Mongodb with Python

Module 1: Introduction to MongoDB

- What is NoSQL?
- Overview of MongoDB (document-based database)
- MongoDB vs SQL databases
- Installing MongoDB locally and using **MongoDB Atlas (cloud)**
- MongoDB Compass overview (GUI for MongoDB)
- Basic Mongo shell commands

Module 2: Connecting Python with MongoDB

- Installing pymongo library
- Connecting to a local MongoDB instance
- Connecting to MongoDB Atlas (Cloud DB)
- Creating a MongoClient, database, and collection in Python
- Introduction to ObjectId

Module 3: CRUD Operations in MongoDB using Python

- **Create**
  - insert_one(), insert_many()
  - Auto-generated vs custom _id
- **Read**
  - find_one(), find()
  - Query with filters, projections, and conditions
  - Sorting results
  - Limiting results
- **Update**
  - update_one(), update_many()
  - Using $set, $inc, $push, $pull
- **Delete**
  - delete_one(), delete_many()

Module 4: Querying and Filtering Documents

- Query operators:
  - $gt, $lt, $in, $or, $and, $regex, $exists
- Nested documents and array queries
- Using indexes for faster querying

- Aggregation Framework basics

Module 5: MongoDB Data Modeling

- Document structure: Embedded vs Referenced
- One-to-one, One-to-many, Many-to-many relationships
- Schema design best practices
- Data normalization vs denormalization
- Using _id, custom IDs, UUIDs

Module 6: Working with JSON and BSON

- Understanding BSON (Binary JSON)
- Converting Python dictionaries to BSON
- Inserting and retrieving JSON data
- Reading data from JSON/CSV files and storing in MongoDB

Module 7: Aggregation Framework

- Aggregation pipeline stages: $match, $group, $project, $sort
- Grouping and counting documents
- Calculating averages, sums
- Filtering and transforming documents

Module 8: Error Handling and Transactions

- Try-except blocks with PyMongo
- Handling connection errors
- Using transactions (multi-document) in MongoDB
- Session-based operations (MongoDB 4.0+)

Module 9: Indexing and Performance

- Creating indexes with PyMongo
- Types of indexes:
    - Single field, compound, unique, TTL, text index
- Index impact on query performance
- Using .explain() for performance analysis

Module 10: Advanced Topics (Optional)

- Geospatial queries and indexes
- GridFS for storing large files
- Time-series collections
- MongoDB Change Streams (real-time data changes)
- MongoDB Aggregations with $lookup (joins)

Module 11: Integration with Web Frameworks

Using MongoDB with:

- **Flask** (Flask-PyMongo)
- **FastAPI**
- **Django** (via djongo or third-party ODMs)
- Creating REST APIs with MongoDB as the backend

Module 12: Using ODMs (Object Document Mappers)

- Introduction to ODMs
- MongoEngine basics
    - Defining documents
    - CRUD with ODM
- Comparing ODM vs PyMongo

==========

END

==========