Below is a comprehensive syllabus for a MongoDB course:

Course Title: MongoDB Development

Course Description: This course provides an in-depth understanding of MongoDB, a popular NoSQL database, for building scalable and flexible database solutions. Students will learn the fundamentals of MongoDB, including document-oriented data model, CRUD operations, indexing, and aggregation framework. The course covers topics such as data modeling, schema design, replication, sharding, and deployment strategies.

Prerequisites: Basic understanding of databases and SQL concepts. Familiarity with JavaScript programming language is recommended but not required.

Course Objectives:

1. Understand the fundamentals of MongoDB and its document-oriented data model.
2. Learn how to perform CRUD operations and query data using MongoDB.
3. Gain proficiency in data modeling and schema design in MongoDB.
4. Develop skills in advanced features such as indexing, aggregation, replication, and sharding.
5. Explore best practices and deployment strategies for MongoDB in production environments.

Course Outline:

Module 1: Introduction to MongoDB

- Overview of MongoDB and NoSQL databases
- Installing and setting up MongoDB
- Introduction to BSON (Binary JSON) data format

Module 2: CRUD Operations in MongoDB

- Performing CRUD operations (Create, Read, Update, Delete) in MongoDB
- Using the MongoDB shell for interacting with databases
- Working with collections and documents

Module 3: Querying Data in MongoDB

- Querying data using find() method
- Query operators and expressions in MongoDB

- Working with nested documents and arrays

Module 4: Data Modeling and Schema Design

- Understanding data modeling concepts in MongoDB
- Schema design best practices
- Embedding vs. referencing documents

Module 5: Indexing and Performance Optimization

- Introduction to indexing in MongoDB
- Types of indexes and their usage
- Performance optimization techniques

Module 6: Aggregation Framework

- Overview of MongoDB aggregation framework
- Using aggregation pipeline for data transformation and analysis
- Aggregation operators and stages

Module 7: Replica Sets

- Understanding replica sets and high availability in MongoDB
- Configuring and managing replica sets
- Automatic failover and recovery

Module 8: Sharding

- Introduction to sharding in MongoDB for horizontal scaling
- Configuring and managing sharded clusters
- Shard key selection and distribution

Module 9: Data Security

- Securing MongoDB deployments
- Authentication and authorization mechanisms
- Role-based access control (RBAC)

Module 10: Backup and Restore

- Backup strategies for MongoDB deployments
- Using mongodump and mongorestore utilities
- Configuring automated backups

Module 11: Deployment Strategies

- Deployment options for MongoDB (on-premises, cloud)
- Best practices for deploying MongoDB in production
- Continuous Integration and Continuous Deployment (CI/CD) pipelines

Module 12: Real-world Projects and Case Studies

- Working on real-world projects and case studies
- Designing and implementing end-to-end MongoDB solutions
- Presenting findings and insights from projects

Module 13: Capstone Project

- Developing a comprehensive MongoDB project
- Identifying a business problem or scenario
- Designing and implementing a solution using skills learned throughout the course

Assessment:

- Weekly assignments to reinforce learning concepts.
- Midterm project: Developing a basic MongoDB application with CRUD operations and simple data modeling.
- Final project: Designing and implementing a comprehensive MongoDB solution addressing a real-world scenario.

Textbook: "MongoDB: The Definitive Guide" by Shannon Bradshaw, Kristina Chodorow, and Michael Dirolf

Additional Resources:

- Online tutorials and documentation (MongoDB official documentation, MongoDB University courses, etc.).
- Supplemental readings and materials provided by the instructor.

Grading:

- Assignments: 30%
- Midterm Project: 20%
- Final Project: 40%
- Participation and Attendance: 10%

Attendance Policy: Regular attendance is expected. Students are allowed a maximum of three unexcused absences. Excessive absences may result in a reduction of the final grade.

Office Hours: Instructor office hours will be held twice a week for additional help and clarification.