DATABASE MANAGEMENT SYSTEMS

(Common to both CSE, IT, CSE(AI&ML) & CSE(DS))

Course Code: 22CT1105

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Course Outcomes: At the end of the course the student shall be able to

CO1: Illustrate the DBMS architecture and model a database using ER diagram.(L3)

CO2: Solve queries using procedural and non-procedural languages.(L3)

CO3: Apply the normalization techniques to improve the database design.(L3)

CO4: Demonstrate the processing and controlling the consequences of concurrent data access.(L3)

CO5: Demonstrate the NoSQL concepts and types of Databases. (L3)

UNIT-I — 12 Lectures

History of Database Systems, Database System Applications, database System vs file System – View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL, DML –Transaction Management – database System Structure – StorageManager – the Query Processor.

Database design and E-R diagrams – Beyond E-R Design Entities, Attributes and Entity sets – Relationships and Relationship sets –Additional features of ER Model – Concept Design with the ER Model – Conceptual Design for Large enterprises.

Learning Outcomes:

At the end of the module, the student will be able to

1. Describe when to use files and when to use a DBMS.(L2)
2. Explain how data can be stored and processed. (L2)
3. Apply data modeling tools like Entity-Relationship Diagrams. (L3)

UNIT-II — 10 Lectures

Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical database Design – Introduction to Views – Destroying/altering Tables and Views. Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Relational calculus –Tuple relational Calculus– Domain relational calculus.

Learning Outcomes:

At the end of the module, the student will be able to

1. Describe the data using a relational model. (L2)
2. Solve queries using relational algebra and calculus (L3)
3. Summarize what views are for and how to use them. (L2)

UNIT-III 8 Lectures

Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF– Schema refinement in Database Design – Multi valued Dependencies – FOURTH Normal Form.

Learning Outcomes:

At the end of the module, the student will be able to

1. Examine the anomalies in a database (L3)
2. Determine the keys for a given set of functional dependencies. (L3)
3. Apply the normal forms to normalize the tables. (L3)

UNIT-IV 12 Lectures

ACID properties – Concurrent Executions-Conflict serializability- view serializability - Concurrency Control: Lock – Based Protocols-Deadlock Handling-TimestampBased Protocols-Multiple Granularity. Advance Recovery systems- ARIES, Log, the Write–ahead Log Protocol, Checkpointing, and Recovering from a System Crash. Primary and Secondary Indexes – Index data structures – Hash-Based Indexing – Tree base Indexing – B+ Trees: A Dynamic Index Structure.

Learning Outcomes:

At the end of the module, the student will be able to

1. Demonstrate the logging techniques used to ensure Atomicity and Durability. (L3)
2. Summarize the anomalies that occur without ACID properties. (L2)
3. Explain how different indexing techniques work. (L2)

UNIT-V 8 Lectures

Motivations for Not Just/No SQL (No SQL) Databases, The CAP theorem, ACID and BASE, Types of NoSQL databases: Key –Value Pair Databases, Document databases, Column Family Databases, Graph Databases. Introduction to Key-Value Databases, Key-Value terminology and Designing for the Key-Value Databases(Text Book-2)

Learning Outcomes:

At the end of the module, the student will be able to

1. Describe the basics concepts of NoSQL (L2)
2. Summarize the types of No SQL databases. (L2)
3. Design Key-Value Databases. (L3)

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke, *Database Management Systems*, 3rd Edition, Tata McGraw-Hill, 2014.
2. Dan Sullivan, *NoSQL for Mere Mortals*, 1st Edition, Pearson Education, 2015.

REFERENCES:

1. Silberschatz, Korth, *Database System Concepts*,6th Edition, TataMcGraw Hill, 2013.
2. C.J.Date, *an introduction to Database Systems*, 8th Edition, Pearson Education, 2003.
3. Peter Rob & Carlos Coronel, *Database Systems design*, Implementation, and Management, 9th Edition, Pearson Education, 2009.
4. ElmasriNavate, *Fundamentals of Database Systems*, 7th Edition, Pearson Education, 2017.
5. SibsankarHaldar, *SQLite Database System Design, and Implementation*, O'Reilly publications,2nd Edition,2015

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs58/preview