



Course Description

CTS2433 | Microsoft SQL Implementation | 4.00 credits

A comprehensive course in learning how to design and implement enterprise database solutions using SQL. Working through a system of modular lessons and hands-on labs to comprehend SQL Architecture. Prerequisite: CTS 1437.

Course Competencies:

Competency 1: The student will demonstrate an understanding of how to implement tables and views by:

1. Creating and altering tables
2. Implementing computed and persisted columns, schemas and scripts to deploy changes to multiple environments, (e.g., dev, test, production; Managing permissions (GRANT, DENY, REVOKE)
3. Creating and altering views using encryption, schema, check options and permissions (GRANT, DENY, REVOKE)
4. Creating and altering indexes
5. Implementing filtered index, including columns, unique, clustered, non-clustered, fill factor, creating statistics and indexing views
6. Creating and modifying constraints
7. Implementing PRIMARY KEY, FOREIGN KEY, UNIQUE, CHECK, cascading referential integrity, enabling/disabling, NOCHECK; SET IDENTITY_INSERT
8. Using FILESTREAM for unstructured data storage
9. Differentiating between structured, and semi-structured FILESTREAM
10. Explaining when and why to keep *BLOB* in the database with all structured relational data or store them outside the database
11. Implementing partitioning solutions
12. Explaining how to use partitioned tables and indexes (constraints, partition functions, partition schemes, *MERGE, SPLIT, SWITCH*), and distributed partitioned views (constraints, linked servers)

Competency 2: The student will demonstrate an understanding of how to program with T-SQL by:

1. Creating and altering stored procedure, including table-valued parameters (TVPs), *EXECUTE AS, RECOMPILE*, parameter direction (output); *WITH ENCRYPTION*; Managing permissions (GRANT, DENY, REVOKE)
2. Creating and altering user-defined functions (UDFs)
3. Managing permissions (GRANT, DENY, REVOKE)
4. Creating and altering DML triggers, including *INSERTED, DELETED, INSTEAD OF, EXECUTE AS*
5. Creating and altering DDL triggers, including enabling/disabling; returning event data
6. Creating and deploying CLR-based objects, including permission sets, such as *SAFE, UNSAFE, EXTERNAL_ACCESS, SET TRUSTWORTHY*
7. Implementing error handling, including *TRY/CATCH, RAISERROR*, retrieving error information, custom error messages, *@@ERROR*
8. Managing transactions, including *BEGIN TRANSACTION, COMMIT, ROLLBACK, SET TRANSACTION ISOLATION LEVEL*

Competency 3: The student will demonstrate an understanding of how to work with query fundamentals by:

1. Using *SELECT* statements to retrieve data, including *LIKE, WHERE, ORDER BY, INTO*
2. Modifying data by using *INSERT, UPDATE, and DELETE* statements
3. Using the *OUTPUT* clause to return data
4. Modifying data by using *MERGE* statements
5. Implementing aggregate queries, including built-in aggregate functions, *GROUPING SETS, GROUP BY, HAVING*

6. Combining datasets using functions including *CROSS APPLY*, *OUTER APPLY*, all join types; *UNION*, *UNION ALL*, *INTERSECT*, *EXCEPT*
7. Applying built-in scalar functions, such as *CAST* and *CONVERT*; *REPLACE*; *LEN* and *DATALENGTH*; *PATINDEX* and *CHARINDEX*

Competency 4: The student will demonstrate an understanding of additional query techniques by:

1. Implementing subqueries including simple, correlated, scalar, list, table valued
2. Implementing CTE (common table expression) queries including recursive and non-recursive
3. Applying ranking functions, such as *RANK*, *PARTITION BY*, *DENSE_RANK*, *OVER*, *ROW_NUMBER*, *NTILE*.
4. Controlling execution plans, including table hints and query hints
5. Managing international considerations such as collations, defining custom errors, filtering data, sort order, varchar, database collation, column collation

Competency 5: The student will demonstrate an understanding of how to work with additional SQL server components by:

1. Integrating Database Mail.
2. Implementing full-text search utilizing *CONTAINS*, *CONTAINSTABLE*, *FREETEXT*, *FREETEXTTABLE*, *STOPLIST*, etc.
3. Implementing scripts by using Windows PowerShell and SQL Server Management Objects (SMOs)
4. Implementing Service Broker solutions, including services, queues, messages, message types, message validation, contracts, and activation procedures
5. Tracking data changes using change tracking, database audit specification, *CHANGETABLE*, etc

Competency 6. The student will demonstrate an understanding of how to work with XML data by:

1. Retrieving relational data as XML
2. Transforming XML data into relational data
3. Querying XML data
4. Managing XML data

Competency 7. The student will demonstrate an understanding of how to gather performance information by:

1. Capturing execution plans, including graphical execution plans and using *SHOWPLAN*
2. Gathering trace information by using the SQL Server Profiler
3. Collecting output from the Database Engine Tuning Advisor, including preparing a workload
4. Collecting information from system metadata utilizing Dynamic Management Views (DMVs), catalog views, etc

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively