

# Formal Foundations of Programming - Course Outline

## SWEN 224: 2015 Trimester 2

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This document sets out the workload and assessment requirements for SWEN 224. It also provides contact information for staff involved in the course. If the contents of this document are altered during the course, you will be advised of the change by an announcement in lectures, ECS email and/or on the course web site. A printed copy of this document is held in the School Office.

### Objectives

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This course introduces a selection of topics, focusing on the use of formal notations and formal models in the specification, design and analysis of programs, languages, and machines. Topics include program specification and verification, formal languages and automata theory, scanners and parsers.

The principal objective of the course is to teach students how to use mathematical techniques to describe and reason about various kinds of computational structures and processes. A student completing the course should be able to:

1. Use mathematical structures such as sets, functions, relations and sequences to model software systems, and to state desired properties of such systems, including pre and postconditions, class invariants and loop invariants; [\(3\(a\),3\(c\)\)](#)
2. Appreciate a range of different techniques for ensuring correctness properties of programs, the strengths and weaknesses of particular techniques; [\(3\(c\),3\(d\),3\(e\)\)](#)
3. Use tools such as Whiley and OpenJML to check correctness properties of software systems; [\(3\(a\),3\(b\),3\(d\),3\(f\)\)](#)
4. Use mathematical reasoning to prove correctness properties of programs. [\(3\(a\),3\(b\),3\(c\)\)](#)

SWEN 224 is part of the Engineering program at Victoria University of Wellington. BE students are expected to exhibit a number of graduate attributes upon graduation. These course objectives contribute to the graduate attributes as indicated above. A full table of these attributes is available at [Graduate Attributes](#).

### Staff

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The course coordinator is David J. Pearce. The lecturers for the course are [David Pearce](#) and [David Streader](#). Their contact details are:

- *David J. Pearce*
- [Cotton 231](#)
- +64 4 463 5833
- [djp@ecs.vuw.ac.nz](mailto:djp@ecs.vuw.ac.nz)
- Office Hours: *by email appointment*
  
- *David Streader*
- [Cotton 260](#)
- +64 4 463 5655
- [David.Streader@ecs.vuw.ac.nz](mailto:David.Streader@ecs.vuw.ac.nz)

The Class Rep this year is:

- *Joely Huang*, [huangjoel@ecs.vuw.ac.nz](mailto:huangjoel@ecs.vuw.ac.nz)

### Announcements and Communication

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The main means of communication outside of lecture will be the web area at [http://ecs.victoria.ac.nz/Courses/SWEN224\\_2015T2/](http://ecs.victoria.ac.nz/Courses/SWEN224_2015T2/). There you will find, among other things, this document, the [lecture schedule](#), and the [SWEN 224 Forum](#). The forum is a web-based bulletin board system. Questions and comments can be posted to the forum, and staff will read these posts and frequently respond to them.

Important announcements for the course will be made at lectures, emailed to the course mailing list and posted on the SWEN 224 web site. We will assume that all students attend all lectures and check the web site and their ECS email at least three times a week.

### Trimester Dates and Lecture Times

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SWEN 224 is a trimester 2 course. The trimester starts on Monday 13th July. The examination period at the end of the course is 23 October - 14 November,

A [schedule](#) of lecture topics, readings, and assignment due dates is available online. A summary of the topics is:

Topic	Lectures
Static Analysis	4
Model Checking	8
Software Verification	10

Lectures are 12pm-12:50pm on Mondays and Wednesdays in Maclaurin MCLT102 (see the [University Timetable](#) for more information).

Attendance at lectures is an essential part of the learning process. Lectures will be used to introduce basic ideas and techniques.

## Textbook

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There is no text book for the course.

Copies of slides used in lectures will be handed out in lectures, and made available on-line on the course website.

Handouts covering the lecture material in more detail will be provided for some parts of the course.

Pointers to additional material, in the VUW library and on the Web, will be provided on the course web site.

## Laboratories

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Starting in the second week, you will be expected to attend one two-hour supervised laboratory a week. In the laboratories, you will be asked to solve small problems that relate to the course material and/or assignments currently underway. The laboratories are assessed, and attendance is mandatory. A schedule for the laboratory times will be posted on the course web site and you will need to sign up to one of the available lab streams.

## Assignments

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There will be four assignments spanning two or three weeks each. Assignments will involve a mixture of written work and the use of software tools such as *Whiley* and *FindBugs*. Some assignments may involve a small amount of Java programming, but this will mainly be in association with the use of tools such as *FindBugs*. Programming will not form a major part of the course, but a reasonable level of proficiency in writing Java programs will be assumed. Practical work underpins this course, since it is essential for a proper understanding of the material. **Therefore, you are required to submit a reasonable attempt on 3 of the 4 assignments in order to pass the course.** We expect that you will spend at least 6 hours a week working on the current assignment.

If you have access to a computer outside the labs, you may use it to work on the assignments, but you will need to acquire your own software for completing assignments. Please note that we do not have the resources to provide assistance if you have difficulties with a computer at home -- the tutors can only answer questions about the assignments/projects and the workstations in the laboratories. Note also that we cannot offer you any help with choosing, setting up, or fixing your own computer system, other than the general advice that we provide on the website.

## Workload

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In order to maintain satisfactory progress in SWEN 224, you should plan to spend an average of at least 10 hours per week on this paper. A reasonable breakdown for these hours would be:

- Lectures & Labs: 4 hours
- Readings: 1 hour
- Assignments: 6 hours

## School of Engineering and Computer Science

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The School office is located on level three of the Cotton Building ([Cotton 358](#)).

## Assessment

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Your grade will be determined based on your lab and assignment marks, the marks obtained for completed questions in the online self-assessment tool, a mid-term test and a final two-hour examination:

Item	Weight
Assignments	16%
Labs	14%
Mid-term test	10%

The test and exam will assess your understanding of the material presented in lectures, while the lab/project work will assess your ability to apply the techniques in practice.

**Note:** Bachelor of Engineering students should be aware that copies of their assessed work may be retained for inspection by accreditation panel.

## Marking Criteria

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The labs will be marked during the lab sessions, according to the following grade scale:

- 0: didn't attend
- E: no achievement on set problem(s)
- D: poor achievement on set problem(s)
- C: satisfactory achievement on set problem(s)
- B: good achievement on set problem(s)
- A: excellent achievement on set problem(s)

## Tests and Exams

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The mid-term test will take the form of a short a written test. The date and time of the test is Wednesday 9th September between 6pm and 7:30pm. The test will help you gauge your understanding of the material so far.

The timetable for final examinations will be available from the University web site and will be posted on a notice board outside the faculty office. The final examination will be two hours long. No computers, electronic calculators or similar device will be allowed in the final examination. Paper non-English to English dictionaries will be permitted. The examination period for trimester 2 is 23 October - 14 November.

## Practical Work

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Hand-in dates for the assignments are:

- Assignment 1 - due Monday 3rd August, 2015 @ midnight
- Assignment 2 - due Monday 7th September, 2015 @ midnight
- Assignment 3 - due Monday 28th September, 2015 @ midnight
- Assignment 4 - due Monday 13th October, 2015 @ midnight

Each piece of work should be handed in on the dates and times specified in the Schedule. Submission should be made via the online submission system (found on the course homepage). **Unless prior agreement with the course coordinator has been made at least 24 hours in advance, late submissions will be penalised 20% of their mark for every day overdue.** This means after 5 days zero marks will be awarded. In this case, the work should still be submitted in order to pass the mandatory requirements. However, submissions will not be accepted once any model answers have been given out. Approval for late submission will only be given in exceptional circumstances.

## Mandatory Requirements

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The mandatory requirements for SWEN 224 that you:

- Make a reasonable attempt on three out of the four assignments
- Attend at least 8 of the 10 weekly two hour lab sessions.
- Achieve at least a 'D' grade in the final exam.

## Passing SWEN 224

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To pass SWEN 224, a student must satisfy mandatory requirements and gain at least a **C-** grade overall.

## Withdrawal

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The last date for withdrawal from SWEN 224 with entitlement to a refund of tuition fees is Friday 24 July 2015. The last date for withdrawal without being regarded as having failed the course is Friday 25 September 2015 -- though later withdrawals may be approved by the Dean in special circumstances.

## Additional Information

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### Rules & Policies

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Find key dates, explanations of grades and other useful information at <http://www.victoria.ac.nz/home/study>.

Find out about academic progress and restricted enrolment at <http://www.victoria.ac.nz/home/study/academic-progress>.

The University's statutes and policies are available at <http://www.victoria.ac.nz/home/about/policy>, except qualification statutes, which are available via the Calendar webpage at <http://www.victoria.ac.nz/home/study/calendar> (See Section C).

Further information about the University's academic processes can be found on the website of the Assistant Vice-Chancellor (Academic) at <http://www.victoria.ac.nz/home/about/avcacademic>

All students are expected to be familiar with the following regulations and policies, which are available from the school web site:

[Grievances](#)

[Student and Staff Conduct](#)

[Meeting the Needs of Students with Disabilities](#)

[Student Support](#)

[Academic Integrity and Plagiarism](#)

[Dates and Deadlines including Withdrawal dates](#)

[School Laboratory Hours and Rules](#)

[Printing Allocations](#)

[Expectations of Students in ECS courses](#)

The School of Engineering and Computer Science strives to anticipate all problems associated with its courses, laboratories and equipment. We hope you will find that your courses meet your expectations of a quality learning experience.

If you think we have overlooked something or would like to make a suggestion feel free to talk to your course organiser or lecturer.

[Course Outline as PDF](#)

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