# SILVER OAK UNIVERSITY

## School of Technology, Design And Computer Application

### Silver Oak College of Computer Application

### Bachelor of Science Computer Science & Information Technology

### Course Name:Advanced DBMS Tools

### Course Code: 3040243208

### Semester: 4th

**Prerequisite:** A basic understanding of databases, programming and NoSQL

**Course Objective**: Understand the fundamental principles and concepts of databases and SQL design, implement, and manage scalable NoSQL databases using MongoDB for efficient data storage and retrieval.

**Teaching Scheme:**

| Teaching Scheme | | | | |
|---|---|---|---|---|
| L | T | P | Contact Hours | Credit |
| 3 | 0 | 2 | 5 | 4 |

**Content:**

| Unit No. | Course Contents | Teaching Hours | % Weightage |
|---|---|---|---|
| 1 | **Introduction to Databases**<br>Overview of database management systems, Types of databases: relational, NoSQL, NewSQL, Evolution and trends in database systems, Foundations of MongoDB, Introduction to MongoDB, MongoDB architecture and components, Installation and setup | 10 | 24 |
| 2 | **Data Modeling with MongoDB**<br>Document-oriented data model, Schema design in MongoDB, Embedded documents and references, Querying MongoDB, CRUD operations in MongoDB, Query language: MongoDB Query Language (MQL), Aggregation framework | 10 | 24 |
| 3 | **Indexing and Performance Optimization**<br>Indexing concepts in MongoDB, Strategies for query optimization, Performance tuning techniques, MongoDB Administration, Deployment strategies: standalone, replica sets, sharding, Backup and restore operations, Security in MongoDB: authentication, authorization, encryption | 10 | 24 |
| 4 | **Advanced MongoDB Features**<br>Geospatial indexing and queries, Text search, Transactions in MongoDB, Integration and Application Development, Connecting MongoDB with programming languages (e.g., Python, Node.js), Using MongoDB with web frameworks, Best practices for application development with MongoDB | 12 | 27 |

**Course Outcome:**

| Sr. No. | CO statement | Unit No |
|---|---|---|
| CO-1 | Understanding of Databases and Foundations of MongoDB | 1 |
| CO-2 | Understanding the Data Modeling with MongoDB | 2 |
| CO-3 | Appling of Indexing and Performance Optimization and MongoDB Administration | 3 |
| CO-4 | Implementation of Advanced MongoDB Features and Integration and Application Development | 4 |

**Teaching & Learning Methodology:**

1. Problem - based Learning
2. Design Thinking
3. Cooperative-based Learning
4. Competency-based Learning

**List of Practical** **Total Hours:28**

| Sr.No. | Practical Name |
|---|---|
| 1 | Install MongoDB on different operating systems (Windows, Linux, macOS) |
| 2 | Perform Basic CRUD Operations: create database, select, update, insert, delete query. |
| 3 | Implement the schema in MongoDB using embedded documents and references |
| 4 | Create indexes on fields to improve query performance |
| 5 | Perform aggregation operations such as group, match, project, sort |
| 6 | Perform Aggregate data from multiple collections |
| 7 | Configure a sharded cluster in MongoDB |
| 8 | Perform backups using mongodump |
| 9 | Restore databases and collections using mongorestore |
| 10 | Enable authentication and create user roles |
| 11 | Insert documents into a MongoDB collection using insertOne() and insertMany(). |

| | |
|---|---|
| 12 | Create indexes for optimized queries (createIndex()). |
| 13 | Use the aggregate() method to perform complex queries like filtering, grouping, sorting, and project data. |
| 14 | Use MongoDB's monitoring tools (e.g., mongostat, mongotop, and MongoDB Atlas monitoring dashboard). |
| 15 | Build a fully functional system with MongoDB for a specific use case (e.g., a customer management system, inventory management, or social media platform). |
| 16 | Create a RESTful API that interacts with a MongoDB database. |

**Major Equipment :**

1. Computer System
2. Projector
3 mongodb

**Books Recommended: -**

1.By Brad Dayley NoSql with MongoDB
2.By Manu Sharma MongoDB complete Guide
3.By Kristina Chodorow and Michael Dirolf. MongoDB: The Definitive Guide"

**List of Open-Source Software/learning website:**

1. https://www.w3schools.com/mongodb/
2. https://www.geeksforgeeks.org/mongodb-tutorial/
3. https://hevodata.com/learn/mongodb-alternatives/

**CO-PO-PSO Matrix:**

| Co. No. | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | | 2 | 3 | | | | | | | | | | 2 | 2 |
| CO-2 | 1 | 2 | 3 | 1 | 1 | | | | | | | 1 | 1 | 1 |
| CO-3 | 2 | 3 | 3 | 1 | 3 | | | | | | | | 2 | 2 |
| CO-4 | 1 | | 1 | 1 | 1 | | | | | | | 1 | 1 | 1 |