



# COIT20256 *Data Structures and Algorithms*

## Term 2 - 2022

Profile information current as at 07/02/2023 10:30 pm

All details in this unit profile for COIT20256 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

## General Information

### Overview

In this unit, you will study advanced data structures and algorithms for software development using an object-oriented programming language. You will learn how to design and build classes, throw exceptions, and extend a class using inheritance and polymorphism. You will practise these concepts and develop applications with front-end Graphical User Interface (GUI) components and backend databases using database programming. You will build software applications using complex data structures and Application Programming Interfaces (APIs). You will gain an understanding of basic algorithms, and learn to evaluate algorithmic performance and assess the correct use of different data structures. You will be introduced to functional programming using Lambdas and Streams. You will obtain hands-on experience using all the concepts by completing programming exercises.

### Details

Career Level: *Postgraduate*

Unit Level: *Level 9*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

### Pre-requisites or Co-requisites

Pre-requisite: COIT20245 Introduction to Programming

Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the [Assessment Policy and Procedure \(Higher Education Coursework\)](#).

### Offerings For Term 2 - 2022

- Brisbane
- Melbourne
- Online
- Rockhampton
- Sydney

### Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

### Website

[This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.](#)

## Class and Assessment Overview

### Recommended Student Time Commitment

Each 6-credit Postgraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

### Class Timetable

#### [Regional Campuses](#)

Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

#### [Metropolitan Campuses](#)

Adelaide, Brisbane, Melbourne, Perth, Sydney

### Assessment Overview

#### 1. **Practical Assessment**

Weighting: 20%

#### 2. **Practical Assessment**

Weighting: 10%

#### 3. **Practical Assessment**

Weighting: 20%

#### 4. **Examination**

Weighting: 50%

### Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the [University's Grades and Results Policy](#) for more details of interim results and final grades.

## CQUniversity Policies

**All University policies are available on the [CQUniversity Policy site](#).**

You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the [CQUniversity Policy site](#).

## Previous Student Feedback

### Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

#### Feedback from Student evaluations and feedback

**Feedback**

Assessment: Students found the assignments challenging, but also engaging and relevant.

**Recommendation**

Continue to provide challenging and interesting assessment items.

#### Feedback from Student feedback

**Feedback**

Content: In some weeks there is too much material to cover in the lectures.

**Recommendation**

Review the weekly content to identify where content can be removed and/or important concepts highlighted.

#### Feedback from Student feedback

**Feedback**

Review textbook to identify if a single textbook is available that covers both the introductory topics in COIT20245 and the advanced topics in this unit.

**Recommendation**

Review textbook to identify if a single textbook is available that covers this unit and COIT20245.

#### Feedback from Feedback from the students and the teaching team

**Feedback**

Some students continue to find this unit challenging and would appreciate additional support.

**Recommendation**

Investigate options for providing additional support for students.

## Unit Learning Outcomes

### On successful completion of this unit, you will be able to:

1. Design classes which use inheritance, polymorphism, and exception handling
2. Develop multi-layered software solutions, focusing on data structures and algorithms
3. Integrate data sets using complex data structures such as linked lists, stacks, and queues
4. Evaluate performance of different algorithms in problem solving
5. Investigate socially innovative practices in software development
6. Create Lambda expressions and streams using functional programming.

Australian Computer Society (ACS) recognises the Skills Framework for the Information Age (SFIA). SFIA provides a consistent definition of ICT skills. SFIA is adopted by organisations, governments, and individuals in many countries and is increasingly used when developing job descriptions and role profiles.

ACS members can use the tool MySFIA to build a skills profile at <https://www.acs.org.au/professionalrecognition/mysfia-b2c.html>

This unit contributes to the following workplace skills as defined by SFIA 7. The SFIA code is included:

- Software Design (SWDN)
- System Integration and Build (SINT)
- Programming/Software Development (PROG)
- Data modelling and design (DTAN)
- Database Design (DBDS)
- Testing (TEST)
- User experience analysis (UNAN)
- User experience design (HCEV).

## Alignment of Learning Outcomes, Assessment and Graduate Attributes



### Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
1 - Practical Assessment - 20%	•	•			•	
2 - Practical Assessment - 10%				•		
3 - Practical Assessment - 20%	•	•	•		•	•
4 - Examination - 50%			•	•		•

### Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
1 - Knowledge	○	○	○	○		○

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
2 - Communication	○		○		○	
3 - Cognitive, technical and creative skills	○	○	○	○		○
4 - Research		○				
5 - Self-management		○				
6 - Ethical and Professional Responsibility						○
7 - Leadership						
8 - Aboriginal and Torres Strait Islander Cultures						

### Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes							
	1	2	3	4	5	6	7	8
1 - Practical Assessment - 20%	○	○	○		○			
2 - Practical Assessment - 10%	○	○	○					
3 - Practical Assessment - 20%	○	○	○	○	○	○		
4 - Examination - 50%	○	○	○					

## Textbooks and Resources

### Textbooks

COIT20256

#### Prescribed

#### Java How to Program, Late Objects, Global Edition

11th Edition (2019)

Authors: Paul Deitel and Harvey Deitel

Pearson Higher Ed US

Harlow , United Kingdom

ISBN: 978-1292273730

Binding: eBook

#### Additional Textbook Information

This book is available to read online through the Library website. If you would like your own copy, you can purchase either paper or eBook copies at the CQUni Bookshop here: <http://bookshop.cqu.edu.au> (search on the Unit code).

[View textbooks at the CQUniversity Bookshop](#)

### IT Resources

#### You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Java 17 (Open JDK) (download and installation instructions on the unit website)
- Apache NetBeans 12.6 (download and installation instructions on the unit website)
- SceneBuilder version18 (download and installation instructions on the unit website)
- JavaFX (will be downloaded by Maven)

## Referencing Style

#### All submissions for this unit must use the referencing styles below:

- [American Psychological Association 7th Edition \(APA 7th edition\)](#)
- [Harvard \(author-date\)](#)

For further information, see the Assessment Tasks.

## Teaching Contacts

**Jacqueline Jarvis** Unit Coordinator

[j.jarvis@cqu.edu.au](mailto:j.jarvis@cqu.edu.au)

## Schedule

### Week 1 - 11 Jul 2022

Module/Topic	Chapter	Events and Submissions/Topic
Classes and Objects: A Deeper Look	8	

### Week 2 - 18 Jul 2022

Module/Topic	Chapter	Events and Submissions/Topic
Inheritance	9	

**Week 3 - 25 Jul 2022**

Module/Topic	Chapter	Events and Submissions/Topic
Polymorphism and Interfaces	10	Assessment 2: Part 1 - due in week 3 tutorial class (Assessment item 2 commences - work to be developed and submitted in weekly tutorial classes from week 3 -12)

**Week 4 - 01 Aug 2022**

Module/Topic	Chapter	Events and Submissions/Topic
JavaFX GUI and Event-Driven Programming	12 and 13	<b>Assessment 2: Part 2</b> - due in week 4 tutorial class

**Week 5 - 08 Aug 2022**

Module/Topic	Chapter	Events and Submissions/Topic
Generic Collections: Lists, Sets, Maps, and Priority Queue	16	<b>Assessment 1 (Assignment) - phase 1 due Friday 11:55pm (AEST)</b> <b>Assessment 2: Part 3</b> - due in week 5 tutorial class

**Vacation Week - 15 Aug 2022**

Module/Topic	Chapter	Events and Submissions/Topic
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**Week 6 - 22 Aug 2022**

Module/Topic	Chapter	Events and Submissions/Topic
Generic classes and methods	20	<b>Assessment 2: Part 4</b> - due in week 6 tutorial class

**Week 7 - 29 Aug 2022**

Module/Topic	Chapter	Events and Submissions/Topic
Recursion	18	<b>Assessment 2: Part 5</b> - due in week 7 tutorial class  <b>Assessment 1 (Assignment) Due:</b> Week 7 Monday (29 Aug 2022) 11:55 pm AEST

**Week 8 - 05 Sep 2022**

Module/Topic	Chapter	Events and Submissions/Topic
Custom Generic Data Structures (Implementing Stacks, Queues, Binary Trees)	21	<b>Assessment 2: Part 6</b> - due in week 8 tutorial class <b>Assessment 3 (Assignment) - phase 1</b> due Friday 11:55pm (AEST) (submission of final phase (completed assignment) due Monday week 12)

**Week 9 - 12 Sep 2022**

Module/Topic	Chapter	Events and Submissions/Topic
Exception Handling, Files, Streams and Serialization	11 and 15	<b>Assessment 2: Part 7</b> - due in week 9 tutorial class

**Week 10 - 19 Sep 2022**

Module/Topic	Chapter	Events and Submissions/Topic
Lambdas and Aggregate Operations for Collection Streams	17	<b>Assessment 2: Part 8</b> - due in week 10 tutorial class

**Week 11 - 26 Sep 2022**

Module/Topic	Chapter	Events and Submissions/Topic
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Sorting and Algorithmic Efficiency 19

**Assessment 2: Part 9** - due in week 11 tutorial class

### Week 12 - 03 Oct 2022

Module/Topic	Chapter	Events and Submissions/Topic
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Graphs and applications;	online resources	
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**Assessment 2: Part 10** - due in week 12 tutorial class

**Assessment 3 (assignment)** Due: Week 12 Monday (3 Oct 2022) 11:55 pm AEST

### Review/Exam Week - 10 Oct 2022

Module/Topic	Chapter	Events and Submissions/Topic
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### Exam Week - 17 Oct 2022

Module/Topic	Chapter	Events and Submissions/Topic
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## Assessment Tasks

### 1 Assessment 1 (Assignment)

#### Assessment Type

Practical Assessment

#### Task Description

In this assignment you will demonstrate your ability to design, develop and test a software application applying the Object-Oriented programming concepts of classes, inheritance, and polymorphism. This assessment task applies the topics studied in Weeks 1 - 5. Further details are in the Assessment 1 specification document available on the Moodle unit website.

#### Assessment Due Date

Week 7 Monday (29 Aug 2022) 11:55 pm AEST

#### Return Date to Students

Week 9 Tuesday (13 Sept 2022)

Feedback on assignment will be returned to students within two weeks after submission date.

#### Weighting

20%

#### Assessment Criteria

1. Design and Implementation
2. Language Use
3. Documentation
4. Testing

#### Referencing Style

- [American Psychological Association 7th Edition \(APA 7th edition\)](#)
- [Harvard \(author-date\)](#)

#### Submission

Online

#### Submission Instructions

Submit the .zip file containing the NetBeans project and the report file (.doc).

#### Learning Outcomes Assessed

- Design classes which use inheritance, polymorphism, and exception handling
- Develop multi-layered software solutions, focusing on data structures and algorithms
- Investigate socially innovative practices in software development



## Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Self-management

## 2 Assessment 2 - Class/Tutorial Activities

### Assessment Type

Practical Assessment

### Task Description

This assessment item is to be developed and submitted as part of your weekly workshop/tutorial sessions. It consists of a series of 10 practical tutorials where the tutorial/lab work is to be developed and submitted in the tutorial class in weeks 3 - 12 (inclusive). For on campus students this work is **due in the weekly workshop, not** the due date shown in Moodle. The date given in Moodle is to cater for all scheduled workshop classes.

*No marks will be awarded for work submitted outside the workshop/tutorial class or for late submissions unless there are special circumstances (approved by the unit coordinator).* If you have special circumstances that prevent you from attending a specific class, please contact your tutor and unit coordinator as soon as you are aware of an issue.

### On-campus students

1. This assessment task must be developed and submitted in your weekly workshop **as and when you are directed to do so** by your tutor.
2. Marks may be deducted if your tutor is not satisfied with your progress or understanding of the work. Marks are not only awarded for the sample of work submitted during the class. Satisfactory participation in all workshop class activities is also required to be awarded marks for this assessment item.

### Online students

1. Submit the sample of your weekly work requested by your tutor by the due date shown on the unit website for the corresponding week. **Late submissions will be awarded 0 marks (unless you have been given approval for an alternative late submission due to special circumstances).**
2. The unit coordinator is your tutor and may make arrangements to discuss aspects of the weekly work with you before marks can be awarded.

### Assessment Due Date

This task commences with an "in-class" submission of work in week 3 and continues with "in-class" weekly submissions until the end of week 12. There is a total of 10 weekly submission. On-campus students must complete and submit the scheduled work in their weekly workshop.

### Return Date to Students

The marked submissions will be returned to you after a week from the date of submission.

### Weighting

10%

### Assessment Criteria

Practical questions in the weekly tutorial will be used to assess your understanding of the topics covered in that week. To be awarded marks, you are required to participate in all activities in the tutorial and submit the sample of work requested **when you are instructed to do so during the class**. Your tutor will monitor your progress in class. Each week is worth 1 mark.

### Referencing Style

- [American Psychological Association 7th Edition \(APA 7th edition\)](#)

- [Harvard \(author-date\)](#)

**Submission**

Online

**Submission Instructions**

Your tutor will give you more details about the submission requirements.

**Learning Outcomes Assessed**

- Evaluate performance of different algorithms in problem solving

**Graduate Attributes**

- Knowledge
- Communication
- Cognitive, technical and creative skills

## 3 Assessment 3 (assignment)

**Assessment Type**

Practical Assessment

**Task Description**

In this assignment, you are required to design, develop and test a software application that employs a Graphical User Interface (GUI). This assessment task requires you to apply topics studied in weeks 1-10. Further details are in the detailed assessment 3 specification available on the Moodle unit website.

**Assessment Due Date**

Week 12 Monday (3 Oct 2022) 11:55 pm AEST

**Return Date to Students**

Exam Week Tuesday (18 Oct 2022)

Feedback on assignment will be returned to students within two weeks after submission date.

**Weighting**

20%

**Assessment Criteria**

1. Design and Implementation
2. Language Use
3. Documentation
4. Testing

**Referencing Style**

- [American Psychological Association 7th Edition \(APA 7th edition\)](#)
- [Harvard \(author-date\)](#)

**Submission**

Online

**Submission Instructions**

Submit the .zip file containing the NetBeans project and the report file (.doc).

**Learning Outcomes Assessed**

- Design classes which use inheritance, polymorphism, and exception handling
- Develop multi-layered software solutions, focusing on data structures and algorithms
- Integrate data sets using complex data structures such as linked lists, stacks, and queues
- Investigate socially innovative practices in software development
- Create Lambda expressions and streams using functional programming.

**Graduate Attributes**

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Research
- Self-management

- Ethical and Professional Responsibility

## Examination

**Outline**

Complete an invigilated examination.

**Date**

During the examination period at a CQUniversity examination centre.

**Weighting**

50%

**Length**

180 minutes

**Exam Conditions**

Open Book.

**Materials**

Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).

Calculator - non-programmable, no text retrieval, silent only

## Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the [Student Academic Integrity Policy and Procedure](#). This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

### What is a breach of academic integrity?

A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

### Why is academic integrity important?

A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

### Where can I get assistance?

For academic advice and guidance, the [Academic Learning Centre \(ALC\)](#) can support you in becoming confident in completing assessments with integrity and of high standard.

### What can you do to act with integrity?



#### Be Honest

If your assessment task is done by someone else, it would be dishonest of you to claim it as your own



#### Seek Help

If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)



#### Produce Original Work

Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem