



**INFORMATION SYSTEMS 1B**  
**INSY6112**  
**MODULE OUTLINE 2025**  
**(First Edition: 2025)**

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# Introduction

Data is not just a digital entity; it's a part of our daily lives. Every time we take a photo, make a purchase, or even play a game online, we're generating data. This ubiquity of data connects us all, shaping our digital experiences and interactions.

Data is the raw facts that are recorded, such as a customer's purchase. That data can be processed into a format called information, which can be used for decision-making. (Coronel et al., 2013) An online retailer can use statistical modelling to find out which products are most popular, for example. That could inform decisions around which products to market most aggressively.

Have you ever wondered how all this data is stored? Or how can we process it to create relevant information for businesses, governments, and individuals? And most importantly, how can we keep our data safe? These are the questions we'll be exploring in this module.

In this module, we will delve into the world of data management and databases. By the end, you will have a solid understanding of how relational databases work and when it is most appropriate to use NoSQL databases.

## Using this Module Outline

This module outline has been developed to **support your learning**. Please note that the content of this module is on ARC as well as in the prescribed material. You will not succeed in this module if you focus on this document alone.

- This document does not reflect all the content on ARC , the links to different resources, nor the specific instructions for the group and individual activities.
- Your lecturer will decide when activities are available/open for submission and when these submissions or contributions are due. Ensure that you take note of announcements made during lectures and/or posted within ARC in this regard.

## This Module on ARC

ARC is an online space, designed to support and maximise your learning in an active manner. Its main purpose is to **guide and pace** you through the module. In addition to the information provided in this document, you will find the following when you access ARC:

- A list of prescribed material;
- A variety of additional online resources (articles, videos, audio, interactive graphics, etc.) in each learning unit that will further help to explain theoretical concepts;
- Critical questions to guide you through the module's objectives;
- Collaborative and individual activities (all of which are gradable) with time-on-task estimates to assist you in managing your time around these;
- Revision questions, or references to revision questions, after each learning unit.

### Kindly note:

- Unless you are completing this as a distance module, ARC does **not** replace your contact time with your lecturers and/or tutors.
- INSY6112 is an ARC module, and as such, you are required to engage extensively with the content on the ARC platform. Effective use of this tool will provide you with opportunities to discuss, debate, and consolidate your understanding of the content presented in this module.
- You are expected to work through the learning units on ARC in your own time – especially before class. Any contact sessions will therefore be used to raise and address any questions or interesting points with your lecturer, and **not** to cover every aspect of this module.
- Your lecturer will communicate **submission dates** for specific activities in class and/or on ARC.

### REMEMBER:

You need to log onto ARC to:

- Access online resources such as articles, interactive graphics, explanations, video clips, etc. which will assist you in mastering the content; and
- View instructions and submit or post your contributions to individual or group activities which are managed and tracked on ARC.

Module Resources	
Prescribed Material (PM) for this Module	IIE Module Manual. 2025.
Recommended Readings, Digital, and Web Resources	<p>Watt, A. and N. Eng. 2014. <i>Database Design</i>. 2<sup>nd</sup> Edition. Victoria, B.C. Available at:  <a href="https://open.bccampus.ca/browse-our-collection/find-open-textbooks/?uuid=5b6f010a-0563-44d4-94c5-67caa515d2c5">https://open.bccampus.ca/browse-our-collection/find-open-textbooks/?uuid=5b6f010a-0563-44d4-94c5-67caa515d2c5</a> [Accessed 22 October 2020].</p> <p>Coronel, C., Morris, S., Crockett, K. and Rob, P. 2013. <i>Database Principles: Fundamentals of Design, Implementation and Management</i>. 2nd edition. Cengage Learning EMEA.</p>
Software required	<p>MySQL 8.0.16</p> <p>Microsoft SQL Server</p> <p>Microsoft Visio</p> <p>MongoDB</p> <p>Visual Studio 2022</p>
Software Licence requirements	<p>MySQL and MongoDB are Open Source</p> <p>Visual Studio 2022 has a free Community Edition</p>
System Requirements	None
Lab minimum requirements	Standard lab computers
Lab configuration settings	See installation instructions for the required software.
Module Overview	You will find an overview of this module on ARC under the <i>Module Information</i> link in the Course Menu.
Assessments	Find more information on this module's assessments in this document and on the Student Portal.

**Module Purpose**

The purpose of this module is to provide students with the knowledge and applied skills necessary for the design, implementation and management of database systems.

**Module Outcomes**

MO1	Identify a relational database and a non-relational database to be applied to a specific business problem.
MO2	Design a relational database from a business problem through to Third Normal Form (3NF).
MO3	Implement a relational database design using a relevant relational database management system (RDBMS).
MO4	Demonstrate applied knowledge and understanding of various statements using the selected database technology to write database queries.
MO5	Implement a non-relational database using a relevant NoSQL database management system.

## Assessments

Integrated Curriculum Engagement (ICE)	
Minimum number of ICE activities to complete	4
Weighting towards the final module mark	10%

Formatives	Practical Assignment 1	Practical Test 1
Weighting	30%	25%
Duration	Approximately 10 hours	1 hours
Learning Units covered	LU1 to 2 (Theme 1)	LU1 to 3
Period	1	4
Resources required	Additional research required	Module Manual Access to the internet
Style	N/A	Practical: Open book

Summative	Examination (Written Unseen Exam)
Weighting	35%
Duration	2 hours
Style	Practical: Open book
Resources required	Module Manual Access to the internet
Learning Units covered	All



Assessment Preparation Guidelines	
Format of the Assessment	Preparation Hints
Assignment	
The assignment will assess your ability to apply the content in Learning Unit 1 and 2 (up to Theme 1).	<ul style="list-style-type: none"> <li>• Read through the prescribed chapters and content for Learning Units 1 and 2 (up to Theme 1).</li> <li>• Ensure your assignment is proofread and polished for style, language, and syntax.</li> <li>• Improve the quality of your assignment by using the provided rubric.</li> </ul>
Test	
The test for this module will assess your understanding of Learning Units 1 to 3 of this module and will include a series of short and medium-length questions and one longer question. You will be expected to apply and recall information per your objectives for these learning units.	<ul style="list-style-type: none"> <li>• This test will be an open book.</li> <li>• Ensure you work through all the relevant activities, exercises and revision questions on ARC in your Module Manual.</li> <li>• Brainstorm possible questions based on the learning outcomes and objectives provided. Then complete these as practise tests.</li> <li>• During both, your preparation for the test and during the test itself, pay attention to the instruction words (like list, apply, describe, etc.) and to the mark allocations of each question to ensure that you can provide the correct depth and detail in your answers.</li> <li>• Ensure you have mastered the objectives in Learning Units 1 to 3.</li> </ul>

Examination	
The examination will assess all learning units in this module and include theory and application-type questions.	<ul style="list-style-type: none"><li>• The examination will be an open book.</li><li>• Make sure that you practise answering the sample questions in the brief to become familiar with the questions likely to appear in the examination itself.</li><li>• Ensure you work through all the activities, exercises and revision questions on ARC in your Module Manual. You must have completed close readings of your prescribed material to ensure that you have prepared adequately for your examination for this module.</li><li>• Pay close attention to the instruction words (like list, apply, describe, analyse, etc.) and to the mark allocations of each question to ensure that you provide the correct depth and detail in your answers.</li><li>• Make sure that you are comfortable in responding to all the objectives for all learning units.</li><li>• Brainstorm possible questions based on the learning outcomes and objectives provided.</li></ul>

Module Pacer			
Code	Programme	Contact Sessions	Credits
INSY6112	BCA1	48 contact	15
INSY6112w	BCA1w	12	
Learning Unit 1	Introduction to Database Concepts		
<p>Overview:</p> <p>In this learning unit we will explore the different technological options for managing data. We will see how a database management system can be classified and which types of databases are currently used for storing and managing data in enterprises. We will also explore the concept of Big Data.</p> <p>Please work through Themes 1 and 2 on ARC, together with the relevant sections of your prescribed source/s.</p>			

Learning Unit 1: Theme Breakdown		
INSY6112 Sessions 1–4	Theme 1: Introduction to Databases	Prescribed Material (PM)
Academic Week: 1	LO1: Explain what a database management system is.	PM: Learning Unit 1
Related Outcomes: MO1	LO2: Identify the different ways of categorising database management systems.	
	LO3: Identify the levels of data abstraction.	
	Theme 2: Types of Databases	
	LO4: Identify the different types of databases.	
	LO5: Choose the appropriate type of database to use for a business problem.	
	LO6: Explain the concept of Big Data.	

Learning Unit 2	Designing Relational Databases
<p><b>Overview:</b></p> <p>In this learning unit we will design a relational database from business rules through to creating a data dictionary. We will learn how to draw entity relationship diagrams (ERDs) using Unified Modelling Language (UML) and how to normalise to third normal form.</p> <p>Please work through Themes 1, 2, 3 and 4 on ARC, together with the relevant sections of your prescribed source/s.</p> <p>The challenge you may experience in this learning unit relates to finding information about modelling database using Unified Modelling Language.</p>	

Learning Unit 2: Theme Breakdown		
INSY6112 Sessions 5–18	Theme 1: Entity Relationship Diagrams	Prescribed Material (PM)
Academic Week: 2-3	LO1: Interpret an entity relationship diagram. LO2: Create entity relationship diagrams using Unified Modelling Language notation. LO3: Review and revise an entity relationship diagram. LO4: Distinguish between primary and foreign keys.	PM: Learning Unit 2
Related Outcomes: MO2	<b>Theme 2: Normalisation</b>	
	LO5: Identify the benefits of normalisation.	
	LO6: Normalise data to first normal form.	
	LO7: Normalise data to second normal form.	
	LO8: Normalise data to third normal form.	
	<b>Theme 3: Data Dictionaries</b>	
	LO9: Explain what a data dictionary is.	
	LO10: Create a data dictionary.	
	<b>Theme 4: Data Security</b>	
	LO11: Identify data that requires additional security.	

Learning Unit 3	Creating a Relational Database
<p><b>Overview:</b></p> <p>In this learning unit, we will learn how to create a database with tables using Structured Query Language (SQL). We will also see how to insert data into those tables, how to update data and how to delete data.</p> <p>Please work through Themes 1, 2, 3 and 4 on ARC, together with the relevant sections of your prescribed source/s.</p> <p>The challenge you may experience in this learning unit relates to finding information that is specifically about the MySQL dialect of SQL.</p>	

Learning Unit 3: Theme Breakdown		
INSY6112 Sessions 19–24	Theme 1: Introduction to SQL	Prescribed Material (PM)
Academic Week: 4-5	LO1: Explain the difference between SQL and programming languages.	PM: Learning Unit 3
Related Outcomes: MO3 MO4	<b>Theme 2: Creating a Single Table</b>	
	LO2: Create schemas.	
	LO3: Create tables.	
	<b>Theme 3: Creating Related Tables</b>	
	LO4: Create tables with constraints.	
	<b>Theme 4: Inserting, Updating and Deleting Data</b>	
	LO5: Use SQL to insert data into a database. LO6: Use SQL to update data. LO7: Use SQL to delete data. LO8: Explain the purpose of transactions.	

Learning Unit 4	Querying Data
<p><b>Overview:</b></p> <p>In this learning unit we will learn how to access data that is stored in a relational database using Structured Query Language (SQL). We will look at getting results that are just rows in the tables, and how to get calculated results that combine multiple rows into fewer aggregate rows. We will also see how to join related tables to get data from multiple tables in the same result set.</p> <p>Please work through Themes 1, 2, 3 and 4 on ARC, together with the relevant sections of your prescribed source/s.</p> <p>The challenge you may experience in this learning unit relates to finding information that is specifically about the MySQL dialect of SQL.</p>	

Learning Unit 4: Theme Breakdown		
INSY6112 Sessions 25-32	Theme 1: Basic Queries	Prescribed Material (PM)
<b>Academic Week: 6-7</b>	LO1: Create queries to retrieve data from a database. LO2: Explain how to order the results returned by a query.	PM: Learning Unit 4
Related Outcomes: MO3 MO4	<b>Theme 2: Joining Tables</b>	
	LO3: Create queries that retrieve data from multiple tables.	
	<b>Theme 3: Aggregate Functions</b>	
	LO4: Create queries that calculate aggregate values.	
	<b>Theme 4: Grouping Records</b>	
	LO5: Use grouping to calculate aggregate values on groups of records.	

Learning Unit 5	Indexes, Views, Temporary Tables and Stored Procedures
<p><b>Overview:</b></p> <p>In this learning unit we will learn how to use indexes to improve performance. We will create views to easily access data. And we will create stored procedures that can be reused. Finally, we will look at how temporary tables can be used.</p> <p>Please work through Themes 1, 2, 3 and 4 on ARC, together with the relevant sections of your prescribed source/s.</p> <p>The challenge you may experience in this learning unit relates to finding information that is specifically about the MySQL dialect of SQL.</p>	

Learning Unit 5: Theme Breakdown		
INSY6112 Sessions 33–40	Theme 1: Indexes	Prescribed Material (PM)
<b>Academic Week:</b> 8-10	LO1: Explain the purpose of an index. LO2: Create an index using SQL.	PM: Learning Unit 5
Related Outcomes: MO3 MO4	<b>Theme 2: Views</b>	
	LO3: Explain the purpose of a view. LO4: Create a view using SQL.	
	<b>Theme 3: Stored Procedures</b>	
	LO5: Explain the purpose of a stored procedure. LO6: Create a stored procedure using SQL.	
	<b>Theme 4: Temporary Tables</b>	
	LO7: Explain the purpose of a temporary table. LO8: Identify the types of temporary tables. LO9: Use temporary tables in queries.	



Learning Unit 6	NoSQL Databases
<p><b>Overview:</b></p> <p>In this learning unit we will make use of a NoSQL database to write and read data. And then we will make use of a NoSQL database to write and read data.</p> <p>Please work through Themes 1 and 2 on ARC, together with the relevant sections of your prescribed source/s.</p> <p>The challenge you may experience in this learning unit relates to understanding how a NoSQL database stores data.</p>	

Learning Unit 6: Theme Breakdown		
INSY6112 Sessions 41–48	Theme 1: JSON Documents	Prescribed Material (PM)
<b>Academic Week:</b> 11-12	LO1: Interpret JSON data. LO2: Explain the benefits of using JSON.	PM: Learning Unit 6
Related Outcomes: MO5	<b>Theme 2: Writing and Reading Data</b>	
	LO3: Explain how to use MongoDB. LO4: Write data to a NoSQL database. LO5: Read data from a NoSQL database.	

## Glossary of Key Terms for this Module

Term	Definition	My Notes
Big Data	“High-volume, high-velocity and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision making, and process automation.” (Gartner, Inc., n.d.)	
Business Rule	“A brief, precise and unambiguous description of a policy, procedure or principle within a specific organisation.” (Coronel, et al., 2013)	
Cardinality	“The maximum number of times an instance in one entity can relate to instances of another entity.” (Lucid Software Inc., 2020)	
Data Abstraction	“The reduction of a particular body of data to a simplified representation of the whole.” (Rouse, 2014)	
Database	“An organised collection of structured information, or data, typically stored electronically in a computer system.” (Oracle, 2020)	
Data Dictionary	“A centralised repository that provides information about specific data such as meaning, relationships to other data, origin, usage, and format. A data dictionary stores metadata that defines and describes data so that it can be easily understood by anyone who would like to use it or analyse it at a later date.” (National Institutes of Health, n.d.)	
Data Lake	“Centralised repository that allows you to store all your structured and unstructured data at any scale.” (Amazon Web Services, Inc., 2020)	
Declarative Languages	“Also called nonprocedural or very high level, are programming languages in which (ideally) a program specifies what is to be done rather than how to do it.” (Encyclopædia Britannica, Inc., 2020)	
Entity	“A real-world object such as an employee or a project.” (Watt & Eng, 2014)	

Entity Integrity	<p>“Entity Integrity ensures that there are no duplicate records within the table and that the field that identifies each record within the table is unique and never null.</p> <p>“The existence of the Primary Key is the core of the entity integrity. If you define a primary key for each entity, they follow the entity integrity rule.” (databasedev.co.uk, 2015)</p>	
Entity Relationship Diagram	<p>“A graphical representation of an organisation's data storage requirements. Entity relationship diagrams are abstractions of the real world which simplify the problem to be solved while retaining its essential features.” (Kirs, 2003)</p>	
Foreign Key	<p>“An attribute in a table that references the primary key in another table OR it can be null. Both foreign and primary keys must be of the same data type.” (Watt &amp; Eng, 2014)</p>	
Functional Dependency	<p>“A relationship between two attributes, typically between the PK and other non-key attributes within a table.” (Watt &amp; Eng, 2014)</p>	
Index	<p>“An on-disk structure associated with a table or view that speeds retrieval of rows from the table or view. An index contains keys built from one or more columns in the table or view.” (Guyer, et al., 2019)</p>	
JavaScript Object Notation (JSON)	<p>“A lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate.” (json.org, n.d.)</p>	
Normalisation	<p>“The process of determining how much redundancy exists in a table.” (Watt &amp; Eng, 2014)</p>	
No-SQL Databases	<p>“High-performance, non-relational data stores. They excel in their ease-of-use, scalability, resilience, and availability characteristics. Instead of joining tables of normalised data, NoSQL stores unstructured or semi-structured data, often in key-value pairs or JSON documents.” (Vettor, et al., 2020)</p>	
Primary Key	<p>“The column (field) in a relational database that uniquely identifies the row in the table. For example, account number is often a primary key. A ‘composite primary key’ or ‘super key’ is made</p>	

	up of two or more columns such as account number + name.” (PCMag Digital Group, 2020)	
Referential Integrity	“Referential integrity requires that a foreign key must have a matching primary key or it must be null. This constraint is specified between two tables (parent and child); it maintains the correspondence between rows in these tables. It means the reference from a row in one table to another table must be valid.” (Watt & Eng, 2014)	
Relationship	“An association among entities; for example, an employee works on many projects. A relationship exists between the employee and each project.” (Watt & Eng, 2014)	
Transaction	“MySQL transaction allows you to execute a set of MySQL operations to ensure that the database never contains the result of partial operations.” (mysqлтutorial.org, n.d.)	
View	“A virtual table whose contents (columns and rows) are defined by a query.” (Milener, et al., 2020)	