Unstructured Databases

Professional Elective III

Course Code: 20CS1154

L	T	P	C
3	0	0	3

PRE-REQUISITES: Database Management Systems

COURSE OUTCOMES: At the end of the course student will be able to

CO1: Understand the architecture of Mongo DB.(L2)

CO2: Demonstrate CRUD operations. (L2)

CO3: Understand the features of Cassandra database and different cql types (L2)

CO4: Design Conceptual Data modeling using Cassandra (L3)

CO5: Understand the process of developing and constructing a model in graph databases (L2)

UNIT- 1 (Text-Book-2) (10 Lectures)

Introduction to MongoDB: definition of MongoDB: what is a document database, what is JSON, How does it look, cross-platform, scalable, flexible, An overview of MongoDB architecture, introduction to mongo dB basics, core concepts and vocabulary, mongo dB databases, mongo dB collections, mongo dB documents, introduction to mongo dB shell, types of storage engines, locks

Learning Outcomes: At the end of the module, students will be able to:

1. Understand mongo dB architecture. (L2)

2. Understand mongo dB collections and documents. (L2)

3. Interpret the types of storage engines and locks. (L2)

UNIT- 2 (Text-Book-2) (10 Lectures)

Mongo DB Data types, CRUD operations: Mongo DB create operations, Mongo DB read operation, Mongo DB update operations, Mongo DB delete operations, mongo DB bulk write operations

Learning Outcomes: At the end of the module, students will be able to:

1. Understand MongoDB data types. (L2)

2. Demonstrate CRUD operations. (L2)

UNIT- 3 (Text-Book-1) (10 Lectures)

Cassandra: Review of Relational databases, Sharding and Shared-Nothing Architecture, Web Scale, Rise of NoSQL, Distributed and Decentralized, Elastic Scalability, High Availability and Fault Tolerance, Tuneable Consistency, High Performance, Brewer's CAP Theorem, Cassandra's Data Model, CQL types, Other Simple Data Types, User-Defined Types

Learning Outcomes: At the end of the module, students will be able to:

1. Understand features of Cassandra database. (L2)

2. Understand concept of CAP (L2)

3. Discuss cql types. (L2)

UNIT- 4 (Text-Book-1) (10 Lectures)

Data Modeling: Conceptual Data modeling, RDBMS design, Logical Data Modeling, physical data Modeling, Evaluating and Refining, Defining database Schema.

Cassandra Architecture: Da Data Centres and Racks, Gossip and Failure Detection, Snitches, Rings and Tokens, Virtual Nodes , Partitioners, Replication Strategies, Consistency Levels, Anti-Entropy, Repair, and Merkle Trees, Lightweight Transactions and Paxos, Memtables, SSTables, and Commit Logs, Caching

Learning Outcomes: At the end of the module, students will be able to:

1. Design Conceptual Data modeling using Cassandra(L3)
2. Understand architecture of Cassandra. (L2)
3. Discuss different consistency levels (L2)

UNIT- 5 (Text-Book-3) (10 Lectures)

Graph Database: Introduction to graphs, Data modelling process, understanding the problem, developing the whiteboard model, constructing the logical data model, checking our model, Mutating a graph, creating vertices and edges, adding edges, removing a vertex, removing an edge

Learning Outcomes: At the end of the module, students will be able to:

1. Understand data modelling process in graphs. (L2)

2. Understand the steps in developing whiteboard model (L2)

3. Understand the concepts of path traversal (L2)

Text books

1. Jeff Carpenter and Eben Hewitt, " Cassandra: The Definitive Guide Distributed Data at Web Scale" oreilly publications , revised third edition 2022
2. Manu Sharma , " MongoDB Complete Guide" bpb publications, 1st edition 2021.
3. Dave Bechberger, Josh Perryman, "Graph Databases in Action " Manning publications 2020

References

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition,2019.
2. Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN: 978-0-470-94224-6