

# Database Design and Programming with SQL

## Overview

This course engages students to analyze complex business scenarios and create a data model—a conceptual representation of an organization's information. Participants implement their database design by creating a physical database using SQL. Basic SQL syntax and the rules for constructing valid SQL statements are reviewed. This course culminates with a project that challenges students to design, implement, and demonstrate a database solution for a business or organization.

## Duration

- 180 hours

## Target Audiences

### *Primary Audience*

- College/university faculty who teach computer programming, information communications technology (ICT), or a related subject
- Secondary school teachers who teach computer programming, ICT, or a related subject.

### *Secondary Audience*

- None

## Prerequisites

### *Required*

- Ease with using a computer
- General knowledge of databases and query activity

### *Suggested*

- None

## Suggested Next Courses

- Java Fundamentals

## Lesson-by-Lesson Topics

### Introduction

- Data vs. information
- History of the database
- Major transformations in computing

### What is Data Modeling?

- Conceptual & physical models
- Entities, instances, attributes and identifiers
- Entity relationship modeling and ERDs

### Entity Relationship Diagramming

- Identifying relationships
- ER diagramming conventions
- Speaking ERD and drawing relationships
- Matrix diagrams

## Supertypes, Subtypes, and Business Rules

- Supertypes and subtypes
- Documenting business rules

## Working with Entity Relationships

- Relationship transferability
- Relationship types
- Resolving many-to-many relationships
- Understanding CRUD requirements

## Unique Identifiers and Normalization

- Artificial, composite and secondary UID
- Normalization and first normal form
- Second normal form
- Third normal form

## Arcs, Hierarchies, and Historical Data

- Arcs
- Hierarchies and recursive relationships
- Modeling historical data

## ERD Project Presentation

- Presentation of the ERD to the client
- Modeling change
- Modeling change time
- Modeling change price
- Adding the time element to an ERD

## Drawing Conventions and Generic Modeling

- Drawing conventions for readability
- Generic modeling

## Transforming From Conceptual Model to Physical Model

- Introduction to relational database concepts
- Basic mapping
- Relationship mapping
- Subtype mapping

## Introduction to SQL

- Introduction to Oracle Application Express
- SQL introduction: querying the database
- Basic modifications
- System development life cycle

## Project

- Project overview and getting started
- Presentation project management
- Final presentation components

## Presentation

- Creating tables for the final presentation
- Preparing written documentation
- Preparing visual materials
- Final presentations

## SELECT Statements and Relational Database Technology

- Anatomy of a SQL statement
- Oracle database environment
- Using applications
- Relational database technology

## Using the WHERE Clause

- Working with columns, characters, and rows
- Limit rows selected
- Comparison operators

## Restricting Rows and Introduction to Functions

- Logical comparisons and precedence rules
- Sorting rows
- Introduction to functions – single row functions

## Using Character, Number, and Date Functions

- Case and character manipulation
- Number functions
- Date functions

## Using Single Row Functions

- Conversion functions
- NULL functions
- Conditional expressions

## Executing Database Joins

- Cross joins and natural joins
- Join clauses
- Inner versus outer joins
- Self joins and hierarchical queries

## Working with Group Functions

- Review of joins
- GROUP functions
- COUNT, DISTINCT, NVL

## Using Complex SQL with Aggregated Data

- Using GROUP BY and HAVING clauses
- Using ROLLUP and CUBE operations, and GROUPING SETS
- Using SET operators

## Creating Subqueries

- Fundamentals of subqueries
- Single row subqueries
- Multiple-row subqueries
- Correlated subqueries

## Constructing DML Statements

- INSERT statements
- Updating column values and deleting rows
- DEFAULT values, MERGE, and multi-table inserts

## Working with DDL Statements

- Creating tables
- Using data types
- Modifying a table

## Ensuring Quality Query Results

- Ensuring quality query results

## Creating and Managing Constraints

- Defining NOT NULL and UNIQUE constraints
- PRIMARY KEY, FOREIGN KEY, and CHECK constraints
- Managing constraints

## Creating and Managing Views

- Creating views
- DML operations and views
- Managing views

## Working with Sequences

- Working with sequences
- Indexes and synonyms

## Fundamentals of Database Security

- Controlling user access
- Creating and revoking object privileges
- Regular expressions

## Understanding Database Transactions

- Database transactions

## Oracle Proprietary Join Syntax

- Cartesian product and the JOIN operations
- NONEQUIJOINS
- OUTER joins

## Project

- Testing
- Final project: database creation
- Final exam review

## Ensuring Quality Query Results – Advanced Techniques

- Ensuring quality query results – advanced techniques

To search and register for events scheduled in your area, visit the [Academy events calendar](#).