Prescription

The course looks at a range of issues relating to the design and implementation of modern compilers. In particular, the course will focus on techniques and algorithms for code generation, code optimisation and type checking. During the course projects, students will be working on a fully-fledged Java compiler to extend it in various ways. Students should expect to learn a great deal about how compilers work and, in particular, about the Java compiler and Java Bytecode instruction set.

Course learning objectives

Students who pass this course should be able to:

1. Understand basic principles of a compiler
2. Understand scanning and parsing stages of the compiler
3. Understand type checking stages of the compiler, including the basics of type systems
4. Understand what dataflow analysis is and how it is used within a compiler
5. Understand the code generation stage of the compiler, including knowledge of Java Bytecode
6. Have a good background for continued research in these areas

Course content

SWEN 430 looks at a range of issues relating to the modern compiler engineering. In particular, the course will focus on techniques and algorithms for code generation, code optimisation and type checking. During the course projects, students will develop a fully-fledged compiler for a small imperative language. Students should expect to learn a great deal about how compilers work and, in particular, about the Java Bytecode and x86 instruction sets.
The aim of this course is to introduce the ideas, techniques and algorithms which form the foundation of modern compilers. The course has a practical focus and students will develop their compiler in the Java language. If you have concerns about whether your Java skills are sufficient, you should speak to the course coordinator as soon as possible.

Withdrawal from Course

Withdrawal dates and process:
https://www.victoria.ac.nz/students/study/course-additions-withdrawals

Lecturers

David Pearce (Coordinator)

david.pearce@vuw.ac.nz   04 4635833

231 Cotton, Kelburn

Lindsay Groves

lindsay.groves@vuw.ac.nz

Teaching Format

During the trimester there will be two lectures per week.

Student feedback

Student feedback on University courses may be found at:
www.cad.vuw.ac.nz/feedback/feedback_display.php

Dates (trimester, teaching & break dates)

- Teaching: 08 July 2019 - 13 October 2019
- Break: 19 August 2019 - 01 September 2019
- Study period: 14 October 2019 - 17 October 2019
- Exam period: 18 October 2019 - 09 November 2019

Class Times and Room Numbers

08 July 2019 - 18 August 2019
- **Monday** 16:10 - 17:00 – 104, Alan MacDiarmid Building, Kelburn
- **Wednesday** 13:10 - 14:00 – 102, Alan MacDiarmid Building, Kelburn

02 September 2019 - 13 October 2019
- **Monday** 16:10 - 17:00 – 104, Alan MacDiarmid Building, Kelburn
- **Wednesday** 13:10 - 14:00 – 102, Alan MacDiarmid Building, Kelburn

Set Texts and Recommended Readings

Required

There is no set text for SWEN 430, but the following book contains most of the material presented in this course and is on closed reserve in VUW Library:

- *Modern Compiler Implementation in Java*, Andrew Appel. (closed reserve)

Recommended

Other books of interest include:

- *Engineering a Compiler,* Keith D. Cooper and Linda Toczon. See Chapter 8. [1 copy in library]
- *Compilers: Principles, Techniques and Tools*, Alfred V. Aho, Ravi Sethi and Jeffrey D. Ullman. See Chapter 10. [1 copy in library]
- *Advanced Compiler Design and Implementation*, Steve S. Muchnick. See Chapter 9.
- *Optimizing Compilers for Modern Architectures*, Randy Allen and Ken Kennedy. See Chapter 4.4 and 11.

Mandatory Course Requirements

In addition to achieving an overall pass mark of at least 50%, students must:

- *Achieve at least 40% average across all of the assignments.*
- *Achieve at least 40% in exam.*

If you believe that exceptional circumstances may prevent you from meeting the mandatory course requirements, contact the Course Coordinator for advice as soon as possible.

Assessment

This course will be assessed through four assignments and final examination.

Assessment Item	Due Date or Test Date	CLO(s)	Percentage
Assignment 1		CLO: 1,2	12.5%
Assignment 2		CLO: 1,3,4	12.5%
Assignment 3		CLO: 1,4,5	12.5%
Assignment 4		CLO: 1,4,5	12.5%
Final exam (2 hours)		CLO: 1,2,3,4,5,6	50%

Extensions

If you anticipate difficulty in meeting a deadline, please approach the course coordinator as soon as possible so an extension can be agreed upon.

Submission & Return

Work for marking should be submitted electronically using the ECS Submission System. Marked projects will be available at lectures, or from the School Office.

Workload

In order to maintain satisfactory progress in SWEN 430, you should plan to spend an average of *10* hours per week on this paper. A plausible and approximate breakdown for these hours would be:

- Lectures: 2 hours,
- Readings: 3 hours,
- Projects: 5 hours.

Teaching Plan

See: https://ecs.victoria.ac.nz/Courses/SWEN430_2019T2/LectureSchedule

Communication of Additional Information

All online material for this course can be accessed at
https://ecs.victoria.ac.nz/Courses/SWEN430_2019T2/

Links to General Course Information

- Academic Integrity and Plagiarism: https://www.victoria.ac.nz/students/study/exams/integrity-plagiarism
- Academic Progress: https://www.victoria.ac.nz/students/study/progress/academic-progess (including restrictions and non-engagement)
- Dates and deadlines: https://www.victoria.ac.nz/students/study/dates
- Grades: https://www.victoria.ac.nz/students/study/progress/grades
- Special passes: Refer to the Assessment Handbook, at https://www.victoria.ac.nz/documents/policy/staff-policy/assessment-handbook.pdf
- Statutes and policies, e.g. Student Conduct Statute: https://www.victoria.ac.nz/about/governance/strategy
- Student support: https://www.victoria.ac.nz/students/support
- Students with disabilities: https://www.victoria.ac.nz/st_services/disability/
- Student Charter: https://www.victoria.ac.nz/learning-teaching/learning-partnerships/student-charter
- Terms and Conditions: https://www.victoria.ac.nz/study/apply-enrol/terms-conditions/student-contract
- Turnitin: http://www.cad.vuw.ac.nz/wiki/index.php/Turnitin
- University structure: https://www.victoria.ac.nz/about/governance/structure
- VUWSA: http://www.vuwsa.org.nz

Offering CRN: 18668

Points: 15
Prerequisites: COMP 261 or SWEN 324 (or 224); 30 further 300-level points from (COMP, NWEN 303, SWEN)
Duration: 08 July 2019 - 10 November 2019
Starts: Trimester 2
Campus: Kelburn