

Data Modelling Foundations for Relational Databases

Course Description This 5-day training program equips participants with the knowledge and practical skills to design, implement, and optimize relational data models. The course covers conceptual, logical, and physical modeling, normalization, dimensional modeling, and advanced SQL Server implementation techniques. Participants will gain hands-on experience in translating business requirements into robust database structures that support scalability, integrity, and performance.

Duration 5 Days (40 Hours)

Pre-requisites

- Basic understanding of databases and data concepts
- Familiarity with SQL fundamentals (preferred but not mandatory)
- Exposure to any programming language (optional)

Learning Objectives

By the end of this course, participants will be able to:

- Understand the principles of conceptual, logical, and physical data modeling
- Apply normalization and denormalization techniques effectively
- Design relational schemas with keys, constraints, and relationships
- Implement dimensional models for analytics and reporting
- Optimize models for scalability, performance, and maintainability in SQL Server
- Translate business requirements into practical database solutions

Day-wise Module Coverage

Day 1: Foundations of Data Modelling

Module 1: Introduction to Data Modelling

- Importance of data modelling in enterprises
- Conceptual, logical, and physical models
- Role of data models in relational databases

- Business requirements to model translation
- Common pitfalls in data modelling

Module 2: Relational Database Concepts

- Tables, rows, and columns
- Primary and foreign keys
- Referential integrity
- Relationships (1:1, 1:N, M:N)
- Constraints and rules

Module 3: SQL Server Architecture Overview

- SQL Server components and services
- Storage structures (pages, extents, files)
- Transaction log basics
- Filegroups and allocation
- Impact of architecture on modelling

Day 2: Logical Modelling & Normalization

Module 4: Entity-Relationship (ER) Modelling

- Entities and attributes
- Identifying relationships
- ER diagrams and notation
- Mapping ER models to relational schemas
- Case study examples

Module 5: Normalization Techniques

- First Normal Form (1NF)
- Second Normal Form (2NF)
- Third Normal Form (3NF)

- Boyce-Codd Normal Form (BCNF)
- Trade-offs of normalization

Module 6: Denormalization & Practical Considerations

- When to denormalize
- Performance vs integrity
- Common denormalization patterns
- Indexing strategies for denormalized tables
- Balancing design with business needs

Day 3: Physical Modelling in SQL Server

Module 7: Translating Logical Models to Physical Models

- Schema creation in SQL Server
- Defining tables and columns
- Applying constraints (PK, FK, CHECK)
- Index creation and usage
- Naming conventions and standards

Module 8: Keys and Relationships in Practice

- Composite keys
- Surrogate vs natural keys
- Cascading actions (ON DELETE/UPDATE)
- Implementing relationships in SQL Server
- Best practices for key design

Module 9: Advanced Constraints & Integrity

- Unique constraints
- Default values
- Triggers for enforcing rules

- Handling NULLs effectively
- Ensuring data consistency

Day 4: Dimensional Modelling & Analytics

Module 10: Introduction to Dimensional Modelling

- OLTP vs OLAP systems
- Facts and dimensions
- Star schema design
- Snowflake schema design
- Role of dimensional models in BI

Module 11: Types of Dimensions

- Slowly Changing Dimensions (SCD)
- Junk dimensions
- Role-playing dimensions
- Conformed dimensions
- Hierarchical dimensions

Module 12: Fact Tables & Measures

- Transactional vs snapshot facts
- Additive, semi-additive, non-additive measures
- Granularity considerations
- Linking fact tables to dimensions
- Case study: sales and inventory

Day 5: Optimization & Practical Applications

Module 13: Performance Optimization in Data Models

- Index tuning strategies
- Partitioning tables

- Query optimization basics
- Execution plans and analysis
- Balancing performance with design

Module 14: Best Practices in Data Modelling

- Naming conventions
- Documentation standards
- Version control for models
- Collaboration with stakeholders
- Common anti-patterns to avoid

Module 15: Case Study & Hands-On Lab

- End-to-end modelling exercise
- Translating business requirements into ER model
- Implementing schema in SQL Server
- Applying normalization and dimensional modelling
- Performance testing and optimization