

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