



TECH NEXTGEN ACADEMY

SQL PROGRAMMING & DATABASE MANAGEMENT

STORE. QUERY. ANALYZE. OPTIMIZE. MASTER.

DURATION: 3 MONTHS

Foundation to Professional

Course Format: Foundation to Professional Level | Practical Classroom Training | Project-Based Learning

MASTER SQL & DATABASE MANAGEMENT

SQL (Structured Query Language) is one of the most important skills for working with databases, business applications, data analytics, reporting, backend systems, and enterprise software.

Almost every modern application — from banking and e-commerce to education, healthcare, and business management — relies on databases to store, organize, and retrieve information.

At **Tech NextGen Academy**, SQL is designed to take you from database beginner to confident SQL practitioner through structured concepts, hands-on query writing, database design, data analysis, optimization, and real-world projects.

OUR ULTIMATE GOAL

From Database Beginner → Confident SQL Practitioner → Job-Ready Database & Data Professional.

The course focuses not only on memorizing SQL commands, but on developing the ability to design databases, write efficient queries, analyze data, solve business problems, and work with real-world datasets.

WHO IS THIS COURSE FOR & PREREQUISITES

PERFECT FOR:

-  School & College Students / BCA / B.Sc. / B.Tech Students
-  Computer Science & Engineering Students
-  Commerce & Non-IT Students
-  Students Interested in Data Analytics
-  Job Seekers & Freshers
-  Aspiring Software & Backend Developers
-  Aspiring Database Professionals & Data Analysts
-  Students Preparing for Technical Interviews
-  Professionals Switching to IT
-  Anyone who wants to master databases and SQL

PREREQUISITE:

- **Basic Computer Knowledge:** Recommended for smooth learning.
- **Prior Experience:** No previous SQL or database experience is required.
- **Programming:** Basic programming knowledge is helpful but not mandatory.
- **Essential Mindset:** A willingness to practice queries, analyze data, and solve real-world problems.

01 DATABASE FUNDAMENTALS & RELATIONAL DATABASE CONCEPTS

UNDERSTAND HOW DATA IS STORED & MANAGED

- What is data?, database?, DBMS?, RDBMS?
- Database vs DBMS vs RDBMS & Why databases are required
- Types of databases & Relational database concepts
- Tables, Rows, Columns, Records, Fields, Relationships
- Primary keys, Foreign keys, Constraints
- SQL overview, SQL standards, SQL commands overview

REAL-WORLD DATABASE EXAMPLES

Understand real-world database systems used in: Banking, E-commerce, Education, Hospitals, Retail, Inventory, HR, Sales, Finance.

PRACTICAL: Convert a real-world business requirement into: *Business Problem* → *Data Requirements* → *Tables* → *Relationships* → *Database*.

02 ENVIRONMENT & DEVELOPMENT TOOLS

SET UP YOUR DATABASE WORKSPACE

- Introduction to MySQL, MySQL Workbench, MS SQL Server, SSMS
- Database server concepts, clients, connecting to databases
- Creating database environments, creating users overview
- SQL editor, query execution, result sets, saving scripts

SQL WORKFLOW

Connect → **Create** → **Query** → **Test** → **Analyze** → **Optimize**

PRACTICAL: Create your first database and execute your first SQL queries.

03 DATABASE DESIGN & TABLE CREATION

BUILD DATABASE STRUCTURE

- Entities, Attributes, Records, Relationships
- Table design, column naming, data modeling basics
- Choosing data types, NULL values, DEFAULT values
- DDL Statements: CREATE DATABASE, USE, DROP DATABASE, CREATE TABLE
- Column definitions & constraints setup

PRACTICAL: Design & create a database for Student / Employee / Sales Management.

04 DATA TYPES, CONSTRAINTS & INTEGRITY

STORE DATA CORRECTLY

- Numeric (Integer, Decimal, Float), Character (Fixed/Var length), Date, Time, DateTime, Boolean, Binary
- Constraints: PRIMARY KEY, FOREIGN KEY, NOT NULL, UNIQUE, CHECK, DEFAULT
- Entity, Referential, and Domain Integrity
- NULL vs zero, NULL vs empty string

PRACTICAL: Create tables preventing invalid records using appropriate integrity constraints.

05 INSERT, UPDATE & DELETE DATA

MANAGE DATABASE RECORDS (DML)

- INSERT INTO: Single-row, multi-row, column-specific & inserting into related tables
- UPDATE: Selected records, multiple columns, conditional updates
- DELETE: Conditional deletion, multi-record deletion & safe deletion practices

PRACTICAL: Perform complete CRUD operations (Create, Read, Update, Delete) on a live database.

06 SELECT & RETRIEVING DATA

MASTER THE HEART OF SQL

- Selecting specific/all columns, column aliases
- DISTINCT keyword, calculated columns, constants
- Renaming columns, result-set ordering basics

PRACTICAL: Retrieve structured information for Employees, Products, Customers, Orders, and Transactions.

07 FILTERING DATA & CONDITIONS

FIND EXACTLY THE DATA YOU NEED

- WHERE clause & comparison operators (=, <>, !=, >, <, >=, <=)
- Logical operators: AND, OR, NOT
- Operators: BETWEEN, IN, NOT IN, LIKE, IS NULL
- Wildcards: % and _

PRACTICAL: Query high-value customers, department employees, price ranges, and pending orders.

08 SORTING, LIMITING & RESULT-SET CONTROL

CONTROL DATA PRESENTATION

- ORDER BY (Ascending/Descending), multi-column sorting
- Sorting calculated values and aliases
- Result limiting: LIMIT, TOP, FETCH
- Pagination concepts for applications

PRACTICAL: Generate top-selling products, highest-paid employees, and recent transaction reports.

09 SQL FUNCTIONS & TRANSFORMATION

TRANSFORM DATA USING BUILT-IN FUNCTIONS

- Numeric: ROUND(), CEILING(), FLOOR(), ABS()
- String: UPPER(), LOWER(), LENGTH(), TRIM(), CONCAT(), SUBSTRING(), REPLACE()
- NULL Handling: COALESCE(), NULLIF()
- Conversion: CAST(), CONVERT()

PRACTICAL: Clean and transform raw customer and sales text/numeric information.

10 AGGREGATE FUNCTIONS & SUMMARIZATION

TURN RAW DATA INTO INFORMATION

- Aggregates: COUNT(), SUM(), AVG(), MIN(), MAX()
- GROUP BY: Single/multiple columns, calculated values
- HAVING clause vs WHERE clause filtering

PRACTICAL PROJECT: Create a comprehensive Sales Summary Report calculating revenues, averages, and counts.

11 SQL JOINS & RELATIONSHIPS

CONNECT DATA ACROSS MULTIPLE TABLES

- INNER JOIN, Join conditions, Multi-table joins
- LEFT JOIN, RIGHT JOIN, FULL OUTER JOIN
- Self Join, Cross Join, Table Aliases
- Relationships: Customer → Orders → Products

PRACTICAL: Build multi-table enterprise relational reports joining 3+ tables seamlessly.

12 SUBQUERIES & NESTED QUERIES

SOLVE COMPLEX SQL PROBLEMS

- Single-row, Multi-row, and Scalar subqueries
- Correlated subqueries
- Subqueries in WHERE, FROM, and SELECT
- Operators: IN, EXISTS, NOT EXISTS, ANY, ALL

PRACTICAL: Query employees earning above department average, unassigned projects, and top category products.

13 SET OPERATORS & COMBINING RESULTS

COMBINE MULTIPLE QUERY RESULTS

- UNION and UNION ALL
- INTERSECT and EXCEPT / MINUS concepts
- Column compatibility and duplicate handling rules

PRACTICAL: Combine datasets from Customers, Suppliers, and Regional Sales into unified master lists.

14 CASE EXPRESSIONS & CONDITIONAL SQL

BRING BUSINESS LOGIC INTO QUERIES

- Simple CASE and Searched CASE
- Conditional calculations, labels, and sorting
- Business categories: High/Med/Low sales, Performance tiers, Inventory status, Customer loyalty

PRACTICAL: Build a Business Performance Classification Report with conditional logic.

16 ADVANCED SQL: CTEs & WINDOW FUNCTIONS

MOVE TOWARD PROFESSIONAL SQL

- **CTEs:** WITH clause, Single/Multiple CTEs, Recursive CTEs
- **Window Functions:** OVER(), PARTITION BY, ORDER BY
- ROW_NUMBER(), RANK(), DENSE_RANK(), NTILE()
- Analytical: LAG(), LEAD(), Running totals, Moving averages

PRACTICAL: Compute customer rankings, running revenue totals, and month-over-month performance.

18 STORED PROCEDURES, FUNCTIONS & TRIGGERS

AUTOMATE DATABASE OPERATIONS

- **Stored Procedures:** Parameters (IN, OUT), business execution logic
- **User-Defined Functions (UDFs):** Reusable logic and return values
- **Triggers:** BEFORE/AFTER (Insert, Update, Delete), audit logging, validation

PRACTICAL: Build automated audit tracking and automated calculations on inventory updates.

20 NORMALIZATION & DATABASE DESIGN

REDUCE REDUNDANCY & ANOMALY

- Normalization principles, Redundancy, Update/Insert/Delete anomalies
- Normal Forms: 1NF, 2NF, 3NF, BCNF introduction
- Relationships: 1-to-1, 1-to-Many, Many-to-Many, Junction tables
- Denormalization and performance considerations

PRACTICAL: Normalize an unorganized raw business dataset into a 3NF relational model.

15 DATE, TIME & TEMPORAL DATA

WORK WITH REAL-WORLD DATES

- Date, Time, DateTime, Timestamp data types
- Extraction (Year, Month, Day), Date arithmetic, Differences
- Formatting dates and filtering by temporal ranges

PRACTICAL: Create a Monthly Sales & Transaction Analysis Report with YoY / MoM metrics.

17 VIEWS & REUSABLE QUERIES

SIMPLIFY ACCESS TO COMPLEX DATA

- What is a view?, Why use views?, CREATE VIEW
- Querying, updating, dropping views
- Security, data abstraction, reporting layers

PRACTICAL: Build reusable reporting views for Executive Dashboards, HR summaries, and Inventory.

19 TRANSACTIONS, ACID & CONTROL

LEARN HOW DATABASES PROTECT DATA

- Transaction lifecycle: COMMIT, ROLLBACK, SAVEPOINT
- ACID Properties: Atomicity, Consistency, Isolation, Durability
- Data consistency, concurrency safety, error recovery

PRACTICAL: Simulate a complete Banking Transaction (Debit → Credit → Validate → Commit/Rollback).

21 PERFORMANCE, INDEXING & OPTIMIZATION

WRITE FASTER & MORE EFFICIENT QUERIES

- Indexes: Clustered, Non-clustered, Single, Composite, Trade-offs
- Query Execution Plans, Table Scans vs Index Scans
- Filtering strategies, Join performance, Avoiding bad subqueries
- SQL Best Practices for enterprise performance

PRACTICAL: Compare inefficient vs optimized queries and eliminate performance bottlenecks.

22 SQL PROBLEM-SOLVING & REAL-WORLD QUERY CHALLENGES

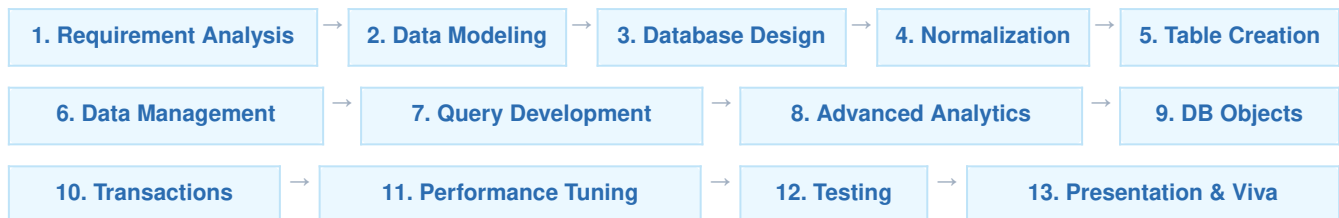
Students solve progressively difficult SQL challenges across all course topics (Beginner → Intermediate → Advanced).

Business Case Studies: Real-world scenario problems from Sales, Banking, HR, Inventory, Education, E-commerce, and Finance.

CHALLENGE WORKFLOW: Understand → Design → Query → Test → Analyze → Optimize

23 REAL-WORLD DATABASE PROJECT DEVELOPMENT

13-STEP STRUCTURED ENGINEERING PROCESS



🚀 CAPSTONE PROJECT — COMPLETE BUSINESS DATABASE & ANALYTICS SYSTEM

Students will develop an end-to-end relational database solution choosing one real-world industry domain:

Student Management Employee & HR Management Library Management Banking & Transactions Inventory Management
Hospital Management Hotel Management E-commerce System Sales & Customer Management School / College System

FINAL DELIVERABLES:

📁 Complete SQL Scripts 🔗 Entity Relationship Diagram (ERD) ⚙️ Views / Procedures / Triggers
📄 Requirement & Project Documentation 🧪 Test Queries & Test Cases 🔒 Transaction & ACID Demos
🗄️ Database Schema & Table Design 📊 Business Analytics Reports 🔑 Final Viva & Presentation

⚡ LEARNING METHODOLOGY & ROADMAP

TECH NEXTGEN LEARNING METHOD:

LEARN → DESIGN → QUERY → TEST → ANALYZE → OPTIMIZE → BUILD → PRESENT → GROW

🔪 ASSESSMENT, GRADING & CERTIFICATION

Your progress is continuously evaluated through practical assignments, CRUD tasks, JOIN projects, query optimization exercises, capstone development, and a final viva.

🏆 CERTIFICATION ISSUED:

Tech NextGen Academy SQL Programming & Database Management Course Completion Certificate.

Score Range	Grade
90% – 100%	A+
80% – 89%	A
70% – 79%	B+
60% – 69%	B
Below 60%	Needs Improvement

☀️ WHY TECH NEXTGEN ACADEMY?

NOT JUST SQL CLASSES. A COMPLETE DATABASE, QUERY & DATA ANALYSIS EXPERIENCE.

- 🧠 **Database Fundamentals:** Deep RDBMS & structural clarity.
- 🔒 **Transaction Control:** Complete ACID property mastery.
- 🖨️ **Hands-On Training:** Live query execution in every session.
- 🌱 **Normalization:** Zero redundancy & zero update anomalies.

- 🛠️ **Database Design:** Scalable and normalized schema modeling.
- 🔗 **Relationships & Joins:** Multi-table enterprise analytics.
- 📊 **Data Analysis:** Turn raw tables into actionable business insights.
- 📄 **Advanced SQL:** CTEs, window functions & analytical queries.
- ⚙️ **Database Programming:** Views, procedures, functions & triggers.
- 🚀 **Query Optimization:** Indexing & execution plan tuning.
- 📁 **Business Case Studies:** Real corporate problem scenarios.
- 🏠 **Real-World Projects:** End-to-end database construction.
- 🔑 **Viva & Presentation:** Technical interview readiness.
- 📜 **Certified Evaluation:** Recognized practical certification.

🚀 PROGRESS YOUR CAREER — WHAT'S NEXT?

📊 DATA ANALYTICS

- Advanced SQL & Excel
- Power BI & Dashboards
- Python (NumPy, Pandas)
- Statistics for Analytics
- Business Intelligence

💻 BACKEND DEVELOPMENT

- Java & Python Programming
- JDBC & Database Integration
- REST API (Spring Boot / FastAPI)
- Full Stack Development
- Git & GitHub Engineering

🗄️ DATABASE SPECIALIZATION

- Advanced Database Admin
- Query & Performance Tuning
- Database Security & Backup
- Recovery & Replication
- Data Engineering Fundamentals

JOIN TECH NEXTGEN ACADEMY

Learn Today. Lead Tomorrow. | *Admissions Open — Limited Seats*

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