



UNIVERSITY
of
TECHNOLOGY,
MAURITIUS

SCHOOL OF INNOVATIVE TECHNOLOGIES AND ENGINEERING

Module Information Pack

**BSc (Hons) Computer Science with Network
Security-BCNS24AFT_2**

Database Design

BCNS1103C

Academic Year 2024 – Semester 1

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Lecture Day and Time: As per Time Table Tuesday 13.00 – 16.00 (G 1.2)

Credits & Level: 6 credits, Level 1

Pre-requisites (If applicable): none

Co-requisites (If applicable): none

Method of Delivery

& frequency of Class: 15 weeks; 15 x 3 hrs sessions (Blend Mode: Lectures/Practical/Tutorials);
+ Additional week(s) – Only for Assignment Presentation if need be.

Method and Criteria

of Assessment: 50% Coursework (1 class test (10 %) + 2 Assignments)
(Assignment 1 (15 % - on MS Access) + presentation)
(Assignment 2 (25 % - Oracle and MySQL))
50 % Exam (2 hours 30 minutes)

Module Aims:

This Module is designed for an introductory course in database management. Such a course is usually required as part of an Information System curriculum in computer technology programmes or computer science programmes.

Learning Objectives and Outcomes:

The course has been designed to help students understand the role of databases in today's organisations. It also compares the database approach with conventional file system, and different models that has been used for the past decades.

At the end of this course, a student will be able to design a database using Microsoft Access, Oracle and mySQL. A lot of emphasis will be laid on the following topics: Relational Database Model, Entity Relationship Diagram, Normalisation and SQL.

Outline Syllabus**a. An Overview of Database System**

- Name several limitations of conventional file processing systems.
- Explain the advantages of the database approach compared to traditional file processing.
- List and briefly describe the components of a typical database environment.
- Briefly describe the evolution of database system.

b. An introduction to Relational Database System

- Describes the advantages of relational model.
- Understand the three parts of the relational model.
- Explain various concepts in the definition of the relational data structure, and the properties of a relation as a mathematical set.
- Describe the general procedure for designing a relational database

c. Relational Integrity

- Understand the importance and objectives of data integrity in a relational database.
- Describe the three types of relational integrity and which rule deals with what problem.
- Describe how to maintain referential integrity.
- Understand the need for application-specific integrity in addition to relational integrity.

d. Entity Relationship Modelling I

- Concisely define each of the following key terms: E-R Model, ERD, entity, entity type, entity instance, strong entity type, weak entity type, attribute, composite attribute, simple attribute, multi-valued attribute, derived attribute, identifier, composite identifier, relationship, relationship instance, associative entity, degree of a relationship, unary relationship, binary relationship, ternary relationship, cardinality constraint, minimum and maximum cardinality.
- Distinguish unary, binary, and ternary relationships and give a common example of each.
- Model each of the following constructs in an E-R diagram: composite attribute, multi-valued attribute, derived attribute, associative entity and identifying relationship.
- Draw an ERD to represent common business situations.
- Model minimum and maximum cardinality constraints on an ERD
- Convert a many-to-many relationship to an associative entity type.

e Entity Relationship Modelling II

- Concisely define each of the following key terms: enhanced entity relationship model, subtype, supertype, attribute inheritance, generalisation, specialisation, subtype discriminator, business rule.
- Recognise when to use subtype/supertype relationships in data modelling.
- Use both specialisation and generalisation as techniques for defining supertype/subtype relationships.
- Specify both completeness constraints and disjointness constraints in modelling supertype/subtype relationships.
- Transform an ERD to a logically equivalent set of relations.

f Normalisation I

- To learn to identify good and poor table structures.
- Concisely define each of the following key terms: 1NF, 2NF, 3NF, BCNF, Determinancy, Dependency, Partial Dependency, Transitive Dependency.
- Explain what is meant by Bracketing Notation.
- To show how to convert an un-normalised table into 3NF

g Normalisation II

- To show how to make use of a determinancy diagram.
- To differentiate between a determinancy diagram and normalisation process.
- A case study to differentiate between the two methods.

h . Introduction to SQL

- Creating and Modifying database tables using Oracle 10g/11g/12c
- Oracle 10g/11g/12c data types
 - Character Data Types
 - Number Data Types
 - Date and Time Data Types
- Constraints
 - Integrity Constraints
 - Value Constraints
- Creating Tables using Foreign Key Constraint
- Viewing information about tables from data dictionary
- Modifying and Deleting Database Tables
 - Deleting and renaming existing tables
 - Adding fields to existing tables
 - Modifying existing field data definitions
 - Deleting a field
 - Adding and deleting constraints
 - Enabling and disabling constraints

i Further SQL

- Inserting data into tables
 - Using the INSERT command
 - Format models
- Creating search condition in SQL queries
- Updating and deleting existing table records
- Database object privileges
 - GRANT & REVOKE
- Retrieving data from a single database table.
 - Suppressing duplicate rows
 - Using search condition in SELECT queries
 - Sorting query output
- Using calculation in SQL queries
 - Performing arithmetic calculations
 - Oracle9i SQL function
- Oracle 10g SQL Group Functions
 - Using the COUNT group functions
 - Using the GROUP BY clause to group data
 - Using the HAVING clause to filter group data
- Joining multiple tables
 - Inner join
 - Outer join
 - Self join
- Creating nested queries
 - Creating nested queries with sub-queries that return single value
 - Creating sub-queries that return multiple values
 - Using multiple sub-queries within a nested query
- Using set operators to combine query result
 - UNION and UNION ALL
 - INTERSECT
 - MINUS
- Creating and using database views
 - Creating views
 - Executing action queries using views

Lecture Schedule

Week	Book Ref. Thomas Connolly – Database System	Lecture Topics	Practical details
1	Chapter 1 & 2	An Overview of Database System + An Introduction to Relational Database System	Microsoft Access: Creating tables and Relationship
2	Chapter 2 & 3	Relational Integrity + Entity Relationship Modelling I	Microsoft Access: Working with Forms
3	Chapter 3	Entity Relationship Modelling II	Microsoft Access: Master and Sub-forms
4	Chapter 11	Entity Relationship Modelling III	Microsoft Access: Working with Query
5	Chapter 12	Normalisation I	Microsoft Access: Creating a Menu and Tab Control
6	Chapter 13	Normalisation II	SELECT SSADM (or any other CASE TOOL)
7		Class test (10 %)	Microsoft Access: More Queries + Report
8		Assignment 1- (15 %) Submission + presentation.	Assignment 1 Presentation
9	Chapter 4	SQL I	SQL using Oracle 10g/11g and MySQL + Assignment 1 Presentation
10	Chapter 4	SQL I	SQL using Oracle 10g/11g and MySQL
11	Chapter 4	SQL II	SQL using Oracle 10g/11g and MySQL
12	Chapter 4	SQL II & SQL III	SQL using Oracle 10g/11g and MySQL
13	Chapter 5 & 6	SQL III & SQL IV	SQL using Oracle 10g/11g and MySQL
14		Assignment 2 Submission & Presentation	Assignment 2 Presentation
15		Assignment 2 Presentation	Assignment 2 Presentation

READING LIST

Assignment Submission (week 8 and week 16) and presentation (Week 8,9,16 and 17)

RECOMMENDED TEXTS (as per availability in the UTM Resource Centre):

1. R Ranakrishnan, J Gehrke, “*Database Management Systems*”, (2nd Edition), McGraw-Hill, 2000.
2. C J Date, “*An Introduction to Database Systems*”, (6th edition), Addison Wesley, 1995
3. P Beynon-Davies, “*Database Systems*”, MacMillan Press, 1996.
4. Mike Morrison & Joline Morrison, “*A Guide to Oracle 9i*”, Thomson, 2003
5. Thomas Connolly & Carolyn Begg, “*Database Systems – A practical Approach to Design, Implementation, and Management*” 4th Edition, Addison Wesley, 2005
6. Peter Rob & Carlos Coronel, “*Database Systems – Design, Implementation and Management*”, 7th Edition, Thomson, 2006

7. LECTURE NOTES

- Will be sent by mail or uploaded online on Google Classroom.

PRACTICAL /TUTORIAL EXERCISES

- Practical and Tutorial Exercises will be sent by mail or uploaded online on Google Classroom

ASSIGNMENTS

50% Coursework (1 class test (10 %) + 2 Assignments (15 % + 25%))

1. Individual/Group Assignment: Assignment 1 (15 % - on MS Access) + presentation
Developing a Database Application using Microsoft Access
2. Individual/Group Assignment: Assignment 2 (25 %) – Developing a Database Application
Using Oracle 10g/11g and MySQL

ONLINE UTM PAST EXAM PAPERS:

Past Exam Papers are downloadable from the following address:

http://www.utm.ac.mu/resource/Online_Resourceslist.php