

Computer Organisation - Course Outline

NWEN 242: 2012 Trimester 2

This document sets out the workload and assessment requirements for NWEN 242. 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 and/or on the course web site. A printed copy of this document is held in the School Office.

Objectives

NWEN242 introduces the common physical components of a computer and their interconnection. It also studies the process of program execution, the fundamentals of assembly language programming, data representation, computer arithmetic, and machine instruction design.

This course focuses on the boundary between hardware and software and explores the levels of hardware in the vicinity of this boundary. The first, smaller part of the course considers the concepts of assembly language programming, data representation and computer arithmetic. The second, larger part considers datapath, control, pipelining, memories, and interface between processors and peripherals.

The purpose of the course is to give you an overall understanding of how the technologies that we use to build computers influence the design of the programming languages and the efficiency of the algorithms that we use on them. By the end of the course you should be able to demonstrate a good understanding of:

1. Main components of a typical computer and their interconnections,
2. Appropriate ways to represent data in hardware,
3. Writing simpler and understanding more complex RISC assembly language programs,
4. The way a computer executes arithmetic operations,
5. Logic designs for:
 1. Performing computations (datapaths),
 2. Controlling datapaths,
 3. Storing information (memories), and
 4. Improving datapaths and memory performance (pipelining and caches).
6. How these designs influence:
 1. The basic operations available to programmers, and
 2. The performance of computer programs.

The objectives 1, 2, 3, and 4 demonstrate the ability to apply mathematical and engineering sciences to gain understanding of a complex engineering problem ([BE graduate attribute 3\(a\)](#)).

The objective 5 develops competence in design of computer system, ability to demonstrate their efficacy, and understanding of the limitations of computer system design methods ([BE graduate attribute 3\(f\)](#), [BE graduate attribute 3\(b\)](#), and [BE graduate attribute 3\(d\)](#)), respectively.

The objective 6 develops ability to solve models that predict behaviour of a computer system ([BE graduate attribute 3\(c\)](#)).

Before you enroll in NWEN242, you must have passed COMP103 and MATH161 (or MATH114). It is assumed that students can understand the semantics of simple Java or C/C++ programs.

Textbook

The textbook for NWEN 242 is: Hennessy and Patterson *Computer Organization and Design*, (Third Edition or Fourth Edition) Morgan Kaufmann, (2005. or 2009, respectively) Approx cost: \$180.

Lectures and Tutorials

A [schedule](#) of lecture topics, readings, project and assignment due dates is available online. Lectures for NWEN 242 are:

- Monday, Tuesday, and Thursday 2:10 to 3:00 pm in HM LT105.

Lectures will introduce and discuss the main concepts and theories, while tutorials will help you understand details and applications of concepts and theories discussed in lectures.

Assignments and Projects

There are three assignments and three lab projects. Approximate assignment and project hand out dates are given [here](#).

Assignments and lab projects will enable you to practice concepts introduced in lectures. Doing the assignments and projects is an important part of your preparation for the test and exam. You will find a submission instruction in each assignment and project.

You are expected to do all the lab projects and all the assignments. Each lab project and each assignment is worth 3% of your final grade. No late submissions will be accepted for these lab projects and assignments. So, late submissions will achieve 0 marks.

If you experience any problems in submitting your assignment or project please identify those to the lecturers as soon as practical.

In past years some students have set up informal study groups to discuss the assignments and projects, and possible approaches to answering the questions. This is perfectly acceptable provided that students declare on their hand-ins with whom they have collaborated. However, **plagiarism is not allowed at any stage of this course**.

Assignments

The first assignment considers main components of a computer system and the MIPS assembly programming language. It is related to course objectives 1, 2 and 3. The second assignment is devoted to the design of logic circuits and computer data path. It is related to the course objectives 5.1 and 5.2. The third assignment deals with pipelining data path, memory hierarchy, and input/output. It helps you achieve the course objectives 5.2 and 5.3.

Projects

Through the first lab project you learn writing, testing, and running assembly language programs (objective 3). In the second lab project you use a simulator to learn how pipelining improves processor's performance and influences writing assembly programs (objectives 5.2 and 6.1), while the third lab project let you experiment with memory caches and learn how they influence processor's performance (objectives 5.3 and 6.2).

Lab sessions are scheduled and you will get the instruction in lectures how to sign up. Each lab project has to be completed during two weeks time. To do the labs you will need an account on the School's Unix system. To activate your ECS computer account, go to a lab and follow the instruction provided. If you experience any problems, ask your tutor for help, or go to the School Office ([CO358](#)) for more information.

There will be an additional lab project, Lab0, in the second week of the term. Lab0 is aimed to help you learn more Unix commands and the School Computer System. Although Lab0 is not a compulsory one and will not be marked, we recommend students to attempt the lab to gain familiarity.

You are of course free to use the school labs when there are no lab sessions scheduled. You should expect to spend about 4 to 6 hours on average on each lab project.

Workload

In order to maintain satisfactory progress in NWEN 242, you should plan to spend an average of at least 10 hours per week on this course. A plausible and approximate breakdown for these hours would be:

- Lectures: 3 hours,
- Readings: 3 hours, and
- Assignments and projects: 4 hours.

School of Engineering and Computer Science

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

Staff

The course organizer and lecturer for NWEN 242 are, respectively: [Ian Welch](#) and [Christian Rolf](#). Christian's contact details are:

- [Christian Rolf](#)
- [Cotton 330](#)
- Christian.Rolf@ecs.vuw.ac.nz

- [Ian Welch](#)
- [Cotton 337](#)
- ian.welch@ecs.vuw.ac.nz

Class Representative

A class representative will be elected during the first week of the course.

Announcements and Communication

The main means of communication outside of lecture will be the NWEN 242 web site at http://ecs.victoria.ac.nz/Courses/NWEN242_2012T2/. There you will find, among other things, this document, the [lecture schedule](#), [assignment handouts](#), and the [NWEN 242 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.

Assessments

Your grade for NWEN 242 will be determined based on the following assessment weightings:

Item	Weight
Assignment 1	3%
Assignment 2	3%
Assignment 3	3%
Project 1	3%
Project 2	3%
Project 3	3%
Mid Term Test	22%
Final Examination	60%

Test and Exam

The **mid-term test** will be 50 minutes, and the date and location will be announced in the second week of the course. The mid-trimester test will help you gauge how well you understand the material in the first half of the course. The mid-trimester test is worth 22% of your final grade.

The **final exam** is worth 60% of your final grade. You may be asked questions about any of the topics that we have covered in lectures and tutorials (this corresponds, roughly, to Chapters 1 to 7 and Appendices B and C of the fourth edition course textbook), or in assignments and lab projects.

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 three hours long. No programmable calculators will be allowed in the final examination. Paper non-English to English dictionaries will be permitted.

Plagiarism

Working Together and Plagiarism

We encourage you to discuss the principles of the course and assignments with other students, to help and seek help with programming details, problems involving the lab machines. However, any work you hand in must be your own work.

The [School policy on Plagiarism](#) (claiming other people's work as your own) is available from the course home page. Please read it. We will penalise anyone we find plagiarising, whether from students currently doing the course, or from other sources. Students who knowingly allow other students to copy their work may also be penalised. If you have had help from someone else (other than a tutor), it is always safe to state the help that you got. For example, if you had help from someone else in writing a component of your code, it is not plagiarism as long as you state (e.g., as a comment in the code) who helped you in writing the method.

Mandatory Requirements

Mandatory requirements for the course are the following:

- Achieve at least 40% of all marks for projects, assignments, and mid-trimester test (this means 40% of the 40% = 16% of the final grade); and
- Achieve at least D grade for the final examination.

Passing NWEN 242

To pass NWEN 242, a student must satisfy mandatory requirements and gain at least a **C** grade overall.

Withdrawal

The last date for withdrawal from NWEN 242 with entitlement to a refund of tuition fees is Friday 27 July 2012. The last date for withdrawal without being regarded as having failed the course is Friday, 28 September 2012 -- though later

withdrawals may be approved by the Dean in special circumstances.

Rules & Policies

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.
