UNSW Course Outline

SENG2011 Workshop on Reasoning about Programs - 2024

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General Course Information

Course Code : SENG2011
Year : 2024
Term : Term 3
Teaching Period : T3
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Computer Science and Engineering
Delivery Mode : Multimodal
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Reasoning involves taking what facts you know (or assume) to be true, and calculating what the consequences will be. Reasoning is what everyone does every day in real life: for example, **!#!* the traffic is bad this morning! I'm going to be late for work. My work says if employees arrive late,*

they must work overtime. I'll be working overtime tonight. This course applies reasoning to computer programming. It involves analysing the behaviour of the program using mathematical logic and creating a specification. This specification allows you to prove exactly what the program does. It means it is impossible for the program to contain any kind of programming error. This has important consequences for software development. It means, for example, a great deal less testing is required because you, the programmer, will be able to proudly promise that the program that you have produced is "perfect".

Course Aims

To learn the thinking, reasoning and programming skills required to write programs that are provably correct and appreciate that this is the responsibility of every software engineer.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Be able to build a formal specification of the behaviour of a program
CLO2 : Be able to write, or even engineer, code that conforms to the specification
CLO3 : Be able to reason abstractly about requirements and be able to model them using formal methods
CLO4 : Be able to implement the reasoning in the compiler/verifier language Dafny
CLO5 : Be aware that proving code is correct is necessary to achieve 100% system reliability

Course Learning Outcomes	Assessment Item
CLO1 : Be able to build a formal specification of the behaviour of a program	• Programming Exercises • Quizzes • Conceptual and programming exercises in Dafny
CLO2 : Be able to write, or even engineer, code that conforms to the specification	• Quizzes • Conceptual and programming exercises in Dafny
CLO3 : Be able to reason abstractly about requirements and be able to model them using formal methods	• Program Verification in Dafny • Programming Exercises • Quizzes
CLO4 : Be able to implement the reasoning in the compiler/verifier language Dafny	• Program Verification in Dafny • Programming Exercises • Quizzes
CLO5 : Be aware that proving code is correct is necessary to achieve 100% system reliability	• Programming Exercises

Learning and Teaching Technologies

Echo 360 | webCMS3

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Programming Exercises Assessment Format: Individual	50%	Start Date: Not Applicable Due Date: Not Applicable
Program Verification in Dafny Assessment Format: Individual	25%	Start Date: Not Applicable Due Date: Not Applicable
Quizzes Assessment Format: Individual	10%	Start Date: Not Applicable Due Date: Not Applicable
Conceptual and programming exercises in Dafny Assessment Format: Individual	15%	Start Date: Not Applicable Due Date: Not Applicable

Assessment Details

Programming Exercises

Assessment Overview

Final Examination (50 marks) comprising just programming exercises

- There is a 'hurdle': if your final exam mark is below the final exam pass mark, your mark for the exam will be set to 0.
- The pass mark for the final exam is *scaled* to the difficulty: the more difficult the exam, the lower the pass mark.
- In individual cases, applying the hurdle always triggers a re-mark of the final exam.

Course Learning Outcomes

- CLO1 : Be able to build a formal specification of the behaviour of a program
- CLO3 : Be able to reason abstractly about requirements and be able to model them using formal methods
- CLO4 : Be able to implement the reasoning in the compiler/verifier language Dafny
- CLO5 : Be aware that proving code is correct is necessary to achieve 100% system reliability

Assignment submission Turnitin type

Not Applicable

Hurdle rules

- If your final exam mark is below the final exam pass mark, your mark for the exam will be set to 0.

- The pass mark for the final exam is *scaled* to the difficulty: the more difficult the exam, the lower the pass mark.
- In individual cases, applying the hurdle always triggers a re-mark of the final exam.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.
For more information on Generative AI and permitted use please see here.

Program Verification in Dafny

Assessment Overview

This assignment involves programming/verification exercises in the Dafny language.

Work will be marked against assessment criteria given in the assignment specification.
Individual, on-line feedback will be provided for the assignments. There is also verbal class-wide feedback during lectures.

Course Learning Outcomes

- CLO3 : Be able to reason abstractly about requirements and be able to model them using formal methods
- CLO4 : Be able to implement the reasoning in the compiler/verifier language Dafny

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

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Quizzes

Assessment Overview

6 weekly quizzes (10 marks total) comprising multiple-choice questions (majority are multiple

selection)

- The final quiz mark will be calculated by the formula *10 * total-number-of-correct-answers / total-number-of-questions*.

There is on-line class-wide feedback for the quizzes,

Course Learning Outcomes

- CLO1 : Be able to build a formal specification of the behaviour of a program
- CLO2 : Be able to write, or even engineer, code that conforms to the specification
- CLO3 : Be able to reason abstractly about requirements and be able to model them using formal methods
- CLO4 : Be able to implement the reasoning in the compiler/verifier language Dafny

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.
For more information on Generative AI and permitted use please see here.

Conceptual and programming exercises in Dafny

Assessment Overview

This assignment is a mix of conceptual and programming exercises in the Dafny language.

Work will be marked against assessment criteria given in the assignment specification. Individual, on-line feedback will be provided for the assignments. There is also verbal class-wide feedback during lectures.

Course Learning Outcomes

- CLO1 : Be able to build a formal specification of the behaviour of a program
- CLO2 : Be able to write, or even engineer, code that conforms to the specification

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are

not permitted to use any generative AI tools, software or service to search for or generate information or answers.

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General Assessment Information

Grading Basis

Standard

Requirements to pass course

Final Examination (50 marks) comprising just programming exercises

- There is a 'hurdle': if your final exam mark is below the final exam pass mark, your mark for the exam will be set to 0.
- The pass mark for the final exam is *scaled* to the difficulty: the more difficult the exam, the lower the pass mark.
- In individual cases, applying the hurdle always triggers a re-mark of the final exam.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Consultation after lecture
Week 2 : 16 September - 22 September	Lecture	Consultation after lecture
	Assessment	Quiz 1
Week 3 : 23 September - 29 September	Lecture	Consultation after lecture
	Assessment	Quiz 2
Week 4 : 30 September - 6 October	Lecture	Consultation after lecture
	Assessment	Quiz 3
Week 5 : 7 October - 13 October	Lecture	Consultation after lecture
	Assessment	Assignment 1
Week 6 : 14 October - 20 October	Homework	revision exercises
Week 7 : 21 October - 27 October	Lecture	Consultation after lecture
	Assessment	Quiz 4
Week 8 : 28 October - 3 November	Lecture	Consultation after lecture
	Assessment	Quiz 5
Week 9 : 4 November - 10 November	Lecture	Consultation after lecture
	Assessment	Quiz 6
Week 10 : 11 November - 17 November	Lecture	Consultation after lecture
	Assessment	Assignment 2

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Albert Nymeyer		not on campus		weekly consultations to be scheduled	Yes	Yes

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable

Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW 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.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures

can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School Contact Information

CSE Help! - on the Ground Floor of K17

- For assistance with coursework assessments.

The Nucleus Student Hub - https://nucleus.unsw.edu.au/en/contact-us

- Course enrolment queries.

Grievance Officer - grievance-officer@cse.unsw.edu.au

- If the course convenor gives an inadequate response to a query or when the courses convenor does not respond to a query about assessment.

Student Reps - stureps@cse.unsw.edu.au

- If some aspect of a course needs urgent improvement. (e.g. Nobody responding to forum queries, cannot understand the lecturer)

You should **never** contact any of the following people directly:

- Vice Chancellor

- Pro-vice Chancellor Education (PVCE)

- Head of School

- CSE administrative staff

- CSE teaching support staff

They will simply bounce the email to one of the above, thereby creating an unnecessary level of indirection and a delay in the response.