

# Operating Systems Design - Course Outline

## NWEN 301: 2012 Trimester 1

This document sets out the workload and assessment requirements for NWEN 301. 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

Operating Systems Design is part of the Engineering program at Victoria University of Wellington. BE graduates are expected to exhibit a number of graduate attributes at the completion of the program. This course contributes to the graduate attributes (GA) as indicated below. A full table of these attributes is available at [Graduate Attributes](#).

By the end of the course, students should be able to explain (GA [3\(a\)](#) & [3\(b\)](#)):

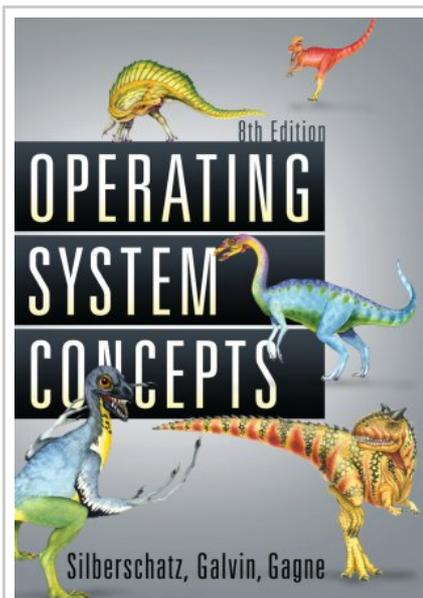
1. *What an operating system is, what it does, and how it is designed and constructed,*
2. *the process concept, lifecycle and concurrency models central to OS design,*
3. *process scheduling, interprocess communication, process synchronization and deadlock handling,*
4. *memory management schemes, such as segmentation, paging and virtual memory, and*
5. *basic mechanisms for protection and system security.*

The programming projects have been selected to emphasise these important operating systems concepts, resulting in:

1. *experience in writing operating system code (in the Win NT kernel) (GA [3\(d\)](#) & [3\(f\)](#)),*
2. *an appreciation of impact upon performance of design choices such as the selection of algorithms with an operating system kernel (GA [3\(b\)](#)),*
3. *a practical understanding of a large body of production quality code (GA [3\(f\)](#)), and*
4. *familiarity with UNIX/Linux; C programming, APIs and System Calls (GA [3\(f\)](#)).*

### Textbook

The textbook used for the course is:



Operating System Concepts, 8th Edition, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, ISBN: 978-0-470-12872-5. 2009

The textbook is **essential** reading for doing well in the course. The lectures will provide a guide to the book but getting a good grade will require you to read the recommended readings. Two copies are on restricted issue at the University Library.

### Lectures, Tutorials, Laboratories, and Practical work

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

Lectures for NWEN 301 are:

|                     |               |                |       |
|---------------------|---------------|----------------|-------|
| 5 Mar - 10 Jun 2012 | Mon 1200-1250 | Laby [Kelburn] | LT118 |
| 5 Mar - 10 Jun 2012 | Wed 1200-1250 | Laby [Kelburn] | LT118 |

Tutorials for NWEN 301 are:

|                      |                |                |       |
|----------------------|----------------|----------------|-------|
| 13 Mar - 10 Jun 2012 | Tues 0900-0950 | Laby [Kelburn] | LT118 |
|----------------------|----------------|----------------|-------|

Labs for NWEN 301 are:

|                      |  |                  |       |
|----------------------|--|------------------|-------|
| 12 Mar - 10 Jun 2012 | Either of Tu 1600 - 1800 or Fr 1100 - 1300 | Cotton [Kelburn] | CO246 |
|----------------------|--|------------------|-------|

There will be no labs in the week containing Easter Friday.

Lecture topics:

- OS components
- Processes and threads
- Concurrency
- Synchronization primitives
- Higher-level synchronization structures
- Deadlock
- Transactions
- CPU scheduling
- Multilevel CPU scheduling
- Memory management
- Memory management (Paging)
- Demand paging (VM)
- File systems introduction
- Directories and abstraction
- File structures and space management
- Access scheduling and storage
- IO subsystems
- Security, domains and authentication
- Access matrices and protection schemes
- Distributed systems

## Homework

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Five homework assignments will be set on a fortnightly basis starting in week 3. These will help focus your learning and exam preparation.

## Projects

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There are three projects for NWEN 301. All projects build upon the [Windows Research Kernel](#) and involve the modification of production derived code to build and execute the windows operating system. We will be using the visual studio development environment to modify the windows kernel and will execute and debug using a Virtual Machine.

- Project 1 will familiarize you with the development environment, permitting you to compile, build, execute and debug your kernel. You will also add a minor system call to the kernel.
- Project 2 will add a system call to windows. The system call will return 'useful' system statistics.
- Project 3 is the major project. We will implement a fair thread scheduler.

## Workload

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In order to maintain satisfactory progress in NWEN 301, you should plan to spend an average of at least *10* hours per week on this paper. A plausible and approximate breakdown for these hours would be:

- Two lectures per week (1 hour each),
- Project work (approximately 3 hrs per week averaged over the course),
- Homework assignment - even weeks (1-2 hours each, 5 in total), and

- Independent study each week (4-5 hours)

## Assessment

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Your grade for NWEN 301 will be determined based on the following assessment weightings:

| Item              | Weight      | Due        |
|-------------------|-------------|------------|
| Homework          | 10% (2% ea) | even weeks |
| Project 1         | 5%          | week 4     |
| Project 2         | 15%         | week 7     |
| Project 3         | 20%         | week 11    |
| Final Examination | 50%         | TBA        |

Please note, all homework and project work is due at 23:59 on the Friday of the indicated week. All work will be submitted via the electronic submission system. All homework must be submitted in PDF - work submitted in any other format will **NOT** be marked. Our goal is to return homework to you within two weeks of submission.

Please note: copies of student work will be kept for the IPENZ BE accreditation process.

## Policies and penalties for late submission of internally accessed work

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Homework assignments will not be accepted after model answers have been posted on the website. However, you can take the best four of five homework marks for your grade.

Project work will be penalised at a rate of 10% per day late. However, for project work you have up to five grace days over the period of the course. This is a total number of days, if you use all five days up on your first project subsequent late projects will be penalised.

## The Exam

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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 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 1 is 15 June - 4 July.

**The examination is open book. You are allowed to bring in one A4 piece of paper that you may write on either side.**

## Mandatory Requirements

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Students must achieve a minimum D grade in the examination and must have attempted all of the projects.

## Passing NWEN 301

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To pass NWEN 301, 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 NWEN 304 with entitlement to a refund of tuition fees is Friday 16 March. The last date for withdrawal without being awarded a failing grade is Friday 18 May -- though later withdrawals may be approved by the Dean in special circumstances.

Due to the revised 2011 Academic Progress Statute that applies from Trimester 1 2011, students withdrawing after the regulation 2 week period will be deemed to have **failed** that course as far as the application of the academic progress statute is concerned.

## School of Engineering and Computer Science

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

The notice board for NWEN 301 is located on the second floor of the Cotton Building.

## Staff

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The course organiser and lecturer for NWEN 301 is [Ian Welch](#):

- [Ian Welch](#)
- [Cotton 338](#)

- +64 4 463 5664
- [ian.welch@vuw.ac.nz](mailto:ian.welch@vuw.ac.nz)

There are three tutors on the course: Ruichen Li, James McVay and Cameron Owen.

A class representative will be chosen during the first week of teaching.

## Announcements and Communication

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The main means of communication outside of lectures will be the NWEN 301 web area at [http://ecs.victoria.ac.nz/Courses/NWEN301\\_2012T1/](http://ecs.victoria.ac.nz/Courses/NWEN301_2012T1/). There you will find, among other things, this document, the [lecture schedule](#) and [homework assignments](#), and the [NWEN 301 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.

## Working Together and Plagiarism

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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 (eg, as a comment in the code) who helped you in writing the method.

## 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.

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