



COIT20256 Data Structures and Algorithms

Term 3 - 2018

Profile information current as at 07/05/2024 06:52 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 build classes, throw exceptions, and extend a class using inheritance and polymorphism. You will practice these concepts and build applications with front-end Graphical User Interface and back-end database using database programming. You will also learn to build software applications using built-in Java Application Programming Interfaces (APIs) for generic collections of linked lists, stacks, queues, sets and maps, and creating custom generic data structures. You will also gain understanding of sorting and searching algorithms, recursion, search trees, and learn to evaluate algorithms using Big O notation. You will be introduced to functional programming using Lambdas and Streams. You will be given hands-on experience to practice all concepts during computer lab tutorials. The object-oriented design will also be covered.

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 3 - 2018

- Brisbane
- Distance
- Melbourne
- 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. **Written Assessment**

Weighting: 20%

2. **Written Assessment**

Weighting: 30%

3. **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 Unit evaluation

Feedback

There have been some dissatisfaction about the clarity of assignment requirements.

Recommendation

The assignments are written based on authentic software development cases and this may cause some inherent vagueness. The students will be given clear instructions to design the solution with supporting assumptions taken by them.

Unit Learning Outcomes

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

1. Compare and contrast different algorithms in problem solving
2. Design and implement appropriate data structures for application development
3. Evaluate a variety of data structures and algorithmic approaches including: recursion, linked lists, stacks, queues, streams, search trees, sorting and searching
4. Analyse, develop and implement software solutions with the focus of data structures and algorithms
5. Apply classes, inheritance, polymorphism, and exception handling
6. Programmatically connect to a database and implement the database operations
7. Work collaboratively as part of a small team
8. Demonstrate socially innovative practices in software development
9. Accomplish functional programming with Lambda expressions and Streams.

Australian Computer Society (ACS) recognises the Skills Framework for the Information Age (SFIA). SFIA is in use in over 100 countries and provides a widely used and consistent definition of ICT skills. SFIA is increasingly being 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. The SFIA code is included:

- Systems design (DESN)
- System Integration (SINT)
- Program ming/Software Development (PROG)
- Data Analysis (DTAN)
- Database/Repository Design (DBDS)
- Testing (TEST)
- Applications Support (ASUP)

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	7	8	9

Assessment Tasks	Learning Outcomes								
	1	2	3	4	5	6	7	8	9
1 - Written Assessment - 20%		•		•	•			•	
2 - Written Assessment - 30%	•	•	•	•	•	•	•	•	
3 - Examination - 50%	•		•						•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes								
	1	2	3	4	5	6	7	8	9
1 - Knowledge	◦	◦	◦	◦	◦	◦			
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 - Written Assessment - 20%	◦	◦	◦		◦			
2 - Written Assessment - 30%	◦	◦	◦	◦	◦	◦		
3 - Examination - 50%	◦	◦	◦					

Textbooks and Resources

Textbooks

COIT20256

Prescribed

Java how to program:Early Objects Edition

Edition: 11th edn (2017)

Authors: Paul Deitel & Harvey Deitel

Pearson Higher Ed

Upper Saddle River , New Jersey , USA

ISBN: 9781292223858

Binding: Paperback

Additional Textbook Information

This unit has an open book final examination where students can take their Textbook with them to the examination. Therefore, it may be better to buy a hard copy of the Textbook even though rest of the study can be managed with an e-Book. Students can take a copy of consolidated notes to refer in the examination. So it is not mandatory to buy a Textbook. Copies of the textbook are available for purchase at 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 Development Kit (JDK) 1.8 or later
- MySQL Database Server version 5.7 or later
- NetBeans IDE 8 or higher

Referencing Style

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

- [American Psychological Association 6th Edition \(APA 6th edition\)](#)
- [Harvard \(author-date\)](#)

For further information, see the Assessment Tasks.

Teaching Contacts

Mary Tom Unit Coordinator
m.tom@cqu.edu.au

Schedule

Week 1 - 05 Nov 2018

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

Week 2 - 12 Nov 2018

Module/Topic	Chapter	Events and Submissions/Topic
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Object-Oriented Programming:
Inheritance

Chapter 9

Week 3 - 19 Nov 2018

Module/Topic	Chapter	Events and Submissions/Topic
Object-Oriented Programming: Polymorphism and Interfaces	10	

Week 4 - 26 Nov 2018

Module/Topic	Chapter	Events and Submissions/Topic
GUI Components	12 and 22	

Vacation Week - 03 Dec 2018

Module/Topic	Chapter	Events and Submissions/Topic
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Week 5 - 10 Dec 2018

Module/Topic	Chapter	Events and Submissions/Topic
Exception Handling, Files, Streams and Object Serialization	11 and 15	

Week 6 - 17 Dec 2018

Module/Topic	Chapter	Events and Submissions/Topic
Object-Oriented Design	33 (online chapter): Object-Oriented Design with the UML	Assignment 1 Due: Week 6 Thursday (20 Dec 2018) 11:45 pm AEST

Week 7 - 31 Dec 2018

Module/Topic	Chapter	Events and Submissions/Topic
Generic Collections	16	

Week 8 - 07 Jan 2019

Module/Topic	Chapter	Events and Submissions/Topic
Algorithms, Algorithmic Efficiency, Lambdas and Streams	19 and 17	

Week 9 - 14 Jan 2019

Module/Topic	Chapter	Events and Submissions/Topic
Accessing Database with JDBC	24	

Week 10 - 21 Jan 2019

Module/Topic	Chapter	Events and Submissions/Topic
Generic Classes and Methods	20	

Week 11 - 28 Jan 2019

Module/Topic	Chapter	Events and Submissions/Topic
Recursion	18	Assignment 2 Due: Week 11 Thursday (31 Jan 2019) 11:45 pm AEST

Week 12 - 04 Feb 2019

Module/Topic	Chapter	Events and Submissions/Topic
Custom Generic Data Structures	21	

Exam Week - 11 Feb 2019

Module/Topic	Chapter	Events and Submissions/Topic
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Term Specific Information

Unit Coordinator
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Assessment Tasks

1 Assignment 1

Assessment Type

Written Assessment

Task Description

In this assignment you will demonstrate your ability to analyse the given problem, model and design data structures using UML class diagrams, develop the software solution applying the Object-oriented programming concepts of classes, inheritance, and polymorphism. You will also design and develop a graphical user interface (GUI). This assessment task is to design, code, debug, and test a software application using the topics covered in weeks 1 - 5. Further details are available on the unit website in the Assignment 1 specification document.

Assessment Due Date

Week 6 Thursday (20 Dec 2018) 11:45 pm AEST

Return Date to Students

Week 8 Thursday (10 Jan 2019)

Weighting

20%

Assessment Criteria

1. Efficient object-oriented programming design
2. Appropriate use of Graphical User Interface (GUI)
3. Appropriate use of data structures and algorithms in problem solving
4. Appropriate use of object-oriented concepts of classes, inheritance, and polymorphism
5. Development of fault-tolerant applications by appropriate use of exception handling
6. Effective use of good coding practices
7. Rigorous testing of software applications.

Referencing Style

- [American Psychological Association 6th Edition \(APA 6th edition\)](#)
- [Harvard \(author-date\)](#)

Submission

Online

Submission Instructions

Submit one zip file containing the source code files (.java) and the report file (.doc). Do not submit the zipped project folder or compiled binaries.

Learning Outcomes Assessed

- Design and implement appropriate data structures for application development
- Analyse, develop and implement software solutions with the focus of data structures and algorithms
- Apply classes, inheritance, polymorphism, and exception handling
- Demonstrate socially innovative practices in software development

Graduate Attributes

- Knowledge
- Communication

- Cognitive, technical and creative skills
- Self-management

2 Assignment 2

Assessment Type

Written Assessment

Task Description

In this assignment, you are required to analyse the given problem, model and design the required data structures using UML class diagrams, and using generic data structures such as linked lists, queues, and streams, and develop a software application having a three tiered architecture with a front-end interactive Graphical User Interface (GUI), the middle layer implementing the business logic, and the back-end database storing the entered data. This assessment task includes design, document, develop code, debug , and test a java application applying topics covered in Weeks 1 - 10. Further details are available on the Moodle unit website in the Assignment 2 specification document.

Assessment Due Date

Week 11 Thursday (31 Jan 2019) 11:45 pm AEST

Return Date to Students

Thursday (14 Feb 2019)

Weighting

30%

Assessment Criteria

Efficient object-oriented program design.

Effective use of Generic data structures and algorithms in problem solving

Effective evaluation of a variety of data structures and algorithmic approaches

Effective use of good programming practice/techniques.

Efficient database programming techniques.

Rigorous testing of software application

Referencing Style

- [American Psychological Association 6th Edition \(APA 6th edition\)](#)
- [Harvard \(author-date\)](#)

Submission

Online

Submission Instructions

Submit one zip file containing the source code files (.java) and the report file (.doc). Do not submit the zipped project folder or compiled binaries.

Learning Outcomes Assessed

- Compare and contrast different algorithms in problem solving
- Design and implement appropriate data structures for application development
- Evaluate a variety of data structures and algorithmic approaches including: recursion, linked lists, stacks, queues, streams, search trees, sorting and searching
- Analyse, develop and implement software solutions with the focus of data structures and algorithms
- Apply classes, inheritance, polymorphism, and exception handling
- Programmatically connect to a database and implement the database operations
- Work collaboratively as part of a small team
- Demonstrate socially innovative practices in software development

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).

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