COIT20256 *Data Structures and Algorithms*
Term 1 - 2024

Profile information current as at 16/05/2024 12:26 am

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 1 - 2024

- 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.

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, feedback from the teaching team and informal feedback

Feedback

The unit learning materials are well written and help the student learning.

Recommendation

Continue with the same materials updating resources and instructions as required for new software releases.

Feedback from Student evaluations and informal feedback

Feedback

Assessments are challenging, but also engaging and extremely helpful for learning

Recommendation

Continue with similar assessments that help students to develop practical skills.

Feedback from Self reflection, teaching team and Head of Course

Feedback

It would be useful to introduce students to version control and secure programming practices in this unit

Recommendation

Introduce version control and secure programming guidelines in this unit.

Feedback from Student feedback

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

— N/A Level	∘ Introductory Level	∘ Intermediate Level	● Graduate Level	∘ Professional Level	∘ Advanced Level

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
Authors: Paul Deitel and Harvey Deitel
Pearson Higher Ed US
ISBN: 978-1292273730
Binding: eBook

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- JDK 21 (available from https://www.oracle.com/java/technologies/downloads or https://jdk.java.net/21/)
- JavaFX (downloaded in NetBeans when use JavaFX Maven archetype)
- SceneBuilder 21 (or higher) (available from https://gluonhq.com/products/scene-builder, current version 21.0)
- Apache NetBeans IDE 20 (https://netbeans.apache.org/download/index.html)

Referencing Style

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

- Harvard (author-date)
- American Psychological Association 7th Edition (APA 7th edition)

For further information, see the Assessment Tasks.

Teaching Contacts

Jacqueline Jarvis Unit Coordinator
j.jarvis@cqu.edu.au

Schedule

Week 1 - 04 Mar 2024

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

Week 2 - 11 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Inheritance	9	

Week 3 - 18 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic

Polymorphism and Interfaces	10	**Tutorial assessment: 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 - 25 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
JavaFX GUI and Event-Driven Programming	12 and 13	**Tutorial assessment:** Part 2 - due in week 4 tutorial class

Week 5 - 01 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Generic Collections: Lists, Sets, Maps, and Priority Queue	16	**Tutorial assessment:** Part 3 - due in week 5 tutorial class **Assignment 1 - phase 1** due Monday 9:00 am (AEST)

Vacation Week - 08 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 15 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Generic Classes and Methods	20	**Tutorial assessment:** Part 4 - due in week 6 tutorial class

Week 7 - 22 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Recursion	18	**Tutorial assessment:** Part 5 - due in week 7 tutorial class **Assignment 1** Due: Week 7 Monday (22 Apr 2024) 11:59 pm AEST

Week 8 - 29 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Custom Generic Data Structures: Implementing Stacks, Queues and Binary Search Trees	21	**Tutorial assessment:** Part 6 - due in week 8 tutorial class **Assignment 2: Phase 1** (GUI) due Friday 11:59pm (AEST) (submission of final phases (completed assignment) due in week 12)

Week 9 - 06 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Lambdas and Streams	17	**Tutorial assessment:** Part 7 - due in week 9 tutorial class

Week 10 - 13 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Exception Handling, Files, Streams and Serialization	11 and 15	**Tutorial assessment:** Part 8 - due in week 10 tutorial class

Week 11 - 20 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Searching, Sorting and Algorithmic Efficiency	19 and lecture notes	**Tutorial assessment:** Part 9 - due in week 11 tutorial class

Week 12 - 27 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Graphs and their applications	Lecture Notes	**Tutorial assessment:** Part 10 - due in week 12 tutorial class
		Assignment 2 Due: Week 12 Monday (27 May 2024) 11:59 pm AEST

Review/Exam Week - 03 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 10 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic

Assessment Tasks

1 Assignment 1

Assessment Type
Practical Assessment

Task Description
In this assignment you will use the key constructs and concepts (inheritance and polymorphism) introduced in weeks 1-5 to develop and test a software application. **Note that a separate phase 1 submission is required early in the development period for this assignment**. Further details are in the Assessment 1 specification document available on the Moodle unit website.

Assessment Due Date
Week 7 Monday (22 Apr 2024) 11:59 pm AEST
Note: Phase 1 is due Monday at 9:00am (AEST) in week 5 (see Moodle for the exact date. The final submission is due Monday week 7.

Return Date to Students

Two weeks after submission

Weighting
20%

Assessment Criteria

1. Design and Implementation.
2. Language Use (Including correct application of classes, inheritance, polymorphism, exception handling and good programming practices).
3. Documentation
4. Testing

Referencing Style

- Harvard (author-date)
- American Psychological Association 7th Edition (APA 7th edition)

Submission
Online

Submission Instructions
Submit a .zip file containing the NetBeans project and a separate file with 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 Class/Tutorial Activities

Assessment Type
Practical Assessment

Task Description
This assessment item is to be developed and submitted as part of your weekly tutorial sessions. It consists of a series of 10 practical tutorial submissions 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 tutorial**, <u>**NOT** the due date shown in Moodle</u>. Moodle cannot have multiple due dates to cater for different tutorial times so the date specified in Moodle is to allow for tutorials held at the end of the week or on weekends. **For on campus students no marks will be awarded for work submitted outside the 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 tutorial** 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 tutorial 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 the unit coordinator 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 submissions. On-campus students must complete and submit the scheduled work in their weekly tutorial.

Return Date to Students

The marks will be returned to you within a week after 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, on campus students are required to participate in all activities in the tutorial and submit the sample of work requested when instructed to do so during the class. The tutor will monitor student progress in class.
To be awarded marks, online students are required to submit their sample of work **(i.e. answers to the questions specified by the unit coordinator**) by the due date. Online students should contact the unit coordinator if they have any questions about the weekly work and may also be asked to make arrangements to discuss their work before marks can be awarded.
Note that although your are only required to submit answers to selected tutorial questions as part of this assessment item, **all the tutorial exercises should be attempted each week**. They are all important for your learning and understanding, not only those questions selected for submission.
Each week's work is worth 1 mark. Total for this assessment item is 10%.

Referencing Style

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

Submission
Online

Learning Outcomes Assessed

- Evaluate performance of different algorithms in problem solving

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills

3 Assignment 2

Assessment Type
Practical Assessment

Task Description
In this assignment you will use the key constructs and concepts introduced in weeks 1- 10 to develop and test a software application that employs a Graphical User Interface (GUI) and uses complex data structures. **Note that a separate phase 1 submission is required early in the development period for this assignment.** Further details are in the detailed assessment 3 (assignment 2) specification available on the Moodle unit website.

Assessment Due Date
Week 12 Monday (27 May 2024) 11:59 pm AEST
Note: Phase 1 is due on Friday of week 8 at 11:59pm (AEST) in week 8 (see Moodle for the exact date). The final submission is due on Monday of week 12.

Return Date to Students

Two weeks after submission

Weighting
20%

Assessment Criteria

1. Design and Implementation.
2. Language Use (including correct application of classes, inheritance, polymorphism, exception handling and good programming practices).
3. Documentation
4. Testing

Referencing Style

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

Submission
Online

Submission Instructions
Submit a .zip file containing the NetBeans project and a separate file with 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