

Maulana Abul Kalam Azad University of Technology, WB
(Formerly known as West Bengal University of Technology)
Syllabus of B.Sc. in Computer Science
Effective from academic session 2023-24

Semester-III

Paper Name: Design and Analysis of Algorithm/ Design Analysis of Algorithm Lab

Code: CS 301/ CS 391

Contact: 3L+ 2P

Course Objective:

- CO1. To introduce students to a powerful programming language
- CO2. To understand the basic structure of a program
- CO3. To gain knowledge of various programming errors.
- CO4. To enable the students to make flowchart and design an algorithm for a given problem.
- CO5. To enable the students to develop logics and programs

Module I:

Time and space complexity. Asymptotic notations. Recurrence for divide and conquer and its solution, the substitution method and recursion-tree method for solving recurrences. The master method: proof and solving recurrence problems, merge sort, heap sort, quick sort and their complexity analysis.

Module II:

Advanced data structure: adt and data structure, linear vs non-linear data structure. Tree: tree as an adt, definition and terminologies, threaded binary tree, bst. Avl tree, b tree, b+ tree, spatial data representation using k-d tree. [8L]

Module III:

Graph: definition, computer representation of graphs, graph traversals: bfs & dfs, spanning tree. Graph colouring- chromatic number and critical paths, Dynamic programming: matrix- chain multiplication, all pair shortest paths, single source shortest path, 0-1 knapsack problem. Greedy method: knapsack problem, activity – selection, huffman codes, minimum spanning tree by prim's and kruskal's algorithms. Disjoint set manipulation: set manipulation algorithm like union-find, union by rank, path compression. Topological sorting Backtracking: use in solving problem, 4 queen and 8-queen problem, subset sum problem Branch and bound: basic method, applications: the 15-puzzle problem.

Maulana Abul Kalam Azad University of Technology, WB
(Formerly known as West Bengal University of Technology)
Syllabus of B.Sc. in Computer Science
Effective from academic session 2023-24

Design and Analysis of Algorithm Lab

Practical: Based on Theory

Reference Books:

1. A.Aho, J.Hopcroft and J.Ullman "The Design And Analysis Of Algorithms", Pe.
2. T Cormen, C Leiserson and R Rivest "Introduction To Algorithms", Phi.
3. Fundamentals Of Algorithms- G.Brassard,P.Bratlay, Phi.
4. Horowitz Ellis, Sahani Sartaz, R. Sanguthevar " Fundamentals Of Computer Algorithms".

Maulana Abul Kalam Azad University of Technology, WB
(Formerly known as West Bengal University of Technology)
Syllabus of B.Sc. in Computer Science
Effective from academic session 2023-24

Paper Name: Database Management Systems/ DBMS Lab

Code: CS 302 / CS 392

Contact: 3L+ 2P

Course Objectives:

CO1. Concepts of file management and relational data management

CO2. Understanding data management

CO3. Understanding attributes of real-world entities

CO4. Define real world entities into schema

CO5. Relational definition among various schemas of a system/ problem 6. Integrity management among data

Module 1: Introducing to Data and Data Management

Introduction, Data and Information, Database and Data Base Management System, Components of Database System, Basics of Database Management System, File-based System and Database Management System, Advantages of using Database over File based system, Data Dictionary and Metadata, ANSI-SPARC Architecture, Database Users, Role of Database Administrator (DBA) and Data Administrator(DA), Database Environment, Need for a Database, Characteristics, or Features, or Advantages of Database Systems, Limitations of Database

Module 2: Data Models and Architecture of DBMS

Schemas and Instances, DBMS Architecture, Three Level Architecture of Database(ANSI SPARC architecture), Evolution of Data Models, Hierarchical Data Model, Network Data Model, Relational Data Model Object-oriented Data Model, Object-relational Data Model, Data and Structural Independence, Database Languages DDL, DML, DCL, TCL, Database Access, Database Structure

Module 3: Data Modeling using ER Modeling

Basic Terminology related to ER Model, Relational Model – Introduction, Advantages and Disadvantages, Identifying Entities, and Relationships, Types of Relationships, Relationship Participation, Notations in ER Model, Strong and Weak entity sets Composite entity, Managing Many-to-many, Relationship, Example of E-R Model, Types of Integrity Constraints, Extended E-R Model, Translating the ER Model into Relational Model, Object Modeling, Subclass and Super class, Specialization, Generalization and Aggregation, Class Diagram

Module 4: Relational Model and Relational Database Management System

Introduction, RDBMS Terminology, Various Types of Keys, Relational Integrity Rules Entity integrity Rule, referential integrity rule, Functional Dependency, Armstrong Axioms, Relational Set Operators, Retrieval Operators, CODD's Twelve Rules of Relational Database, ACID properties, Views and their purpose, Database Life Cycle, Data

Maulana Abul Kalam Azad University of Technology, WB
(Formerly known as West Bengal University of Technology)
Syllabus of B.Sc. in Computer Science
Effective from academic session 2023-24

Dictionary, Relational Algebra and relational calculus, Comparisons of relational algebra and calculus Tuple Relational Calculus, Domain Relational Calculus, Introduction to SQL

Module 5: Normalization

Introduction, Need for Normalization, Types of Dependencies - Functional Partial functional and Transitive, Multi- valued Dependency, Join Dependency, Lossless and Lossy Decompositions, Normalizing Tables, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Examples on Normalization, Determining, Candidate Key and further decomposition.

Module 6: Managing Data Using Structured Query Language (SQL)

Introduction, Features of SQL, Database Languages - data definition and Data manipulation languages, Data Definition Commands, Data Manipulation Commands, (SELECT Statement and different Clauses, SQL Functions - Aggregate, Date and Time Functions, String Functions, Conversion Functions, Mathematical Functions, Special Operators), Types of Constraints, Different types of Join and Set Operators, Group by and having clauses, Sub-query, Views, Advances SQL, Roll-up, Commit and Save point, Create user grant revoke, Introduction to PL/SQL – conditional statements, loop, variable binding, Embedded SQL

DBMS Lab

Practical: Based on Theory

Reference Books:

1. Korth, Silberschatz, Sudarshan – Database System Concepts; Tata Mc. Graw Hill
2. Ramez Elmasri, Shamkant B Navathe - Fundamentals of Database Systems; Pearson
3. C.J. Date - An Introduction to Database Systems, 8e, Pearson Education
4. Rajiv Chopra - Database Management Systems ; S CHAND
5. Atul Kahate - Introduction to Database Management Systems , Pearson
6. P.S. Deshpande - SQL and PL/SQL for Oracle 10g Black Book; Wiley Dreamtech
7. Database Management Systems, R.P. Mahapatra, Khanna