COIT20257 *Distributed Systems: Principles and Development*
Term 1 - 2024

Profile information current as at 12/05/2024 07:50 pm

All details in this unit profile for COIT20257 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

Distributed Systems: Principles and Development you will learn basic principles of distributed systems including architecture, design, and algorithms and how to use these principles in the development of distributed applications. You will explore the significant distributed system characteristics of scalability, heterogeneity, security, and failure handling in addition to the fundamentals of networking, inter-process communication, remote invocation, and operating system support. You will examine different approaches to supporting distributed applications including distributed objects, web services, and peer-to-peer solutions. You will learn about distributed file systems, naming, and data-related aspects of distributed transactions, and data replication. Algorithms associated to timing, and coordination and agreement will also be studied. You will also analyse the areas of mobile and ubiquitous computing and the social impact arising from the ubiquity of distributed systems. You will consolidate the key theoretical material through the computer lab tutorial sessions and development of software applications.

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

Prerequisite unit: COIT20256 Data structures and AlgorithmsAnti-Requisite unit: COIT23005 Distributed Systems
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: 30%
2. **Practical Assessment**
Weighting: 35%
3. **Written Assessment**
Weighting: 35%

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 UC self reflection and teaching team feedback

Feedback

Students need a comprehensive and complex case study to synthesise the concepts, models and architecture that are covered by the unit.

Recommendation

Combine Transactions and Distributed Transactions to a single week. Then a week space can leave to introduce social computing networks by a comprehensive and complex distributed case study (e.g. secured chat systems).

Feedback from UC self reflection and teaching team feedback

Feedback

Lack or not enough depth in advanced Java programming.

Recommendation

Introduce or strengthen Java interfaces, object serialization and streaming, Java generics and multithreading to handle distributed interaction and modelling.

Feedback from UC self reflection and teaching team feedback

Feedback

Involving more students for unit evaluation.

Recommendation

1. In Week 1 and 6 Lectures: clearly explain to students why teaching evaluations are important to the improvement of the unit and helps instructors enhance their teaching methods. 2. In Week 10 Lecture and Tutorial: encourage class discussions about the importance of feedback and improvements. Lead discussions on the topic and involve students in brainstorming ways to enhance the unit.

Unit Learning Outcomes

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

1. Develop distributed applications using networking, inter-process communication, and remote invocation
2. Design and develop distributed applications using one of the approaches of distributed objects, web services, and peer-to-peer solutions
3. Solve problems in the distributed systems domain by applying the principles of distributed systems to authentic problems
4. Critique the issues involved in developing reliable, secure, and scalable distributed systems
5. Discuss the technology needs and social impact arising from ubiquitous distributed systems
6. Work independently and collaboratively in small teams.

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)
- Systems Integration (SINT)
- Program ming/Software Development (PROG),
- Database/Repository Design (DBDS)
- Testing (TEST)
- Network Support (NTAS)
- Release and Deployment (RELM),
- Application 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**
1 - Practical Assessment - 30%	●		●			
2 - Practical Assessment - 35%		●	●	●		●
3 - Written Assessment - 35%				●	●	●

Alignment of Graduate Attributes to Learning Outcomes

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

Graduate Attributes	Learning Outcomes					
	1	**2**	**3**	**4**	**5**	**6**
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 - 30%	○	○	○		○			
2 - Practical Assessment - 35%	○	○	○	○	○	○	○	
3 - Written Assessment - 35%	○	○	○	○	○	○		

Textbooks and Resources

Textbooks
COIT20257

Supplementary

Distributed Systems Concepts and Design
Edition: 5 (2012) (2012)
Authors: George Coulouris,Jean Dollimore, Tim Kindberg and Gordon Blair
Pearson Education
Gordon Blair , UK
ISBN: 13: 9780137521081
Binding: Paperback

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 17 or a higher version
- NetBeans IDE 13 or a higher version

Referencing Style

All submissions for this unit must use the referencing style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Wei Li Unit Coordinator
w.li@cqu.edu.au

Schedule

Week 1 - 04 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
An Introduction to Distributed Systems	Chapter 1 and Chapter 2	

Week 2 - 11 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Inter-process Communication	Chapter 4	

Week 3 - 18 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Distributed Objects and Remote Invocation	Chapter 5	

Week 4 - 25 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Process and Thread Management - Operating System Support	Chapter 7	

Week 5 - 01 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Security in Distributed Systems	Chapter 11	**Assignment 1** Due: Week 5 Friday (5 Apr 2024) 11:59 pm 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
Replication and Fault Tolerance	Chapter 18	

Week 7 - 22 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Name Services	Chapter 13	

Week 8 - 29 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Coordination and Agreement	Chapter 15	

Week 9 - 06 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Transactions, Distributed Transactions, and Concurrent Control	Chapter 16 and 17	

Week 10 - 13 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Distributed File Systems	Chapter 12	**Assignment 2** Due: Week 10 Friday (17 May 2024) 11:59 pm AEST

Week 11 - 20 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Web Services and Mobile/Ubiquitous Computing	Chapter 9 and Chapter 19	

Week 12 - 27 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
A Complex Distributed System Case Study	Unit Moodle online materials	

Review/Exam Week - 03 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic
		Assignment 3 Due: Review/Exam Week Friday (7 June 2024) 11:59 pm AEST

Exam Week - 10 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic
Assignment 3 Submission		

Term Specific Information

This is an advanced unit in MIT Course, covering theory and practice of distributed computing. Students' commitment is very important for your success of this unit. Please attend each lecture and tutorial to build your knowledge and skills for development of distributed systems.
The unit coordinator contact information for this term:
DR Wei Li
School of Engineering & Technology
Central Queensland University
Rockhampton QLD 4702, Australia
Phone: + 61 7 4930 9686
Email: w.li@cqu.edu.au

Assessment Tasks

1 Assignment 1

Assessment Type
Practical Assessment

Task Description
Your task for this assignment is to develop a simplified Remote Task Offloading Framework. The framework is a typical client/server system to utilise distributed computing power. The purpose of this assignment is to assess your competence on Java multi-threading, TCP streaming, object serialization and client/server model.
The assignment specification and marking criteria can be accessed from the unit Moodle site.

Assessment Due Date
Week 5 Friday (5 Apr 2024) 11:59 pm AEST
Assignment 1 Due

Return Date to Students
Week 6 Friday (19 Apr 2024)
Assignment 1 results release two weeks after submission

Weighting
30%

Assessment Criteria
The assignment will be assessed by the software implementation and user instruction document.

1. Analysis and design of a software application using TCP networking and client-server model for the given problem
2. Implementation of the application using TCP streaming, multi-threading, and object serialization
3. Incorporation of concurrent multi-user access to the software application
4. Use of good programming techniques/practices
5. Rigorous testing of software application.

The detailed assessment description and marking criteria can be found under the Assessment block of the unit website.

Referencing Style

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

Submission
Online

Submission Instructions
You must submit your assignment via the online submission system on the unit Moodle site.

Learning Outcomes Assessed

- Develop distributed applications using networking, inter-process communication, and remote invocation
- Solve problems in the distributed systems domain by applying the principles of distributed systems to authentic problems

Graduate Attributes

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

2 Assignment 2

Assessment Type
Practical Assessment

Task Description
You will be tasked with a team-based software development project. You will be part of a small team to design, implement, test and document a Secured Remote Task Offloading Framework. The purpose of this assignment is to assess your competence in symmetrical and asymmetrical cryptography and the applications in mutual authentication and secured communication. Your ability to work collaboratively in a small team will also be assessed by this assignment.
The assignment specification and marking criteria can be accessed from the unit Moodle site.

Assessment Due Date
Week 10 Friday (17 May 2024) 11:59 pm AEST
Assignment 2 Due

Return Date to Students
Week 12 Friday (31 May 2024)
Assignment 2 results release two weeks after submission

Weighting
35%

Assessment Criteria
The assignment will be assessed by the software implementation and user instruction document.

1. Analysis and design of a secured software application using symmetrical and asymmetrical cryptography for the given problem
2. Implementation of the secured application using mutual authentication
3. Critique the issues involved in developing secured, reliable, and scalable distributed systems
4. Work independently and collaboratively in small teams

The detailed assessment description and marking criteria can be found under the Assessment block of the unit website.

Referencing Style

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

Submission
Online

Submission Instructions
You must submit your assignment via the online submission system on the unit Moodle site.

Learning Outcomes Assessed

- Design and develop distributed applications using one of the approaches of distributed objects, web services, and peer-to-peer solutions
- Solve problems in the distributed systems domain by applying the principles of distributed systems to authentic problems
- Critique the issues involved in developing reliable, secure, and scalable distributed systems
- Work independently and collaboratively in small teams.

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Research
- Self-management
- Ethical and Professional Responsibility
- Leadership

3 Assignment 3

Assessment Type
Written Assessment

Task Description
Your task for this assignment is to research and address some key issues in the area of distributed systems or distributed computing. The purpose of this assignment is to assess your understanding of the key issues or competence to apply the key principles to distributed computing. Writing of a formal academic report is also assessed.
The assignment specification and marking criteria can be accessed from the unit Moodle site.

Assessment Due Date
Review/Exam Week Friday (7 June 2024) 11:59 pm AEST
Assignment 3 Due

Return Date to Students

The marked assignment will be returned on the day of Certification of Grades

Weighting
35%

Assessment Criteria
The assignment will be assessed by understanding of the given key issues and application of the key principles.

1. Clear demonstration of your understanding of the topics given in the specification
2. Critical review of relevant information and logical construction of arguments
3. Relevant discussion of the impact of specific aspects of distributed systems
4. Appropriate formatting, clarity of expressions, and relevant and correct use of references.

The detailed assessment description and marking criteria can be found under the Assessment block of the unit website.

Referencing Style

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

Submission
Online

Submission Instructions
You must submit your assignment via the online submission system on the unit Moodle site.

Learning Outcomes Assessed

- Critique the issues involved in developing reliable, secure, and scalable distributed systems
- Discuss the technology needs and social impact arising from ubiquitous distributed systems
- Work independently and collaboratively in small teams.

Graduate Attributes

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

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