



# COIT20256 Data Structures and Algorithms

## Term 1 - 2018

Profile information current as at 05/05/2024 11:59 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 1 - 2018

- Brisbane
- Distance
- Melbourne
- 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. **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

Received many positive feedbacks from students regarding the opportunity to learn database programming, lambdas, and graphical user interface coding. Teach more algorithms.

##### Recommendation

Formalise inclusion of Lambdas by updating the unit profile sections of overview and assessment. Algorithms are already part of the unit. It is difficult to include more content as the Unit is already content intensive. Some minor modifications can be done and this will be considered.

## 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



### Alignment of Assessment Tasks to Learning Outcomes

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 10 (2014)

10 edition (2014)

Authors: Paul Deitel & Harvey Deitel

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Upper Saddle , NJ , USA

ISBN: 9781292018195

Binding: Hardcover

#### 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.

[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 5.7 or later
- NetBeans IDE

## 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](mailto:m.tom@cqu.edu.au)

**Michael Li** Unit Coordinator

[m.li@cqu.edu.au](mailto:m.li@cqu.edu.au)

## Schedule

### Week 1 - 05 Mar 2018

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

### Week 2 - 12 Mar 2018

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

9

### Week 3 - 19 Mar 2018

Module/Topic

Chapter

Events and Submissions/Topic

Object-Oriented Programming:  
Polymorphism and Interfaces

10

### Week 4 - 26 Mar 2018

Module/Topic

Chapter

Events and Submissions/Topic

GUI Components

12 and 22

### Week 5 - 02 Apr 2018

Module/Topic

Chapter

Events and Submissions/Topic

Exception Handling, Files, Streams and  
Object Serialization

11 and 15

### Vacation Week - 09 Apr 2018

Module/Topic

Chapter

Events and Submissions/Topic

### Week 6 - 16 Apr 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  
(19 Apr 2018) 11:45 pm AEST

### Week 7 - 23 Apr 2018

Module/Topic

Chapter

Events and Submissions/Topic

Generic Collections

16

### Week 8 - 30 Apr 2018

Module/Topic

Chapter

Events and Submissions/Topic

Algorithms, Algorithmic Efficiency,  
Lambdas and Streams

19 and 17

### Week 9 - 07 May 2018

Module/Topic

Chapter

Events and Submissions/Topic

Accessing Databases with JDBC

24

### Week 10 - 14 May 2018

Module/Topic

Chapter

Events and Submissions/Topic

Generic Classes and Methods

20

### Week 11 - 21 May 2018

Module/Topic

Chapter

Events and Submissions/Topic

Recursion

18

**Assignment 2** Due: Week 11  
Wednesday (23 May 2018) 11:45 pm  
AEST

### Week 12 - 28 May 2018

Module/Topic

Chapter

Events and Submissions/Topic

Custom Generic Data Structures

21

### Review/Exam Week - 04 Jun 2018

Module/Topic

Chapter

Events and Submissions/Topic

### Exam Week - 11 Jun 2018

Module/Topic

Chapter

Events and Submissions/Topic

## Term Specific Information

### Unit Coordinator

**Dr. Mary Tom**  
**School of Engineering & Technology**  
**Central Queensland University**

Brisbane QLD 4000, Australia

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**Email: m.tom@cqu.edu.au**

## Assessment Tasks

### 1 Assignment 1

#### Assessment Type

Written Assessment

#### Task Description

In this assignment you will demonstrate your understanding of object oriented programming concepts in Java, and show an ability to develop a GUI (Graphical User Interface) based Java application. This assessment task is to design, code, debug, and test 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 (19 Apr 2018) 11:45 pm AEST

#### Return Date to Students

Week 9 Tuesday (8 May 2018)

#### Weighting

20%

#### Assessment Criteria

1. Efficient object-oriented program 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 programming practice/techniques.
7. Rigorous testing of Java applications

#### Referencing Style

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

#### Submission

Online

#### Submission Instructions

Submit one zip file containing all source code (.java) and the report (.doc) file. Do not submit the whole NetBeans 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 will demonstrate your understanding of object oriented programming concepts and a variety of data structures and algorithms in Java, and show an ability to develop a GUI (Graphical User Interface) based Java application. 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 Wednesday (23 May 2018) 11:45 pm AEST

### Return Date to Students

Review/Exam Week Wednesday (6 June 2018)

### Weighting

30%

### Assessment Criteria

1. Efficient object-oriented program design.
2. Appropriate choice of data structures and algorithms in problem solving.
3. Effective use of algorithms and Generic data structures
4. Effective use of good programming practice/techniques.
5. Rigorous testing of Java applications.
6. Effective evaluation of algorithms, data structures and program designs.

### Referencing Style

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

### Submission

No submission method provided.

### 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).  
No calculators permitted

## 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