**Java JDBC - Complete Guide**

## ****1. Introduction to JDBC****

* What is JDBC?
* Why use JDBC?
* JDBC vs Hibernate (ORM)
* JDBC Architecture
* Types of JDBC Drivers
  + JDBC-ODBC Bridge Driver
  + Native API Driver
  + Network Protocol Driver
  + Thin Driver (Pure Java Driver)

## ****2. Setting Up JDBC Environment****

* Installing JDBC Drivers
* Adding JDBC JAR to Java Project (MySQL, PostgreSQL, Oracle, etc.)
* Establishing a Database Connection

## ****3. JDBC API Components****

* **DriverManager** (Manages database drivers)
* **Connection** (Creates a connection to the database)
* **Statement** (Executes static SQL queries)
* **PreparedStatement** (Executes precompiled SQL queries, prevents SQL injection)
* **CallableStatement** (Used to execute stored procedures)
* **ResultSet** (Retrieves and processes query results)
* **SQLException** (Handling exceptions in JDBC)

## ****4. Connecting to Different Databases****

* **MySQL Database Connection**
* **PostgreSQL Database Connection**
* **Oracle Database Connection**
* **SQL Server Connection**
* **MongoDB Connection using JDBC Drivers**

## ****5. CRUD Operations in JDBC****

* **Create** → INSERT INTO
* **Read** → SELECT
* **Update** → UPDATE
* **Delete** → DELETE
* **Batch Processing** → Running multiple queries at once

## ****6. Advanced JDBC Features****

* **Transaction Management**
  + Commit and Rollback
  + Savepoints
* **Batch Processing**
  + Executing multiple queries efficiently
* **Metadata in JDBC**
  + DatabaseMetaData (Info about DB)
  + ResultSetMetaData (Info about query results)
* **Scrollable and Updatable ResultSet**
* **BLOB & CLOB Handling**
  + Storing & Retrieving Large Data (Images, Files, etc.)

## ****7. CallableStatement & Stored Procedures****

* **Calling Stored Procedures in MySQL, PostgreSQL, and Oracle**
* Handling **IN, OUT, and INOUT** Parameters

## ****8. Connection Pooling in JDBC****

* **What is Connection Pooling?**
* **Why use Connection Pooling?**
* Implementing Connection Pooling using:
  + Apache DBCP (Database Connection Pooling)
  + HikariCP (Fastest Connection Pool)
  + C3P0

## ****9. JDBC Best Practices & Security****

* Avoid SQL Injection
* Using **PreparedStatement** over **Statement**
* Connection Management (Closing Connections, Statements, and ResultSet Properly)
* Using **Connection Pooling** for Performance
* Error Handling & Logging

## ****10. JDBC with Frameworks****

* JDBC with **Spring JDBC Template**
* JDBC with **Hibernate (JPA)**
* JDBC with **MyBatis**

## ****11. Mini Projects with JDBC****

1. **Employee Management System**
2. **Library Management System**
3. **Online Banking System**
4. **Student Record Management System**
5. **JDBC-based CRUD Web App using Servlets & JSP**