

STORAGE AREA NETWORKS
(Effective from the academic year 2018 -2019)
SEMESTER – VII

Course Code	18CS822	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	03

CREDITS –3

Course Learning Objectives: This course (18CS822) will enable students to:

- Evaluate storage architectures,
- Define backup, recovery, disaster recovery, business continuity, and replication
- Examine emerging technologies including IP-SAN
- Understand logical and physical components of a storage infrastructure
- Identify components of managing and monitoring the data center
- Define information security and identify different storage virtualization technologies

Module 1

Storage System: Introduction to Information Storage: Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing. **Data Center Environment:** Application Database Management System (DBMS), Host (Compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application
Textbook1 : Ch.1.1 to 1.4, Ch.2.1 to 2.10
RBT: L1, L2

Contact Hours

08

Module 2

Data Protection - RAID : RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison. **Intelligent Storage Systems :** Components of an Intelligent Storage System, Types of Intelligent Storage Systems. **Fibre Channel Storage Area Networks - Fibre Channel:** Overview, The SAN and Its Evolution, Components of FC SAN.
Textbook1 : Ch.3.1 to 3.6, Ch. 4.1, 4.3, Ch. 5.1 to 5.3
RBT: L1, L2

08

Module 3

IP SAN and FCoE: iSCSI, FCIP, Network-Attached Storage: General-Purpose Servers versus NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance
Textbook1 : Ch.6.1, 6.2, Ch. 7.1 to 7.8
RBT: L1, L2

08

Module 4

Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions, **Backup and Archive:** Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments
Textbook1 : Ch.9.1 to 9.6, Ch. 10.1 to 10.9
RBT: L1, L2

08

Module 5

Local Replication: Replication Terminology, Uses of Local Replicas, Replica Consistency, Local Replication Technologies, Tracking Changes to Source and Replica, Restore and Restart Considerations, Creating Multiple Replicas. **Remote Replication:** Modes of Remote

08

NOSQL DATABASE
(Effective from the academic year 2018 -2019)
SEMESTER – VIII

Course Code	18CS823	CIE Marks	40
Number of Contact Hours/Week	3:0:0	SEE Marks	60
Total Number of Contact Hours	40	Exam Hours	03

CREDITS –3

Course Learning Objectives: This course (18CS823) will enable students to:

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph).
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
- Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

Module 1

Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Aggregate Data Models; Aggregates, Example of Relations and Aggregates, Consequences of Aggregate Orientation, Key-Value and Document Data Models, Column-Family Stores, Summarizing Aggregate-Oriented Databases.
More Details on Data Models; Relationships, Graph Databases, Schemaless Databases, Materialized Views, Modeling for Data Access,
Textbook1: Chapter 1,2,3
RBT: L1, L2, L3

Contact Hours
08

Module 2

Distribution Models; Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.
Consistency, Update Consistency, Read Consistency, Relaxing Consistency, The CAP Theorem, Relaxing Durability, Quorums.
Version Stamps, Business and System Transactions, Version Stamps on Multiple Nodes
Textbook1: Chapter 4,5,6
RBT: L1, L2, L3

08

Module 3

Map-Reduce, Basic Map-Reduce, Partitioning and Combining, Composing Map-Reduce Calculations, A Two Stage Map-Reduce Example, Incremental Map-Reduce
Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preference, Shopping Cart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets
Textbook1: Chapter 7,8
RBT: L1, L2, L3

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Module 4

Document Databases, What Is a Document Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure
Textbook1: Chapter 9

08

RBT: L1, L2, L3	
Module 5	
Graph Databases, What Is a Graph Database?, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use. Textbook1: Chapter 11 RBT: L1, L2, L3	08
Course Outcomes: The student will be able to :	
<ul style="list-style-type: none"> Define, compare and use the four types of NoSQL Databases (Document-oriented, Key/Value Pairs, Column-oriented and Graph). Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases. Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases. 	
Question Paper Pattern:	
<ul style="list-style-type: none"> The question paper will have ten questions. Each full Question consisting of 20 marks There will be 2 full questions (with a maximum of four sub questions) from each module. Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module. 	
Textbooks:	
1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addison Wesley, 2012	
Reference Books:	
1. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN-13: 978-9332557338) 2. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022) 3. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)	



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