COIT13229 *Applied Distributed Systems*
Term 1 - 2023

All details in this unit profile for COIT13229 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

Modern Computer Systems commonly rely on Distributed and cloud computing systems which enable seamless access to networked resources such as processors, data stores, sensor networks, cyber-physical systems, and multimedia services. In this unit, you will gain foundation knowledge and understanding of the system models and enabling technologies, including clustering and virtualization, and cloud computing. You will learn the core concepts of distributed computing such as interprocess communication, concurrency and synchronisation, transactions and concurrency control, and distributed databases and files. This unit also exposes you to distributed system characteristics of scalability, heterogeneity, security, and failure handling. The areas of mobile and ubiquitous computing and the social impact arising from the ubiquity of distributed systems will also be explored. You will learn to develop secure and reliable distributed computing applications and web services that can perform concurrent operations across multiple computers.

Details

Career Level: *Undergraduate*
Unit Level: *Level 3*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites

Prerequisite: COIT11134 and COIT11237.
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 - 2023

- Brisbane
- Cairns
- 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 Undergraduate 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.

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 Coordinator reflection and teaching team feedback

Feedback

A good proportion of students lacked the required programming skills expected to be achieved from pre-requisite units.

Recommendation

The second-year unit, COIT12200, will be added as a pre-requisite to support students' learning as currently this third-year unit only has first-year pre-requisites.

Unit Learning Outcomes

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

1. Develop software applications that can run in parallel and on multiple networked computers using approaches such as multi-threading, and client-server architecture
2. Design and develop secure distributed applications using approaches such as RESTful webservices
3. Implement software applications that enable concurrent access to distributed databases
4. Analyse the use of algorithms and other mechanisms such as replication and load balancing to execute coordinated concurrent processes in distributed systems
5. Examine the technology needs and social impact arising from ubiquitous distributed systems
6. Evaluate techniques for creating secure, reliable and efficient distributed systems.

Australian Computer Society (ACS) recognises the Skills Framework for the Information Age (SFIA). SFIA is 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 8. The SFIA code is included:

- Software Design (SWDN)
- Systems integration and build (SINT)
- Programming/Software Development (PROG),
- Database Design (DBDS)
- User Experience Evaluation (USEV)
- Testing (TEST)
- System Installation and Removal (HSIN)
- 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 - Communication	●	●	●	●	●	
2 - Problem Solving	●	●	●			
3 - Critical Thinking	●	●	●	●	●	●
4 - Information Literacy		●		●	●	●
5 - Team Work						
6 - Information Technology Competence	●	●	●	●		●
7 - Cross Cultural Competence					●	
8 - Ethical practice					●	
9 - Social Innovation					●	●
10 - Aboriginal and Torres Strait Islander Cultures						

Textbooks and Resources

Textbooks

There are no required textbooks.

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- JDK 11 - OpenJDK
- Apache NetBeans IDE 12.4 (available from https://netbeans.apache.org/download/nb124/nb124.html)
- MySQL Community Server 8.0.26 (available from https://dev.mysql.com/downloads/mysql/)
- Apache TomEE 8.0.0 TomEE Plus (available from https://tomee.apache.org/download.html)
- Jakarta EE 8 (available from https://jakarta.ee/release/8/)

Referencing Style

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

Teaching Contacts

Farzad Sanati Unit Coordinator
f.sanati@cqu.edu.au

Schedule

Week 1 - 06 Mar 2023

Module/Topic	Chapter	Events and Submissions/Topic
An Introduction to Distributed System - System Characterization and Models	1 and 2	

Week 2 - 13 Mar 2023

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

Week 3 - 20 Mar 2023

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

Week 4 - 27 Mar 2023

Module/Topic	Chapter	Events and Submissions/Topic
Distributed Objects and Introduction to Web Services	8 plus additional lecture notes	

Week 5 - 03 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic
Web Services	9 plus additional lecture notes	

Vacation Week - 10 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 17 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic
Security in Distributed Systems	11	**Assignment 1** Due: Week 6 Monday (17 Apr 2023) 11:45 pm AEST

Week 7 - 24 Apr 2023

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

Week 8 - 01 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Transactions and Concurrent Control	16	

Week 9 - 08 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Distributed Transactions	17	**Assignment 2** Due: Week 9 Monday (8 May 2023) 11:45 pm AEST

Week 10 - 15 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Distributed File Systems and Name Services	12 and 13	

Week 11 - 22 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Replication and Fault Tolerance	18	

Week 12 - 29 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Mobile and Ubiquitous Computing	19	

Review/Exam Week - 05 Jun 2023

Module/Topic	Chapter	Events and Submissions/Topic
		Assignment 3 Due: Review/Exam Week Monday (5 June 2023) 11:45 pm AEST

Exam Week - 12 Jun 2023

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

Dr Farzad Sanati (Unit Coordinator)
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Assessment Tasks

1 Assignment 1

Assessment Type
Practical Assessment

Task Description
Your task for this assignment is to design, implement, test and document a client/server system which allows concurrent access to multiple clients. The purpose of this assignment is to assess your competency in Java TCP networking, multi-threading, and object serialization. This assignment task is to assess your skills in practicing the theoretical concepts learnt in Weeks 1 - 5. Further details are in the Assignment 1 Specification document available on the Unit website .

Assessment Due Date
Week 6 Monday (17 Apr 2023) 11:45 pm AEST

Return Date to Students
Week 8 Monday (1 May 2023)

Weighting
30%

Assessment Criteria

1. Appropriate analysis and design of a software application using networking and client-server communication for the given problem
2. Correct implementation of the application using networking, multi-threading, and object serialization.
3. Correct incorporation of multi-user access to the software application
4. Use of good programming techniques/practices
5. Rigorous testing of software applications.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Submit one zip file containing all source code (.java) files and the report (.doc/x) file using the Assignment submission link available on unit website. Do not submit the zipped project folder or compiled binaries(.class, .jar).

Learning Outcomes Assessed

- Develop software applications that can run in parallel and on multiple networked computers using approaches such as multi-threading, and client-server architecture
- Design and develop secure distributed applications using approaches such as RESTful webservices

2 Assignment 2

Assessment Type
Practical Assessment

Task Description
Your task for this assignment is to design, implement, test and document a secure three tier client/server system which allows concurrent access to multiple clients. Your system will have graphical user interface, a business logic layer, and a back-end database. This assignment task is to assess your skills in practicing the theoretical concepts learnt in Weeks 1-8 and in the pre-requisite units. You will be completing the software design and development working in team consisting of 3 - 5 members. You will develop a test plan and test the software application individually. You will individually write and submit a report documenting the testing details and any other theoretical aspects required. Further details are in the Assignment 2 Specification document available on the Unit website .

Assessment Due Date
Week 9 Monday (8 May 2023) 11:45 pm AEST

Return Date to Students
Week 11 Monday (22 May 2023)

Weighting
35%

Assessment Criteria

1. Analyse the given problem and design a 3-tier client-server software application using distributed system concepts.
2. Correct design and implementation of a software solution to provide secure multi-user client access using one of the approaches of distributed objects, web services, or peer-to-peer communication
3. Use of good programming techniques/practices
4. User interface design following user interface design guidelines
5. Rigorous testing of software application
6. Correct and concise documentation as required
7. Good collaboration working in a small team.

Referencing Style

- Harvard (author-date)

Submission
Online Group

Submission Instructions
Submit one zip file containing all source code (.java) and the report (.doc) file using the Assignment submission link available on unit website. Do not submit the zipped project folder or compiled binaries (.class, .jar). Each team member should submit his/her individually prepared report.

Learning Outcomes Assessed

- Develop software applications that can run in parallel and on multiple networked computers using approaches such as multi-threading, and client-server architecture
- Design and develop secure distributed applications using approaches such as RESTful webservices
- Implement software applications that enable concurrent access to distributed databases
- Analyse the use of algorithms and other mechanisms such as replication and load balancing to execute coordinated concurrent processes in distributed systems
- Evaluate techniques for creating secure, reliable and efficient distributed systems.

3 Assignment 3

Assessment Type
Written Assessment

Task Description
Your task in this assignment is to demonstrate your understanding of the role distributed systems play in facilitating pervasive computing and critically evaluate the technology needs in terms of reliability and security and the related issues impacting the society. This assessment task is to assess your knowledge in the topics learnt in Weeks 9 - 12 as well as your understanding of the current developments in distributed systems. Further details are available in the Assignment 3 Specification document available on the Unit website.

Assessment Due Date
Review/Exam Week Monday (5 June 2023) 11:45 pm AEST

Return Date to Students

Marking sheet with comments will be returned to you after publication of grades.

Weighting
35%

Assessment Criteria

1. Clear demonstration of your understanding of the importance of distributed system principles of security, reliability etc. as per the requirement
2. Demonstration of a good understanding of the topics related to current developments in Distributed Systems as given in the specification
3. Demonstration of deep understanding of the theoretical concepts learnt in relation to fault tolerance
4. A critical review of relevant information and logical construction of arguments
5. Relevant discussion of the impact of specific aspects of distributed systems on society
6. Appropriate formatting, clarity of expressions, and relevant and correct use of references

Referencing Style

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

Submission
Online

Submission Instructions
Submit the report (.doc or .docx) file using the Assignment submission link available on the Unit website.

Learning Outcomes Assessed

- Analyse the use of algorithms and other mechanisms such as replication and load balancing to execute coordinated concurrent processes in distributed systems
- Examine the technology needs and social impact arising from ubiquitous distributed systems
- Evaluate techniques for creating secure, reliable and efficient distributed systems.

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