

Branch Name:	Artificial Intelligence and Data Science
Program Code:	ET108
Semester/Year:	Semester VII/ Fourth Year
Course Name:	NoSQL Database
Course Code:	1ET1080701
Pre-requisite Course:	Basic Knowledge about DBMS.

Course Objectives:

- Explore the origins of NoSQL databases and the characteristics that distinguish them from traditional relational database management systems.
- Understand the architectures and common features of the main types of NoSQL databases (key-value stores, document databases, column-family stores, graph databases).
- Discuss the criteria that decision makers should consider when choosing between relational and non-relational databases and techniques for selecting the NoSQL database that best addresses specific use cases.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)				
					Theory (Marks)		Practical (Marks)		Total (Marks)
	L	T	P	Total	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
5	4	-	2	6	70	30	30	20	150

Subject Contents

Sr. No	Topic	Total Hours	Weight (%)
1	Overview and History of NoSQL Databases, Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.	06	15
2	Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.	10	25
3	NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented 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, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.	08	20

4	Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.	08	20
5	NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases	08	20

List of Reference Books:

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications, 1st Edition, 2019.
2. "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence" by Pramod J Sadalage and Martin Fowler.
3. "Making Sense of NoSQL: A guide for Managers and the Rest of us (Manning)" by Dan McCreary and Ann Kelly.

List of Experiments:

1. Installation of NoSQL Databases: Redis, MongoDB, Cassandra, Neo4j on Windows
2. Practice CRUD (Create, Read, Update, and Delete) operations on the four databases: Redis, MongoDB, Cassandra
3. Study about Usage of Where Clause equivalent in MongoDB
4. Study about Usage of operations in MongoDB – AND in MongoDB, OR in MongoDB, Limit Records and Sort Records
5. Study about ' macdonalds ' collection data for document oriented database. Import restaurants collection and apply some queries to get specified output.
6. Write a program to count the number of occurrences of a word using MapReduce
7. Creating database employee
 - a) Create collections emp_personal_details with emp_id, emp_name, emp_address, emp_DOB, emp_age, emp_mobile number
 - b) Create another collection emp_professional_details with emp_id, emp_name, designation ,salary ,incentive, working hours
8. Insert 10 records in collection emp_personal_details and emp_professional_details
 - a) Show all the employees having designation manager
 - b) Show all the employees having salary 6000
9. Find sum of salaries of employee having designation clerk.
10. Filter the employees having designation software engineer and find the minimum salary

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Explain and compare different types of NoSQL Databases	1. Remembering 2. Understanding
CLO2	Compare and contrast RDBMS with different NoSQL databases.	4. Analyze 5. Evaluate
CLO3	Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases.	4. Analyze
CLO4	Explain performance tune of Key-Value Pair NoSQL databases.	2. Understanding 4. Analyze
CLO5	Apply Nosql development tools on different types of NoSQL Databases.	3. Applying 6. Creating

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1		M	M	M	M	L						M	H	M	M	
CLO2	L	H	H	M	H					L		M		H	L	
CLO3	L	H	M	M	H	L								M		M
CLO4	M	M	H	M	M			L					H		M	H
CLO5	H	M	H		H				L			M	M		M	H

H: High, M: Medium, L: Low