

# COMPLETE T-SQL TUTORIAL

## TRAINING OUTLINES - (T-SQL)

By

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### 1. T-SQL Concepts

- SQL and its variants
- T-SQL Features (variables, control flow logic [if, while, etc], error-handling [TRY...CATCH])
- Query Command Categories Overview (DDL, DML, SQL, DCL, TCL)

### 2. Data Structure and Types

- Tables, columns, rows, schemas and naming convention)
- SQL Server Data Types
- Null Concepts
- Constraints (NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, IDENTITY, etc)

### 3. T-SQL Fundamentals

- Select statement and Basic Queries (Syntax, selecting columns, aliases, distinct, basic expressions and calculations)
- Filtering Data (WHERE clause, comparison and logical operators, between, in, like)
- Sorting and Conditional Logic (ORDER BY, single and multi-column sorting, TOP & ORDER BY, OFFSET, FETCH)
- CASE expressions

## 4. Summary/Aggregation and Grouping

- Aggregate Functions (SUM, AVG, COUNT, MIN, MAX)
- Aggregation rules, Handling NULLs
- GROUP BY concepts
- HAVING vs WHERE
- Multi-level Grouping

## 5. DML - Data Manipulation Lang

- INSERT INTO
- UPDATE with joins
- DELETE with conditions
- Safety best practices

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## 6. Joins and Multi-level Queries

- Table relationships
- INNER JOIN, LEFT, RIGHT, OUTER,
- UNION vs UNION ALL
- Join Best practices and mistakes, cardinality awareness

## 7. Subqueries and CTEs

- Subqueries (scalar vs multi-row subqueries; subqueries in SELECT, WHERE, FROM; Correlated Subqs)
- CTEs (CTE syntax, Recursive CTEs, Readability vs Subqueries)

## 8. Window Functions and Analytics

- OVER() clause
- PARTITION BY
- ORDER BY within windows
- ROW\_NUMBER, RANK, DENSE\_RANK
- LAG, LEAD
- Running totals
- Moving Averages

## 9. Procedural Logic Control Flows

- Variables Declaration (DECLARE) and assignment (SET).
- Code block (BEGIN, END)
- IF condition
- WHILE loop

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## 9 MERGE Statement

- UPSERT logic
- Synchronizing tables
- Common issues

## 10. Database Objects

- Views and Stored Procedure (syntax, creation, parameters, execution)
- OUTPUT parameters

- Built-in Functions (DateTime fns, Numeric fns, String fns, math fns, etc)
- User-Defined functions (scalar fns, Table-valued fns, When to avoid fns)

## 11. Database Trigger

- Trigger Concepts
- Trigger creation and execution (BEFORE, AFTER, etc commands)
- Best practices

## 12. Performance and Indexing

- Clustered vs Non-clustered
- When to index
- covering indexes

# ADVANCED ADDENDUM

## Query Optimization

- Execution Plans
- Common Performance killers
- Query refactoring techniques (AI-Assisted).

## Transactions, Error Handling & Security

- Transactions (BEGIN, END, COMMIT, ROLLBACK)
- TRY... CATCH error handling
- Basic Security concepts (roles, permissions, authorizations)

# FINAL PROJECTS

## Capstone Project 1

- Business Scenario Briefing
- Data Exploration
- Query Design
- KPI definition

## Capstone Project 2

- Performance optimization
- Reusable objects (Functions, Procedures, CTEs)
- Best Practices recap
- Next Steps