Database Design and Programming with SQL

Overview

This course of study teaches students to analyze complex business scenarios, design and create data models and create databases using SQL. Oracle SQL Developer Data Modeler and Application Express (APEX) are utilized to provide practical, hands-on, engaging activities. Leveraging project-based learning techniques, students will create and work with projects which challenge them to design, implement, and demonstrate a database solution for a business or organization.

Duration

- Recommended total course time: 180 Hours*
- Professional education credit hours for educators who complete Oracle Academy training: 60

* Total course time includes instruction, self-study/homework, practices, projects and assessment

Target Audiences

Educators
- Technical, vocational and 2- and 4- year college and university faculty members who teach computer science, information communications technology (ICT), data science, or a related subject
- Secondary and vocational school teachers who teach computer science, ICT, or a related subject

Students
- Students who wish to learn to learn the techniques and tools to design, build and extract information from a database.
- This foundational course is suitable for computer science majors and non-majors alike.

Prerequisites

Required:
- General knowledge of the purpose of a database

Suggested:
- Previous experience with a database application

Suggested Next Courses

- Oracle Academy course – Programming with PL/SQL
- Advanced database courses

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
• NONEQUIJOIN
• 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.