

Entrance Examination Syllabus for Admission to Ph.D.
Computer Science & Computer Engineering

SYLLABUS

Section No	Subject Name
SECTION - 1	Database Management System
SECTION - 2	Data Structure and Algorithms
SECTION - 3	Fundamentals of C Programming
SECTION - 4	Fundamentals of JAVA Programming
SECTION - 5	Fundamentals of C++ Programming
SECTION - 6	Data Mining
SECTION - 7	Software Engineering
SECTION - 8	Microprocessors
SECTION - 9	Systems Programming and Compiler Design
SECTION - 10	Operating Systems

SECTION-1: DATABASE MANAGEMENT SYSTEMS

UNIT-I

Database System Architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML)

Data Models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations

UNIT-II

Relational Query Languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs.

Relational database design: Domain and data dependency, Normal forms, Dependency preservation, Lossless design

UNIT-III

Storage strategies: Indices, B-trees, hashing.

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery

UNIT-IV

Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, aggregate functions,

Reference Books:

1. An introduction to Database Systems, C J Date, Addison-Wesley.
2. Database System Concepts, Abraham Silberschatz, Henry F. Korth & S. Sudarshan, McGraw Hill.
3. Understanding SQL by Martin Gruber, BPB
4. SQL-PL/SQL by Ivan bayross

SECTION-2: DATA STRUCTURES AND ALGORITHMS

UNIT-I

Review of Abstract Data Types: Arrays, Stacks & Queues, Multiple Stacks & Queues –Application of Stacks-Postfix, Prefix representation and Evaluation, Application of Queue-Priority Queue, Simulation

UNIT-II

Linked Lists: Singly Linked Lists, Reusable Linked List Class, Circular Lists, Linked Stacks & Queues, Polynomials, Doubly Linked Lists, Generalized Lists. Complexity Analysis

UNIT-III

Trees: Introduction -Binary Trees -Binary Tree Traversal

UNIT-IV

Graphs: Elementary Graph Operations -Minimum Cost Spanning Trees -Shortest Paths. Sorting: Motivation -Insertion Sort -Quick Sort -Merge Sort -Heap Sort -Sorting on Several Keys

Reference Books:

1. Data structures and Algorithms, AHO, HOPCROFT and ULLMAN, Addison Wesley, 1983.
2. Data structures using C and C++ -Langsam, Augenstein, Tanenbaum, PHI

SECTION-3: FUNDAMENTALS OF C PROGRAMMING

UNIT-I

Features of C and its Basic Structure, Simple C programs, Constants, Integer Constants, Real Constants, Character Constants, String Constants, Role of Compiler, Role of Interpreter

UNIT-II

Control structure in C: Simple statements, Decision making statements, Looping statements, Nesting of control structures, break and continue , goto statement

UNIT-III

Pointers:Basics of pointers, pointer to pointer , pointer and array.

UNIT-IV

Dynamic memory allocation: Introduction to Dynamic memory allocation, malloc, Calloc,

Reference Books:

1. Balaguruswami E., Programming in ANSI C,Tata McGraw-Hills publication.
2. Kanetkar Yashavant, Let us 'C', BPB publications

SECTION-4: FUNDAMENTALS OF JAVA PROGRAMMING

UNIT-I

Review of Object oriented concepts, History of Java, Java buzzwords, JVM architecture, Data types, Variables, Scope and lifetime of variables, arrays, operators, control statements, type conversion and casting, simple java program, constructors, methods, Static block, Static Data, Static Method String.

UNIT-II

Inheritance and Polymorphism: Basic concepts, Types of inheritance, Member access rules, Usage of this and Super keyword, Method Overloading, Method overriding, Abstract classes, Dynamic method dispatch, Usage of final keyword.

UNIT-III

Packages and Interfaces: Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces.

UNIT-IV

Thread, Thread life cycle, creating threads using Thread class and Runnable interface.

Reference Books:

1. Herbert Schildt (2010), The Complete reference, 7th edition, Tata McGraw Hill, New Delhi
2. Head First Java, O'reilly publications

SECTION-5: FUNDAMENTALS OF C++ PROGRAMMING

UNIT-I

Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Selection control statements in C++.

UNIT-II

Data types, Expression and control statements Iteration statements in C++, Introduction to Arrays, Multidimensional Arrays, Strings and String related Library Functions.

Functions, Passing Data to Functions, Scope and Visibility of variables in Functions, Structures in C++.

UNIT-III

Classes objects, data members, member functions, this Pointer, Friends, Friend Functions, Friend Classes, Friend Scope, and Static Functions. Constructor. Operator Overloading.

UNIT-IV

Inheritance in C++, Types of Inheritance, Pointers, Objects and Pointers, Multiple Inheritance. Standard input and output operations.

Reference Books:

1. E. Balagurusamy – Object Oriented Programming with C++, Fifth edition, Tata McGraw Education Hill , 2011.
2. Ashok N. Kamthane, Object oriented Programming with ANSI & Turbo C++, First Edition, Pearson India.

SECTION-6:DATA MINING

UNIT-I

Introduction: Scope of Data Mining: What is Data Mining; How does Data Mining Works, Predictive Modeling: Data Mining and Data Warehousing: Architecture for Data Mining.

UNIT-II

Introduction, Data Preprocessing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT-III

Introduction, Data Mining, Data Mining Versus Database Management System, Data Mining Techniques- Association rules, Classification, Regression, Clustering, Neural networks.

UNIT-IV

Introduction to Clustering, Cluster Analysis, Clustering Methods- K means, Hierarchical clustering, Agglomerative clustering, Divisive clustering, clustering and segmentation software, evaluating clusters.

Reference Books:

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques.

SECTION-7: SOFTWARE ENGINEERING

UNIT-I

Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Agile Process Model, Component-Based Development, Process, Product and Process.

UNIT-II

Agility and Agile Process model, Extreme Programming, Other process models of Agile Development and Tools

UNIT-III

Coding Standard and coding Guidelines, Code Review, Software Documentation, Testing Strategies, Testing Techniques and Test Case, Test Suites Design, Testing Conventional Applications, Testing Object Oriented Applications, Testing Web and Mobile Applications,

UNIT-IV

Software Metrics (Process, Product and Project Metrics), Software Project Estimates, Software Project Planning (MS Project Tool), Project Scheduling & Tracking, Risk Analysis & Management (Risk Identification, Risk Projection, Risk Refinement , Risk Mitigation)

Quality Assurance and Management

Reference Books:

1. Roger S.Pressman, Software engineering-A practitioner's Approach, McGraw-Hill International Editions
- 2.Ian Sommerville, Software engineering, Pearson education Asia

SECTION-8: MICROPROCESSORS

UNIT-I

Definition of computer, classification of computers, A block diagram of a general purpose processor system; concept of Microprocessor, concept of hardware and software, operating system; Data and control paths concepts, registers and memory organization, Instruction set basics and assembly language programming: Instruction structure and addressing modes.

UNIT-II

8086 CPU Architecture, Machine language Instructions, concept of interpreter, compiler and debugger, Instruction execution timing.

UNIT-III

Basics of 8085 microprocessor interfacing. Basics of Instruction Cycle and its phases.

UNIT-IV

Architecture of 8051, Signals, Operational features, Memory and I/O addressing, Interrupts, Instruction set, Applications.

Reference Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh S. Gaonkar Pub: Penram International.
2. Microprocessors and Interfacing, N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah, Oxford

SECTION-9: SYSTEM PROGRAMMING AND COMPILER DESIGN

UNIT-I

Basics of System Programming, Elements of Assembly Language Programming, Design of the Assembler, 1-pass and 2-pass assembler, Elements of Programming environment -Editor, Preprocessor, Assembler, Compiler, Interpreter, Linker and Loader, Debugger, Device drivers, Operating System.

UNIT-II

Macros and Macro Processors: Introduction, Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities. Concept of bindings, static and dynamic binding, translated, linked and load time addresses. Relocatability.

UNIT-III

Fundamentals of Compiler Design. The Phases of a Compiler, Cousins of the Compiler, Lexical Analyzer Introduction to Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzers, Finite Automata From a Regular Expression, Design of a Lexical Analyzer Generator, Optimization of DFA

UNIT-IV

Parsing Theory, Top Down and Bottom up Parsing Algorithms, Top-Down Parsing, Bottom-Up Parsing, Operator-Precedence Parsing, LR Parsers,

Reference Books:

1. System Programming by D M Dhamdhare McGraw Hill Publication
2. System Programming by Srimanta Pal OXFORD Publication
3. Compilers: Principles, Techniques and Tools By Aho, Lam, Sethi, and Ullman, Second Edition, Pearson, 2014
4. Compilers: Principles, Techniques and Tools By Aho, Sethi, and Ullman, Addison-Wesley, 1986

SECTION-10: OPERATING SYSTEMS

UNIT-I

Introduction, Process Concept, Process states, Process control, Threads, Uni-processor Scheduling: Types of scheduling: Preemptive, Non preemptive, Scheduling algorithms: FCFS, SJF, RR, Priority, Thread Scheduling.

UNIT-II

Concurrency: Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors

Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem.

Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal, kill.

UNIT-III

Memory Management Memory Management requirements, Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit).

Virtual Memory: Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.

UNIT-IV

I/O management & Disk scheduling: Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID, Disk Cache.

Reference Books:

1. Operating Systems Concepts, Fifth Edition; Silberschatz and Galvin