# Performance Tuning and Optimizing SQL Databases Training

BILGINÇ
IT Academy
info@bilginc.com
+44 20 3807 0925
+90 212 282 7700

Duration: **4 Day**

## Overview

This four-day instructor-led course provides students who manage and maintain SQL Server databases with the knowledge and skills to performance tune and optimize their databases.

**Target Audience**

The primary audience for this course is individuals who administer and maintain SQL Server databases and are responsible for optimal performance of SQL Server instances that they manage. These individuals also write queries against data and need to ensure optimal execution performance of the workloads.

The secondary audiences for this course are individuals who develop applications that deliver content from SQL Server databases.

Please note: Although this course is within the Microsoft SQL Server 2016 curriculum it is applicable to version 2012 and 2014 as well. Some features are from the later version but the tools and techniques for performance tuning and optimising a SQL Server database and queries are the same for all the versions

## Prerequisites

In addition to their professional experience, students who attend this training should already have the following technical knowledge:

- Basic knowledge of the Microsoft Windows operating system and its core functionality.
- Working knowledge of database administration and maintenance
- Working knowledge of Transact-SQL.

## What You Will Learn

After completing this course, students will be able to:

- Describe the high level architectural overview of SQL Server and its various components.
- Describe the SQL Server execution model, waits and queues.
- Describe core I/O concepts, Storage Area Networks and performance testing.
- Describe architectural concepts and best practices related to data files for user databases and TempDB.
- Describe architectural concepts and best practices related to Concurrency, Transactions, Isolation Levels and Locking.
- Describe architectural concepts of the Optimizer and how to identify and fix query plan issues.
- Describe architectural concepts, troubleshooting scenarios and best practices related to Plan Cache.
- Describe architectural concepts, troubleshooting strategy and usage scenarios for Extended Events.
- Explain data collection strategy and techniques to analyze collected data.
- Understand techniques to identify and diagnose bottlenecks to improve overall performance.

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## Outline

**Module 1: SQL Server Architecture, Scheduling, and Waits**

This module covers high level architectural overview of SQL Server and its various components. It dives deep into SQL Server execution model, waits and queues.

Lessons

- SQL Server Components and SQL OS
- Windows Scheduling vs SQL Scheduling
- Waits and Queues

Lab : SQL Server Architecture, Scheduling, and Waits

**Module 2: SQL Server I/**O

This module covers core I/O concepts, Storage Area Networks and performance testing. It focuses on SQL Server I/O operations and how to test storage performance.

Lessons

- Core Concepts
- Storage Solutions
- I/O Setup and Testing

Lab : Testing Storage Performance

**Module 3: Database Structures**

This module covers Database Structures, Data File and TempDB Internals. It focuses on architectural concepts and best practices related to data files for user databases and TempDB.

Lessons

- Database Structure Internals
- Data File Internals
- TempDB Internals

Lab : Database Structures

**Module 4: SQL Server Memory**

This module covers Windows and SQL Server Memory internals. It focuses on architectural concepts and best practices related to SQL Server Memory Configuration.

Lessons

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- Windows Memory
- SQL Server Memory
- In-Memory OLTP

Lab : SQL Server Memory

**Module 5: Concurrency and Transactions**

This module covers Transactions and Locking Internals. It focuses on architectural concepts and best practices related to Concurrency, Transactions, Isolation Levels and Locking.

Lessons

- Concurrency and Transactions
- Locking Internals

Lab : Concurrency and Transactions

**Module 6: Statistics and Index Internals**

This module covers Statistics and Index Internals. It focuses on architectural concepts and best practices related to Statistics and Indexes.

Lessons

- Statistics Internals and Cardinality Estimation
- Index Internals
- Columnstore Indexes

Lab : Statistics and index Internals

**Module 7: Query Execution and Query Plan Analysis**

This module covers Query Execution and Query Plan Analysis. It focuses on architectural concepts of the Optimizer and how to identify and fix query plan issues.

Lessons

- Query execution and optimizer internals
- Analyzing query plans

Lab : Query execution and query plan analysis

**Module 8: Plan Caching and Recompilation**

This module covers Plan Caching and Recompilation. It focuses on architectural concepts, troubleshooting

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scenarios and best practices related to Plan Cache.

Lessons

- Plan cache internals
- Troubleshooting plan cache issues
- Query store

Lab : Plan caching and recompilation

**Module 9: Extended Events**

This module covers Extended Events. It focuses on architectural concepts, troubleshooting strategy and usage scenarios for Extended Events.

Lessons

- Extended events core concepts
- Implementing extended events

Lab : Extended events

**Module 10: Monitoring, Tracing, and Baselining**

This module covers tools and techniques to monitor, trace and baseline SQL Server performance data. It focuses on data collection strategy and techniques to analyze collected data.

Lessons

- Monitoring and tracing
- Baselining and benchmarking

Lab : Monitoring, Tracing and Baselining