

UTKAL UNIVERSITY
B. Sc. [H] Computer Science
CHOICE BASED CREDIT SYSTEM

S E M E S T E R	COURSE OPTED	COURSE NAME	F U L L M A R K S	C R E D I T S
I	Ability Enhancement Course-I	Environmental Science/ English	100	4
	Core Course-I	Programming using C	100	4
	Core Course-I Practical	Programming using C LAB	50	2
	Core Course-II	Computer Organization	100	4
	Core Course-II Practical	Computer Organization LAB	50	2
	Generic Elective-I	Probability & Statistics	100	4
	Generic Elective-I Practical	Probability & Statistics LAB	50	2
II	Ability Enhancement Course-II	English/ Environmental Science	50	2
	Core Course-III	Programming using C++	100	4
	Core Course-III Practical	Programming using C++ LAB	50	2
	Core Course-IV	Data Structure	100	4
	Core Course-IV Practical	Data Structure LAB	50	2
	Generic Elective-II	Numerical Technique	100	4
	Generic Elective-II Practical	Numerical Technique LAB	50	2
III	Core Course-V	Operating Systems	100	4
	Core Course-V Practical	Operating Systems LAB	50	2
	Core Course-VI	Database Management System	100	4
	Core Course-VI Practical	Database Management System LAB	50	2
	Core Course-VII	Discrete Structures	100	4
	Core Course-VII Practical	Discrete Structures LAB	50	2
	Skill Enhancement Course-I	English Proficiency	50	2
	Generic Elective-III	Electricity & Magnetism	100	4
	General Elective-III Practical	Electricity & Magnetism LAB	50	2
IV	Core Course-VIII	JAVA Programming	100	4
	Core Course-VIII Practical	JAVA Programming LAB	50	2
	Core Course-IX	Computer Network	100	4
	Core Course-IX Practical	Computer Network LAB	50	2
	Core Course-X	Computer Graphics	100	4
	Core Course-X Practical	Computer Graphics LAB	50	2
	Skill Enhancement Course-II	Android Programming	50	2
	Generic Elective-IV	Electronics	100	4

	General Elective-IV Practical	Electronics LAB	50	2
V	Core Course-XI	Internet Technology	100	4
	Core Course-XI Practical	Internet Technology LAB	50	2
	Core Course-XII	Software Engineering	100	4
	Core Course-XII Practical	Software Engineering LAB	50	2
	Discipline Specific Elective-I	Information Security	100	4
	Discipline Specific-I Practical	Information Security LAB	50	2
	Discipline Specific Elective-II	Microprocessor	100	4
	Discipline Specific Elective-II Practical	Microprocessor LAB	50	2
IV	Core Course-XIII	Artificial Intelligence	100	4
	Core Course-XIII Practical	Artificial Intelligence LAB	50	2
	Core Course-XIV	Design & Analysis of Algorithms	100	4
	Core Course-XIV Practical	Design & Analysis of Algorithms LAB	50	2
	Discipline Specific Elective-III	Cloud Computing	100	4
	Discipline Specific Elective-III Practical	Cloud Computing LAB	50	2
	Discipline Specific Elective-IV	Project Work	100	4
	Discipline Specific Elective-III Practical	Project Work LAB	100	4

ENGLISH

UNIT-I

Short Story: Jim Corbett-The Fight between Leopards; Dash Benhur- The Bicycle

Dinanath Pathy- George V High School; Alexander Baron- The Man who knew too much; Will F Jenkins- Uneasy Homecoming

UNIT-II

Prose: C V Raman-Water- The Elixir of Life; Harold Nicolson- An Educated Person; Claire Needell Hollander- No Learning without Feeling; Steven Harvey- The Empty Page; Santosh Desai-Emoji Disruption

UNIT-III

Comprehension of a passage from any of the prescribed pieces and answering the questions

UNIT-IV

Expanding an idea into a paragraph

UNIT-V

Language exercises-test of vocabulary, usage and grammar based on the prescribed pieces

Prescribed Text

The Widening Arc: A Selection of Prose and Stories. Ed. Asim R Parhi, S Deepika and Pulastya Jani. Kitab Bhavan, Bhubaneswar. 2016.

Suggested Reading:

Fluency in English – Part II, OUP, 2006

Communicative English. E. Suresh Kumar and P. Sreehari

PROGRAMMING USING C

UNIT- I

Introduction to Programming Language, Introduction to C Programming , Character Set, C Tokens, Keywords & Identifiers, Constants, Variables, Data Types, Variables , Storage Classes, Operators (Arithmetic, Relational, Logical , Assignment, Increment & Decrement, Conditional , Bitwise), Expressions , Input and Output Operations.

UNIT- II

Decision Making and Branching: Simple IF Statement, IF ELSE Statement, Nesting IF ELSE Statement, ELSE IF Ladder, Switch Statement, ? Operator, GOTO Statement. Decision Making and Looping: The WHILE Statement, The DO Statement, The FOR Statement, Jumps in LOOPS. Arrays, Character Arrays and Strings.

UNIT- III

User-defined Functions: Need, Elements & Definition, Function Calls, Function Definition, Category of Functions, Recursion. Structures and Unions: Defining, Declaring, Accessing, Initialization Structure, Arrays of Structures, Arrays within Structures, Structures and Functions, Unions.

UNIT- IV

Pointers: Accessing the Address of a Variable, Declaring Pointer Variables, Initializations of Pointer Variable, Accessing a Variable through its Pointer, Chain of Pointers, Pointer Expressions, Pointer Increments and Scale Factor, Pointers and Arrays,, Pointers and Character Strings, Array of Pointers, Pointers as Function Arguments, Functions Returning Pointers, Pointers to Functions, Pointers to Structures, Troubles with Pointers.

UNIT- V

File Management in C: Defining and Opening a File, Closing a File, Input/ Output Operations on Files, Error Handling During I/O Operations, Random Access to Files, Command Line Arguments, Dynamic Memory Allocation.

Recommended Books:

1. E. Balaguruswamy, "Programming in ANSI C", 4/e, (TMH)
2. Paul Deitel, Harvey Deitel, "C: How to Program", 8/e, Prentice Hall.
3. J. R. Hanly, "Problem Solving & Program Design in C", 7/e, Pearson
4. B. Kernighan & D.M. Ritchie, "The C Programming Language", 2/e PHI

COMPUTER ORGANIZATION

UNIT-I

Character Codes, Decimal System, Binary System, Decimal to Binary Conversion, Hexadecimal Notation, Boolean Algebra, Basic Logic Functions: Electronic Logic Gates, Synthesis of Logic Functions, Minimization of Logic Expressions, Minimization using Karnaugh Maps, Synthesis with NAND and NOR Gates.

UNIT-II

Flip-Flops, Gated Latches, Master-Slave Flip-Flops, Edge-Triggering, T Flip-Flops, JK Flip-Flops. Registers and Shift Registers, Counters, Decoders, Multiplexers, Programmable Logic Devices (PLDs), Programmable Array Logic (PAL), Complex Programmable Logic Devices (CPLDs), Field-Programmable Gate Array (FPGA), Sequential Circuits, Timing Diagrams, The Finite State Machine Model, Synthesis of Finite State Machines.

UNIT-III

Basic Structure of Computers: Computer Types, Functional Units, Input Unit, Memory Unit, Arithmetic and Logic Unit, Output Unit, Control Unit, Basic Operational Concepts, Bus Structures, Software. Machine Instructions and Programs: Numbers, Arithmetic Operations, and Characters: Number Representation, Addition of Positive Numbers, Addition and Subtraction of Signed Numbers, Overflow of Integer Arithmetic, Characters, Memory Locations and Addresses, Byte Addressability, Word Alignment, Accessing Numbers, Characters, and Character Strings, Memory Operations, Instructions and Instruction Sequencing, Register Transfer Notation, Basic Instruction Types, Instruction Execution and Straight-Line Sequencing, Branching, Condition Codes, Generating Memory Addresses, Addressing Modes, Implementation of Variables and Constants, Indirection and Pointers, Indexing and Arrays, Relative Addressing.

UNIT-IV

THE ARM EXAMPLE: Registers, Memory Access, and Data Transfer, Register Structure, Memory Access Instructions and Addressing Modes, Register Move

Instructions, Arithmetic and Logic Instructions: Arithmetic Instructions, Logic Instructions, Branch Instructions, Setting Condition Codes, Assembly Language, Pseudo-Instructions, I/O Operations, Subroutines, Vector Dot Product Program, Byte-Sorting Program, Linked-List Insertion and Deletion Subroutines. Basic Input-Output Operations, Stacks and Queues, Subroutines. PowerPC Example: Basic PowerPC Processor Organization, Load and Store Instructions, Arithmetic and Logic Instructions, Flow Control Instructions, Compare Instructions, Logic Instructions, Subroutines.

UNIT-V

Memory System: Semiconductor RAM Memories, Internal Organization of Memory Chips, Static Memories, Asynchronous DRAMS, Synchronous DRAMS, Structure of Large Memories, Memory System Considerations, RAMBUS Memory. Read-Only Memories: ROM, PROM, EPROM, EEPROM, Flash Memory, Speed, Size, and Cost of Memory. Secondary Storage: Magnetic Hard Disks, Optical Disks, Magnetic Tape Systems.

Recommended Books:

1. Carl Hamacher, Z. Vranesic, S. Zaky: Computer Organization, 5/e (TMH)
2. William Stallings: Computer Organization and Architecture (Design for Performance), 9/e
3. S. Brown, & Z. Vranesic, "Fundamentals of Digital Logic Design with VHDL", 2/e, McGraw-Hill
4. J. P. Uyemura, "A First Course in Digital System Design, An Integrated Approach", Cengage Learning.

PROBABILITY AND STATISTICS

UNIT-I

Probability and Probability Distribution: Events and the Sample Space, Calculating Probabilities using Simple events, Useful counting rules, Probability rules: Addition rule, Conditional probability and multiplication rule, Bayes' rule.

UNIT-II

Probability Distributions: Random Variable, Discrete random variable, Mean and Standard deviation of discrete random variable, Discrete Probability Distributions: Binomial, Poisson and Hypergeometric probability distribution, Continuous Probability distribution: Normal distribution.

UNIT-III

Sampling Distribution: sampling plans and experimental designs, Sampling distribution of a statistic, Central Limit theorem, Sampling distribution of the Sample mean and Proportion.

Large Sample Estimation: Point estimation, Interval estimation, Confidence interval of population mean, Population proportion, difference between two population means, difference between two population proportions.

UNIT-IV

Large Sample Tests of Hypothesis: Test of a Population mean, Test of difference of two population means, Test of hypothesis for a binomial proportion, Test of hypothesis for the difference between two binomial proportions.

Inference from Small Samples: Student's t Distribution, Small Sample inferences concerning a population mean and difference between two population means, Inferences concerning a population variance and difference between two population variances.

UNIT-V

Analysis of Variance: One-way classification, Two-way classification.

Linear regression and Correlation: Method of least squares, Analysis of variance for linear regression, Testing the usefulness of the linear regression model, Estimation and Prediction using the fitted line. Carl Pearson's coefficient of Correlation, Test of hypothesis concerning the Correlation coefficient.

Recommended Books:

1. William Mendenhall, Robert J. Beaver, Barbara M. Beaver, "Probability and Statistics" 14/e, CENGAGE Learning.
2. W. W. Hines, D.C. Montgomery, D.M. Goldsman, & C.M. Borror, "Probability & Statistics in Engineering"

ENVIRONMENTAL SCIENCE

UNIT-I

THE ENVIRONMENT: The Atmosphere, Hydrosphere, Lithosphere, Biosphere, Ecology, Ecosystem, Biogeochemical Cycle (Carbon Cycle, Nitrogen Cycle).

UNIT-II

ENVIRONMENT POLLUTION: Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, Thermal Pollution, Radiation Pollution, Natural Disasters and their Management.

UNIT-III

POPULATION ECOLOGY: Individuals, Species, Pollution, Community, Control Methods of Population, Urbanization and its effects on Society, Communicable Diseases and its Transmission, Non-Communicable Diseases.

UNIT-IV

ENVIRONMENTAL MOVEMENTS IN INDIA: Grass-root Environmental Movements in India, Role of Women, Environmental Movements in Odisha, State Pollution Control Board, Central Pollution Control Board.

UNIT-V

NATURAL RESOURCES: Conservation of Natural Resources, Management and Conservation of Wildlife, Soil Erosion and Conservation, Environmental Laws; Water Act: 1974, Air Act: 1981, The Wildlife (Protection) Act: 1972, Environmental Protection: 1986.

References

1. Kumarasamy, K., A. Alagappa Moses and M. Vasanthi, 2004. Environmental Studies, Bharathidasan University pub, 1, Trichy
2. Rajamannar, 2004, Environmental Studies, EVR College pub, Trichy
3. Kalavathy, S. (ed.) 2004, Environmental Studies, Bishop Heber College pub., Trichy
3. Kalavathy, S. (ed.) 2004, Environmental Studies, Bishop Heber College pub., Trichy

PROGRAMMING USING C++

UNIT- I

Principles of Object-Oriented Programming: Object-Oriented Programming (OOP) Paradigm, Basic Concepts of OOP, Benefits of OOP, Object Oriented Languages, Applications of OOP. Beginning with C++: Applications of C++, C++ statements, Example with Class, Structure of C++ Program, Creating the Source File, Compiling and Linking. Tokens, Expressions and Control Structures: Tokens, Keywords, Identifiers & Constants, Basic Data Types, User-Defined Data Types, Derived Data Types, Symbolic Constants, Type Compatibility, Declaration of Variables, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Cast Operators, Expressions and their Types, Special Assignment Expressions, Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures.

UNIT- II

Functions in C++: The Main Function, Function Prototyping, Call By Reference, Return by Reference, Inline Functions, Default Arguments, Const. Arguments, Function Overloading, Friend & Virtual Functions, Math. Library Functions. Classes and Objects: Specifying a Class, Defining Member Functions, Making an outside Function Inline, Nested Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects, Const. Member Functions, Pointer to Members, Local Classes.

UNIT- III

Constructors & Destructors: Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic

Initialization of Objects, Copy Constructor, Dynamic Constructors, Constructing Two-Dimensional Arrays, Const. Objects, Destructors. Operator Overloading and Type Conversions: Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Binary Operators using Friends, Manipulation of Strings using Operators, Rules for Overloading Operators, Type Conversions.

UNIT- IV

Inheritance : Defining Derived Classes, Single Inheritance, Making a Private Member Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Member Classes, Nesting of Classes. Pointers, Virtual Functions and Polymorphism: Pointers, Pointers to Objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

UNIT- V

Managing Console I/O Operations: C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted Console I/O Operations, Managing Output with Manipulators. Files: Classes for File Stream Operations, Opening and Closing a File, Detecting end-of-file, File Modes, File Pointers and their Manipulations, Sequential Input and Output Operations, Updating a File: Random Access, Error Handling During File Operations, Command-line Arguments.

Recommended Books;

1. E. Balgurusamy, Object Oriented Programming with C++ :, 4/e (TMH).
2. Paul Deitel, Harvey Deitel, "C++: How to Program", 9/e. Prentice Hall.
3. J. Farrell, "Object-Oriented Programming, Cengage Learning
4. Bjarne Stroustrup, "Programming -- Principles and Practice using C++", 2/e, Addison-Wesley 2014

DATA STRUCTURE

UNIT-I

Introduction and Overview: Definitions, Concept of Data Structures, Overview of Data Structures, Implementation of Data Structures. Arrays: Terminology, One-Dimensional Array, Multi-Dimensional Arrays, Pointer Arrays.

UNIT-II

Linked Lists: Single Linked List, Circular Linked List, Double Linked List, Circular Double Linked List, Application of Linked Lists, Memory Representation, Boundary Tag System, De-allocation Strategy, Buddy System, Compaction.

UNIT-III

Stacks: Definition, Representation of Stack (Array, Linked List), Operations on Stacks, Applications of Stack (Evaluation of Arithmetic Expressions, Code

Generation, Implementation of Recursion, Factorial Calculation, Quick Sort, Tower of Hanoi, Activation Record Management).

UNIT – IV

Queues: Definition, Representation of Queues (Array, Linked List), Circular Queue, Deque, Priority Queue, Application of Queues (Simulation, CPU Scheduling in Multiprogramming Environment, Round Robin Algorithm).

UNIT –V

Tree: Binary Trees, Properties of Binary Tree, Linear Representation of Binary a Binary Tree, Linked Representation of a Binary Tree, Physical Implementation of Binary Tree in Memory, Operations on Binary Tree (Insertion, Deletion, Traversal, Merging of two Binary Trees), Types of Binary Trees (Expression Tree, Binary Search Tree, Heap Tree, Threaded Binary Trees, Height Balanced Binary Tree, Weighted Binary Tree, Decision Trees).

Recommended Books:

1. D. Samanta, "Classic Data Structures":, 2/e (PHI).
2. D.S Malik, "Data Structure using C++", 2/e, Cengage Learning, 2010
3. Adam Drozdek, "Data Structures and algorithm in C++", 3/e, Cengage Learning, 2012.
4. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.

NUMERICAL TECHNIQUES

UNIT – I

Introduction: Numbers and their accuracy, Chopping and Rounding off, Errors: Absolute and Relative errors, Floating point representations of numbers, Loss of significance. Solution of Algebraic and Transcendental Equations: Bisection Method, Newton-Raphson Method, Secant Method, Method of false position, Rate of convergence and comparison of iterative methods.

UNIT-II

Interpolation and Numerical Differentiation: Polynomial Interpolation, Interpolating polynomial: Lagrange form, Newton form, Nested form, Divided difference Interpolation, Inverse Interpolation, Errors in polynomial Interpolation. First derivative and second derivative via Taylor Series, Richardson Extrapolation.

UNIT-III

Numerical Integration: Trapezoidal Rule, Composite Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Gaussian Quadrature formulae (1-point, 2-point, 3-point)

UNIT-IV

Solution of System of Linear Equations: Gaussian Elimination method and Pivoting, LU factorization method, ill Conditioning, Iterative Methods: Jacobi iterative method, Gauss Seidel iterative method.

Eigen Values and Eigen Vectors: Eigen value properties, Computation Eigen values by Power method.

UNIT - V

Solution of Ordinary Differential Equations: Taylor Series method, Runge-Kutta method of order 2 and order 4, Predictor-Corrector method: Adam's-Bashforth-Moulton method. Smoothing of Data and the Method of Least Squares: Linear and non-linear least square method.

Recommended Books:

1. E. Ward Cheney and David R. Kincaid ,“Numerical Methods and Applications” CENGAGE Learning India Private Ltd., New Delhi.
2. S.R.K. Iyengar, R.K. Jain, & M.K. Jain, ”Numerical Methods for Scientific & Engineering Computation”, 6/e, New Age Int. Pub.
3. S.S. Sastry, “ Introductory Methods of Numerical Analysis”, 5/e, EEE
4. Steven C. Chapra, “Applied Numerical Methods with MATLAB”, 2/e, McGraw-Hill.

OPERATING SYSTEMS

UNIT- I

Operating System, Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Distributed Systems, Special Purpose Systems, Computing Environments, Open-Source Operating Systems. Operating System Services, User Operating System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating System Structure, Virtual Machines, Operating System Debugging, Operating System Generations. System Boot.

UNIT- II

Process: Process Concept, Process Scheduling, Operations on Processes, Inter-Process Communication, Examples of IPC Systems, Communication in Client-Server Systems. Multithreaded Programming: Multithreading Models, Thread Libraries, Threading Issues, Operating-System Examples.

UNIT- III

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling. Multiple-Process Scheduling. Synchronization: The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Monitors, Synchronization Examples, Atomic Transactions.

UNIT- IV

Deadlocks: System Model, Deadlock Characterization, Methods of Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection, Recovery from Deadlock. Memory Management Strategies: Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Example: The Intel Pentium.

UNIT- V

Virtual-Memory Management: Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory. File System: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection.

Recommended Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8/e, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3/e, Pearson Education 2007
3. W. Stallings, "Operating Systems, Internals & Design Principles", 5/e, Prentice Hall of India. 2008
4. G. Nutt, "Operating Systems: A Modern Perspective", 2/e, Pearson Education 1997.

DATABASE MANAGEMENT SYSTEM

UNIT-I

Databases and Database Users, Database System Concepts and Architecture, Data Modelling using the Entity-Relationship(ER) Model, The Enhanced Entity-Relationship (EER) Model.

UNIT-II

Relational Model: The Relational Data Model and Relational Database Constraints, The Relational Algebra and Relational Calculus.

UNIT-III

Relational Database Design by ER- and EER-to-Relational Mapping, SQL-99: Schema Definition, Constraints, Queries, and Views, Introduction to SQL Programming Techniques.

UNIT-IV

Functional Dependencies and Normalization for Relational Databases, Relational Database Algorithms and Further Dependencies, Practical Database Design Methodology and use of UML Diagrams.

UNIT-V

Disk Storage, Basic File Structures, and Hashing, Indexing Structures for Files, Algorithms for Query Processing and Optimization, Physical Database Design and Tuning.

Recommended Books:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", 6/e, Pearson Education, 2010
2. A. Silberschatz, H.F. Korth, S. Sudarshan, "Database System Concepts" 6/e, McGraw Hill, 2010
3. R. Ramakrishanan, J. Gehrke, "Database Management Systems", McGraw-Hill
4. C. Coronel, S. Morris, & P. Rob, "Database Principles (Fundamentals of Design, Implementation, and Management), 9/e, Cengage Learning.

DISCRETE STRUCTURES

UNIT-I

Logic and Proofs: Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Normal Forms, Proof Methods and Strategy, Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms.

UNIT-II

Basic Structures: Sets, Set Operations, Functions, Recursive Functions, Sequences and Summations. Relations: Relations and their Properties, n-ary Relations and their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Ordering. Boolean.

UNIT-III

Algebra: Boolean Functions, Representing Boolean Functions, Logic Gates, Minimization of Circuits. Algebraic Structures & Coding Theory: The Structure of Algebras, Semi-groups, Monoids and Groups, Homomorphism, Normal Subgroups, and Congruence Relations, Rings, Integral Domains and Fields, Quotient and Product Algebras, Coding Theory. Polynomial Rings and Polynomial Codes.

UNIT-IV

Counting: Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations. Advanced Counting Techniques, Applications of Inclusion-Exclusion, Discrete probability, Conditional probability, Bayes' Theorem.

UNIT-V

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Havel-Hakimi Theorem, Representing Graphs and Graph Isomorphism, Connectivity, Cut-Sets, Euler and Hamiltonian Paths, Shortest-Path Problem, Planar Graphs, Graph Coloring, Network Flows.

Recommended Books:

1. Kenneth H Rosen, Discrete Mathematics & Its Applications, McGraw-Hill. 7/e.
2. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009
3. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition , Tata McGraw Hill, 1985
4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms , John wiley Publication, 1988

ELECTRICITY AND MAGNETISM

UNIT-I

Electric Field and Electric Potential: Electric field: Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace's and Poisson, equations. The Uniqueness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole.

UNIT-II

Electrostatic energy of system of charges. Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Method of Images and its application to: (1) Plane Infinite Sheet, and (2) Sphere.

UNIT-III

Dielectric Properties of Matter: Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector **D**. Relations between **E**, **P** and **D**. Gauss' Law in dielectrics.

UNIT-IV

Magnetic Field: Magnetic force between current elements and definition of Magnetic Field **B**. Biot-Savart's Law and its simple applications: straight wire and circular loop. Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole). Ampere's Circuital Law and its application to (1) Solenoid

and (2) Toroid. Properties of **B**: curl and divergence. Vector Potential. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements. Torque on a current loop in a uniform Magnetic Field.

UNIT-V

Magnetic Properties of Matter: Magnetization vector (**M**). Magnetic Intensity(**H**). Magnetic Susceptibility and permeability. Relation between **B**, **H**, **M**. Ferromagnetism. B-H curve and hysteresis. Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current. Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit. Network theorems: Ideal Constant-voltage and Constant-current Sources. Network Theorems: Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem. Applications to dc circuits.

Recommended Books:

1. S. Mahajan & Choudhury, "Electricity, Magnetism & Electromagnetic Theory, 2012, Tata McGraw Hill
2. Edward M. Purcell, "Electricity and Magnetism", 1986 McGraw-Hill Education
3. M.N.O. Sadiku, "Elements of Electromagnetics", 2010, Oxford University Press.
4. J.H.Fewkes & J.Yarwood , "Electricity and Magnetism",. Vol. I, 1991, Oxford Univ. Press

JAVA PROGRAMMING

UNIT-I

Introduction to Java: Java Architecture and Features, Understanding the semantic and syntax differences between C++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting, Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and Type and Checking, Built-in Java Class Methods).

UNIT-II

Arrays, Strings and I/O: Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple

I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files. Object-Oriented Programming Overview: Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection.

UNIT-III

Inheritance, Interfaces, Packages, Enumerations, Autoboxing and Metadata: Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes, Autoboxing/Unboxing, Enumerations and Metadata.

UNIT-IV

Exception Handling, Threading, Networking and Database Connectivity: Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Using java.net package, Overview of TCP/IP and Datagram programming. Accessing and manipulating databases using JDBC.

UNIT-V

Applets and Event Handling: Java Applets: Introduction to Applets, Writing Java Applets, Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using the AWT controls, Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts. Overview of servlets.

Recommended Books:

1. E. Balagurusamy, " Programming with Java", 4/e, TMH
2. Bruce Eckel, "Thinking Java", 8/e, Pearson India, 2010.
3. John R. Hubbard, "Programming with JAVA", Schaum's Series, 2/e, 2004.
4. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 1 ,9/e,Printice Hall.2012.

COMPUTER NETWORK

UNIT-I

Introduction: Data Communications, Networks, The Internet, Protocols and Standards. Network Models: Layered Tasks, The OSI Model, Layers in the OSI Model, TCP/ IP Protocol Suite, Addressing.

UNIT-II

Data and Signals: Analog and Digital, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance. Digital Transmission: Digital-To-Digital Conversion, Analog-To-Digital Conversion, Transmission Modes. Analog Transmission: Digital-To-Analog Conversion, Analog-To-Analog Conversion.

UNIT-III

Multiplexing and Spreading: Multiplexing, Spread Spectrum. Transmission Media: Guided Media, Unguided Media (Wireless). Switching: Circuit Switched, Datagrams, Virtual Circuit Networks, Structure of a Switch. Telephone Network, Dial-Up MODEMS, Digital Subscriber Line (DSL), Cable TV Networks, Cable TV for Data Transfer.

UNIT-IV

Error Detection and Correction: Introduction, Block Coding, Linear Block Codes, Cyclic Codes, Checksum. Data Link Control: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy Channels, HDLC, Point-To-Point Protocol. Multiple Access: Random Access, Controlled Access, Channelization. Wired LANs: IEEE Standards, Standard Ethernet, Changes in the Standard, Fast Ethernet, Gigabit Ethernet: Wireless LANs: IEEE 802.11, Bluetooth.

UNIT-V

Connecting LANs: Connecting Devices, Backbone Networks, Virtual LANs. Wireless LANs: Cellular Telephony, Satellite Networks. SONET: Architecture, SONET Layers, SONET Frames, STS Multiplexing, SONET Networks, Virtual Tributaries. Virtual-Circuit Networks. Frame Relay, ATM, ATM LANs,

Recommended Books:

1. B. A. Forouzan, "Data Communications and Networking", 4/e, THM ,2007
2. A. S. Tanenbaum, & David J. Wetherall, "Computer Networks", 5/e, Pearson

COMPUTER GRAPHICS

UNIT-I

Computer Graphics: A Survey of Computer graphics, Overview of Graphics System: Video Display Devices, Raster-Scan Systems, Input Devices, Hard-Copy Devices, Graphics Software, Introduction to OpenGL. Graphics Output Primitives: Point and Lines, Algorithms for line, circle & ellipse generation, Filled-Area Primitives. Attributes of Graphics Primitives: Point, line, curve attributes, fill area attributes, fill methods for areas with irregular boundaries, Antialiasing.

UNIT-II

Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Matrix Representation and Homogeneous Coordinates, Composite

Transformations, Inverse Transformations, Other Transformations (Reflection, shear), Transformation between coordinate systems, Affine Transformations. Two Dimensional Viewing: Viewing pipeline, Clipping Window, Normalization & Viewport coordinate Transformations, Clipping Algorithms: Point clipping, Line clipping and Polygon clipping. Three Dimensional Viewing: 3-dimensional Viewing Concepts, Viewing pipeline, Projection Transformations (Orthogonal, Oblique parallel, Perspective), Clipping Algorithms.

UNIT-III

Three Dimensional Object Representations: Curved Surfaces, Quadratic Surfaces, Spline Representations, Bezier Spline Curves and Surfaces, B-Spline Curves and Surfaces, Octrees, BSP Trees, Fractal Geometry Methods, Gamma correction.

UNIT-IV

Visible Surface Detection Methods: Classification of Visible-Surface Detection Algorithms, Back-Face Detection, Depth-Buffer method, A-Buffer Method, Scan line and Depth Sorting, Area subdivision Method, Ray Casting Method.

UNIT-V

Illumination Models: Basic Illumination Models, Displaying light Intensities, Halftone Patterns and Dithering techniques, Polygon-Rendering Methods (Gouraud Shading, Phong Shading), Ray-Tracing Methods (Basic Ray-Tracing Algorithm, Ray-Surface Intersection Calculations). Computer Animation, Hierarchical Modeling (introductory idea only).

Recommended Books:

1. Donald Hearn & M. Pauline Baker, "*Computer Graphics with OpenGL*", Pearson Education.
2. A.V. Dan, F.H. Jones, J.D. Foley, S.K. Feiner, "Computer Graphics Principles & Practices in C", 2/e, Pearson.
3. D. F. Rogers, "Procedural Elements for Computer Graphics", McGraw Hill
4. D. F. Rogers, & J. A. Adams, "Mathematical Elements for Computer Graphics", 2/e, McGraw Hill

ANDROID PROGRAMMING

UNIT-I

Introduction: History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture. Overview of object oriented programming using Java: OOPs Concepts: Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

UNIT-II

Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the

installed tools, creating a android project , – Hello Word, run on emulator, Deploy it on USB-connected Android device.

UNIT-III

User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes.

UNIT-IV

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners (Combo boxes), Images, Menu, Dialog.

UNIT-V

Database: Understanding of SQLite database, connecting with the database.

Recommended Books:

1. James C. Sheusi, “Android application Development for Java Programmers”, Cengage Learning, 2013.
2. M. Burton, & D. Felker, “Android Application Development for Dummies”, 2/e, Wiley India.

ELECTRONICS

UNIT-I

Semiconductor Diodes: P and N type semiconductors. Energy Level Diagram. Conductivity and Mobility, Concept of Drift velocity. PN Junction Fabrication (Simple Idea). Barrier Formation in PN Junction Diode. Static and Dynamic Resistance. Current. Flow Mechanism in Forward and Reverse Biased Diode. Drift Velocity. Derivation for Barrier Potential, Barrier Width and Current for Step Junction. Current Flow Mechanism in Forward and Reverse Biased Diode.

UNIT-II

Two-terminal Devices and their Applications: (1) Rectifier Diode: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, C-filter (2) Zener Diode and Voltage Regulation. Principle and structure of (1) LEDs, (2) Photodiode and (3) Solar Cell. Bipolar Junction Transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains α and β Relations between α and β . Load Line analysis of Transistors. DC Load line and Q-point. Physical Mechanism of Current Flow. Active, Cutoff and Saturation Regions.

UNIT-III

Amplifiers: Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as 2-port Network. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Classification of Class A, B & C Amplifiers.

UNIT-IV

Coupled Amplifier: Two stage RC-coupled amplifier and its frequency response. Feedback in Amplifiers: Effects of Positive and Negative Feedback on Input Impedance, Output Impedance, Gain, Stability, Distortion and Noise. Sinusoidal Oscillators: Barkhausen's Criterion for self-sustained oscillations. RC Phase shift oscillator, determination of Frequency. Hartley & Colpitts oscillators. Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical Op-Amp. (IC 741) Open-loop and Closed-loop Gain. Frequency Response. CMRR. Slew Rate and concept of Virtual ground.

UNIT-V

Applications of Op-Amps: (1) Inverting and non-inverting amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Log amplifier, (7) Zero crossing detector (8) Wein bridge oscillator. Conversion: Resistive network (Weighted and R-2R Ladder). Accuracy and Resolution. A/D Conversion (successive approximation)

Recommended Books:

1. J. Millman and C.C. Halkias , "Integrated Electronics", 1991, Tata Mc-Graw Hill.
2. J.D. Ryder , "Electronics: Fundamentals and Applications" , 2004, Prentice Hall.
3. B. G. Streetman & S. K. Banerjee, "Solid State Electronic Devices", 6/e ,2009, PHI Learning
4. S. Salivahanan & N. S. Kumar, "Electronic Devices & Circuits", 3/e, 2012, Tata Mc-Graw Hill
5. R. A. Gayakwad, "OP-Amps and Linear Integrated Circuit", 4/e, 2000, Prentice Hall

INTERNET TECHNOLOGY

UNIT-I

Java: Use of Objects, Array and ArrayList class

UNIT-II

JavaScript: Data types, operators, functions, control structures, events and event handling.

UNIT-III

JDBC: JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements, Creating and Executing SQL Statements, Working with Result Set Objects.

UNIT-IV

JSP: Introduction to Java Server Pages, HTTP and Servlet Basics, The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, Implicit JSP Objects, Conditional Processing, Displaying Values, Using an expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Sharing Data Between JSP Pages, Requests, and Users, Database Access.

UNIT-V

Java Beans: Java Beans Fundamentals, JAR files, Introspection, Developing a simple Bean, Connecting to DB

Recommended Books:

1. Ivan Bayross, Web Enabled Commercial Application Development Using HTML, DHTML, Javascript, Perl CGI , BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication , 3/e, 2009
3. Herbert Schildt , Java 7, The Complete Reference, , 8/e, 2009.
4. Jim Keogh ,The Complete Reference J2EE, TMH, , 2002

SOFTWARE ENGINEERING

UNIT-I

Professional Software Development, Software Engineering Ethics, Software Processes, Software Process Models, Process Activities, Coping with Change, The Rational Unified Process, Agile Software Development, Agile Methods, Plan-Driven and Agile Development, Extreme Programming, Agile Project Management, Scaling Agile Methods.

UNIT-II

Requirements Engineering, Functional and Non-Functional Requirements, The Software Requirements Document, Requirements Specification, Requirements Engineering Processes, Requirements Elicitation and Analysis, Requirements Validation, Requirements Management, System Modelling, Context Models, Interaction Models, Structural Models, Behavioural Models, Model-Driven, Engineering, Architectural Design, Architectural Design Decisions, Architectural Views, Architectural Patterns, Application Architectures.

UNIT-III

Design and Implementation: Object-Oriented Design using the UML, Design Patterns, Implementation Issues, Open Source Development, Software Testing: Development Testing, Test-Driven Development, Release Testing, User Testing, Software Evolution: Evolution Processes, Program Evolution Dynamics, Software Maintenance, Legacy System Management, Dependability and Security.

UNIT-IV

Socio-technical Systems: Complex Systems, Systems Engineering, System Procurement, System Development, System Operation. Dependability and Security: Dependability Properties, Availability and Reliability, Safety, Security. Dependability and Security Specification: Risk-Driven Requirements, Specification, Safety Specification, Reliability Specification, Security, Specification, Formal Specification.

UNIT-V

Dependability Engineering: Redundancy and Diversity, Dependable Processes, Dependable Systems Architectures, Dependable Programming. Security Engineering: Security Risk Management, Design for Security, System Survivability. Dependability and Security Assurance: Static Analysis, Reliability Testing, Security Testing, Process Assurance, Safety and Dependability Cases.

Recommended Books:

1. I. Sommerville, "Software Engineering", 9/e, Addison Wesley.
2. R. Mall, "Fundamentals of Software Engineering", 3/e, PHI
3. R.S. Pressman, "Software Engineering", A Practitioner's Approach, 7/e, McGraw-Hill, 2009
4. K.K. Aggarwal and Y. Singh, "Software Engineering", 2/e, New Age International Publishers, 2008

INFORMATION SECURITY

UNIT-I

Introduction: Security, Attacks, Computer Criminals, Security Services, Security Mechanisms. Cryptography: Substitution ciphers, Transpositions Cipher, Confusion, diffusion, Symmetric, Asymmetric Encryption. DES Modes of DES, Uses of Encryption, Hash function, key exchange, Digital Signatures, Digital Certificates.

UNIT-II

Program Security: Secure programs, Non malicious Program errors, Malicious codes virus, Trap doors, Salami attacks, Covert channels, Control against program.

UNIT-III

Threats: Protection in OS: Memory and Address Protection, Access control, File Protection, User Authentication. Database Security: Requirements, Reliability, Integrity, Sensitive data, Inference, Multilevel Security.

UNIT-IV

Security in Networks: Threats in Networks, Security Controls, firewalls, Intrusion detection systems, Secure e-mails.

UNIT-V

Administrating Security: Security Planning, Risk Analysis, Organisational Security Policy, Physical Security. Ethical issues in Security: Protecting Programs and data. Information and law.

Recommended Books:

1. C. P. Pfleeger, S. L. Pfleeger; Security in Computing, PHI, 2006
2. W. Stallings; Network Security Essentials: Applications and Standards, 4/E, 2010

MICROPROCESSOR

UNIT-I

An Introduction to Processor Design: Processor architecture and organization , Abstraction in hardware design, MU0 - a simple processor, Instruction set design ,Processor design trade-offs ,The Reduced Instruction Set Computer, Design for low power consumption .The ARM Architecture: The Acorn RISC Machine ,Architectural inheritance, The ARM programmer's model, ARM development tools.

UNIT-II

ARM Assembly Language Programming: Data processing instructions, Data transfer instructions, Control flow instructions, Writing simple assembly language programs. ARM Organization and Implementation: Pipeline, Types, 3-stage pipeline ARM organization , 5-stage pipeline ARM organization, ARM instruction execution, ARM implementation, The ARM coprocessor interface.

UNIT-III

The ARM Instruction Set: Introduction, Exceptions, Conditional execution , Branch and Branch with Link (B, BL),Branch, Branch with Link and exchange (BX, BLX) , Software Interrupt (SWI) ,Data processing instructions, Multiply instructions, Single word and unsigned byte data transfer instructions , Half-word and signed byte data transfer instructions, Multiple register transfer instructions , Status register to general register transfer instructions ,General register to status register transfer instructions , Coprocessor instructions. Coprocessor data operations, Coprocessor data transfers, Coprocessor register transfers, Breakpoint instruction (BRK - architecture v5T only), Unused instruction space, Memory faults, ARM architecture variants.

UNIT-IV

Architectural Support for High-Level Languages: Abstraction in software design, Data types, Floating-point data types, The ARM floating-point architecture, Expressions, Conditional statements, Loops , Functions and procedures , Use of memory, Run-time environment , Examples and exercises.

UNIT-V

Thumb Instruction Set: The Thumb bit in the CPSR, The Thumb programmer's model, Thumb branch instructions, Thumb software interrupt instruction, Thumb data processing instructions, Thumb single register data transfer instructions, Thumb multiple register data transfer instructions, Thumb breakpoint instruction, Thumb implementation, Thumb applications. Architectural Support for System Development: The ARM memory interface, The Advanced Microcontroller Bus Architecture (AMBA), The ARM reference peripheral specification, Hardware system prototyping tools, The ARMulator.

Recommended Books:

1. Steve Furber : "ARM System-On-Chip Architecture".

ARTIFICIAL INTELLIGENCE

UNIT-I

Intelligent Agents, Solving problems by searching, Uninformed search strategies (BFS, DFS, DLS, IDS, BD and Uniform cost search), Informed search and exploration (Greedy Best first, A* and its variations) Constraint satisfaction Problems, Adversarial search (Alpha-beta pruning).

UNIT-II

Knowledge and reasoning, logical agent (Wumpus world), Propositional logic, First order logic, Inference in first order logic (Forward chaining, backward chaining, Resolution), Knowledge representation.

UNIT-III

Planning, Partial-Order planning, Planning Graphs, Planning and acting in the real world, Uncertain knowledge and reasoning.

UNIT-IV

Learning from Observations, Decision trees, Neural network (Multilayer), Reinforcement Learning.

UNIT-V

NLP, Communication, A formal grammar for a fragment of English, Syntactic analysis (chat parsing), semantic Interpretation, Ambiguity of grammar, Machine Translation.

Recommended Books:

1. Stuart Russell and Peter Norvig, "ARTIFICIAL INTELLIGENCE A MODERN APPROACH", 2/e, PHI.
2. D.W. Patterson, "Introduction to A.I and Expert Systems", PHI, 2007.
3. Rich & Knight, "Artificial Intelligence", 2/e, Tata McGraw Hill, 1991.

4. W.F. Clocksin and Mellish, "Programming in PROLOG", Narosa Publishing House, 3/e

DESIGN AND ANALYSIS OF ALGORITHMS

UNIT-I

Analysis and Design of Algorithm (Case study insertion sort and merge sort) Asymptotic Analysis, Divide and Conquer, Recurrence Relations, Strassen's Matrix Multiplication.

UNIT-II

Sorting: Quick sort, heap sort, Counting sort, lower bound for sorting, Randomized quicksort, Order Statistics.

UNIT-III

Amortized Analysis (Aggregate analysis, Accounting analysis, Potential analysis), 2-3-4 tree Advanced Data structure: Fibonacci heap, Redblack tree, hashing, data structure on disjoint set, Scicinet Data Structure.

UNIT-IV

Dynamic Programming : Matrix Chain multiplication, LCS, TSP, Branch and Bound. Greedy Algorithm: MST: Kruskal , Prims, Dijkstra Algorithm, Huffman Coding, Maxflow matching, Computational geometry: Convex Hull, 0-1-knapsack, fractional knapsack, Back tracking (4-Queen Prob.)

UNIT-V

Complexity Class: P, PSPACE, NP, NP-Hard, NP Complete, Satisfiability, Cheque, Vertex Cover, Independent set, Exact cover, Graph Coloring, Hamiltonian, Cycle Matching. Approximation Algorithm: Vertex Cover, TSP, Independent Set, Sum of subset.

Recommended Books:

1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein "Introduction to Algorithms", PHI, 3/e, 2009.
2. Sarabasse & A.V. Gelder Computer Algorithm, "Introduction to Design and Analysis", Pearson 3/e, 1999
3. E. Horowitz, S. Sahni, & S. Rajasekaran, "Fundamentals of Computer Algorithms", 2/e, University Press.
4. A.V. Aho, J.E. Hopcroft, & J.D. Ullman, "The Design and Analysis of Computer Algorithm, Pearson.

CLOUD COMPUTING

UNIT-I

Overview of Computing Paradigm: Recent trends in Computing : Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. Introduction to Cloud Computing: Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing.

UNIT-II

Cloud Computing Architecture: Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment , Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

UNIT-III

Case Studies: Case Study of Service, Model using Google App Engine, Microsoft Azure, Amazon EC2, Eucalyptus.

UNIT-IV

Service Management in Cloud Computing, Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of Scaling.

UNIT-V

Cloud Security: Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in Cloud Computing.

Recommended Books:

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010
2. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, "Cloud Computing Principles & Paradigms", Wiley-2011.
3. Nikos Antonopoulos, Lee Gillam, "Cloud Computing: Principles, Systems and Applications", Springer, 2012.
4. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley-India, 2010.
5. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw Hills, 2010.
6. Dimitris N. Chorafas, "Cloud Computing Strategies", CRC Press, 2010