

(Building Futures Through Digital Knowledge and Innovation)

MySQL (01 Month)

Syllabus

01: Introduction to Databases & MySQL

- ✓ What is a Database?
- ✓ Types of Databases (Relational vs. Non-Relational)
- ✓ Introduction to RDBMS
- ✓ Features of MySQL
- ✓ Installing MySQL on Windows/Linux/Mac
- ✓ MySQL Workbench & Command-Line Interface
- ✓ Connecting to MySQL Server
- ✓ Understanding Database Clients and Tools

02: MySQL Database Basics

- ✓ Creating Databases
- ✓ Listing and Dropping Databases
- ✓ Selecting a Database to Use
- ✓ Understanding Data Types in MySQL
 - Numeric (INT, FLOAT, DOUBLE, etc.)
 - String (VARCHAR, TEXT, CHAR)
 - Date & Time (DATE, DATETIME, TIMESTAMP)
 - Boolean
- ✓ Using SHOW and DESCRIBE Commands
- ✓ SQL Syntax Overview

03: Tables and Data Handling

- Creating Tables with Various Data Types
- Modifying Table Structures (ALTER TABLE)
- Dropping Tables Safely
- Column Constraints
 - PRIMARY KEY
 - FOREIGN KEY
 - UNIQUE
 - NOT NULL
 - DEFAULT
 - AUTO_INCREMENT

04: Data Manipulation (CRUD)

- ✓ **INSERT** – Adding Records
 - Single and Bulk Insert
- ✓ **SELECT** – Retrieving Data
 - Basic SELECT Queries
 - Filtering with WHERE
 - Pattern Matching with LIKE, IN, BETWEEN
 - Sorting with ORDER BY
 - Limiting Results (LIMIT, OFFSET)
- ✓ **UPDATE** – Modifying Records
- ✓ **DELETE** – Removing Records
- ✓ NULL Values and IS NULL / IS NOT NULL

05: Functions and Operators

- ✓ Mathematical Functions
- ✓ String Functions
- ✓ Date and Time Functions
- ✓ Aggregate Functions:
 - SUM(), AVG(), COUNT(), MIN(), MAX()
- ✓ Logical Operators (AND, OR, NOT)
- ✓ Comparison Operators (=, !=, <, >, <=, >=)

06: Advanced SELECT Queries

- Aliases (AS)
- DISTINCT Keyword
- Combining Results using UNION, UNION ALL
- Subqueries
- Nested SELECT Statements
- Correlated Subqueries

Module 7: Joins in MySQL

- Understanding Relationships
- Types of Joins:
 - INNER JOIN
 - LEFT JOIN (LEFT OUTER JOIN)
 - RIGHT JOIN (RIGHT OUTER JOIN)
 - FULL JOIN (with workaround in MySQL)
 - SELF JOIN
- Joining More than Two Tables
- Using Joins with Aggregate Functions

Module 8: Indexing and Optimization

- ✓ What is Indexing?
- ✓ Types of Indexes:
 - Single Column
 - Composite Index
 - Unique Index
 - Full-Text Index
- ✓ How Indexing Works in MySQL
- ✓ Analyzing Query Performance with EXPLAIN
- ✓ Optimization Techniques for Queries

09: Views in MySQL

- ✓ Creating Views
- ✓ Updating and Dropping Views
- ✓ Advantages and Limitations of Views
- ✓ Updating Data through Views

10: Stored Procedures & Functions

- ✓ Introduction to Stored Procedures
- ✓ Creating and Calling Procedures
- ✓ IN, OUT, INOUT Parameters
- ✓ Control Flow in Procedures (IF, CASE, WHILE, LOOP)
- ✓ Declaring and Using Variables
- ✓ Creating and Using Stored Functions
- ✓ Error Handling in Stored Procedures

11: Triggers and Events

- ✓ What are Triggers?
- ✓ Creating Triggers for INSERT, UPDATE, DELETE
- ✓ BEFORE vs AFTER Triggers
- ✓ Viewing and Dropping Triggers
- ✓ Event Scheduler
- ✓ Creating and Managing Events

Module 12: Transactions and Locks

- What is a Transaction?
- COMMIT, ROLLBACK, SAVEPOINT
- Atomicity, Consistency, Isolation, Durability (ACID)
- Implicit vs Explicit Transactions
- Isolation Levels
- Locking Mechanisms
 - Shared vs Exclusive Locks
 - Deadlocks and Lock Monitoring

13: MySQL User Management & Security

- ✓ Creating and Managing Users
- ✓ Granting and Revoking Privileges
- ✓ GRANT, REVOKE, SHOW GRANTS
- ✓ Password Management and Policies
- ✓ Understanding mysql.user Table
- ✓ Secure Authentication Plugins
- ✓ Role-Based Access Control (RBAC)
- ✓ Security Best Practices

14: Backup and Recovery

- ✓ Backup Strategies
- ✓ Logical Backups using mysqldump
- ✓ Physical Backups using mysqlhotcopy, file-based
- ✓ Restoring from Backups
- ✓ Import and Export Data using .sql and .csv files
- ✓ Scheduling Backups with Cron Jobs

15: MySQL Configuration and Administration

- ✓ MySQL Architecture Overview
- ✓ MySQL Configuration File (my.cnf / my.ini)
- ✓ Memory and Cache Configuration
- ✓ Understanding Logs:
 - Error Log
 - General Log
 - Slow Query Log
- ✓ Monitoring MySQL Server
- ✓ Managing Storage Engines (InnoDB, MyISAM)
- ✓ Performance Tuning Techniques

16: Real-World Projects and Use Cases

- ✓ Designing a Complete E-commerce Database Schema
- ✓ Implementing a Student Management System
- ✓ Developing a Blog Platform Database
- ✓ Reporting and Analytics Dashboards
- ✓ Practice on Sample Datasets (World, Sakila, Employees)

17: MySQL in Web Applications

- ✓ MySQL with PHP (Basic Integration)
- ✓ MySQL with Python (Using mysql-connector or SQLAlchemy)
- ✓ Connecting MySQL with JavaScript (Node.js – mysql2)
- ✓ Using MySQL in Full Stack Applications
- ✓ Preventing SQL Injection Attacks (Prepared Statements)

18: Capstone Project and Certification Preparation

- Designing and Building a Complete Database System
- Final Project Presentation
- Query Optimization Practice
- Troubleshooting Scenarios