Cloud Contraptions
TRAINING & CONSULTING

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SQL Server for Developers

Class Duration

21 hours of live training delivered over 3-5 days to accommodate your scheduling needs.

Student Prerequisites

- Programming experience in any language (data access examples use C#)
- Basic SQL: SELECT, WHERE, joins, and GROUP BY
- Familiarity with tables, keys, and relationships
- No prior SQL Server experience required

Target Audience

Application developers and tech leads who build on SQL Server or Azure SQL Database, especially C# and .NET teams. Developers new to SQL can start with SQL Fundamentals. Teams building the application layer can add Modern C# Development with .NET.

Description

This course teaches developers to build and tune applications on SQL Server and Azure SQL Database. Students write T-SQL with joins, CTEs, window functions, and MERGE, and design tables with the right keys and constraints. They learn how indexes and execution plans work, and use Query Store to find slow queries. Later sections cover transactions, locking, stored procedures, and JSON and vector data. The course ends with security, data access from .NET, database projects, and CI/CD.

Learning Outcomes

- Write T-SQL queries with joins, CTEs, window functions, and APPLY.
- Change data safely with INSERT, UPDATE, DELETE, MERGE, and OUTPUT.
- Design tables with suitable data types, keys, and constraints.
- Choose clustered, nonclustered, filtered, and columnstore indexes.
- Read execution plans and fix common performance problems.

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- Find and fix query regressions with Query Store.
- Choose isolation levels and avoid blocking and deadlocks.
- Write stored procedures, functions, and triggers with proper error handling.
- Store and query JSON and vector data.
- Secure data with Microsoft Entra authentication, row-level security, and Always Encrypted.
- Access SQL Server from .NET with Microsoft.Data.SqlClient, Dapper, and Entity Framework Core.
- Manage schema changes with SQL database projects and deploy them through CI/CD.

Training Materials

Comprehensive courseware is distributed online at the start of class.

Software Requirements

Students will need a free, personal GitHub account to access the courseware, Docker Desktop or Podman to run SQL Server 2025 locally, a SQL client (SQL Server Management Studio or VS Code with the MSSQL extension), and the .NET 10 SDK. If students are unable to configure a local environment, a cloud-based environment can be provided.

Training Topics

SQL Server and Azure SQL

- Editions and deployment options
- Azure SQL Database
- Azure SQL Managed Instance
- SQL Server in containers
- SSMS and VS Code tools
- Databases, schemas, and objects

T-SQL Querying

- Filtering and sorting
- Joins and APPLY
- Grouping and aggregation
- Subqueries and CTEs
- Window functions

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- Paging with OFFSET and FETCH
- Regular expression functions

Modifying Data

- INSERT, UPDATE, and DELETE
- MERGE and its pitfalls
- The OUTPUT clause
- Set-based versus row-by-row code
- Bulk loading data

Designing Tables

- Choosing data types
- Primary keys and identity columns
- Sequences versus GUID keys
- Foreign keys and constraints
- Computed columns
- Temporal tables

Indexes

- Heaps and clustered indexes
- Nonclustered and covering indexes
- Filtered indexes
- Columnstore indexes
- Index maintenance basics
- Missing index suggestions

Execution Plans and Query Tuning

- Reading an execution plan
- Seeks, scans, and lookups
- Statistics and cardinality estimates
- Parameter sniffing
- Intelligent query processing
- Query Store
- Forcing a known good plan

Transactions and Concurrency

- Explicit transactions
- Isolation levels

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- Read committed snapshot isolation
- Optimized locking
- Blocking and deadlocks
- Retrying transient errors

Programmable Objects

- Stored procedures
- Table-valued parameters
- Scalar and table-valued functions
- Triggers and their costs
- TRY…CATCH and THROW
- Safe dynamic SQL

JSON and Vector Data

- The native json data type
- JSON functions in T-SQL
- The vector data type
- Storing embeddings
- Vector similarity search
- Vector indexes

Security

- Logins, users, and roles
- Microsoft Entra authentication
- Least-privilege permissions
- Row-level security
- Dynamic data masking
- Always Encrypted
- Preventing SQL injection

Data Access from .NET

- Microsoft.Data.SqlClient
- Connection pooling and resilience
- Dapper for SQL-first code
- Entity Framework Core with SQL Server
- Reviewing ORM-generated SQL
- Drivers for Python, Java, and Node.js

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Schema Changes and CI/CD

- SQL database projects
- Building and deploying dacpacs
- Migrations with Entity Framework Core
- Unit testing with tSQLt
- Deploying through CI/CD pipelines
- Reviewing SQL from AI assistants

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