

B.Sc. (Hons.) Computer Science Syllabus

CHOICE BASED CREDIT SYSTEM (CBCS)

S.C.S. (A) College, Puri



**Academic Session
2015-18**

CBCS - B.Sc. Computer Science (Hons.) Syllabus

SEMESTER – I CORE COURSE – I

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.

Text Book:

1. *Programming in ANSI C – E. Balguruswamy4/e (TMH)*
2. *Programming in ANSI & Turbo C – A. Kamthane*

SEMESTER – I CORE COURSE – II 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.

Text Book:

1. Carl Hamacher, Z. Vranesic, S. Zaky: *Computer Organization*, 5/e (TMH)

Reference Book:

William Stallings: *Computer Organization and Architecture (Design for Performance)*, 9/e

CORE COURSE – III **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 Deferencing 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, Cons. 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.

Text Book:

1. *Object Oriented Programming with C++: E. Balgurusamy, 4/e (TMH).*

CORE COURSE – IV

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).

TEXT BOOK:

1. *Classic Data Structures – D. SAMANTA (PHI).*
2. *Data Structure through C – A. Rath & Jagdev*

CORE COURSE – V

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.

TEXT BOOK:

1. *Operating System Concepts: Silberschatz, Galvin, Gagne, 8/e (Wiley-India)*

CORE COURSE – VI **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.

TEXT BOOK:

1. *Fundamentals of Database Systems, Ramez Elmasri & Shamkant B. Navathe, Pearson (Fifth Edition)*

CORE COURSE – VII **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.

Text Book:

1. *Kenneth H Rosen, Discrete Mathematics & Its Applications, McGraw-Hill. 7/e*

CORE COURSE – VIII 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, Auto boxing 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, Auto boxing/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 are 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.

Text Book:

1. *JAVA: How to Program – Deitel & Deitel*
2. *Java Complete reference – H. Schildt*

CORE COURSE – IX 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 Accesses: 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,

TEXT BOOK:

1. *Data Communications and Networking, 4/e, Forouzan, B. (TMH)*

SKILL ENHANCEMENT COURSE
SEC – I
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 (Gouroud Shading, Phong Shading), Ray-Tracing Methods (Basic Ray-Tracing Algorithm, Ray-Surface Intersection Calculations), Computer Animation, Hierarchical Modeling (introductory idea only).

TEXT BOOK:

1. Donald Hearn & M. Pauline Baker, “*Computer Graphics with OpenGL*”, Pearson Education, Inc. New Delhi.

SEC - II

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.

Text Book:

1. *Android application Development for Java Programmers: James C. Sheusi. Cengage Learning, 2013.*

CORE COURSE – XI

INTERNET TECHNOLOGY

UNIT – I

Java: Use of Objects, Array and Array List 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

TEXT 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 , 3rd Edition, 2009*
3. *Herbert Schildt, Java 7, The Complete Reference, 8th Edition, 2009.*
4. *Jim Keogh, The Complete Reference J2EE, TMH, 2002.*
5. *O' Reilly, Java Server Pages, Hans Bergsten, Third Edition, 2003.*

CORE COURSE – XII SOFTWARE ENGINEERING

UNIT – I

Professional Software Development, Software Engineering Ethical, 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, Behavioral 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 Dynamic, 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.

TEXT BOOK:

1. *Software Engineering, Ian Sommerville, 9/e (Pearson Education)*

SEMESTER – V
DSE – I
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.

TEXT BOOK:

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

SEMESTER – V
DSE - II
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.

TEXT BOOK:

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

CORE COURSE – XIII 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.

TEXT BOOK:

1. *Stuart Russell and Peter Norvig, "ARTIFICIAL INTELLIGENCE A MODERN APPROACH" 2/e*

**CORE COURSE – XIV
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, Prim's, Dijkstra Algorithm, Huffman Coding, Maxflow matching, Computational geometry: Convex Hull, 0-1-knapsack, fractional knapsack, Backtracking (4-Queen Prob.)

UNIT – V

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

TEXT BOOK:

1. *Introduction To Algorithm: Corman, Leisenm, Rives & Stein*

SEMESTER – VI
DSE – III
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.

TEXT BOOKS:

1. *Cloud Computing Bible*, Barrie Sosinsky, Wiley-India, 2010
2. *Cloud Computing: Principles and Paradigms*, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
3. *Cloud Computing: Principles, Systems and Applications*, Editors: Nikos

SEMESTER – VI
DSE – IV

A Project work is to be undertaken by the student in consultation with the teachers of the department. The student has to prepare the project under the supervision of a teacher of the department. Further, he/she has to submit one Seminar Paper in the department.

Project Work/ Seminar	- 100 Marks
A) Dissertation/ Viva-voce	- 75 Marks
B) Seminar	- 25 Marks

The project work is to be evaluated by both the Internal & External Examiners and an External Examiner is to be invited to conduct the Project Evaluation and Viva-Voce.