School of Science, Computing and Engineering Technologies

Unit Outline

COS60009

Data Management for the Big Data Age

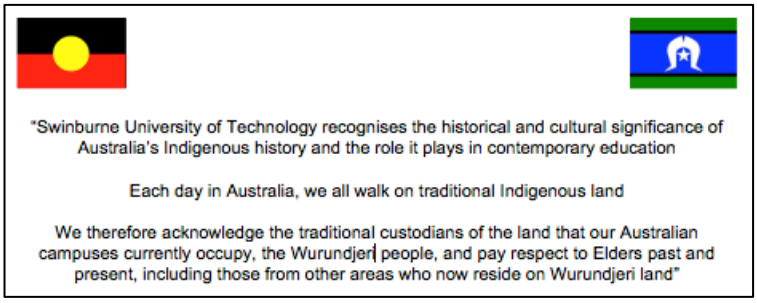
Semester 1 2024

Please read this Unit Outline carefully. It includes:

PART A Unit summary

PART B Your Unit in more detail

PART C Further information



PART A: Unit Summary

Unit Code(s)		COS60009
Unit Title		Data Management for the Big Data Age
Duration		One semester or equivalent
Total Contact Hours		36 hours
Requisites:		
	Pre-requisites	Nil
	Co-requisites	Nil
	Concurrent pre-requisites	COS60006 Introduction to Programming OR COS60010 Technology Enquiry Project
	Anti-requisites	Nil
	Assumed knowledge	Nil
Credit Points		12.5 credit points
Campus/Location		Hawthorn
Mode of Delivery		Live Online & Face to Face
Assessment Summary		Assignment 1 (Group) 15% Assignment 2 (Group) 15% Final Online Quiz Test (Individual) 50% Tutorial exercises (Individual) 20%

Aims

This unit is designed to deliver a variety of technologies and techniques used in managing different types of data in the big data age. Database technologies including data modelling and database design at conceptual level, logical level and physical level, query language and processing, transaction management will be introduced. Two types of database systems – SQL and NoSQL will be presented and their differences will be discussed.

Unit Learning Outcomes

Students who successfully complete this Unit should be able to:

1 Explain features of big data and the roles of different types of data

2 Critically review the concepts and principles of databases and database management systems including relational data model for handling structured data

3 Use SQL to create, query and manipulate databases

4 Design databases using ER modelling techniques and functional dependencies using normalization

5 Select technologies for data storage and physical database design, query processing and transaction management

6 Use XML and JSON to design, query and manipulate semi-structured data and explain unstructured/text data processing and information retrieval techniques

7 Evaluate different types of NoSQL databases, their differences from SQL databases and big data technologies on MapReduce and Hadoop

Graduate Attributes

The Swinburne Graduate Attributes describe the capability of our graduates to use knowledge, skills and behaviours to contribute to society meaningfully and positively. They include professional, self-directed learning and future-ready skills.

This unit contributes to the development of the following Swinburne Graduate Attributes:

- Communication skills
- Teamwork skills
- Digital literacies

Other graduate attributes may be practised in the unit but are not formally taught as part of the unit content, nor incorporated within formal assessment.

Content

- 3Vs features of Big data and different types of data: structured, semi-structured and unstructured data
- Introduction to all database concepts
- Relational data model
- Entity Relationship (ER) models for database design
- SQL and SQL Programming Techniques
- Functional dependencies and normalization for relational databases
- Physical database design and query processing
- Transaction management - concurrency control and recovery
- XML related technologies and JSON
- Different types of NoSQL databases and their differences from SQL databases
- Big data technologies on MapReduce and Hadoop
- Unstructured/text data processing and information retrieval

PART B: Your Unit in more detail

Unit Improvements

Feedback provided by previous students through the Student Survey has resulted in improvements that have been made to this unit. Recent improvements include:

- Improved lecture notes
- Improved tutorial exercises

Unit Teaching Staff

Name	Role	Room	Phone	Email	Consultation Times
Prof. Chengfei Liu	Unit Convenor / Lecturer / Tutor	EN511d	9214 5035	cliu@swin.edu.au	By email appointment
Mr. Yunfei Li	Tutor			yunfeili@swin.edu.au	By email appointment
Mr. Mohammad Abuhassan	Tutor			mabuhassan@swin.edu.au	By email appointment

Learning and Teaching Structure

Activity	Total Hours	Hours per Week	Teaching Period Weeks
Lectures	24 hours	2 hours	Weeks 1 to 12
Tutorials	12 hours	1 hour	Weeks 1 to 12

In a Semester, you should normally expect to spend, on average, twelve and a half hours of total time (formal contact time plus independent study time) a week on a 12.5 credit point unit of study.

Week by Week Schedule

Week	Week Beginning	Teaching and Learning Activity	Student Task or Assessment
1	Feb 26	Lecture: An Overview and Introduction to Databases Tutorial 1: An Overview and Introduction to Databases	Tutorial 1 group exercises
2	Mar 4	Lecture: Relational Data Model and Basic SQL Tutorial 2: Relational Data Model and Basic SQL	Tutorial 2 group exercises
3	Mar 11	Lecture: More SQL and SQL Programming Techniques Tutorial 3: More SQL and SQL Programming Techniques	Tutorial 3 group exercises Assignment 1 released
4	Mar 18	Lecture: Conceptual Database Design by ER Model and ER to Relational Mapping Tutorial 4: Conceptual Database Design by ER Model and ER to	Tutorial 4 group exercises

		Relational Mapping	
5	Mar 25	Lecture: Functional Dependencies and Normalization for Relational Databases Tutorial 5: Functional Dependencies and Normalization for Relational Databases	Tutorial 5 group exercises Individual tutorial exercise 1 released
		Easter break Thursday Mar 28 – Wednesday Apr 3	
6	Apr 8	Lecture: File Structures and Physical Database Design, Query Processing, and Transaction Management Tutorial 6: File Structures and Physical Database Design, Query Processing, and Transaction Management	Tutorial 6 group exercises Individual tutorial exercise 1 due on Wednesday
7	Apr 15	Lecture: XML and DTD Tutorial 7: XML and DTD	Tutorial 7 group exercises Assignment 1 due on Wednesday Assignment 2 released
8	Apr 22	Lecture: XPath and JSON Tutorial 8: XPath and JSON	Tutorial 8 group exercises
9	Apr 29	Lecture: NoSQL Databases and Big Data Technologies on MapReduce and Hadoop Tutorial 9: NoSQL Databases and Big Data Technologies on MapReduce and Hadoop	Tutorial 9 group exercises Individual tutorial exercise 2 released
10	May 6	Lecture: Document-based NoSQL System MongoDB Tutorial 10: Document-based NoSQL System MongoDB	Tutorial 10 group exercises Individual tutorial exercise 2 due on Wednesday
11	May 13	Lecture: Unstructured Data Processing and Information Retrieval Tutorial 11: Regular Expression and Information Retrieval	Tutorial 11 group exercises Assignment 2 due on Wednesday
12	May 20	Lecture: More on Text Processing, Unit Review and Final Assessment Matters	Sample Online Quiz Test (for all students)

Assessment

a) Assessment Overview

Tasks and Details	Individual or Group	Weighting	Unit Learning Outcomes that this assessment task relates to	Assessment Due Date
Individual Tutorial (Laboratory) Exercises	Individual	20% (2 individual tutorial exercises, 10% each, released	All	One week after each individual tutorial exercise is released, i.e., on tutorials of

		in week 5 and week 9)		week 6 and week 10, respectively
Assignment 1 (RDB design and SQL manipulation task)	Group	15%	3,4	End of week 7
Assignment 2 (Semi-structured database design and manipulation task)	Group	15%	6,7	End of week 11
Final Online Quiz Test	Individual	50%	All	Formal Exam Period

b) Minimum requirements to pass this Unit

To pass this unit, you must:

- achieve an overall mark for the unit of 50% or more

c) Final Assessment Period

If the unit you are enrolled in has a final assessment (including invigilated exams), you will be expected to be available for the entire final assessment period including any Special Exam period.

This unit has a final online quiz test in the examination period. It is open book online test on Canvas. The detailed information regarding the final online quiz test will be given before the examination period.

d) Submission Requirements

Assignments and other assessments are generally submitted online through the Canvas assessment submission system which integrates with the Turnitin plagiarism checking service.

Please ensure you keep a copy of all assessments that are submitted.

In cases where a hard copy submission is required an Assessment Cover Sheet must be submitted with your assignment. The standard Assessment Cover Sheet is available from the Submitting work webpage or www.swinburne.edu.au/studentforms/

Detailed submission instructions will be stated in the assessment specifications.

e) Extensions and Late Submission

Extensions for ongoing assessments are available for medical reasons (Doctors certificate must be provided). Students must apply for an extension by emailing the Unit of Study convenor at least 24 hours prior to the due date and also must supply any supporting documentation if requested.

Late Submissions - Unless an extension has been approved, late submissions will result in a penalty. You will be penalised 10% of your achieved mark for each working day the task is late, up to a maximum of 5 working days. After 5 working days, a zero result will be recorded.

f) Referencing

To avoid breaching academic integrity, you are required to provide references whenever you include information from other sources in your work and acknowledge when you have used Artificial Intelligence (AI) tools (such as ChatGPT).

Further details regarding academic integrity are available in Section C of this document.

Referencing conventions required for this unit are: Institute of Electrical & Electronics Engineers (IEEE) Style Guide.

Helpful information on referencing can be found at
http://www.swinburne.edu.au/library/referencing/

g) Groupwork Guidelines

A group assignment is the collective responsibility of the entire group, and if one member is temporarily unable to contribute, the group should be able to reallocate responsibilities to keep to schedule. In the event of longer-term illness or other serious problems involving a member of group, it is the responsibility of the other members to notify immediately the Unit Convenor or relevant tutor.

Group submissions must be submitted with an Assignment Cover Sheet, signed by all members of the group.

All group members must be satisfied that the work has been correctly submitted. Any penalties for late submission will generally apply to all group members, not just the person who submitted.

Recommended Reading Materials

The Library has a large collection of resource materials, both texts and current journals. Listed below are some references that will provide valuable supplementary information to this unit. It is also recommended that you explore other sources to broaden your understanding.

There is no prescribed text for this subject.
Printed Resources:
- Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson, 2016.

On-line books / eBooks / hard copies:
- https://ebookcentral.proquest.com/lib/swin/detail.action?docID=5573709
- There are many other good books on-line, as eBooks, available through the Library. http://www.swinburne.edu.au/lib/
- Hard copies of the textbook are also reserved in the library.

On-line References:
- The MongoDB 4.0 Manual https://docs.mongodb.com/manual/
- MySQL https://www.w3schools.com/php/php_mysql_intro.asp
- XML https://www.w3schools.com/xml/
- JSON https://www.w3schools.com/js/js_json_intro.asp
- XML DTD https://www.w3schools.com/xml/xml_dtd.asp
- XML Schema https://www.w3schools.com/xml/xml_schema.asp
- XPath https://www.w3schools.com/xml/xml_xpath.asp
- XQuery https://www.w3schools.com/xml/xml_xquery.asp
- XSLT https://www.w3schools.com/xml/xml_xslt.asp
- XML DOM https://www.w3schools.com/xml/xml_dom.asp
- Regular Expression https://www.w3schools.com/jsref/jsref_regexp_charset_not.asp

PART C: FURTHER INFORMATION

For further information on any of these topics, refer to Swinburne's Current Students web page http://www.swinburne.edu.au/student/.

Student behaviour and wellbeing

All students are expected to: act with integrity, honesty and fairness; be inclusive, ethical and respectful of others; and appropriately use University resources, information, equipment and facilities. All students are expected to contribute to creating a work and study environment that is safe and free from bullying, violence, discrimination, sexual harassment, vilification and other forms of unacceptable behaviour.

The Student Charter describes what students can reasonably expect from Swinburne in order to enjoy a quality learning experience. The Charter also sets out what is expected of students with regards to your studies and the way you conduct yourself towards other people and property.

You are expected to familiarise yourself with University regulations and policies and are obliged to abide by these, including the Student Academic Misconduct Regulations, Student General Misconduct Regulations and the People, Culture and Integrity Policy. Any student found to be in breach of these may be subject to disciplinary processes.

Examples of expected behaviours are:

- conducting yourself in teaching areas in a manner that is professional and not disruptive to others
- following specific safety procedures in Swinburne laboratories, such as wearing appropriate footwear and safety equipment, not acting in a manner which is dangerous or disruptive (e.g. playing computer games), and not bringing in food or drink
- following emergency and evacuation procedures and following instructions given by staff/wardens in an emergency response

Canvas

You should regularly access the Swinburne learning management system, Canvas, which is available via the Current Students webpage or https://swinburne.instructure.com/ Canvas is updated regularly with important unit information and communications.

Communication

All communication will be via your Swinburne email address. If you access your email through a provider other than Swinburne, then it is your responsibility to ensure that your Swinburne email is redirected to your private email address.

Academic Integrity

Academic integrity is about taking responsibility for your learning and submitting work that is honestly your own. It means acknowledging the ideas, contributions and work of others; referencing your sources and acknowledging the use of artificial intelligence tools (such as ChatGPT, DALLE, Midjourney); contributing fairly to group work; and completing tasks, tests and exams without cheating. Artificial intelligence tools should only be used where approved by the Unit Convenor.

Swinburne University uses the Turnitin system, which helps to identify inadequate citations, poor paraphrasing and unoriginal work in assignments that are submitted via Canvas. Your Unit Convenor will provide further details.

Plagiarising, cheating and seeking an unfair advantage in a test, exam or assessment task are all breaches of academic integrity and treated as academic misconduct. Examples of breaches of academic integrity include:

- using the whole or part of computer program written by another person as your own without appropriate acknowledgement
- copying the whole or part of somebody else's work in an assessment, including material from a published work, a website or database, a set of lecture notes, current or past student's work, or any other person's work
- using output from artificial intelligence tools (e.g. ChatGPT) in whole or part without acknowledgement and/or without the approval of the Unit Convenor
- poorly paraphrasing somebody else's work
- using a musical composition or audio, visual, graphic and photographic work created by another without acknowledgment
- using objects, artefacts, costumes or models created by another person and presenting them as your own
- submitting assessments that have been developed by another person or service (paid or unpaid), referred to as contract cheating
- presenting or submitting assignments or other work in conjunction with another person or group of people when that work should be your own independent work.
- enabling others to cheat, including letting another student copy your work or by giving access to a draft or completed assignment.

The penalties for academic misconduct can be severe, ranging from a zero grade for an assessment task through to exclusion from Swinburne.

For further details, see https://www.swinburne.edu.au/student-login/academic-integrity/

Student support

Swinburne offers a range of services and resources to help you complete your studies successfully. Your Unit Convenor or studentHQ can provide information about the study support and other services available for Swinburne students. See https://www.swinburne.edu.au/life-at-swinburne/student-support-services/ for further information.

Special consideration

If your studies have been adversely affected due to serious and unavoidable circumstances outside of your control (e.g. severe illness or unavoidable obligation), you may be able to apply for special consideration (SPC).

Applications for Special Consideration are submitted via the SPC online tool normally no later than 5.00pm on the third working day after the submission/sitting date for the relevant assessment component. See https://www.swinburne.edu.au/life-at-swinburne/student-support-services/special-consideration-assistance/

Accessibility needs

Sometimes students with a disability, a mental health or medical condition or significant carer responsibilities require reasonable adjustments to fully access and participate in education. Swinburne's AccessAbility Services can develop an 'Education Access Plan' that includes the services and reasonable adjustments that you need. The plan makes recommendations to University teaching and examination staff.

It is recommended that you register with AccessAbility Services within one week after the commencement of your unit to allow the University to make reasonable adjustments.

Review of marks

An independent marker reviews all fail grades for major assessment tasks. In addition, a review of assessment is undertaken if your final result is between 45 and 49 or within 2 marks of any grade threshold.

You can ask the Unit Convenor to check the result for an assessment item or your final result. Your request must be made in writing within 10 working days of receiving the result. The Unit Convenor can discuss the marking criteria with you and check the aggregate marks of assessment components to identify if an error has been made. This is known as local resolution.

If you are dissatisfied with the outcome of the local resolution, you can lodge a formal complaint.

Feedback, complaints and suggestions

In the first instance, discuss any issues with your Unit Convenor. If your concerns are not resolved or you would prefer not to deal with your Unit Convenor, then you can complete a feedback form.

See https://www.swinburne.edu.au/corporate/feedback/

Advocacy

If you require assistance with any academic issues, University statutes, regulations, policies and procedures, you are advised to seek advice from an Independent Advocacy Officer at Swinburne Student Life. Talking to an Advocacy Officer is free, independent and confidential.

For more information and booking an appointment, please see https://www.swinburne.edu.au/current-students/student-services-support/advocacy/