (Sutherland-Hodgeman Algorithm)

Module III **(12 Lectures)**

Three-Dimensional Transformation and Projection: Translation Rotation, Scaling, Reflections, Shear, Projection: Types of Projections (Parallel and Prospective), Mathematical Description of Projections

Three-Dimensional Viewing and Clipping: Three-Dimensional Viewing, Clipping, Viewing Transformation

Geometric Forms and Models: Simple and Complex geometric forms, Wireframe Model

Three Dimensional Object Representations: Curve Design, Blending Functions and its types, Spline Curve, Bezier Curves and Surfaces, B-Spline Curves and surfaces.

Fractal Geometry Methods: Fractal Generation Procedure, Classification of Fractals Dimension, geometric Construction of Deterministic self-similar.

Module IV **(08 Lectures)**

Visible Surface Detection Methods: Hidden Lines and Surfaces, Depth Comparisons, Back-face Detection, Z-Buffer, A-Buffer, Area-Subdivision Algorithms

Illumination Models: Basic Models, Displaying Light Intensities, Halftone Pattern and Dithering Techniques

Surface Rending Methods: Polygon Rendering Methods, Gouraud and Phong Shading

Text Books:

1. Computer Graphics, D.Hearn and M.P.Baker (C Version), Prentice Hall, 1999

Reference Books:

1. Computer Graphics Principle and Practice, J.D.Foley, A.Dam, S.K.Feiner, Addison, Wesley.
2. Schaum's Outlines Computer Graphics, Z. Xiang and Roy A Plastock, 2nd Edition, McGraw Hill Education, Indian Edition 2006.

COMPILER DESIGN LAB (CS15-997)

L-T-P: (0-0-3) **Cr:** 2

- Introduction to LEX and YACC
- Write a LEX program to evaluate the arithmetic expression
- Write a LEX program for tokenizing the given program.
- Integration LEX with YACC program
- Write a LEX program to find out the comment lines of a given program.
- Write a LEX program toidentify the strings ending with abb.
- Write a YACC program to evaluate the following grammars: $\{a^nb^n|n>0\}$, $\{a^nb^nc^n|n>0\}$,$\{(ab)^n|n>0\}$

COMPUTER NETWORK LAB (CS15-994)

L-T-P: (0-0-3) **Cr:** 2

1. To study about different physical equipment used for networking.
2. To Connect 2 PCs using Peer to Peer communication.
3. Development of Stop & Wait protocol for file transfer
4. Study of Network Utilities.
5. Write a program to generate CRC code for checking error.
6. To Plot Efficiency of pure Aloha and slotted ALOHA in MATLAB.
7. To plot Channel Efficiency for Ethernet in MATLAB.
8. To Study the Network Simulator (NS2).
9. To implement wired network topology and wireless network Topology in ns2.
10. To implement UDP protocol and study performance using Network simulator (ns2).
11. a) Write a program to implement bit stuffing &Destuffing.
    b) Write a program to implement character stuffing &Destuffing.
12. Write a C program for IPV4, Implementation of decimal to binary, Implementation of binary to decimal.

SIMULATION AND MODELLING LAB (CS15-982)

L-T-P: (0-0-3) **Cr:** 2

1.Introduction to MATLAB
2.Programming in Matlab: Introduction, Branching statements, loops, functions, additional data types, plots, arrays, inputs/outputs etc.
3.Program to display a Matrix
4.Program to Addition of matrix
5.Program to transpose of a Matrix.
6.Introduction regarding usage of any Network Simulator.
7.Practical Implementation of Queuing Models using C/C++.
8.Simulation of events/models using MATLAB

COMPUTER GRAPHICS LAB (CS15-995)

L-T-P: (0-0-3) **Cr:** 2

1.Write a program to construct the following figures and color them using graphics built-in library functions:

i) Smiling Face
ii) Indian Flag
iii) House

2.Write a program to construct a moving car using graphics built-in library functions.
3.Write a program to construct a line by using slope-intercept method.
4.Write a program to construct a line using DDA algorithm.
5.Write a program to construct a dotted line using DDA algorithm.
6.Write a program to construct a dashed line using DDA algorithm where the length of dash is given by user.
7.Write a program to construct a dashed line using Bresenham's algorithm where the length of dash is given by user for m +ve, m<1, Direction of line left to right.
8.Write a program to construct a line using Bresenham's algorithm for the following cases:

i) m +ve, m<1, Direction of line left to right
ii) m +ve, m<1, Direction of line right to left
iii) m +ve, m>1, Direction of line left to right
iv) m +ve, m>1, Direction of line right to left

9.Write a program to construct a line using Bresenham's algorithm where the line is drawn simultaneously from both sides for m +ve, m<1, Direction of line left to right.
10.Write a menu driven program to create a circle using polynomial method:

i. Without using the symmetric concept
ii. Using the symmetric concept
11. Write a menu driven program to create a circle using trigonometric method:
iii. Without using the symmetric concept
iv. Using the symmetric concept

12.Write a program to construct a circle using the symmetric concept by applying the Mid-Point Circle Algorithm.
13.Write a program to construct a circle using the symmetric concept by applying the Bresenham's Circle Algorithm.
14.Write a program to draw two intersecting circles by applying i) Mid-Point ii) Bresenham's method and then fill the three areas differently.
15.Write a program to generate the following shapes using i) Mid-Point ii) Bresenham's circle drawing method:
16.Write a program to create a circle and a rectangle and fill those using the boundary fill algorithm using the 4-connected method.
17.Write a program to create a triangle and an ellipse and fill those using the flood fill algorithm using the 8-connected method.
18. Write a program to create a polygon with 'n' vertices and fill it using scan line fill algorithm.
19.Write a program to apply the series of transformations: Translation, Rotation and Scaling on the following graphical objects:

i) Line
ii) Circle
iii) Triangle
iv) Rectangle

Display the original and transformed figures after applying each transformation.
20.Write a program to construct a rectangle and then rotate it by angle Θ w.r.t. pivot point Pr(Xr,Yr). Display the original and transformed figure.

21.Write a program to create a circle and then scale the circle by S(Sx,Sy) w.r.t. fixed point Pf(Xf,Yf). Display the original and transformed figure.

22.Write a program to apply the reflection transformations on the following graphical objects: (For viewing the reflected image, create the x-y axis with origin at center of the screen)

i) Reflect a Triangle about the line y = 0
ii) Reflect a Triangle about the line y = 5
iii) Reflect a Rectangle about the line x = 0
iv) Reflect a Rectangle about the line x = 5

Display the original and transformed figure for each of the above cases.

23.Write a program to apply the shearing transformations on the following graphical objects:

i. Shear a Triangle about the line y = 0
ii. Shear a Triangle about the line y = 5
iii. Shear a Rectangle about the line x = 0
iv. Shear a Rectangle about the line x = 5

Display the original and transformed figure for each of the above cases.

SEVENTH SEMESTER

ADVANCED COMPUTER ARCHITECTURE (CS15-001)

L-T-P: 3-1-0 **Cr.-4**

Module-I

Flynn's classification: SISD, SIMD, MISD, MIMD, message passing, Loosely coupled and tightly coupled system,Basic ideas on parallel algorithm: SIMD algorithmfor matrix multiplication.

Parallel Processing: Definition, Theory of Parallelism. Parallel Computer Models, Parallelism in Uni-processor computers, Implicit Parallelism vs. explicit parallelism, Levels of parallelism.Soft ware Parallelism, Hardware Parallelism.

Pipelining: Linear pipe line processor, Asynchronous and Synchronous models, speed up,Efficiency,Throughput,Nonlinearpipelineprocessor,Instructionpipeline,Conditions of Parallelism pipeline hazards, Arithmetic pipeline

Module-II

Parallel Interconnection Systems: Static and Dynamic Networks, Linear Array, Ring, Star, Tree, Mesh, Systolic Array, Chordal ring, Completely connected network, Cube connected cycles, Torus, K-ary-n cube, Barrel shifter, single stage interconnection network, Multistage Interconnection Networks, Control Structure, Node degree, diameter, Bisection width, symmetric, functionality, Network Latency, Bandwidth, Scalability, Data routing functions:- Permutation, Perfect shuffle exchange, Hypercube Routing function.

Module-III

Instruction level parallelism:

Concepts and challenges – Hardware and software approaches, Dynamicscheduling, Speculation , Branch prediction. Amdhal's Law.

Module-IV

Cache performance, Reducing cache miss penalty and miss rate, Reducing hit time, Main memory and performance, Memory Interleaving technology, Buses, RAID.

Module-V

Software and hardware multithreading, SMT and CMP architectures, Design issues, Case studies, Intel Multi-core architecture, SUN CMP architecture,heterogeneous multi-core processors,Case study: IBM Cell Processor.

Text Books:

1. Advanced Computer Architecture, byKai Hwang Mc Graw Hill.
2. Computer Architecture –A quantitative approach By J.L Hennessy and D.A.Patterson (Morgan)

INTERNET & WEB PROGRAMMING (IT15-006)

L-T-P: 3-1-0 **Cr.-4**

Module I (10 Lectures)

Internet architecture: Internet overview, evolution of internet. Internet components: Local Area Networks, Access Networks, Core Networks, Routers, Transmission infrastructure, ISPs. TCP/IP model, TCP/IP vs OSI model.
HTML: HTML Overview, Structure of HTML Documents, Document Types, HTML Elements and attributes. Anchor Attributes, Image Tag and its attributes, Image and Anchors, Table

Module II (10 Lectures)

Image Map: Attributes, Client Side Image Maps and Server Side Maps.
HTML Layout: Background,colorsand text, Tables, Frames, Layers, Page content Division <Div>, <SPAN>.
CSS: Style Sheet Basic, Properties, Positioning with Style Sheet. **Forms:** <FORM> Elements, Form controls. Dynamic HTML.

Module III (10 Lectures)
Java Script : Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators :Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++ (Increment), -- (Decrement), -(Unary Negation), Logical Operators, String Operators, Special Operators, ? (Conditional operator), ,(Comma operator), delete, new, this, void, Statements **:** Break, comment, continue, delete, do … while, export, for, for…in, function, if…else, import, labelled, return, switch, var, while.
JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, regExp. **Document and its associated objects :**document, Link, Area, Anchor, Image, Applet, Layer.

Module IV (10 Lectures)
Events and Event Handlers : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDblClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload.

Server Side Programming : Common Gateway Interface (CGI), Active Server Pages. Internet applications: FTP, Telnet, Email, Chat. World Wide Web: HTTP protocol. Search Engines. E-commerce and security issues including symmetric and asymmetric key, encryption and digital signature, and authentication. Emerging trends, Internet telephony, virtual reality over the web, etc. Intranet and extranet, firewall.

Text Books:

1. Computer Networking A Top-Down Approach Featuring the Internet by Kurose and Ross.
2. Web Design The Complete Reference by Thomas Powell, Tata McGrawHill.

Reference Books:

1. HTML The Complete Reference by Thomas Powell, Tata McGrawHill.
2. JavaScript The Complete Reference, Second Edition by Thomas Powell, Fritz Schneider . Tata McGrawHill.

EMBEDDED AND REAL TIME SYSTEM (CS15-017)

L-T-P: 3-1-0 **Cr.-4**

Module- I

Introduction to embedded systems: Categories of embedded systems, overview of embedded system architecture; specialties of embedded systems recent trends in embedded systems, Communication interfaces: RS232/UART RS422/RS485.

Module- II

Survey of software Architectures: Round Robin, Round Robin with interrupts, Function Queue scheduling Architecture, RTOS Architecture, Architecture selection, Introduction to RTOS,Task and task states, Task and data, Semaphore and shared data, More operating system services, Message Queues, Mail boxes and pipes, Timer functions , events, Memory Management, Interrupt routine in an RTOS environment.

Module- III

Embedded Software Development Tools: Host and Target Machines, Linker/ Locator for Embedded Software , Getting Embedded Software into the target system, Debugging Techniques, Testing on your host machine, Instruction set Simulators, The Assert Macro using Laboratory tools.

Module-IV

Writing Software for Embedded Systems: The compilation process, Native versus cross compilers, Run time libraries, Writing a library, Using alternative libraries, Using a standard library, Porting Kernels, C extensions for Embedded Systems, Downloading, Emulation and Debugging Techniques, Buffering and other data structures: What is a Linear buffer, Directional buffer, Double buffering, buffer exchanging, Linked lists, FIFO, Circular buffers, Buffer under run and overrun, Allocating buffer memory, memory leakage, Memory and performance trade offs

TEXT BOOKS

1. "Embedded / Real time systems: Concepts, Design and Programming", Dr.K V K K Prasad, Dream Tech press, New Delhi, 2003.
2. "Embedded Software Primer", David Simon, AddisonWesley, 1999.

REFERENCES

1. "Introduction to Embedded Systems", Raj Kamal, TMS, Tata McGraw Hill Publications, 2002.
2. "Embedded System Design, A Unified Hardware/ Software Introduction", Frank Vahid,Tony D. Givargis, John Wiley and Sons, Inc 2002
3. "Embedded Microcomputer systems", Jonathan W. Valvano, Brooks / Cole, Thompson Learning.
4. "Embedded Systems Design Introduction to Processes, Tools, Techniques", Arnold S Burger, CMP books.

INTERNET AND WEB PROGRAMMING LAB (IT15-997)

L-T-P: (0-0-3) **Cr:** 2

- Web design environment : HTML elements coding and testing
- Cascading style sheet
- Implementation of website navigation
- Implementation of table elements
- Implementation of textual linking
- Implementation of page templates
- Implementation of frames and frame elements
- Implementation of web typography
- Implementation of graphics and coloring
- Server side and client side scripting (PHP and JavaScript)
- Mini project on website design using active and dynamic contents.

EIGHTH SEMESTER

MOBILE COMPUTING (CS15-022)

L-T-P: 3-1-0 **Cr.-4**

Module – I ch - 1,2,3

Overview of wireless technologies: Signal propagation, Multiplexing, Modulation and Spread Spectrum techniques;Media access control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), FDMA, TDMA, CDMA.

Module – II

Mobile IP : chp-8 GPRS : 4.1.8

Mobile Network Layer : Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP), General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes, Mobile Data Communication; WLANs (Wireless LANs) IEEE 802.II standard

MANET : 8.3 WLAN : chp - 7

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms.

Module – III chp 9

Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

Module – IV GSM : 4.1 WAP : ch - 10

GSM : Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services, Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management),

Bluetooth : 7.5

Module – V

Server-side programming in Java, Pervasive web application architecture, Device Independent example application

Text Book:

1. Mobile Communication, J.Schiller, Pearson
2. Mobile computing, Talukdar& Yavgal.

Reference Book:

1. Mobile and Personal Communication Systems and Services", Raj Pandya, Prentice Hall of India, 2001.

PARALLEL AND DISTRIBUTED SYSTEMS (CS15-027)

L-T-P: 3-1-0 **Cr.-4**

Module – I

Need for Parallel Computers, Models of Computation, Analyzing Parallel Algorithms, Expressing Parallel Algorithms, Matrix Vector Multiplication, Matrix Matrix Multiplication, Database Query Processing, 15 Puzzle Problem, Parallel Discrete Event Simulation, Image Dithering, Dense LU Factorization.

Module – II

Hyper Quick Sort, Merge Sort, Bitonic Merge Sort, Odd Even Transposition, Enumeration Sort, Sorting on the CRCW Model, CREW Model and EREW Model, MPI and PVM.

Module – III

Introduction to Distributed Systems, Routing Algorithms, Destination-Based Routing, The All-Pairs Shortest-Path Problem, The Netchange Algorithm, Routing with Compact Routing Tables, Hierarchical Routing.

Module – IV

Fault Tolerance in Distributed Systems, Fault Tolerance in Asynchronous and Synchronous Systems, Failure Detection, Stabilization.

Text Books

1. G. Tel, Introduction to Distributed Algorithms, 2nd Edition, Cambridge University Press, 2000.
2. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Introduction to Parallel Computing, Second Edition, Addison Wesley, 2003.

Reference Books

1. F. T. Leighton, Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes, M K Publishers, San Mateo California, 1992.
2. B. Wilkinson, M. Allen, Parallel Programming Techniques and Applications using Networked Workstations and Parallel Computers, Prentice Hall, 2005.
3. Michael J. Quinn, Parallel Computer Theory and Practice, McGraw Hill, Second Edition, 1994.
4. S. G. Akl, The Design and Analysis of Parallel Algorithms, PHI, 1989.

CORE ELECTIVES-I

ARTIFICIAL INTELLIGENCE AND ROBOTICS (CS15-002)

L-T-P: 3-1-0 **Cr.-4**

Module 1: Introduction to AI and Search Techniques

Introduction to AI, production system, production rules, State-space problem, Problem Solving by Intelligent search: BFS, DFS, Iterative Deepening Search, Hill Climbing, Simulated Annealing, heuristic Search: A*,AO* , Adversary Search: MIN-MAX Algorithm, Alpha-Beta Cut-off algorithm.

Module 2: Knowledge and Reasoning

Propositional Logic, Theorem Proving by Propositional Logic, Resolution principle, Predicate Logic, wff conversion to clausal form, Dealing with Imprecision and Uncertainty: Probabilistic Reasoning, Dempster-Shafer Theory for Uncertainty Management.

Module 3: Machine Learning

Machine Learning: Supervised learning, unsupervised learning, Reinforcement learning, Artificial Neural Net, perceptron model, feed-forward neural network, Back propagation.

Module 4: Fundamental of robotics

Fundamentals: Components, degrees of freedom, joints, reference frames, characteristics Mathematical modelling of a robot: Mapping between frames, Description of objects in space, Transformation of vectors. Direct Kinematic model: Mechanical Structure and notations, Description of links and joints, Kinematic modelling of the manipulator, Denavit-Hartenberg, Kinematic relationship between adjacent links, Manipulator Transformation matrix, Inverse Kinematics: Manipulator workspace, Solvable of inverse kinematic model, Manipulator Jacobian, Jacobian inverse, Application of robotics : path planning of mobile robot.

Text book:

1. Fu, Gonzales and Lee, Robotics, McGraw Hill
2. Robotics and Control Mittal and Nagrath Tata McGraw-Hill Education
3. *Artificial Intelligence and Soft Computing*: Behavioral and Cognitive Modeling of the Human Brain, Amit Konar, CRC Press
4. Artificial Intelligence, Dan W Patterson, Prentice Hall of India
5. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education

Reference Books:

1. Robert Shilling, Fundamentals of Robotics-Analysis and control, Prentice Hall of India
2. Artificial Intelligence, Nils J.Nilsson, ELSEVIER.
3. E.Rich and K.Knight, Artificial Intelligence, - TMH

COMPUTER GRAPHICS AND VISUALIZATION (CS15-006)

L-T-P: 3-1-0 **Cr.-4**

MODULE I **(10 LECTURES)**

Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface; Graphics architectures; Programmable pipelines; Performance characteristics. Graphics Programming: The Sierpinski gasket; Programming two-dimensional applications.

The OpenGL: The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plotting implicit functions.

MODULE II **(12 LECTURES)**

Input and Interaction: Interaction; Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking; A simple CAD program; Building interactive models; Animating interactive programs; Design of interactive programs; Logic operations.

Geometric Objects and Transformations: Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling. Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices; Interfaces to three-dimensional applications; Quaternions.

MODULE III **(10 LECTURES)**

Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal; Interactive mesh displays; Parallel-projection matrices; Perspective-projection matrices; Projections and shadows.

Lighting and Shading: Light and matter; Light sources; The Phong lighting model; Computation of vectors; Polygonal shading; Approximation of a sphere by recursive subdivisions; Light sources in OpenGL; Specification of materials in OpenGL; Shading of the sphere model; Global illumination.

MODULE IV **(08 LECTURES)**

Curves and surfaces: Representation of curves and surfaces; Design criteria; Parametric cubic polynomial curves; Interpolation; Hermite curves and surfaces; Bezier curves and surfaces; Cubic B-Splines; General B-Splines; Rendering curves and surfaces; Curves and surfaces in OpenGL.

TEXT BOOK:

1. Edward Angel: Interactive Computer Graphics A Top-Down Approach with OpenGL, 5th Edition, Pearson, 2009.

REFERENCE BOOKS:

1. Donald Hearn and Pauline Baker: Computer Graphics- OpenGL Version, 2nd Edition, Pearson, 2004.
2. F.S. Hill,Jr.: "Computer Graphics Using OpenGL",2nd Edition, Pearson, 2001.
3. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics, Addison-wesley 1997.

DIGITAL IMAGE PROCESSING (CS15-014)

L-T-P: 3-1-0 **Cr.-4**

Module-I: Introduction

What Is Digital Image Processing? The Origins of Digital Image Processing. Examples of Fields that Use Digital Image Processing. Fundamental Steps in Digital Image Processing. Components of an Image Processing System. Image Sampling and Quantization.Some Basic Relationships between Pixels.Linear and Nonlinear Operations.

Module-II: Image Enhancement in the Spatial Domain

Some Basic Gray Level Transformations.Histogram Processing.Enhancement Using Arithmetic/Logic Operations.Basics of Spatial Filtering.Smoothing Spatial Filters. Sharpening Spatial Filters.Combining Spatial Enhancement Methods.

Module-III: Image Enhancement in the Frequency Domain

Introduction to the Fourier Transform and the Frequency Domain. Smoothing Frequency- Domain Filters. Sharpening Frequency Domain Filters. Homo-morphic Filtering.

Module-IV: Morphological Image Processing and Image Segmentation

Dilation and erosion, opening and closing, Hit-or-Miss transformations, basic morphological algorithms, Detection of discontinues, edge linking and boundary detection, thresh holding, region –based segmentation.

Module-V: Use of Image Processing in Pattern Recognition

Introduction to the tools of Matlab and Open CV. Case study on Object Identification, Biometrics and Content Based Image retrieval.

Text Books:

1. Rafael C Gonzalez and Richard E Woods, Digital Image Processing, Pearson Education, 2002.
2. Anil K Jain, Fundamental of Digital Image Processing, Prentice Hall of India, 2004.

Reference Books:

1. William K Pratt, Digital Image Processing PIKS Scientific Inside, 4th Edition, Wiley
2. Vipul Singh, Digital Image Processing With Matlab&LabView, Reed Elsevier India Pvt Ltd, 2013,

DISTRIBUTED COMPUTING SYSTEMS (CS15-015)

L-T-P: 3-1-0 **Cr.-4**

Module – I

Introduction to Distributed Computing, Architectures, Models: Workstation, Workstation-Server and Processor-Pool, Issues in Designing Distributed Systems, Inter Process Communication (IPC), Message Passing, IPC Message Format, IPC Synchronization, Message Buffering Strategies, Process Addressing Techniques, Failure Handling Mechanism: 4-Message, 3-Message and 2-Message IPC Protocol, Introduction to Remote Communication, Remote Procedural Call (RPC), RPC Implementation, RPC Communication and Issues, Introduction to Remote Method Invocation (RMI), RMI Implementation, Design Issues, RMI Execution, RMI Parameter Passing.

Module – II

Introduction to Synchronization, Clock Synchronization, Synchronization Algorithms: Centralized and Distributed, Logical Clocks: Event Ordering, Implementation, Lamport's Timestamps and Vector Timestamps, Global State, Mutual Exclusion: Centralized, Distributed and Token Ring Algorithm, Election Algorithms: Bully and Ring.

Module - III

Introduction to Distributed System Management, Resource Management, Task Assignment: Graph Theoretic Deterministic, Centralized Heuristic and Hierarchical Algorithm, Load-Balancing, Load Sharing, Global Scheduling Algorithms, Process Management, Process Migration, Threads, Thread Control Block, Models, Design Issues, Fault Tolerance, Component Faults, System Failures, Use of Redundancy, Distributed Shared Memory Architecture, Types, Design Issues in DSM Systems, Implementing DSM Systems, Data Location and DSM Management: Centralized-Manager, Broadcast, Fixed and Dynamic Distributed-Manager Algorithm, Replication vs Migration.

Module - IV

Introduction to Distributed File System (DFS), File Models: Structured and Unstructured Files, Mutable and Immutable Files, Design: File Service Interface, Directory Service Interface and Naming Transparency, File Caching in DFS: Location and Consistency, Cache Consistency, Replication, Introduction to Grid Computing, Grid Middleware, Architecture: Fabric, Connectivity, Resource, Collective and Application Layer, Types of Grids, Applications, Simulators, Globus Toolkit, BOINC, SETI, Service Oriented Architecture.

Text Books

1. S. Mahajan and S. Shah, Distributed Computing, 2nd Edition, Oxford University Press, 2013.
2. A. S. Tanenbaum, Distributed Systems: Principles and Paradigms, Maarten Van Steen, 2nd Edition, Pearson Prentice Hall, 2007.
3. G. F. Coulouris, J. Dollimore and T. Kindberg, Distributed Systems: Concepts and Design, Addison Wesley, 2005.

Reference Books

1. (Edited By) I. Foster and C. Kesselman, The Grid: Blueprint for a New Computing Infrastructure, Morgan Kaufmann, Elsevier, 2004.
2. S. Ghosh, Distributed Systems: An Algorithmic Approach, Chapman and Hall / CRC, 2006.

OBJECT ORIENTED ANALYSIS AND DESIGN (CS15-024)

L-T-P: 3-1-0 Cr.-4

OBJECTIVE: The objective of the course is to give students a detailed understanding of processes and techniques for building large object-oriented software systems. To develop skills to evolve object-oriented systems from analysis, to design, to implement and to understand most of the major object-oriented technologies including basic OO concepts, processes, languages, databases, user interfaces, frameworks, and design patterns.

PRE-REQUISITE:

- Software Engineering Concepts
- Object Oriented Programming Concepts

Module - I

Review of Object modeling, new paradigm, object oriented thinking-rethinking, Objects and Classes. Links and association, Generalization and specialization, Inheritance, Grouping concepts, aggregation, composition , abstracts classes, Polymorphism, Metadata, Constraints, Reuse.

Object Oriented Lifecycle Model, Introduction to Object Oriented Methodology, Overview of various object oriented methodologies- OOD, HOOD, OMT, CRC, OOA, OOSA, OOSE, OOSD, OORASS. [No. of Hrs.: 12]

Module - II

Architecture: Introduction, System development is model building, model architecture, requirements model, analysis model, the design model, the implementation model, test model.

Analysis: Introduction, the requirements model, the analysis model. [No. of Hrs.: 09]

Module - III

Construction: Introduction, the design model, block design, working with construction.

Testing: introduction, on testing, unit testing, integration testing, system testing, the testing process. [No. of Hrs.: 09]

Module - IV

Modeling with UML: Origin of UML, 4+1 view architecture of UML, Basic Building Blocks of UML, A Conceptual Model of UML, Basic Structural Modeling, UML Diagrams. Case Studies. [No. of Hrs.: 12]

TEXT BOOKS:

1. Ivar Jacobson, “Object Oriented Software Engineering”, Seventh Impression , Pearson, 2009.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, “The UML User Guide”, 2nd Edition, Pearson, 2008.

PATTERN RECOGNITION (CS15-028)

L-T-P: 3-1-0 Cr.-4

Module-I

INTRODUCTION: Machine perception, pattern recognition systems, design cycle, learning and adaptation, training and learning in pattern recognition approach, Applications of pattern recognition, Patterns and features, different types of pattern recognition

Module-II

PROBABILITY: Introduction, probability of events, random variables, Joint distributions and densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.

Module-III

STATISTICAL DECISION MAKING: Introduction, Baye's Theorem, multiple features, conditionally independent features, decision boundaries, unequal costs of error, estimation of error rates, the leavingone- out technique. Characteristic curves, estimating the composition of populations.

Module-IV

NONPARAMETRIC DECISION MAKING: Introduction, histograms, Kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate Functions, minimum squared error discriminate functions, choosing a decision making technique.

Module-V

UNSUPERVISED LEARNING AND CLUSTERINGS: Unsupervised Bayesian learning, data decryption and clustering, criterion functions and clustering, Hierarchical clustering, Online clustering, component analysis.

Module-VI

ARTIFICIAL NEURAL NETWORKS: Introduction, nets without hidden layers. nets with hidden layers, the back Propagation algorithms, Hopfield nets, an application.

TEXT BOOKS:

1. Pattern Classification Duda R. O., and Hart P E., and Stork D G., Wiley Publishers
2. Pattern Recognition and Image Analysis, Earl Gose, Richard J and Steve J, PHI
3. Pattern recognition (Statistical, structural and Neural Approaches), Robert Schalkoff

SOFT COMPUTING (C15-030)

L-T-P: 3-1-0 Cr.-4

Module 1: Neural Network

Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks, perception model, feed forward neural network, Back propagation, Adaline, Widrow-Hoff's Adaline model, Madaline, Unsupervised learning neural network: Hopfield neural network, Competitive learning, self-organizing feature map, Reinforcement learning: Q-learning, Temporal difference learning.

Module 2 : Fuzzy Logic

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, membership functions, Fuzzy set theory and operations, Extension principle of fuzzy set, fuzzy inference, Fuzzy implications, fuzzy relation, fuzzy reasoning , fuzzy c-means clustering , fuzzy inference Engine on VLSI architecture, Defuzzification techniques

Module 3: Evolutionary Computing

Fundamentals of genetic algorithms: Encoding, Fitness functions, Reproduction Genetic Modeling : Cross cover, Inversion and deletion, Mutation operator, Bit-wise operators, Bitwise operators used in GA. Convergence of Genetic algorithm. GA as an alternative to back propagation, Applications of GA in navigational planning of robots , Real life Problems.

Module 4: Hybrid Systems

Hybrid Systems: Neuro-fuzzy synergism, weakly coupled Neuro-fuzzy system, Tightly coupled Neuro-Fuzzy System, fuzzy-GA synergism, Neuro-GA, Adaptation of neural learning algorithm using GA

Text Books:

1. **Computational Intelligence** Principles, Techniques and Applications, Amit Konar, Springer publication.
2. Neural Networks, Fuzzy Logic, and Genetic Algorithm (synthesis and Application) S.Rajasekaran, G.A. Vijayalakshmi Pai, PHI
3. **Principles of Soft Computing** S.N.Sivanandam & S.N.Deepa,Wiley-India Edition

Reference Books:

1. Neuro Fuzzy and Soft Computing, J. S. R. JANG,C.T. Sun, E. Mitzutani, PHI

Soft-computing, D.K.Pratihar,Alpha Scie

WIRELESS SENSOR NETWORKS (CS15-034)

L-T-P: 3-1-0 **Cr.-4**

Module - I

OVERVIEW OF WIRELESS SENSOR NETWORKS: Challenges for Wireless Sensor Networks, Enabling Technologies For WirelessSensor Networks.

Module - II

ARCHITECTURES: Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, GatewayConcepts.

Module - III

NETWORKING SENSORS: Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Address and NameManagement, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing. INFRASTRUCTURE ESTABLISHMENT: Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

Module - IV

SENSOR NETWORK PLATFORMS AND TOOLS: Sensor Node Hardware – Berkeley Motes, ProgrammingChallenges, Node-level software platforms, Node-level Simulators, State-centric programming.

TEXT BOOKS:

1. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks”, John Wiley, 2005.

2. Feng Zhao & Leonidas J. Guibas, "Wireless SensorNetworks- An Information Processing Approach", Elsevier, 2007.

REFERENCES :

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor NetworksTechnology, Protocols, And Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

INFORMATION SECURITY (IT15-002)

L-T-P: 3-1-0 **Cr.-4**

SYLLABUS

Module I: **Introduction** (8 LECTURES)

Introduction to Information Security: Security Goals, Attacks, Security services and Mechanism. Cryptography: Plain Text and Cipher Text, Encryption and Decryption, Substitution cipher, Transposition Cipher, Stream and Block Cipher, Modern block ciphers, Modern stream Ciphers

Module II: **Cryptographic Techniques** (14 LECTURES)
Data Encryption Standard (DES), Security of DES, Advanced Encryption Standard (AES), Analysis of AES, Use of Modern Block Ciphers, Use of Stream ciphers. Public Key Encryption, Hash Functions, Key exchange, Digital Signatures

Module III: (8 LECTURES)
Viruses and Malicious Code:
Secure Programs, Non-malicious Program Errors, viruses and other malicious code, Targeted Malicious code, controls Against Program Threats
Operating Systems Security:
Access Control, File Protection, User Authentication, Security Policies, Models of Security

Module IV: (10 LECTURES)
Data base Security:
Security requirements, Reliability and integrity, Sensitive data, Inference, multilevel database, proposals for multilevel security.
Security in Network:
Threats in Network, Network Security Controls, Firewalls, Intrusion Detection Systems, Secure E-Mail.
Legal and Ethical Issues:
Protection of data and Information Laws, Employees rights, Software failure, Computer Crime, Privacy, Ethics

Text Books:

1. B. A. Forouzan & D Mukhopadhyay ,Cryptography and Network Security., McGraw Hill, 2nd ed.2010

Reference Book:

1. Stallings ,Cryptography and Network Security., PHI, 4th ed.2010
2. A. Kahate, Cryptography and Network Security, TMH.

SOFTWARE TESTING (IT15-009)

L-T-P: 3-1-0 **Cr.-4**

MODULE I: Introduction- Basics of Software Testing, Goals of Software Testing, Model for Software Testing. Software Testing Terminology & Methodology - Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.Verification&Validation- Verification of High Level Design, Low Level Design, Verification of a Code.
MODULE II: Black Box Testing- Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing,State Table Based Testing. White Box Testing- Need, Logic Coverage Criteria, Basic Path Testing, Graph Matrices, Loop Testing, Data Flow Testing, Mutation Testing. Static Testing – Inspections, Structured Walkthrough, Technical Reviews. Validation Activities- Unit Validation Testing, Integration Testing, Function Testing, System Testing, Acceptance Testing. Regression Testing.
MODULE III: Test Management- Test Organization, Test Planning, Test Design & Test Specification. Software Metrics, Testing Metrics for Monitoring and Controlling the Testing Process, Efficient Test Suite Management- Test Suite Minimization & Test Suite Prioritization, Software Quality Management.
MODULE IV: Automation & Testing Tools- Need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Overview of Testing Tools. Testing Object Oriented Software- OOT Basics, Object Oriented Testing. Testing Web Based System- Web Based System, Challenges in Testing for Web Based System, Web Engineering, Testing for Web Based System. Debugging

TEXT BOOKS

1. Foundations of Software Testing – Aditya P Mathur. Pearson Education
2. Software Testing Principles and Practices- Naresh Chauhan, Oxford University Press.
3. Software Testing Tools - Dr.K.V.K.K.Prasad, Dreamtech press.
4. Software Testing: Principles and Practices- Srinivasan Desikan, Gopalaswamy Ramesh, Pearson Education.

REFERENCE BOOKS

1. Software Testing - B.Bezier- 2nd Edn, Techniques, Dreamtech, New Delhi
2. Software Testing, Second Edition By: Ron Patton, Pearson Education
3. Software Testing Principles and Tools By M.G. Limaye TMG Hill Publication

CORE ELECTIVES-II

COMBINATORIAL OPTIMIZATION (CS15-003)

L-T-P: 3-1-0 **Cr.-4**

MODULE I (10 periods)
Introduction : Enumeration, Running Time of Algorithms, Linear Optimization Problems, Sorting.

Graphs : Trees, Circuits, and Cuts , Connectivity, Eulerian and Bipartite Graphs, Planarity, Planar Duality.

MODULE II (10 periods)

Linear Programming : Polyhedra, The Simplex Algorithm, Duality, Convex Hulls and Polytopes.

Linear Programming Algorithms : Size of Vertices and Faces, Continued Fractions, Gaussian Elimination, The Ellipsoid Method, Khachiyan's Theorem, Separation and Optimization.

MODULE III (10 periods)

Integer Programming : The Integer Hull of a Polyhedron, Unimodular Transformations, Total Dual Integrality , Totally Unimodular Matrices, Cutting Planes.

Shortest Paths : Shortest Paths From One Source, Shortest Paths Between All Pairs of Vertices, Minimum Mean Cycles.

MODULE IV (10 periods)

Network Flows : Max-Flow-Min-Cut Theorem, Menger's Theorem, The Edmonds-Karp Algorithm, Blocking Flows, The Goldberg-Tarjan Algorithm, The Minimum Cut in an Undirected Graph.

Minimum Cost Flows : Problem Formulation, An Optimality Criterion, Minimum Mean Cycle-Cancelling Algorithm, Successive Shortest Path Algorithm

Text Book –

Combinatorial Optimization Theory and Algorithms : B. Korte, Springer, 2nd Edition.

COMPUTER VISION (CS15-009)

L-T-P: 3-1-0 **Cr.-4**

Module I **(10 Lectures)**

Digital Image Formation and low-level processing: Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

Depth estimation and Multi-camera views: Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration.

Module II **(10 Lectures)**

Feature Extraction: Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

Image Segmentation: Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.

Module III **(08 Lectures)**

Object Recognition: Structural, model-based, appearance and shape-based methods; probabilistic paradigms; discriminative part-based models; BOW, ISM, Learning methods.

Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

Module IV **(12 Lectures)**

Motion Analysis: Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

Shape from X: Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.

Miscellaneous: Applications: CBIR, CBVR, Activity Recognition, computational photography, Biometrics, stitching and document processing; Modern trends - super-resolution; GPU, Augmented Reality; cognitive models, fusion and SR&CS.

Textbooks:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.

References:

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.
3. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992.

GAME THEORY (CS15-018)

L-T-P: 3-1-0 **Cr.-4**

Module-I

Introduction to Game Theory : Game theory, Theory of rational choice, Interacting decision makers. Strategic Games and Nash Equilibrium Strategic games: examples Nash equilibrium: concept and examples Best response functions Dominated Actions Symmetric games and symmetric equilibria.

Module-II

Illustrations of Nash Equilibrium Cournot's model of duopoly market, Bertrand's model of duopoly market Electoral Competition War of Attrition, Auctions Accident Laws.

Module-III

Mixed Strategy Nash Equilibrium Introduction Strategic games with randomisation Mixed strategy Nash equilibrium: concept and examples Dominated Actions Formation of Players' beliefs.

Module-IV

Extensive Games and Nash Equilibrium Introduction to extensive games Strategies and outcomes Nash equilibrium Subgame perfect Nash equilibrium Backward induction.

Illustrations of Extensive Games and Nash Equilibrium Stackelberg model of duopoly markets Ultimatum game

Books :

1. Osborne, M.J.An Introduction to Game Theory, Oxford University Press, 2004
2. Mas-Colell,A., M.D. Whinston and J.R. Green Microeconomic Theory, Oxford University Press, 1995
3. Gibbons, R.A Primer in Game Theory,Pearson Education, 1992

HUMAN-COMPUTER INTERFACE (CS15-020)

L-T-P: 3-1-0 **Cr.-4**

Module I :

Introduction to human computer interaction , Input-output channels, human memory, Thinking, Emotion, cause of emotion, characteristics of emotion Basic Components of Emotion, regulation and control of Emotion, biological basis of Emotion, emotion learning, mathematical modelling of emotional

dynamics, controlling emotion by artificial means, effect of emotion modelling on Human machine interaction, Emotion dynamics and stability analysis, text entry devices, device for virtual reality and 3D interaction, models of interaction, frameworks and HCL

Module II:

System Modeling and Stability, Stability Analysis of Dynamics by Lyapunov Energy Functions, Stability Analysis of Fuzzy Systems, Mamdani Type Fuzzy Systems, Takagi-Sugeno Type Fuzzy Systems, Stability Analysis of T-S Fuzzy Systems, Emotional Dynamics and Stability Analysis, Emotion Processing by the Human Brain, Role of Medial Frontal Cortex in Self-regulation of Emotion, Anterior Cingulate Cortex as a Self-regulatory Agent, Neural Circuitry Underlying Emotional Self-regulation, EEG Conditioning and Affective Disorders

Module III:

EEG Prediction by Adaptive Filtering: LMS Filter, EEG Prediction by NLMS Algorithm, RLS Filter for EEG Prediction, Emotion Clustering by Neural Networks, Application in Human-Machine Interactive Systems: Input Interfaces, Output Interfaces, Embodiment of Artificial Characters, Application in Multi-agent Co-operation of Mobile Robotics, Detection of Anti-social Motives from Emotional Expressions, Emotion Recognition from Voice Samples.

Text Books

1. Emotional Intelligence: A Cybernetic Approach, Aruna Chakraborty and Amit Konar, springer
2. Dix A. et al., Human-Computer Interaction. Harlow, England: Prentice Hall

Reference Books

1. B. Shneiderman, C. Plaisant, M. Cohen, and S. Jacobs, Designing the User Interface: Strategies for Effective Human-Computer Interaction, Addison-Wesley,

2. Y. Rogers, H. Sharp, and J. Preece, Interaction Design: Beyond Human-Computer Interaction, John Wiley & Sons

VLSI ALGORITHMS (CS15-033)

L-T-P: 3-1-0 **Cr.-4**

Module I INTRODUCTION AND BASIC CONCEPTS (8 Lectures)

VLSI Physical Design Automation **:** VLSI Design Cycle, Physical Design Cycle, Design Styles, System Packaging Styles.

Design and Fabrication of VLSI Devices **:** Fabrication Materials, Transistor Fundamentals, Fabrication of VLSI Circuits, Layout of Basic Devices, Additional Fabrication Factors.

Module II PARTITIING (8 Lectures)

Partitioning : Problem Formulation, Classification of Partitioning Algorithms, Group Migration Algorithms, Kernighan-Lin Algorithm, Fiduccia-Mattheyses Algorithm, Goldberg and Burstein Algorithm, Component Replication, Ratio Cut, Simulated Annealing and Evolution, Simulated Annealing and Evolution, Other Partitioning Algorithms, Performance Driven Partitioning.

Module III PLACEMENT, FLOOR PLANNING AND PIN ASSIGNMENT (12 Lectures)

Placement : Problem Formulation, Classification of Placement Algorithms, Simulation Based Placement Algorithms, Partitioning Based Placement Algorithms, Other Placement Algorithms, Performance Driven Placement.

Floor-planning : Problem Formulation, Classification of Floor planning Algorithms, Constraint Based Floorplanning, Integer Programming Based Floorplanning, Rectangular Dualization.
Pin Assignment : Problem Formulation, Classification of Pin Assignment Algorithms, General Pin Assignment, Channel Pin Assignment.

Module IV ROUTING, COMPACTION AND FPGA (12 Lectures)

Global Routing : Maze Routing, Line-Probe, Shortest-Path, Steiner Tree, Integer Programming based Algorithms.
Detailed Routing : Problem Formulation, Single-Layer Routing, Two-Layer Channel Routing, Three-Layer Channel Routing, Multi-Layer Channel Routing, Switchbox Routing Algorithms.

Concepts of Compaction, Physical Design Automation of FPGAs.

Text Book :

1. Algorithms for VLSI Physical Design Automation – N. A. Sherwani, Kluwer Academic Publishers.

CLOUD COMPUTING (IT15-001)

L-T-P: 3-1-0 **Cr.-4**

Module – I

Introduction to Cloud Computing, Gartner's Hype Cycle for Emerging Technologies, Comparisons: Cluster, Grid and Cloud, Cloud Computing at a Glance, Vision, A Close Look, The NIST Model, Cloud Cube Model, Types: Deployment and Service Models, Public, Private, Hybrid and Community Cloud, IaaS, PaaS, SaaS, Characteristics, Applications, Benefits, Disadvantages, Web 2.0, The Laws of Cloudonomics, Obstacles, Cloud Adoption, Measuring the Costs, Service-Level Agreement, Cloud Architecture, Virtual Appliances, Connecting to the Cloud, IaaS Workloads, Open SaaS and SOA, OnDemand vs. OnPremises IT, Bird's-Eye View of Cloud Computing Vendors, Virtualization, Characteristics of Virtualized Environments, Taxonomy of Virtualized Techniques, Full Virtualization, Paravirtualization, Partial Virtualization, Pros and Cons of Virtualization, Hypervisor, Open Challenges: Interoperability, Scalability, Fault Tolerance, Security, Trust and Privacy.

Module – II

Resource Allocation, Leases: Advance Reservation, Best Effort, Immediate, Deadline Sensitive and Negotiated, Haizea, Swapping and Backfilling, Resource Allocation Measures, Task Scheduling, Task: Dependent and Independent, Job, Application, Workflow: Montage, Epigenomics, SIPHT, LIGO, CyberShake, Machine: Homogeneous and Heterogeneous, Mode: Immediate, Intermediate and Batch, Expected Time to Compute Matrix, Manager Server, Data Center, Virtual Machine, Server, Makespan, Resource Utilization, Average Execution Time, Uncertainty, Heterogeneity: Consistent, Inconsistent and Partially-Consistent, Mapping Heuristics, Immediate: MCT, MET, RR, CLS, Switching Algorithm, KPB OLB and MCC, Batch: Min-Min, Max-Min, Sufferage, Duplex, GA, PSO, SA, GSA, Tabu, A*, CMMS, MEMAX and CMMN, CNXM, QoS Guided Min-Min and Selective Algorithm, Synthetic and Benchmark Datasets, Fairness-Based Task Scheduling, Allocation-Aware Task Scheduling.

Module - III

Introduction to Energy Efficient Task Consolidation, Energy-Conscious Task Consolidation, MaxUtil, Energy-Aware Task Consolidation, Virtual Cluster, CPU Utilization Threshold, Sleep or Power Saving Mode, High-Throughput Computing: Task Computing and Task-based Application Models, Aneka Task-Based Programming, Market-Based Management of Clouds, Green Cloud Computing Architecture, Federated Clouds, Pricing Mechanism, SLA Violation.

Module - IV

Introduction to Cloud Security, Case Studies: Manjrasoft Aneka, Amazon Web Services, Google AppEngine, Microsoft Azure, Force.com and Salesforce.com, MetaCDN, SpotCloud, Introduction to CloudSim, Cloudlet, Virtual Machine and its Provisioning, Time and Space-shared Provisioning.

Text Books

1. R. Buyya, C. Vecchiola and S. T. Selvi, Mastering Cloud Computing Foundations and Applications Programming, Morgan Kaufmann, Elsevier, 2013.
2. B. Sosinsky, Cloud Computing Bible, Wiley, 2011.
3. D. N. Chorafas, Cloud Computing Strategies, CRC Press, Taylor and Francis Group, 2011.
4. (Edited By) I. Foster and C. Kesselman, The Grid: Blueprint for a New Computing Infrastructure, Morgan Kaufmann, Elsevier, 2004.

Reference Books

1. R. Buyya, High Performance Cluster Computing: Architectures and Systems, Volume 1, Pearson Education, 2008.
2. A. Chakrabarti, Grid Computing Security, Springer, 2007.
3. B. Wilkinson, Grid Computing: Techniques and Applications, CRC Press, 2009.
4. C. S. R. Prabhu, Grid and Cluster Computing, PHI, 2008.
5. D. Janakiram, Grid Computing, Tata McGraw-Hill, 2005.

6.P. K. Pattnaik, M. R. Kabat and S. Pal, Fundamentals of Cloud Computing, Vikas Publishing House Pvt. Ltd., 2015.

DATA MINING (IT15-003)

L-T-P: 3-1-0 **Cr.-4**

Module - I

Data Mining overview, Data Warehouse and OLAP Technology Data Warehouse Architecture, Steps for the Design and Construction of Data Warehouses, A Three-Tier Data Warehouse Architecture, OLAP , OLAP Queries, Metadata Repository, Data Preprocessing – Data Integration and Transformation, Data Reduction,
Data Mining Primitives, System Architectures – Data Mining Primitives: What Defines a Data Mining Task? Task-Relevant Data, The Kind of Knowledge to be Mined, KDD

Module - II

Mining Association Rules in Large Databases, Association Rule Mining, Market Basket Analysis: Association Rule Mining, Basic Concepts, Association Rule Mining A Road Map, Mining Association Rules from Frequent Itemsets, Mining Multilevel Association Rules from Transaction Databases, Multilevel Association Rules, Approaches to Mining Multilevel Association Rules, Mining Distance-Based Association Rules, From Association Mining to Correlation Analysis,

Module - III

Classification and Prediction – What is Classification? What Is Prediction? Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Bayes Theorem, Classification by Back propagation, A Multilayer Feed-Forward Neural Network, MLP, RBFN, Defining a Network Topology, Classification Based of Concepts from Association Rule Mining, Other Classification Methods, k-Nearest Neighbor Classifiers, Genetic Algorithms, Fuzzy Set Approaches, Prediction, Linear and Multiple Regression, Nonlinear Regression, Other Regression Models, Classifier Accuracy,

Module – IV

Cluster Analysis – What Is Cluster Analysis, Types of Data in Cluster Analysis, , A Categorization of Major Clustering Methods, Classical Partitioning Methods: k-Means and k-Medoids, Partitioning Methods in Large

Databases: k-Medoids, Hierarchical Methods, Agglomerative and Divisive Hierarchical Clustering, Clustering Using Wavelet Transformation, Clustering High-Dimensional Space, Model-Based Clustering Methods, Statistical Approach, Neural Network Approach, LVQ, SOM,Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web. Applications and Trends in Data Mining – Data Mining Applications, Data Mining System Products.

BOOKS:

1. Data Mining: – Concepts and Techniques by Jiawei Han and Micheline Kamber, -- Morgan Kaufmann Publisher (Elseviers)
2. Data Mining Concepts, Models, Methods and Algorithms By Mehmed Kantardzic Wiley Interscience, IEEE Press.

INFORMATION RETRIEVAL (IT15-005)

L-T-P: 3-1-0 **Cr.-4**

Module-I

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses. **Information Retrieval System Capabilities:** Search, Browse, Miscellaneous

Module-II

Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction **Data Structures:** Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

Module-III

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages **Document and Term Clustering:** Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

Module-IV

User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, Weighted searches of Boolean systems, Searching the Internet and hypertext. **Information Visualization:** Introduction, Cognition and perception, Information visualization technologies.

Module-V

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems. **Information System Evaluation:** Introduction, Measures used in system evaluation, Measurement example – TREC results.

TEXTBOOK :

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.

REFERENCES :

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Modern Information Retrival By Yates Pearson Education.

3. Information Storage & Retieval By Robert Korfhage – John Wiley & Sons.

SOFTWARE ARCHITECTURE (IT15-007)

L-T-P: 3-1-0 **Cr.-4**

Module-I

Review of Basic Concepts: What is a pattern? What makes a pattern? Pattern Categories; Relationships between patterns; Pattern description; Patterns and software architecture; What software architecture is and what it is not; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.

Module-II

Designing the Architecture: Architecture in the life cycle; Designing the architecture; Forming the team structure; Creating a skeletal system. **Reconstructing Software Architectures:** Introduction; Informal extraction; Database construction; View fusion; Reconstruction; Examples.

Module-III

Software Product Lines: Introduction; What makes software product lines work? Scoping; Architectures for product lines; What makes software product lines difficult? **Building Systems from Off-the-Shelf Components:** Impact of components on architecture; Architectural mismatch; Component-based design as search; ASEILM example.

Module-IV

Some Design Patterns: Introduction; Management: Command processor, View handler; Communication: Forwarder-Receiver, Client-Dispatcher-Receiver, Publisher-Subscriber. **Pattern Systems:** What is a Pattern System? Pattern classification; Pattern selection; Pattern systems as implementation guidelines; The evolution of pattern systems.

TEXT BOOKS:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 2nd Edition, Pearson Education, 2003.
2. Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007.
3. Mary Shaw and David Garlan: Software Architecture-Perspectives on an Emerging Discipline, PHI Learning, 2007.

REFERENCE BOOKS:

1. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns-Elements of Reusable Object-Oriented Software, Pearson Education, 1995.

SOFTWARE PROJECT MANAGEMENT (IT15-008)

8. L-T-P: 3-1-0 **Cr.-4**

a.

b. Module I:

Introduction To Software Project Management And Step Wise Project Planning: Introduction, What is a Project? Software Projects Versus Other Types of Project, Contact Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods, and Methodologies, Some ways of Categorizing Software Projects, What is Management?, Problems

with Software Projects, Setting Objectives, Stakeholders, The Business Case, Requirement Specification, Management Control, Overview of Project Planning (Step wise).**Project Evaluation**: Introduction, Strategic Assessment, Technical Assessment, Cost- Benefit Analysis, Cash Flow Forecasting, Cost- Benefit Evaluation Techniques, Risk Evaluation. **Selection Of An Appropriate Project Approach**: Introduction, Choosing Technologies, Technical Plan Contents List, Choice of Process Models, Structure Versus Speed of Delivery, The Waterfall Model, The V- Process Model, The Spiral Model, Software Prototyping, Other ways of Categorizing Prototyping, Controlling Changes during Prototyping, Incremental Delivery, Dynamic Systems Development Method, Extreme Programming, Managing Iterative Processes.

c. Module II:

Software Effort Estimation: Introduction, Where are Estimates done? , Problems with Over-and Under- Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Expert Judgement, Estimating by Analogy, Albrecht Function Point Analysis, Function Point Mark II, Object Points, A Procedural Code- Oriented Approach, COCOMO: A Parametric Model.**Activity Planning**: Introduction, The Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, The Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity- On – Arrow Networks.**Risk Management**: Introduction, The Nature of Risk, Types of Risk, Managing Risk, Hazard Identification, Hazard Analysis, Risk Planning and Control, Evaluating Risks to the Schedule. **Resource Allocation**: Introduction, The Nature of Resources, Identifying Resources Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resources Schedule, Cost Schedules, The Scheduling Sequence.

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d. Module III:

Monitoring And Control: Introduction, Creating the Framework, Collecting the Data, Visualizing Progress, Cost Monitoring, Earned Value, Prioritizing Monitoring, Getting the Project Back to Target, Change Control. **Managing Contracts**: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance.**Managing People And Organizing Teams**: Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting The Right Person For The Job, Instruction In The Best Methods, Motivation, The Oldham- Hackman Job Characteristics Model, Working In Groups, Becoming A Team, Decision Making, Leadership, Organizational Structures.

e. Module IV:

Software Quality: Introduction, The Place Of Software Quality In Project Planning, The Importance Of Software Quality, Defining Software Quality, ISO 9126, Practical Software Quality Measures, Product Versus Process Quality Management, External Standards, Techniques To Help Enhance Software Quality, Quality Plans.

Text Book:

1. B.Huges and M.Cotterell- Software Project Management 3rdEdn, TMH, New Delhi.
2. Ashfaque Ahmed- SoftwareProjectManagement- CRC Press.

Reference Book:

1. P.Jolote- Software Project Management in Practice, Pearson Education, New Delhi.