

MySQL Administration and Development

Preliminary Outline

COURSE OVERVIEW

MySQL is the open source community's most popular Relational Database Management System (RDBMS) offering, and is a key part of LAMP, the most popular open source enterprise software stack. Minimum requirements for an RDBMS are defined by both ANSI and ISO. MySQL provides not only all of the standard RDBMS features, but many of the non-standard features offered by other database vendors, simplifying conversions from those platforms.

This class provides a complete view of database fundamentals and MySQL features, encouraging the student to explore. Students will learn the basics of MySQL use and the programming of stored routines and triggers. Students will also participate in database design discussions, perform administrative functions, learn about optimization and performance tuning, and explore various APIs.

COURSE OBJECTIVES

- Describe the major features of MySQL.
- Install MySQL and troubleshoot installations.
- Perform database design and normalization.
- Work with the command-line mysql tool.
- Set up and manage data and data schemas in MySQL.
- Use of SELECT to retrieve data from a database.
- Combine data from multiple sources.
- Gain familiarity with MySQL storage engine types and their applicability.
- Use several of the more common MySQL stand-alone tools.
- Manage resources and users.
- Investigate more complex SQL functionality.
- Write and use stored code.
- Tune a MySQL database.
- Utilize MySQL interfaces for several programming languages.

AUDIENCE

Application and web developers, or system administrators.

PREREQUISITES

Prior experience installing software and programming in any language, such as HTML, is recommended but not required.

COURSE LENGTH

5 days

MATERIALS INCLUDED

Student workbook

COURSE CONTENTS

- 1 Course Introduction**
 - Course Objectives
 - Overview
 - Suggested References
- 2 Introduction to Database Concepts and MySQL**
 - Why MySQL?
 - Features of a Relational Database
 - Where does SQL Fit in?
 - Database Access
 - The History of MySQL
- 3 Installation, Configuration, and Upgrading**
 - MySQL Software
 - MySQL Software Features
 - Available Client Software
 - Downloading MySQL Packages on Linux and Windows
 - After the Download
 - Configuring the Server
 - Starting the Server
 - The Initial User Accounts
 - Verifying Server Operation and Troubleshooting
 - Upgrading
 - Copying a Database Between Architectures
 - Linux-Specific Problems
- 4 Database Design**
 - Developing the Design of a Database
 - Database Entities
 - Data Models and Normalization
 - The Primary Key (unique identifier)
 - Relationships
 - Second Normal Form (2NF)
 - Third Normal Form (3NF) and Beyond
 - Translating a Data Model into a Database Design
- 5 Using the mysql Command Line Tool**
 - Running the mysql Client
 - Customizing the mysql Prompt
 - Talking to mysql
 - Getting Help About the Server
 - Some Useful mysql Options
 - Working with a Database
 - Examining Table Definitions
 - Other SHOW Options
- 6 DDL – Data Definition Language**
 - DDL & DML Overview
 - Building Table Definitions
 - Identifiers
 - Case Sensitivity and the OS
 - Column Definitions
 - Understanding MySQL Numeric, Character, and Non-Specific Data Types
 - Understand MySQL Specified Data Types
- 7 DML – Data Manipulation Language**
 - Date and Time Datatypes
 - Working with AUTO_INCREMENT
 - Modifying and Renaming Tables
 - RENAME TABLE and DROP TABLE
 - Special Concerns for InnoDB
 - Data Manipulation Overview
 - Data Values: Numbers
 - Data Values: Strings
 - Working with NULL Values
 - Bulk Loading of Data
 - Bulk Data Format
 - Working with Special Values in Bulk Data
 - Adding New Table Rows with INSERT
 - Changing Row Contents
 - Removing Table Rows
 - What are Transactions and Why Would you Need Them?
 - InnoDB: Using Transactional Processing
 - Locking Tables
- 8 Queries – The SELECT Statement**
 - SELECT Syntax Summary
 - Choosing Data Sources and Destinations for SELECT
 - Presentation of Table Data with SELECT
 - Being Selective About Which Rows are Displayed
 - User-Defined Variables
 - Expressions and Functions
 - Control Flow Operators and Functions
 - Function Names
 - Comparison Operators and Functions
 - String Functions
 - Numeric Operators and Functions
 - Date and Time Functions
 - Forcing Data Interpretation
 - Miscellaneous Functions
- 9 Combining Output from Several Sources**
 - Union
 - Combining Data from Two Tables
 - Using WHERE to Choose Matching Rows
 - INNER JOIN
 - LEFT JOIN, RIGHT JOIN, and ‘self’ Joins
 - Multiple Tables, Fields, Joins, and Ordering
 - SELECT * and USING Columns
- 10 MySQL Storage Engines**
 - Storage Engine Overview
 - Other Storage Engine Types
 - The Basics of Commonly Used Storage Engines
 - MyISAM Limits and Features
 - MyISAM Data File Format
 - InnoDB and Hardware Limitations
 - InnoDB Shared Tablespace Configuration

- InnoDB Per-Table Tablespaces
- InnoDB Data Management
- MEMORY and FEDERATED: Tables in Unusual Places
- MERGE and ARCHIVE: Managing Space Requirements
- 11 Utilities**
 - Client Overview
 - Specifying Options for Command-Line Clients
 - Client Option Files
 - Using myisamchk and mysqlchk to Check a Table
 - Using myisamchk and mysqlchk for Repairs
 - Using mysqlshow and mysqlimport
 - Using mysqldump
 - MySQL GUI Clients: The Query Browser
 - MySQL Query Browser: Deeper
 - MySQL Administrator: Basic Operations
 - MySQL Administrator: Monitoring the Server and User Administration
 - Third Party Tools
- 12 Administering a Database and Users**
 - The Server-Side Programs
 - Starting the MySQL Server
 - Using SET for Server Options
 - Table Management
 - Server Log Files
 - mysqladmin
 - Backup and Restore
 - Miscellaneous Functions
 - User Account Management
 - Understanding User Privileges
 - User Account Rights Management
 - User Account Privileges
 - Managing Access to the Database Environment
- 13 Advanced SQL Techniques**
 - MySQL Pattern Matching
 - Multipliers, Anchors, and Grouping
 - SELECT Grouping: GROUP BY
 - Advanced Use of SELECT: Aggregates
 - Advanced Use of SELECT: Subqueries
 - Subquery Comparisons and Quantifiers
 - Other Subqueries
 - Subquery Alternatives and Restrictions
 - InnoDB Multi-Table Updates and Deletes
 - Building a VIEW
 - Updatable Views
- 14 Database Programmability**
 - Stored Routines: Basic Concepts
 - Routine Creation and Use
 - Flow Control Statement
 - Writing Blocks of Code
 - Triggers
 - Stored Routines, Triggers, and the Binary Log
 - Table HANDLERS
 - Prepared Statements
- 15 Optimization and Performance Tuning**
 - Hardware Limitations
 - Optimizing the MySQL Server's Interaction with the External World
 - Adjusting the MySQL Server Configuration
 - Optimizing Your Database
 - Optimizing Queries
 - The Use of Indexes to Support Queries
 - Thinking about JOIN Queries
 - Query Sorts, Indexes, and Short-Circuiting INSERT, UPDATE, DELETE, and Table Locks
 - Some General Optimizations
 - Optimizations Specific to MyISAM
 - Optimizations Specific to InnoDB
- 16 MySQL Programming Interfaces**
 - Database Application Architectures
 - Connecting MySQL to ODBC
 - Connecting MySQL to MS/Office and MS/Access
 - Connecting to MySQL from Perl
 - Programming Perl to MySQL
 - Connecting to MySQL from PHP
 - Programming PHP to MySQL