### Phone: +91 8882618533

Email: info@geekinstitute.org

Website: www.geekinstitute.org

## THE GEEK INSTITUTE Regd. By: E-Max India

**OF CYBER SECURITY** 

Centre Code: EMAX/EK80606

(Recognized By Govt. Of India)

(Building Futures Through Digital Knowledge and Innovation)

## MongoDB (01 Month)

## **Syllabus**

#### 01: Introduction to NoSQL and MongoDB

- ✓ What is NoSQL? Types and Use Cases
- Comparison: SQL vs NoSQL
- ✓ Overview of MongoDB and its Architecture
- Documents and Collections
- ✓ BSON vs JSON
- ✓ Installing MongoDB on Windows/Linux/macOS
- Using Mongo Shell & Mongo DB Compass (GUI Tool)
- ✓ Introduction to MongoDB Atlas (Cloud Version)

#### 02: MongoDB Basics and Core Operations

- **Creating Databases and Collections**
- **Inserting Documents** 
  - insertOne(), insertMany()
- **Querying Documents** 
  - o find(), findOne(), Projection, Filtering
  - Using Comparison Operators (\$eq, \$ne,
  - Logical Operators (\$and, \$or, \$not)
  - Array Queries (\$in, \$all, \$elemMatch)
- **Updating Documents** 
  - o updateOne(), updateMany(), \$set, \$unset, \$inc, \$push
- **Deleting Documents** 
  - deleteOne(), deleteMany()
- Query Optimization with Indexes

#### 03: Advanced Querying and Aggregation

- ✓ Understanding Aggregation Framework
- Stages in Aggregation Pipeline
  - \$match, \$group, \$project, \$sort, \$limit, \$unwind, \$lookup
- **Expressions in Aggregation**
- ✓ Working with Dates, Arrays, and Conditional Operators
- Data Transformation using Aggregation
- Performance Considerations with Aggregations

#### 04: MongoDB Data Modeling

- Schema Design Basics in MongoDB
- **Embedding vs Referencing**
- One-to-One, One-to-Many, and Many-to-Many Relationships
- **Denormalization Best Practices**
- Modeling Hierarchical Data
- Handling Large Collections

#### 05: Indexing and Performance Optimization

- ✓ What is an Index? Why Index?
- Creating Indexes (createIndex())
- Types of Indexes:
  - o Single Field, Compound, Multikey, Text, Geospatial
- Index Strategies and Query Analysis
- Using explain() for Performance Debugging
- ✓ Covered Queries and Index Usage
- ✓ TTL (Time-To-Live) Indexes

#### 06: MongoDB Administration

- MongoDB Configuration Files
- **Database Profiling**
- Working with Logs
- **Authentication and Authorization** 
  - Role-Based Access Control (RBAC)
- Creating Users and Assigning Roles
- Backup and Restore with mongodump, mongorestore
- Data Import and Export (mongoimport, mongoexport)

#### 07: MongoDB Atlas (Cloud-Based MongoDB)

- ✓ Introduction to MongoDB Atlas
- ✓ Creating a Free Cluster
- ✓ Setting Up IP Whitelists and Users
- ✓ Connecting Atlas with Compass and Applications
- ✓ Cloud Backups, Monitoring & Alerts
- ✓ Atlas Performance Advisor
- ✓ Atlas Triggers and Data Federation

#### 08: Mongoose (MongoDB with Node.js)

- ✓ Introduction to Mongoose ODM
- ✓ Setting Up Mongoose in a Node.js Project
- ✓ Connecting to MongoDB via Mongoose
- ✓ Defining Schemas and Models
- √ Validations in Mongoose
- ✓ CRUD Operations using Mongoose
- ✓ Mongoose Middleware (Pre/Post Hooks)
- ✓ Virtuals and Schema Methods
- ✓ Population and Relationships in Mongoose

#### 09: MongoDB in Full Stack Applications

- ✓ Integrating MongoDB with Express.js (Node.js)
- ✓ REST API with Express and MongoDB
- MongoDB in MERN Stack (Mongo, Express, React, Node)
- ✓ Authentication with JWT and MongoDB
- Using MongoDB with GraphQL (Optional Advanced Module)
- Real-Time Applications with MongoDB and WebSockets

#### 10: Security and Best Practices

- ✓ Secure MongoDB Deployment
- ✓ Role-Based Access Controls
- ✓ Enabling TLS/SSL for Connections
- ✓ Preventing NoSQL Injection
- ✓ Secure Password Storage with Bcrypt
- ✓ Auditing and Monitoring
- ✓ Limiting Database Exposure in Production

# 11: Backup, Replication, and Sharding (Advanced Concepts)

- ✓ Introduction to Replication
- ✓ Setting Up Replica Sets
- ✓ Failover and High Availability
- ✓ Sharding in MongoDB
  - o Shard Key Selection
  - Partitioning Data Across Shards
- ✓ Backup Strategies in Production
- ✓ Using Ops Manager and Cloud Manager (Optional)

#### 12: Real-World Projects and Capstone

- ✓ E-commerce Application Database
- ✓ Blogging System with Comments and Likes
- ✓ Inventory Management System
- ✓ Real-Time Chat Application with MongoDB
- ✓ Hosting Full Project on MongoDB Atlas