Computer Science Syllabus

1. Digital Logic and Circuits & Discrete Mathematical Structures

- Number Systems
- Boolean Algebra and Logic Gates
- Simplification of Boolean Functions
- Combinational Circuits
- Sequential Circuits
- Memory Circuits
- Sets, Relations & Functions
- Mathematical Logic
- Combinatorics & Recurrence Relations
- Graph Theory

2. Computer Organization and Architecture

- Stored Program Concept
- Components of a Computer System
- Machine Instruction, Opcodes, and Operands
- Instruction Cycle
- Organization of CPU (ALU, Hardwired & Microprogrammed Control Unit, Registers)
- Memory Organization
- I/O Organization
- Functioning of CPU
- Instruction Formats & Types
- Addressing Modes
- Common Microprocessor Instructions
- Multi-core Architecture
- Multiprocessor and Multicomputer Systems

3. Data Structures and Algorithms

- Definition and Types of Data Structures
- Linear and Non-Linear Structures
- Hashing and Collision Resolution Techniques
- Searching and Sorting Algorithms
- Algorithm Analysis & Complexity
- Growth of Functions & Performance Measurements
- Advanced Data Structures (Red-Black Trees, B-Trees, Binomial Heaps, Fibonacci Heaps)
- Design Techniques (Divide & Conquer, Greedy, Dynamic Programming, Backtracking, Branch and Bound)
- Graph Algorithms (Dijkstra, Bellman-Ford, Floyd-Warshall, Travelling Salesman, Hamiltonian Cycles, Graph Coloring)
- Fast Fourier Transform
- String Matching Algorithms
- Theory of NP-Completeness
- Approximation & Randomized Algorithms

4. Problem Solving through C Programming

- Basic Programming Concepts
- Introduction to C Language
- Structured Programming in C

5. Object-Oriented Techniques & Programming

- Concepts: Encapsulation, Polymorphism, Abstraction
- Information Hiding and Generality
- UML Modelling (Structural, Behavioural, Architectural)
- Object-Oriented Analysis & Design (OOAD)
- Structured Analysis and Design (SA/SD), JSD
- Object-Oriented Programming in Java
- JavaBeans, Enterprise JavaBeans (EJB), Java Swing
- Java as Internet Programming Language
- JDBC/ODBC Connectivity
- Servlets

6. Operating Systems

- Definition, Design Goals & Evolution
- Structure & Functions of Operating Systems
- Process Management
- Memory Management
- Concurrent Processes
- File & Secondary Storage Management
- UNIX & Shell Programming
- Windows Programming

7. Database Management Systems (DBMS)

- Database Systems & Data Views
- Database Models & Languages
- DBMS Architecture
- Database Users & Data Independence
- ER Modelling
- Relational Model
- SQL – Basics & Queries
- Relational Database Design
- Database Security & Transaction Management
- Query Processing & Optimization
- Concurrency Control
- Recovery Techniques

8. Computer Networks

- Network Definition & Types
- Network Topologies & Classifications
- Network Protocols & Standards
- Layered Network Architecture
- OSI Reference Model & TCP/IP Protocol Suite
- Data Communication Fundamentals
- Switching Techniques & Access Mechanisms
- Data Link Layer Functions & Protocols

- Multiple Access Protocols
- Network Layer Functions & Protocols
- Transport Layer Functions & Protocols
- Application Layer Protocols

9. Software Engineering

- Definition, Goals, and Evolution
- Software Development Life Cycle (SDLC) Models
- Capability Maturity Model (CMM)
- Software Quality & Metrics
- Requirements Analysis and Specification
- Software Project Planning
- Software Architecture & Design
- Software Implementation
- Software Testing & Reliability

10. Internet Technology, Web Design & Web Technology

- Internet Protocols & Connectivity
- Internet Services (Email, Web, Publishing, Browsing)
- HTML Programming Basics
- Interactivity Tools
- Web Security Management Concepts
- Privacy & Copyright Issues
- Web Development Strategies & Applications
- Server-Side Programming
- Web Page Designing & Scripting
- Web Project Management & Team Roles

11. System Analysis and Design

- Analysis & Design of a System
- System Documentation & Evaluation
- Data Modelling
- Development of Information Management Systems
- System Implementation & Testing
- System Security Aspects

12. Information Security and Cyber Laws

- Security Needs & Disaster Controls
- Physical Security & Entry Controls
- Access Control Models
- Cryptographic Systems (Design & Implementation)
- Network Security & Intrusion Detection
- Security Metrics & Classification
- Information Security Laws & Ethics
- Issues in Data & Software Privacy
- Cyber Crimes (Types & Case Studies)

13. Computer Graphics

- Types of Computer Graphics
- Graphic Displays: Random Scan & Raster Scan
- Frame Buffer & Video Controllers
- Line and Circle Generation Algorithms
- Transformations
- Windowing and Clipping
- 3D Graphics (Curves, Surfaces, Hidden Lines & Surfaces)