SQL Server Syllbus

**Introduction to SQL Server**

* Overview of SQL Server
  + What is SQL Server?
  + Editions and versions of SQL Server
  + SQL Server architecture: Instance, Database, Tables, and Data Types
* Installing SQL Server
  + Prerequisites for installation
  + Installation steps for SQL Server and SQL Server Management Studio (SSMS)
* SQL Server Management Studio (SSMS)
  + Introduction to SSMS interface
  + Connecting to a database instance
  + Overview of the Object Explorer, Query Window, and Results Pane

**Basic SQL Queries**

* Introduction to SQL
  + What is SQL (Structured Query Language)?
  + Basic SQL syntax and queries
* CRUDOperations
  + SELECT: Retrieving data from a database
  + INSERT: Inserting data into tables
  + UPDATE: Modifying existing data
  + DELETE: Removing data from tables
* Filtering Data
  + WHERE clause
  + Comparison operators (=, <>, >, <, BETWEEN, LIKE, IN, etc.)
  + Logical operators (AND, OR, NOT)
* Sorting and Limiting Results
  + ORDER BY clause
  + DISTINCT keyword
  + TOP and LIMIT clauses

**SQL Server Database Design**

* Understanding Database Design
  + Normalization and De-normalization
  + Primary keys, Foreign keys, Unique constraints
* Creating Tables
  + CREATE TABLE statement
  + Data types in SQL Server (INT, VARCHAR, DATETIME, etc.)
  + Constraints and indexes
* Working with Indexes
  + Types of indexes: Clustered vs. Non-clustered indexes
  + Creating and managing indexes
* Views and Schemas
  + What are Views?
  + Creating and using views
  + Understanding Schemas in SQL Server

**SQL Server Advanced Queries**

* **J**oins
  + INNER JOIN, LEFT JOIN, RIGHT JOIN, FULL JOIN, CROSS JOIN
  + Understanding relationships between tables
* Subqueries
  + Inline subqueries
  + Correlated subqueries
  + Subqueries in SELECT, WHERE, and FROM clauses
* Grouping and Aggregating Data
  + GROUP BY clause
  + Aggregate functions: COUNT(), SUM(), AVG(), MIN(), MAX()
  + HAVING clause for filtering grouped data
* Set Operations
  + UNION, UNION ALL, INTERSECT, EXCEPT

**Functions and Stored Procedures**

* SQL Server Functions
  + Built-in Functions: Scalar Functions, Aggregate Functions, Conversion Functions
  + String Functions (LEN, SUBSTRING, REPLACE)
  + Date and Time Functions (GETDATE, DATEADD, DATEDIFF)
* Stored Procedures
  + What are Stored Procedures?
  + Creating and executing Stored Procedures
  + Input and Output parameters in Stored Procedures
  + Managing Stored Procedures (ALTER, DROP)
* Triggers
  + What are Triggers?
  + AFTER, INSTEAD OF Triggers
  + Trigger creation and management

**SQL Server Data Manipulation & Management**

* Transactions
  + What is a Transaction?
  + ACID properties (Atomicity, Consistency, Isolation, Durability)
  + COMMIT, ROLLBACK, and SAVEPOINT
  + Managing transactions in SQL Server
* Error Handling
  + TRY-CATCH blocks in SQL Server
  + THROW and RAISERROR
  + Error logging strategies
* Concurrency Control
  + Locking mechanisms in SQL Server (Pessimistic vs Optimistic Locking)
  + Isolation levels (Read Uncommitted, Read Committed, Serializable)
  + Deadlock management

**SQL Server Performance Tuning & Optimization**

* Query Optimization
  + Analyzing and optimizing queries using Execution Plans
  + Common performance bottlenecks
  + Indexing for performance
* SQL Server Profiler and Extended Events
  + Using SQL Server Profiler for tracing queries
  + Extended events for monitoring and troubleshooting

**SQL Server Backup and Recovery**

* Backup Types
  + Full, Differential, and Transaction Log Backups
  + Backup and restore strategies
  + Scheduling backups
* Restoring Databases
  + Restoring full and differential backups
  + Point-in-time restore using transaction log backups
* Disaster Recovery
  + Database recovery models (Simple, Full, Bulk-Logged)
  + SQL Server Always On Availability Groups and Mirroring

**Advanced SQL Server Features Overview**

* SQL Server Integration Services (SSIS)
  + ETL (Extract, Transform, Load) process using SSIS
  + Creating and managing SSIS packages
* SQL Server Reporting Services (SSRS)
  + Introduction to SSRS
  + Report creation, customization, and deployment
* SQL Server Analysis Services (SSAS)
  + Introduction to OLAP and Data Warehousing
  + Building cubes and dimensions with SSAS
  + Using MDX queries for analysis

**Conclusion: Project Work / Real-life Scenarios**

* Capstone Project
  + Students apply their learning to a real-world project, such as database design, optimization, and performance tuning.
* Review and Certification
  + Review of key concepts covered in the course
  + Certification exam or practical assessments