# Unit Outline

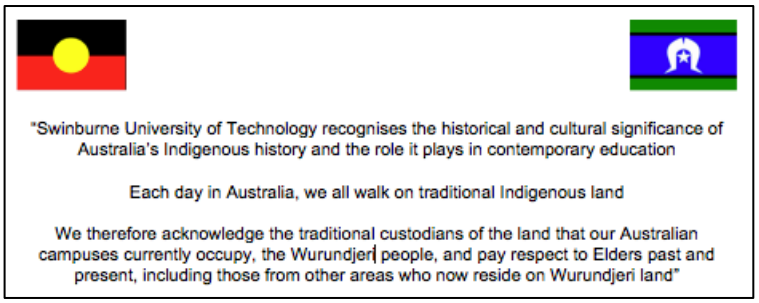
## COS20015

## Fundamentals of Data Management

Semester 2 2021

**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)** | | COS20015 |
| **Unit Title** | | Fundamentals of Data Management |
| **Duration** | | One Semester or equivalent |
| **Total *Scheduled Contact Hours** | | 24 hours<br>☐ Face to Face ☑ Blended ☐ Fully Online |
| **Delivery Locations** | | ☑ On-campus ☐ Sarawak ☐ OUA ☐ SOL<br>☐ Other |
| **Requisites:** | | |
| | **Pre-requisites** | COS10009 Introduction to Programming |
| | **Co-requisites** | none |
| | **Concurrent pre-requisites** | none |
| | **Anti-requisites** | none |
| | **Assumed knowledge** | none |
| **Credit Points** | | 12.5 |
| **Campus/Location** | | Hawthorn |
| **Mode of Delivery** | | Blended |
| **Assessment Summary** | | Portfolio 100% |

## Aims

This unit introduces students to a range of skills, techniques, technologies and fundamental computer science concepts related to managing data within software systems. Students will learn how to organise data, efficiently search and sort information, as well as apply techniques to optimise these operations. Data management is a critical component in most software systems – knowledge and skills gained in this unit can be applied to a range of different solution domains from enterprise systems to smaller desktop and mobile applications.

## Unit Learning Outcomes

Students who successfully complete this Unit should be able to:

1. Appreciate set theory, ternary logic, and algorithmic complexity in the context of data management
2. Use techniques, tools and methods to sort, search and transform data stored in a variety of data formats
3. Explain the role of data types, data representation, indexing and schemas in managing data, and use methods to validate that data matches an expected schema
4. Use appropriate methods to efficiently store, insert and retrieve data appreciating the underlying tradeoffs between different strategies
5. Appreciate issues related to concurrency in data management and describe basic strategies for addressing these issues

## Key Generic Skills

You will be provided with feedback on your progress in attaining the following generic skills:

- Communications skills
- Ability to work independently

### Content

- Set theory and relational algebra
- Data types, schema and validation
- Ternary logic and dealing with null values
- Tabular representation (Text, CSV)
- Hierarchical representation (XML and JSON)
- Relational representation and basics of normalisation
- Searching, sorting and algorithmic complexity
- Text processing tools and techniques
- Importing, exporting and transforming data
- Indexing, B+ -Trees, algorithms and tradeoffs
- Querying with regular expressions, SQL and tree-matching expressions
- Transactions and concurrent data access

## 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:

- Tasks on Doubtfire have been consolidated to combine small tasks into larger ones.
- Tasks have been adjusted to introduce relational modelling in smaller, more concise steps.
- Some videos have been re-recorded to clarify topics, particularly relational modelling.

### Unit Teaching Staff

| Name | Role | Room | Phone | Email | Consultation Tim |
|---|---|---|---|---|---|
| Irene Moser | Convenor | EN504 | 4745 | imoser@swin.edu.au | by appointment |
| Eureka Priyadarshani | Tutor | - | | wpriyadarshani@swin.edu.au | by appointment |
| Gamunu Dassanayake | Tutor | - | | gdassanayake@swin.edu.au | by appointment |
| Hamid Bagha | Tutor | - | | hbagha@swin.edu.au | by appointment |
| Dinithi Bamunuarachchi | Tutor | - | | mbamunuarachchi@swin.edu.a | by appointment |
| Hardik Mandani | Tutor | - | | hmandani@swin.edu.au | by appointment |
| Harindu Korala | Tutor | - | | hkorala@swin.edu.au | by appointment |
| Afzal Chowdhary | Tutor | - | | achowdhary@swin.edu.au | by appointment |

### Learning and Teaching Structure

| Activity | Total Hours | Hours per Week | Teaching Period Weeks |
|---|---|---|---|
| Tutorials | 24 hours | 2 hours | Weeks 1 to 12 |
| Online learning | 24 hours | 2 hours | Weeks 1 to 12 |

## Week by Week Schedule

| Week | Week Beginning | Teaching and Learning Activity | Student Task or Assessment |
|---|---|---|---|
| 1 | 2 August | Online module and quiz:<br>- Types of data storage, hierarchical storage, unstructured data processing, regular expressions | Tutorial 1: Text Processing, regular expressions, command line tools |
| 2 | 9 August | Online module and quiz:<br>– Semi-structured data modelling and queries | Tutorial 2: XML and Jason, modelling and queries;<br>Week 1 tasks due. |
| 3 | 16 August | Online module and quiz:<br>– ER modelling, UML diagrams, Attribute types, primary keys, relationship types | Tutorial 3: Creating an ER model;<br>Week 2 tasks due. |
| 4 | 23 August | Online module and quiz:<br>– Normalisation, functional dependencies | Tutorial 4: Normalising model to third normal form;<br>Week 3 tasks due. |
| 5 | 30 August | Online module and quiz:<br>- SQL DDL, data types and constraints | Tutorial 5 SQL DDL, data types, constraints;<br>Week 4 tasks due. |
| 6 | 6 September | No new topic | Tutorial 6: no new topic, catch up on missing tasks;<br>Week 5 tasks due. |
| | 13 September | Mid-semester break | |
| 7 | 20 September | Online module and quiz:<br>- SQL DML: Queries, joins, views and ternary logic | Tutorial 7: SQL Queries, joins and ternary logic<br>No new tasks due. Complete missing tasks. |
| 8 | 27 September | Online module and quiz:<br>- SQL DML: Updates | Tutorial 8: SQL Write operations<br>Week 7 tasks due. |
| 9 | 4 October | Online module and quiz:<br>- Transactions and concurrent data access, anomalies, isolation levels | Tutorial 9: Planning transactions, avoiding inconsistencies using isolation levels;<br>Week 8 tasks due. |
| 10 | 11 October | Online module and quiz:<br>- Performance and complexity, bind variables, indexes (including B+ tree), joins, denormalisation | Tutorial 10: Query plans, creating indexes, bind variables;<br>Week 9 tasks due.<br>Test sit 1, date and time TBC |
| 11 | 18 October | Online module and quiz:<br>- NoSQL, aggregation-based DBMSs, modelling, querying, consistency, concurrency | Tutorial 11: Working with MongoDB;<br>Week 10 tasks due.<br>Test sit 2, date and time TBC |
| 12 | 25 October | No new topic. | No new topic – finish all outstanding work.<br>Week 11 tasks due. |

## Assessment

### a) Assessment Overview

| Tasks and Details | Individual or Group | Weighting | Unit Learning Outcomes that this assessment task relates to | Assessment Due Date |
|---|---|---|---|---|
| 1. Portfolio (for Pass and Credit) | Individual | 100% | All | Monday 1 November |
| 2. Portfolio and Interview (for Distinction and High Distinction) | Individual | 100% | All | Monday 8 November |
| 3. Semester Test | Individual | Pass / Fail | All | Sits in week 10 and 11.<br>Must be signed off by Fri 29 Oct |

### b) Minimum requirements to pass this Unit

In order to achieve a pass in this unit of study, you must:

- Pass the Semester Test or, if a Test is marked as Fix, have made the required corrections and had them checked and signed off on Doubtfire before the portfolio submission.
- Submit a passable Portfolio, see the Submission Requirements section for details.

### c) Examinations

This unit does not normally have an examination. A unit test is part of the pass requirements. A resit is offered to students who fail the test at the first sit.

A special exam is offered to students who are granted special considerations, unless it is possible to accommodate the special considerations during the semester.

### d) Submission Requirements

All tasks, including the test, and the portfolio are submitted to **Doubtfire on time**. The tasks and test have to be signed off on Doubtfire to count towards the portfolio.

### e) Extensions and Late Submission

Tasks will be signed off during the tutorial sessions in the week they are due. If a task is submitted later than a week after the tutorial it is due, this may affect the mark for the portfolio.

Late Submissions - Unless an extension has been approved, you cannot submit an assessment after the due date. If this does occur, you will be penalised 10% of the assessments worth for each calendar day the task is late up to a maximum of 5 days. After 5 days a zero result will be recorded.

### f) Referencing

To avoid plagiarism, you are required to provide a reference whenever you include information from other sources in your work. Further details regarding plagiarism are available in Section C of this document.

Referencing conventions required for this unit are: Harvard Style Referencing

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

### 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 immediately notify 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.

Connolly & Begg, Database Systems
Elmasri & Navathe Fundamentals of Database Systems
Sadalage & Fowler, NoSQL Distilled
Dayley, NoSQL with MongoDB in 24 hours

# PA PART C: FURTHER INFORMATION

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

## Student Charter

Please familiarise yourself with Swinburne's Student Charter. The charter describes what students can reasonably expect from Swinburne in order to enjoy a quality learning experience. As students contribute to their own learning experience to that of their fellow students, the charter also defines the University's expectations of students.

## Student behaviour and wellbeing

Swinburne has a range of policies and procedures that govern how students are expected to conduct themselves throughout the course of their relationship with the University. These include policies on expected standards of behaviour and conduct which cover interaction with fellow students, staff and the wider University community, in addition to following the health and safety requirements in the course of their studies and whilst using University facilities.

All students are expected to familiarise themselves with University regulations, policies and procedures and have an obligation to abide by the expected guidelines. Any student found to be in breach may be subject to relevant disciplinary processes. Some examples of relevant expected behaviours are:

- Not engaging in student misconduct
- Ensuring compliance with the University's Anti-Discrimination, Bullying and Violence and Sexual Harassment requirements
- Complying with all Swinburne occupational health and safety requirements, including following emergency and evacuation procedures and following instructions given by staff/wardens or emergency response.

In teaching areas, it is expected that students conduct themselves in a manner that is professional and not disruptive to others. In all Swinburne laboratories, there are specific safety procedures which must be followed, 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.

## Blackboard

You should regularly access the Swinburne Course Management System (Blackboard) available via http://ilearn.swin.edu.au. Blackboard is regularly updated 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.

## Plagiarism

Plagiarism is the action or practice of taking and submitting or presenting the thoughts, writings or other work of someone else as though it is your own work. Plagiarism includes any of the following, without full and appropriate acknowledgment to the original source(s):

- The use of the whole or part of a computer program written by another person;
- the use, in essays or other assessable work, of the whole or part of a written work from any source including but not limited to a book, journal, newspaper article, set of lecture notes, current or past student's work, any other person's work, a website or database;
- The paraphrasing of another's work;
- The use of musical composition, audio, visual, graphic and photographic models,

- The use of realia that is objects, artefacts, costumes, models and the like.

Plagiarism includes the submission of assessments that have been developed by another person or service through contract, tender or online writing services.

Plagiarism also includes the preparation or production and submission or presentation of assignments or other work in conjunction with another person or other people when that work should be your own independent work. This remains plagiarism whether or not it is with the knowledge or consent of the other person or people. It should be noted that Swinburne encourages its students to talk to staff, fellow students and other people who may be able to contribute to a student's academic work but that where independent assignment is required, submitted or presented work must be the student's own.

Plagiarism includes the submission of assessments that have been developed by another person or service through contract, tender or online writing services.

Enabling plagiarism contributes to plagiarism and therefore will be treated as a form of plagiarism by the University. Enabling plagiarism means allowing or otherwise assisting another student to copy or otherwise plagiarise work by, for example, allowing access to a draft or completed assignment or other work.

Swinburne University uses plagiarism detection software (such as Turnitin) for assignments submitted electronically via Blackboard. Your Convenor will provide further details.

The penalties for plagiarism can be severe ranging from a zero grade for an assessment task through to expulsion from the unit and in the extreme, exclusion from Swinburne. Consequently you need to avoid plagiarism by providing a reference whenever you include information from other sources in your work.

## Student support

You should talk to your Unit Convenor or Student Services, for information on academic support services available for Swinburne students.

## 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 will be 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.

## Special needs

Sometimes students with a disability, a mental health or medical condition or significant carer responsibilities require reasonable adjustments to enable full access to and participation in education. Your special needs can be addressed by Swinburne's Disability Services, who can negotiate and distribute an 'Education Access Plan' that outlines recommendations for university teaching and examination staff. You must notify the University Disability Liaison Officer of your disability or condition within one week after the commencement of a unit of study 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.

If you are not satisfied with the result of an assessment you can ask the Unit Convenor to review the result. Your request must be made in writing within 10 working days of receiving the result. The Unit Convenor will review your result to determine if your result is appropriate.

If you are dissatisfied with the outcomes of the review you can lodge a formal complaint.

## Feedback, complaints and suggestions

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

## Advocacy

You are advised to seek advice from the staff at the Swinburne Student Amenities Association (SSAA) if you require assistance with any academic issues.