Macao Polytechnic Institute
School of Applied Sciences
Bachelor of Science in Computing
Module Outline

Learning Module	Database Administration and Programming		Class Code	COMP403
Pre-requisite(s)	COMP224 Database Management Systems			
Medium of Instruction	English		**Credit**	3
Lecture Hours	22.5 hrs	**Lab/Practice Hours**	22.5 hrs	**Total Hours**	45 hrs

Description

This module aims to provide students with an overall understanding of how to develop, implement and deploy database applications using modern DBMSs and associated tools. Students will also gain a conceptual understanding of the Oracle database architecture and how the architectural structures work and interact with one another. Students will learn how to create an operational database and properly manage the various structures in an effective and efficient manner in order to have a well-designed and operational database.

Learning Outcomes

After completing the learning module, students will be able to:

1. Conclude the fundamental principles of database and features of commonly used DBMSs; (P1)

2. Construct simple applications with Oracle DBMS; (EA1, EA2)

3. Design Index, Stored Procedures and Triggers for complex queries; (EA2, EA3)

4. Measure query performance; (EA1, EA2. EA3, P1)

5. Make complexity analysis. (EA1, EA3)

Content

1. Introduction to Database Administration and Programming   (3 hours)
   1.1. Introduction to Oracle Database 11g
   1.2. SQL*Plus
   1.3. Oracle SQL
   1.4. Revisiting fundamental SQL operations

2. PL/SQL   (12 hours)
   2.1. PL/SQL Overview
   2.2. Block Structure of PL/SQL
   2.3. Procedures and Functions
   2.4. PL/SQL-Variables and Data Types
   2.5. Control Structures
   2.6. Nested Blocks
   2.7. Cursors
   2.8. Triggers
   2.9. Exception Handling

3. Interacting with DBMSs by JDBC   (4.5 hours)
   3.1. Overview of JDBC
   3.2. Implementation with JDBC
   3.3. Collaborating with in-memory computation

4. Access Permissions   (4.5 hours)
   4.1. User authentication
   4.2. Privileges
   4.3. Access Permissions in ORACLE
   4.4. Access restrictions

5. Index Structures for System Optimization   (6 hours)
   5.1. B-tree and B+-tree
   5.2. Hash-index
   5.3. R-tree for spatial data
   5.4. Improving system performance with index

6. Query Optimization with advanced data structures   (6 hours)
   6.1. Index design
   6.2. Pruning techniques
   6.3. Case Study: join queries

7. Evaluation   (6 hours)
   7.1. Fundamental concepts of complexity
   7.2. Basic complexity analysis
   7.3. Trade-off between time and space

    7.4.   Case Study: Shortest-path query

8.   Introductions to other commonly-used DBMSs   (3 hours)
    8.1.   MySQL
    8.2.   Hadoop – a Distributed Database
    8.3.   NoSQL – a DBMS with low consistency model
    8.4.   DBMSs for smartphones

Teaching Method

Lectures, videos, case studies.

Attendance

Attendance requirements are governed by the "Academic Regulations Governing Bachelor's Degree Programmes of Macao Polytechnic Institute". Students who do not meet the attendance requirements for the module will not be permitted to sit the final or re-sit examination and shall be awarded an 'F' grade.

Assessment

This learning module is graded on a 100 point scale, with 100 being the highest possible score and 50 being the passing score.

	Item	Description	Percentage
1.	Test	Knowledge assessment	25%
2.	Project	Knowledge assessment	25%
3.	Examination	3-hour written examination	50%
		Total Percentage:	100%

Students with an overall score of less than 35 in the coursework must take the re-sit examination even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination must take the re-sit examination even if the overall score for the module is 50 or above.

Students with an overall final grade of less than 35 are NOT allowed to take the re-sit examination.

Teaching Material
Textbook(s)

There is no official text for this module. Module notes are distributed in the class.

Reference

Reference book(s)

1. Ravinder Gupta. (2021). *Oracle Database 19c DBA By Examples: Installation and Administration*. Independently published.

2. Steven Feuerstein, Bill Pribyl, Chip Dawes (2015). *Oracle PL/SQL Language Pocket Reference: A Guide to Oracle's PL/SQL Language Fundamentals*. O'Reilly Media; 5th edition