

## Implementing a Microsoft SQL Server 2008 R2 Database

### Introduction

This **five-day** instructor-led course is intended for Microsoft SQL Server database developers who are responsible for implementing a database on SQL Server 2008 R2. In this course, students learn the skills and best practices on how to use SQL Server 2008 R2 product features and tools related to implementing a database server.

### Audience Profile

This course is intended for IT Professionals who want to become skilled on SQL Server 2008 R2 product features and technologies for implementing a database. To be successful in this course, the student should have knowledge of basic relational database concepts and writing T-SQL queries.

### At Course Completion

After completing this course, students will be able to:

- Understand the product, its components, and basic configuration.
- Work with the data types supported by SQL Server.
- Design and implement tables and work with schemas.
- Design and implement views and partitioned views.
- Describe the concept of an index and determine the appropriate data type for indexes and composite index structures.
- Identify the appropriate table structures and implement clustered indexes and heaps.
- Describe and capture execution plans.
- Design and implement non-clustered indexes, covering indexes, and included columns.
- Design and implement stored procedures.
- Implement table types, table valued parameters, and the MERGE statement.
- Describe transactions, transaction isolation levels, and application design patterns for highly-concurrent applications.
- Design and implement T-SQL error handling and structured exception handling.
- Design and implement scalar and table-valued functions.
- Design and implement constraints.
- Design and implement triggers.
- Describe and implement target use cases of SQL CLR integration.
- Describe and implement XML data and schema in SQL Server.

- Use FOR XML and XPath queries.
- Describe and use spatial data types in SQL Server.
- Implement and query full-text indexes.

### Pre-requisites

- Working knowledge of Transact-SQL (ability to write Transact-SQL queries) or Course 2778A: Writing Queries Using Microsoft SQL Server 2008 Transact-SQL
- Working knowledge of relational databases (database design skills).
- Core Windows Server skills.
- Basic programming language.

### Duration

- 5 days
- Includes lunch, refreshments and manuals

## Course Outline

### Module 1: Introduction to SQL Server and its Toolset

This module introduces you to the entire SQL Server platform and its major tools. This module also covers editions, versions, basics of network listeners, and concepts of services and service accounts.

#### Lessons

- Introduction to SQL Server Platform
- Working with SQL Server Tools
- Configuring SQL Server Services

#### Lab : Introduction to SQL Server and its Toolset

- Verifying SQL Server Component Installation
- Altering Service Accounts for New Instance
- Enabling Named Pipes Protocol for Both Instances
- Creating Aliases for AdventureWorks and Proseware
- Ensuring SQL Browser is Disabled and Configure a Fixed TCP/IP Port

**After completing this module, students will be able to:**

- Describe the SQL Server Platform.
- Work with SQL Server Tools.
- Configure SQL Server Services.

### Module 2: Working with Data Types

This module describes the data types supported by SQL Server and how to work with them.



Learning Solutions

## Lessons

- Using Data Types
- Working with Character Data
- Converting Data Types
- Working with Specialized Data Types

## Lab : Working with Data Types

- Choosing Appropriate Data Types
- Writing Queries With Data Type Conversions
- Designing and Creating Alias Data Types

## After completing this module, students will be able to:

- Work with data types.
- Work with character data.
- Convert between data types.
- Use specialized data types.

## Module 3: Designing and Implementing Tables

This module describes the design and implementation of tables.

## Lessons

- Designing Tables
- Working with Schemas
- Creating and Altering Tables

## Lab : Designing and Implementing Tables

- Improving the Design of Tables
- Creating a Schema
- Creating the Tables

## After completing this module, students will be able to:

- Design tables.
- Work with schemas.
- Create and alter tables.

## Module 4: Designing and Implementing Views

This module describes the design and implementation of views.

## Lessons

- Introduction to Views
- Creating and Managing Views
- Performance Considerations for Views

## Lab : Designing and Implementing Views

- Designing, Implementing and Testing the WebStock Views
- Designing and Implementing the Contacts View
- Modifying the AvailableModels View

## After completing this module, students will be able to:

- Explain the role of views in database development.
- Implement views.
- Describe the performance related impacts of views.

## Module 5: Planning for SQL Server Indexing

This module describes the concept of an index and discusses selectivity, density, and statistics. It covers appropriate data type choices and choices around composite index structures.

## Lessons

- Core Indexing Concepts
- Data Types and Indexes
- Single Column and Composite Indexes

## Lab : Planning for SQL Server Indexing

- Exploring Existing Index Statistics
- Designing Column Orders for Indexes

## After completing this module, students will be able to:

- Explain core indexing concepts.
- Describe the effectiveness of each data type common used in indexes.
- Plan for single column and composite indexes.

## Module 6: Implementing Table Structures in SQL Server

This module covers clustered indexes and heaps.

## Lessons

- SQL Server Table Structures
- Working with Clustered Indexes
- Designing Effective Clustered Indexes

## Lab : Implementing Table Structures in SQL Server

- Creating Tables as Heaps
- Creating Tables with Clustered Indexes
- Comparing the Performance of Clustered Indexes vs. Heaps

## After completing this module, students will be able to:

- Explain how tables can be structured in SQL Server databases.
- Work with clustered indexes.
- Design effective clustered indexes



## Module 7: Reading SQL Server Execution Plans

This module introduces the concept of reading execution plans.

### Lessons

- Execution Plan Core Concepts
- Common Execution Plan Elements
- Working with Execution Plans

### Lab : Reading SQL Server Execution Plans

- Actual vs. Estimated Plans
- Identify Common Plan Elements
- Query Cost Comparison

### After completing this module, students will be able to:

- Explain the core concepts related to the use of execution plans.
- Describe the role of the most common execution plan elements.
- Work with execution plans.

## Module 8: Improving Performance through Nonclustered Indexes

This module explains nonclustered indexes, covering indexes and included columns.

### Lessons

- Designing Effective Nonclustered Indexes
- Implementing Nonclustered Indexes
- Using the Database Engine Tuning Advisor

### Lab : Improving Performance through Nonclustered Indexes

- Reviewing Nonclustered Index Usage
- Improving Nonclustered Index Designs
- Using SQL Server Profiler and Database Engine Tuning Advisor
- Nonclustered Index Design

### After completing this module, students will be able to:

- Design effective nonclustered indexes.
- Implement nonclustered indexes.
- Use the Database Engine Tuning Advisor to design indexes.

## Module 9: Designing and Implementing Stored Procedures

This module describes the design and implementation of stored procedures.

### Lessons

- Introduction to Stored Procedures
- Working With Stored Procedures
- Implementing Parameterized Stored Procedures
- Controlling Execution Context

### Lab : Designing and Implementing Stored Procedures

- Creating Stored Procedures
- Creating a Parameterized Stored Procedure
- Altering the Execution Context of Stored Procedures

### After completing this module, students will be able to:

- Describe the role of stored procedures and the potential benefits of using them.
- Work with stored procedures.
- Implement parameterized stored procedures.
- Control the execution context of a stored procedure.

## Module 10: Merging Data and Passing Tables

This module covers table types, table valued parameters and the MERGE statement as used in stored procedures.

### Lessons

- Using the MERGE Statement
- Implementing Table Types
- Using Table Types as Parameters

### Lab : Merging Data and Passing Tables

- Creating a Table Type
- Using a Table Type Parameter
- Using a Table Type with MERGE

### After completing this module, students will be able to:

- Use the MERGE statement.
- Implement table types.
- Use TABLE types as parameters.

## Module 11: Creating Highly Concurrent SQL Server Applications

This module covers transactions, isolation levels, and designing for concurrency.

### Lessons

- Introduction to Transactions
- Introduction to Locks
- Management of Locking
- Transaction Isolation Levels

### Lab : Creating Highly Concurrent SQL Server Applications

- Detecting Deadlocks
- Investigating Transaction Isolation Levels



## After completing this module, students will be able to:

- Describe the role of transactions.
- Explain the role of locks.
- Manage locking.
- Work with transaction isolation levels.

## Module 12: Handling Errors in T-SQL Code

This module describes structured exception handling and gives solid examples of its use within the design of stored procedures.

### Lessons

- Designing T-SQL Error Handling
- Implementing T-SQL Error Handling
- Implementing Structured Exception Handling

### Lab : Handling Errors in T-SQL Code

- Replacing @@ERROR Based Error Handling With Structured Exception Handling
- Adding Deadlock Retry Logic to the Stored Procedure

## After completing this module, students will be able to:

- Design T-SQL error handling.
- Implement T-SQL error handling.
- Implement structured exception handling.

## Module 13: Designing and Implementing User-Defined Functions

This module describes the design and implementation of functions, both scalar and table-valued.

### Lessons

- Designing and Implementing Scalar Functions
- Designing and Implementing Table-valued Functions
- Implementation Considerations for Functions
- Alternatives To Functions

### Lab : Designing and Implementing User-Defined Functions

- Formatting Phone Numbers
- Modifying an Existing Function
- Resolving a Function-related Performance Issue

## After completing this module, students will be able to:

- Design and implement scalar functions.
- Design and implement table-valued functions.
- Describe implementation considerations for functions.
- Describe alternatives to functions.

## Module 14: Ensuring Data Integrity through Constraints

This module describes the design and implementation of constraints.

### Lessons

- Enforcing Data Integrity
- Implementing Domain Integrity
- Implementing Entity and Referential Integrity

### Lab : Ensuring Data Integrity through Constraints

- Designing Constraint
- Testing the Constraints

## After completing this module, students will be able to:

- Explain the available options for enforcing data integrity and the levels at which they should be applied.
- Describe how domain integrity can be maintained.
- Describe how entity and referential integrity can be maintained.

## Module 15: Responding to Data Manipulation via Triggers

This module describes the design and implementation of triggers.

### Lessons

- Designing DML Triggers
- Implementing DML Triggers
- Advanced Trigger Concepts

### Lab : Responding to Data Manipulation via Triggers

- Creating the Audit Trigger
- Improving the Audit Trigger

## After completing this module, students will be able to:

- Design DML triggers.
- Implement DML triggers.
- Explain advanced DML trigger concepts.

## Module 16: Implementing Managed Code in SQL Server

This module describes the implementation of and target use-cases for SQL CLR integration.

### Lessons

- Introduction to SQL CLR Integration
- Importing and Configuring Assemblies



- Implementing SQL CLR Integration

## Lab : Implementing Managed Code in SQL Server

- Assessing Proposed CLR Code
- Implementing a CLR Assembly
- Implementing a CLR User-defined Aggregate and User-defined Type

### After completing this module, students will be able to:

- Explain the importance of SQL Server CLR Integration.
- Import and configure assemblies.
- Implement objects that have been created within .NET assemblies.

## Module 17: Storing XML Data in SQL Server

This module covers the XML data type, schema collections, typed and untyped columns and appropriate use cases for XML in SQL Server.

### Lessons

- Introduction to XML and XML Schemas
- Storing XML Data and Schemas in SQL Server
- Implementing the XML Data Type

### Lab : Storing XML Data in SQL Server

- Appropriate Usage of XML Data Storage in SQL Server
- Investigating the Storage of XML Data in Variables
- Investigating the Use of XML Schema Collections
- Investigating the Creation of Database Columns Based on XML

### After completing this module, students will be able to:

- Describe XML and XML schemas.
- Store XML data and associated XML schemas in SQL Server.
- Implement the XML data type within SQL Server

## Module 18: Querying XML Data in SQL Server

This module covers the basics of FOR XML and XPath Queries.

### Lessons

- Using the T-SQL FOR XML Statement
- Getting Started with XQuery
- Shredding XML

### Lab : Querying XML Data in SQL Server

- Learning to Query SQL Server Data as XML
- Writing a Stored Procedure Returning XML
- Writing a Stored Procedure that Updates Using XML

### After completing this module, students will be able to:

- Use the T-SQL FOR XML statement.

- Work with basic XQuery queries.
- Shred XML to a relational form.

## Module 19: Working with SQL Server Spatial Data

This module describes spatial data and how this data can be implemented within SQL Server.

### Lessons

- Introduction to Spatial Data
- Working with SQL Server Spatial Data Types
- Using Spatial Data in Applications

### Lab : Working with SQL Server Spatial Data

- Familiarity With Geometry Data Type
- Adding Spatial Data to an Existing Table
- Business Application of Spatial Data

### After completing this module, students will be able to:

- Describe the importance of spatial data and the industry standards related to it.
- Explain how to store spatial data in SQL Server.
- Perform calculations on and query SQL Server spatial data.

## Module 20: Working with Full-Text Indexes and Queries

This module covers full text indexes and queries.

### Lessons

- Introduction to Full-Text Indexing
- Implementing Full-Text Indexes in SQL Server
- Working with Full-Text Queries

### Lab : Working with Full-Text Indexes and Queries

- Implementing a Full-Text Index
- Implementing a Stoplist
- Creating a Stored Procedure to Implement a Full-Text Search

### After completing this module, students will be able to:

- Describe why user interfaces in existing applications are not sufficient for end user search needs.
- Implement full-text indexes in SQL Server.
- Query SQL Server using full-text queries.

