

SQL Server Fundamentals

- Introduction to Relational Databases
- SQL Server Editions & Architecture
- Installing & Configuring SQL Server
- SQL Server Management Studio (SSMS)
- Azure Data Studio Basics

T-SQL Core (Transact-SQL)

- SELECT, FROM, WHERE, ORDER BY
- Filtering with AND, OR, NOT, IN, BETWEEN, LIKE
- Aggregate Functions (SUM, COUNT, AVG, MIN, MAX)
- GROUP BY & HAVING
- Aliases, DISTINCT & TOP / OFFSET-FETCH

Joins & Set Operations

- INNER JOIN, LEFT / RIGHT / FULL OUTER JOIN
- CROSS JOIN & SELF JOIN
- UNION, UNION ALL, INTERSECT, EXCEPT
- Subqueries & Correlated Subqueries
- APPLY (CROSS APPLY / OUTER APPLY)

Advanced T-SQL

- Common Table Expressions (CTEs)
- Window Functions (ROW_NUMBER, RANK, DENSE_RANK)
- LEAD, LAG, FIRST_VALUE, LAST_VALUE
- PIVOT & UNPIVOT
- Dynamic SQL & EXEC / sp_executesql

Database Design & Modeling

- Entity-Relationship (ER) Diagrams
- Normalization (1NF, 2NF, 3NF, BCNF)
- Primary Keys, Foreign Keys & Constraints
- Data Types & NULL Handling
- Database Diagrams in SSMS

Stored Procedures, Functions & Triggers

- Creating & Executing Stored Procedures

- Input / Output Parameters & Return Values
- Scalar & Table-Valued Functions (TVF)
- DML Triggers (AFTER / INSTEAD OF)
- Error Handling (TRY...CATCH, THROW, RAISERROR)

Indexes & Query Optimization

- Clustered vs Non-Clustered Indexes
- Covering Indexes & Included Columns
- Filtered Indexes & Indexed Views
- Execution Plans & Query Analyzer
- Statistics, SARGability & Query Hints

Transactions & Concurrency

- ACID Properties
- BEGIN / COMMIT / ROLLBACK TRANSACTION
- Isolation Levels (READ COMMITTED, SNAPSHOT, etc.)
- Deadlocks — Detection & Prevention
- Optimistic vs Pessimistic Concurrency

Security & Administration

- SQL Server Authentication vs Windows Authentication
- Logins, Users, Roles & Permissions
- Row-Level Security (RLS)
- Dynamic Data Masking
- Transparent Data Encryption (TDE)

Backup, Restore & High Availability

- Full, Differential & Transaction Log Backups
- Restore Strategies & Point-in-Time Recovery
- SQL Server Agent & Maintenance Plans
- Always On Availability Groups
- Database Mirroring & Log Shipping

SQL Server Integration Services (SSIS)

- ETL Concepts & SSIS Architecture
- Control Flow & Data Flow Tasks
- Connection Managers & Data Sources
- Transformations (Lookup, Merge, Derived Column)
- Package Deployment & Scheduling

SQL Server Reporting Services (SSRS)

- Report Builder & Report Designer

- Tabular, Matrix & Chart Reports
- Parameters, Filters & Drill-through
- Subscriptions & Report Delivery
- Embedding Reports in Applications

SQL Server Analysis Services (SSAS)

- Multidimensional vs Tabular Models
- Dimensions, Measures & Hierarchies
- MDX Queries Fundamentals
- DAX in Tabular Models
- Deploying & Querying SSAS Cubes

Cloud & Modern SQL Server

- Azure SQL Database & Managed Instance
- SQL Server on Azure VM
- Elastic Pools & Serverless Tier
- Azure Synapse Analytics Integration
- Migrating On-Premises to Azure SQL

Real-world Projects

- Retail Sales Database Design & Reporting
- ETL Pipeline with SSIS from CSV to Data Warehouse
- HR Analytics Dashboard via SSRS
- Inventory Management System with Stored Procedures
- Azure SQL Migration & Performance Tuning Lab