UNIVERSITY OF MAURITIUS
MODULE CATALOGUE

1. GENERAL INFORMATION

Academic Year: 2024-2025

Semesters: 1 and 2

Title	Codes	Duration (hours)		No. of credits
Database Systems	ICDT1202Y	Direct Contact Lectures Practicals Tutorials	60	12 LCCS credits
		Self-Learning	120	
		Other Learning Activities*	180	

*working on assignments, sitting for Class Tests and preparation time for same, sitting for Examinations and preparation time for same, group work, attending Workshops/Conference recommended by the Department/Faculty, fieldwork, site visits/trips, additional practicals, presentations among peers, experiential learning, placements/internships and guest lectures.

2. PRE-REQUISITE(S)/PRE-REQUIREMENT(S)

None.

3. AIMS

Data is the core component of all information systems and organizations simply cannot operate without it. Databases are created to store and organize large volumes of data. The design, implementation and management of databases are crucial for the proper running of the day-to-day operations of an organization. The better the design and utility of the database, the better the organization will be positioned for strategic decision making.

The first part of the module will cover fundamental database system concepts (such as database management systems, database architectures, data models), database design principles (such as Entity Relationship models and normalization), and database implementation using Structured Query Language (SQL), which is the most widely used language to create and query databases.

The second part of the module will focus on more advanced concepts of databases, like transaction processing and concurrency control, efficient searching mechanisms, and database administration. In addition, the module will cover the main characteristics and implementation of NoSQL databases and will provide an overview of alternative technologies like distributed and cloud databases. Practical sessions will introduce students to SQL functional programming and stored procedures.

4. OUTLINE SYLLABUS

Through Contact Hours	Database Concepts and Terminologies, Database Management System (DBMS), Database Architecture, Database Transactions, Relational Data Model, Entity-Relationship Modelling, Relational Database Design and Implementation, Structured Query Language (SQL), Data Definition Language (DDL), Data Manipulation Language (DML), SQL Functions, Triggers and Stored Procedures, Concurrency Control, Database Normalization, NoSQL
Through Self-Learning	Database Applications (Case Studies), Components of a DBMS,Database Architecture, DBMS Installation and Configuration, Data Availability, Database Security and Authorization,Database Backup and Recovery

5. LEARNING OUTCOMES AND ASSESSMENT CRITERIA

Having studied this module, the students should be able to achieve the following learning outcomes. The assessment criteria used to reflect the expected learning outcomes are also given hereunder:

	Learning Outcomes	Assessment Criteria
1	Demonstrate understanding of databases, database management systems (DBMS), and the three-level database architecture	Recognize problems associated with file-based systems Recognize the advantages that a database/DBMS offers Explain common terminology used in a database and a DBMS Describe the purpose of the different components of a DBMS Explain the purpose of the three-level database architecture Discuss the client–server architecture and its advantages for a DBMS
2	Demonstrate understanding of the relational database model	Explain the purpose of a data model. Identify the different types of data models. Determine candidate keys, primary keys and foreign keys in database relations. Understand the importance of database constraints and referential integrity.
3	Design databases using the entity-relationship approach	Explain the importance of data abstraction Explain the purpose of conceptual modeling Recognise and draw the different components of an Entity Relationship Diagram (ERD)

		Interpret user requirements and construct an ERD using the Chen's notation, based on these requirements
4	Convert an entity-relationship diagram to a relational database schema	Explain the common terminology used in a relational database schema Apply an algorithm to convert an ER diagram into relations Apply the database design guidelines when constructing relations
5	Apply normalization technique when designing relational databases	Understand the problems associated with data redundancy. Identify the different types of Functional Dependencies. Explain the importance of data normalization Apply normalization process to obtain 3NF relations from unnormalized data (UNF)
6	Create databases and their tables specifying appropriate data types and constraints using SQL	Distinguish between DDL, DML and DCL statements Use DDL statements to create,alter and drop a database, its tables and other database objects and specify data types and constraints Explain the importance of table index
7	Manipulate data from a database using SQL	Use DML statements to retrieve data from database tables Use DML statements to query from multiple databases (using inner join or outer join) Use DML statements to summarize data from database tables Use DML statements to modify data from database table
8	Grant privileges on database objects to specific users	Use DDL statements to create database views Use DCL statements to grant and revoke permissions from users on database objects Explain the purpose and importance of views Differentiate between views and base relations

9	Demonstrate an understanding on how the use of SQL functions, triggers and stored procedures in PL/SQL, influence design and programming database systems.	Apply SQL functions, SQL triggers and SQL procedures to perform operations and actions on databases. Use Cursors to traverse across records
10	Demonstrate an understanding of performance in a database environment	Explain performance management in a database environment Describe how data is organised on physical storage Explain how a DBMS retrieves data from secondary storage devices for query processing Use single-level indices to organise and retrieve data from secondary storage Use multi-level indices to organise and retrieve data from secondary storage Explain the impact of indices on query performance
11	Demonstrate understanding of concurrency control protocols (locking, deadlock)	Define database transactions List and explain the properties (ACID) of transactions Discuss the need for concurrency control Recognise the following problems when there is concurrency control (Lost update problem; Uncommitted dependency problem ; and Inconsistent analysis problem) Describe the Two-Phase Locking (2PL) protocols and its various types Explain what deadlock is and how it can be resolved
12	Demonstrate an understanding of database backup and recovery methods used in the event of failures, and of how data could be moved around	Discuss the need for recovery control Identify some causes of database failure Discuss the importance of backups in database recovery Explain the various methods of database backups

		Differentiate between the various types of recovery methods
13	Demonstrate an understanding of NoSQL database systems	Distinguish the different types of NoSQL database systems Describe how NoSQL databases differ from relational database Discuss how NoSQL data models and approaches can be applied to address challenges with Big Data List and understand the BASE approach Compare and contrast the ACID vs. BASE approaches to store and retrieve data.
14	Design databases using NoSQL systems	Use data control, definition and manipulation languages of the NoSQL databases Perform insert, query, update and delete documents operations in NoSQL Understand index concepts, index types, index properties in NoSQL Work with aggregations

6. COORDINATORS

	Programme Coordinator	**Module Coordinator Semester 1**	**Module Coordinator Semester 2**
Name	Dr Paramasiven Appavoo / Dr Bikash Sonah	Dr Anisah Ghoorah	Mrs Sudha Cheerkoot-Jalim
Department	ICT	DT	ICT
Building	Phase II Building, FoE	Phase II Building, FoE	Phase II Building, FoE
Room Number	2.18	2.17	2.17
Phone No.	403 7751 / 403 7753	403 7749	403 7747
E-mail address	p.appavoo@uom.ac.mu / bsonah@uom.ac.mu	a.ghoorah@uom.ac.mu	s.cheerkoot@uom.ac.mu
Consultation Time	Email to arrange meeting	Email to arrange meeting	Email to arrange meeting

7. LECTURER(S)

Programme	**Bsc(Hons) Computer Science**
Semester	**1 & 2**
Name	Sudha Cheerkoot-Jalim
Department	ICT
Building	Phase II Building, FOE
Room Number	2.17
Phone No.	403 7737
E-mail address	s.cheerkoot@uom.ac.mu
Contact Hours	2 L + 1 P
Consultation Time	On Appointment
Contact Address (for P/T)	

8. VENUE AND HOURS/WEEK

Lectures and tutorials/practicals will be delivered in blended mode. Please check your email for all communiqués concerning any updates regarding the module. Hours/week: 3 hours direct contact through lectures and tutorials/practicals for ten weeks per semester. More details in Section 9 Module Map.

9. MODULE MAP

Week	Topics	DC	SS	OA
START OF SEMESTER ONE				
1	Database System Concepts	3	6	6
2	Relational Data Model	3	6	6
3	SQL : Data Definition Language	3	6	6
4	SQL : Data Manipulation Language	3	6	6
5	SQL : Data Manipulation Language	3	6	6
6	SQL : Data Manipulation Language SQL : Data Control Language	3	6	6
7	Data Modelling (ERD)	3	6	6
8	Relational Databases (Converting ERD to Relational DB)	3	6	6
	Practical Test	0	0	10
9	Database Design : Functional Dependencies	3	6	6
10	Database Design : Normalisation	3	6	6
	Class Test	0	0	5
	Revision and Feedback	0	0	15
	Total	**30**	**60**	**90**
END OF SEMESTER ONE				

Week	Topic	DC	SS	OA
START OF SEMESTER TWO				
1	Programming database systems: Procedural Programming	3	6	6
2	Programming database systems: Functions and procedures	3	6	6
3	Programming database systems: Cursors and triggers	3	6	6

4	Efficient searching mechanisms: Single Level Indexing	3	6	6
5	Efficient searching mechanisms: Multi Level Indexing	3	6	6
6	Transaction Processing	3	6	6
7	Concurrency Control	3	6	6
	Class Test	0	0	5
8	NoSQL : Introduction	3	6	6
	Finalize work on Database Assignment **Assignment Demonstration**	0	0	10
9	NoSQL : CRUD operations	3	6	6
10	NoSQL: Querying	3	6	6
	Revision and Feedback	0	0	15
	Total	30	60	90
END OF SEMESTER TWO				

Abbreviations: ***DC****: Direct Contact;* ***SS****: Self Study;* ***OA****: Other Learning Activities*

DC *includes* ***L****: Lectures,* ***P****: Practicals,* ***T****: Tutorials;*

10. RECOMMENDED BOOKS/JOURNALS/WEBSITES

- Elmasri, R. and Navathe, S. B. (2010) Fundamental of Database Systems, 6th edition, Pearson.
- Connolly, T. and Begg, C. (2014) Database Systems – A practical approach to design, implementation, and management, 6th edition, Addison-Wesley.
- Mullins, C. S. (2003) Database Administration: The Complete Guide to Practices and Procedures, 2nd edition.
- Dan Sullivan. NoSQL for Mere Mortals. Addison-Wesley Professional. 2015. ISBN: 0134023218 (DS)
- Guy Harrison. Next-Generation Databases. Apress. 2016. ISBN: 9781484213292 (GH)

11. TEST(S)/ASSIGNMENT(S)/PRACTICAL(S)

Subject to change. As per university communique.

Semester	Title	%
1	Class Test 1	10
	Practical Test	10
2	Class Test 2	10
	Assignment	10

12. ASSESSMENT

Subject to change. As per university communique.

(i) Written Examination

Paper Structure	
Sections (if any): None	No. of questions to be answered: 4
Multiple Choice Questions: 0	Compulsory Questions (if any): 4
Exams date: As per UoM calendar	Paper Duration: 3 hours
Weighting (%): 60	
Total Marks: 100	Pass Mark: 40

(ii) Continuous Assessment

	Weighting (%)
Assignment(s): 1	10.00%
Practical(s):1	10.00%
Test(s): 2	20.00%
Total Marks:	40.00%

13. OFFICE HOURS

Email to arrange a meeting.

14. PORTFOLIO REQUIREMENT

All students should keep a portfolio of all coursework for their respective Programme of studies and same should be made available upon request, to the Faculty/Centre Examination Office.

15. OTHER INFORMATION

None.

16. APPROVAL BY HEAD OF DEPARTMENT

Module Catalogue approved at Departmental Meeting on	
Head of Department **Name and Signature**	

A copy of the approved Module Catalogue has to be submitted to the relevant Dean of Faculty for records purposes.