Course Outline

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Course Details

Course Code	COMP3151/9154
Course Title	Foundations of Concurrency
Convenor	Liam O'Connor (/users/z3253158)
Admin	Liam O'Connor (/users/z3253158)
Classes	**Lectures** : Lectures are online via Blackboard Collaborate. There are no tutorials for this course, despite what the timetable says. Timetable for all classes (/COMP3151/20T2/timetable)
Consultations	Arranged via email to the Lecturer in Charge.
Units of Credit	6
Course Website	http://cse.unsw.edu.au/~cs3151/20T2/ (http://cse.unsw.edu.au/~cs3151/20T2/)
Handbook Entry	http://www.handbook.unsw.edu.au/undergraduate/courses/current/COMP3151.html (http://www.handbook.unsw.edu.au/undergraduate/courses/current/COMP3151.html) http://www.handbook.unsw.edu.au/undergraduate/courses/current/COMP9154.html (http://www.handbook.unsw.edu.au/undergraduate/courses/current/COMP9154.html)

Course Summary

In this course you will learn about the foundational concepts of concurrent programs (including multi-threaded, parallel, and distributed programs) and the crucial abstractions used to implement or understand behaviour of concurrent programs. Classical problems arising in concurrent programs will be examined and solutions to

these problems will be analysed. Practical work will include proofs of program properties, plus some programming in a concurrent programming language (Java or a suitable alternative) with simultaneous model checking.

Assumed Knowledge

You need to have successfully completed the core programming, algorithm, and discrete mathematics courses. The course makes use of a number of discrete mathematics concepts. You may find the course very difficult without MATH1081 or equivalent discrete mathematics background.

Student Learning Outcomes

After completing this course, students will be able to:

1. design and implement multi-threaded, parallel, and distributed programs,
2. talk, write, and reason about such programs, and
3. appreciate the complexities involved in the previous two.

This course contributes to the development of the following graduate capabilities:

Graduate Capability	**Acquired in**
Scholars capable of independent and collaborative enquiry, rigorous in their analysis, critique and reflection, and able to innovate by applying their knowledge and skills to the solution of novel as well as routine problems	Lectures, Assignments
Entrepreneurial leaders capable of initiating and embracing innovation and change, as well as engaging and enabling others to contribute to change	Pair work in Assignments
Professionals capable of ethical, self- directed practice and independent lifelong learning	Homework Problems
Global citizens who are culturally adept and capable of respecting diversity and acting in a socially just and responsible way	Pair work in Assignments

Teaching Strategies

The learning focus in this course is primarily on lectures and homework assignments. While marks are assigned to the homework, their primary purpose is to give you concrete tasks with deadlines to help you structure your learning.

- The **lectures** will introduce you to new material, which is being reinforced and practised in the assignments and homework. The course draws on two main textbooks for material, listed later in this document. More reading material covering specific topics will be identified throughout the course. Students are required to study reading material as advised during the lecture and/or on the course web page.
- There are eight **homeworks** released throughout the course. They will be a series of questions that keep you up to date with course content and structure your learning. Feedback will be provided by the lecturer to help you identify problems in your learning. It's expected that you will do this homework alone, to maximise its value to you as a learning resource. Don't cheat yourself by plagiarising. More information on plagiarism is provided below.
- There will be three **assignments** released throughout the course. One warm-up assignment worth 10%, and two main assignments worth 15%. The two main assignments will be done in pairs.

Teaching Rationale

This course is taught the way it is because ...

Student Conduct

The **Student Code of Conduct** (Information (https://student.unsw.edu.au/conduct) , Policy (https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf)) sets out what the University expects from students as members of the UNSW community. As well as the learning, teaching and research environment, the University aims to provide an environment that enables students to achieve their full potential and to provide an experience consistent with the University's values and guiding principles. A condition of enrolment is that students *inform themselves* of the University's rules and policies affecting them, and conduct themselves accordingly.

In particular, students have the responsibility to observe standards of equity and respect in dealing with every member of the University community. This applies to all activities on UNSW premises and all external activities related to study and research. This includes behaviour in person as well as behaviour on social media, for example Facebook groups set up for the purpose of discussing UNSW courses or course work. Behaviour that is considered in breach of the Student Code Policy as discriminatory, sexually inappropriate, bullying, harassing, invading another's privacy or causing any person to fear for their personal safety is serious misconduct and can lead to severe penalties, including suspension or exclusion from UNSW.

If you have any concerns, you may raise them with your lecturer, or approach the School Ethics Officer (mailto:ethics-officer@cse.unsw.edu.au) , Grievance Officer (mailto:grievance-officer@cse.unsw.edu.au) , or one of the student representatives.

Plagiarism is defined as (https://student.unsw.edu.au/plagiarism) using the words or ideas of others and presenting them as your own. UNSW and CSE treat plagiarism as academic misconduct, which means that it carries penalties as severe as being excluded from further study at UNSW. There are several on-line sources to help you understand what plagiarism is and how it is dealt with at UNSW:

- Plagiarism and Academic Integrity (https://student.unsw.edu.au/plagiarism)
- UNSW Plagiarism Procedure (https://www.gs.unsw.edu.au/policy/documents/plagiarismprocedure.pdf)

Make sure that you read and understand these. Ignorance is not accepted as an excuse for plagiarism. In particular, you are also responsible that your assignment files are not accessible by anyone but you by setting the correct permissions in your CSE directory and code repository, if using. Note also that plagiarism includes paying or asking another person to do a piece of work for you and then submitting it as your own work.

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.

If you haven't done so yet, please take the time to read the full text of

- UNSW's policy regarding academic honesty and plagiarism (https://student.unsw.edu.au/plagiarism)

The pages below describe the policies and procedures in more detail:

- Student Code Policy (https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf)
- Student Misconduct Procedure (https://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)
- Plagiarism Policy Statement (https://www.gs.unsw.edu.au/policy/documents/plagiarismpolicy.pdf)
- Plagiarism Procedure (https://www.gs.unsw.edu.au/policy/documents/plagiarismprocedure.pdf)

You should also read the following page which describes your rights and responsibilities in the CSE context:

- Essential Advice for CSE Students (https://www.engineering.unsw.edu.au/computer-science-engineering/about-us/organisational-structure/student-services/policies/essential-advice-for-cse-

students)

Assessment

Item	Topics	Due	Marks	Contributes to
Homeworks	All topics	Weeks 1,2,3,4,5,7,8,9	10%	CLOs 1,2, 3
Assignment0	Formal Reasoning	Week 3	10%	CLOs 2,3
Assignment1	Synchronisation	Week 7	15%	CLOs 1, 2, 3
Assignment2	Concurrent PLs	Week 10	15%	CLOs 2,3
Final Exam	All topics	Exam period	50% with a pass hurdle	CLOs 1,2

Course Schedule

Week	Lectures	Lecturer	Homeworks	Assignments
1	Course intro, Concurrent Semantics, Temporal Logic and Promela	Liam	**Theory:** Temporal Logic	
2	Critical Section Problem, Fairness, Proof Methods	Liam	**Practical:** Promela Modelling	Assn0 Released
3	Critical Section Algorithms, Szymanski's Algorithm	Liam	**Theory:** Critical Sections	Assn0 due
4	Semaphores and Monitors	Liam	**Practical:** Semaphore and Monitor Problems	Assn1 Released
5	Channels and Message Passing	Liam	**Practical:** Message-Passing Problems	-
6	Flexibility Week	-	-	-
7	Message Passing Proof Methods, Compositionality	Liam	**Theory:** Message-Passing Proofs	Assn1 due
8	Distributed Algorithms, Byzantine and Crash Failure	Vladimir	**Practical:** Distributed Algorithms	Assn2 Released
9	Consensus and Commitment, (Global Properties if Time)	Vladimir	**Theory:** Distributed Algorithms	-
10	Revision			Assn2 due

Resources for Students

The primary textbook for the course is:

- M. Ben-Ari, **Principles of Concurrent and Distributed Programming** , 2nd edition, Addison-Wesley, 2005.

We also will draw some material from:

- W.P. de Roever et al., **Concurrency Verification** : Introduction to Compositional and Noncompositional Methods, Cambridge 2012.
- A.B. Downey, **The Little Book of Semaphores** , Green Tea Press. https://greenteapress.com/wp/semaphores/ (https://greenteapress.com/wp/semaphores/)

Other resources (e.g. links to on-line documentation):

The SPIN model checker (http://spinroot.com/spin/whatispin.html)

Course Evaluation and Development

This course is evaluated each session using the myExperience system.

In the previous offering of this course, students generally gave positive feedback, but noted that the formal methods component of the course was not thoroughly covered.

Based on their comments, we have increased the coverage of formal methods in the course, including changing primary lecturer to a formal methods specialist.

Resource created about a year ago (Sunday 24 May 2020, 10:08:17 PM), last modified 11 months ago (Sunday 02 August 2020, 04:08:28 PM).

Comments

(/COMP3151/20T2/forums/search?forum_choice=resource/47546)

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There are no comments yet.