

Advanced Database

Course Title: Advanced Database
Course No: CSC475
Nature of the Course: Theory + Lab
Semester: VIII

Full Marks: 60 + 20 + 20
Pass Marks: 24 + 8 + 8
Credit Hrs: 3

Course Description:

This course includes advanced concept of database system. The main topics covered are advanced concept of relational data model, Extended E-R model, new database management technologies, query optimization, NoSQL database and big data processing techniques.

Course Objectives:

At the end of the course students should be able to know new developments in database technology, interpret and explain the impact of emerging database standards, evaluate the contribution of database theory to practical implementations of database management systems. Also, students should be able to develop more advanced application using MapReduce and Hadoop.

Course Contents:

Unit 1: Enhanced Entity Relationship Model and Relational Model (8 Hrs.)

Entity Relationship Model Revised; Subclasses, Superclasses and Inheritance; Specialization and Generalization; Constraints and characteristics of specialization and Generalization; Union Types; Aggregation; Relational Model Revised; Converting ER and EER Model to Relational Model; SQL and Advanced Features; Concepts of File Structures, Hashing, and Indexing

Unit 2: Object and Object Relational Databases (10 Hrs.)

Object Database Concepts; Object Database Extensions to SQL; The ODMG Object Model and the Object Definition Language ODL; Object Database Conceptual Design; Object Query Language OQL; Language Binding in the ODMG Standard

Unit 3: Query Processing and Optimization (7 Hrs.)

Concept of Query Processing; Query Trees and Heuristics for Query Optimization; Choice of Query Execution Plans; Cost-Based Optimization

Unit 4: Distributed Databases, NOSQL Systems, and BigData (12 Hrs.)

Distributed Database Concepts and Advantages; Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design; Types of Distributed Database Systems; Distributed Database Architectures
Introduction to NOSQL Systems; The CAP Theorem; Document-based, Key-value Stores, Column-based, and Graph-based Systems; BigData; MapReduce; Hadoop

Unit 5: Advanced Database Models, Systems, and Applications (8 Hrs.)

Active Database Concepts and Triggers; Temporal Database Concepts; Spatial Database Concepts; Multimedia Database Concepts; Deductive Database Concepts; Introduction to Information Retrieval and Web Search

Laboratory Works:

Students should implement different concepts of database system studied in each unit of the course during lab time and should submit a mini project at the end the course.

Recommended Books:

1. Elmasri and Navathe, Fundamentals of Database Systems, Pearson Education.
2. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-Hill
3. Korth, Silberchatz, Sudarshan, Database System Concepts, McGraw-Hill.
4. Peter Rob and Coronel, Database Systems, Design, Implementation and Management, Thomson Learning.
5. C. J. Date & Longman, Introduction to Database Systems, Pearson Education
6. Tiwari, Shashank and Safari, professional Nosql, O'Reilly Media Company.
7. Gunarathne, Thilina Hadoop MapReduce v2 Cookbook: Explore the Hadoop MapReduce v2.
8. Ecosystem to Gain Insights from very Large Datasets, 2nd Edition, PACKT Publishing.