

**TRAINING TRAINS**

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IT Services and IT Consultancy \ Internship-Inplant Training \ Software Training Institute

உங்கள் கடை மற்றும் வியாபாரத்திற்கு ஏற்ற **Website & Android App** மற்றும் **Software** மிகச்சிறந்த முறையில் செய்து கொடுக்கப்படும்.

Expertise : **AI, Machine Learning & Data Science \ Cybersecurity & Ethical Hacking  
IoT, Blockchain & Cloud Computing \ Full Stack Web & Mobile Development  
Digital Marketing & SEO**

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# Computer Science – 100+ Lab Exercises (Basic, Intermediate, Advanced)

## □ Basic Level (30+ Exercises)

**Objective:** Establish foundational computer science principles and programming skills.

### Programming Fundamentals

- Write simple programs using Python/C/Java.
- Understand variables, data types, and operators.
- Implement conditional statements and loops.
- Create and use functions/methods.
- Explore arrays and basic data structures.

### Problem Solving & Algorithms

- Solve basic algorithmic problems (sorting, searching).
- Understand time complexity and Big O notation.
- Implement linear and binary search.
- Work on simple recursion problems.
- Use debugging tools and techniques.

### Computer Organization & Systems

- Understand binary number systems and conversions.
- Study basic logic gates and circuits.
- Learn about CPU architecture and memory.
- Use command-line interface commands.
- Introduction to operating systems concepts.

## □ Intermediate Level (40+ Exercises)

**Objective:** Deepen knowledge in data structures, algorithms, and system-level programming.



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## Data Structures

- Implement linked lists (singly, doubly).
- Work with stacks and queues.
- Create trees and binary search trees.
- Understand hash tables and hashing.
- Explore graphs and graph traversal algorithms.

## Advanced Algorithms

- Implement sorting algorithms (merge, quicksort).
- Solve algorithmic problems using dynamic programming.
- Use greedy algorithms and backtracking.
- Study graph algorithms (Dijkstra's, BFS, DFS).
- Analyze algorithm efficiency in complex scenarios.

## Operating Systems & Networking

- Manage processes and threads.
- Implement synchronization mechanisms (mutex, semaphores).
- Understand memory management and paging.
- Explore file systems basics.
- Study fundamentals of computer networks (TCP/IP, HTTP).

## Software Engineering

- Understand software development life cycle (SDLC).
- Practice version control with Git.
- Write unit tests and debugging.
- Explore design patterns basics.
- Use UML diagrams for system modeling.

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## □ Advanced Level (40+ Exercises)

**Objective:** Master advanced topics, research methodologies, and cutting-edge technology integration.

## Advanced Systems & Architecture



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- Study distributed systems and cloud computing fundamentals.
- Implement multithreading and concurrency control.
- Explore virtual memory and kernel modules.
- Work on containerization with Docker/Kubernetes.
- Analyze security models and cryptography basics.

## Theory of Computation & AI

- Understand automata theory and formal languages.
- Work on Turing machines and decidability.
- Explore machine learning basics and neural networks.
- Implement AI search algorithms (A\*, Minimax).
- Analyze computational complexity classes (P, NP, NP-complete).

## Databases & Big Data

- Design normalized databases.
- Implement SQL and NoSQL queries.
- Work with big data tools (Hadoop, Spark).
- Analyze data mining and visualization techniques.
- Practice data warehousing and ETL processes.

## Capstone Projects

- Develop a compiler or interpreter for a small language.
- Build a multi-threaded web server.
- Design a secure distributed application.
- Implement a machine learning model end-to-end.
- Create a scalable social network backend.

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## □ Tools & Languages Covered

- Python, Java, C/C++, SQL
- Git, Docker, Kubernetes
- Linux/Unix environments
- Jupyter, TensorFlow, Hadoop