

# COMPSCI 340 & SOFTENG 370

## Operating Systems

### Introduction

An operating system is the software which makes a raw computer more or less usable by people. To most people who use computers, the operating system is indistinguishable from the hardware; they never experience the machine by itself. It is the operating system's job to communicate with the people who use it, to look after their files, to do sensible things when they do silly things, and generally to look after all the jobs that must be done but which are too complicated (at the moment) to be built into the hardware.

This course tries to look at general principles of operating systems, but we do look at some low level details as well. You are expected to be a competent programmer in a language such as Java or C++. The early assignments this year will use Python. For those students who have never programmed in Python there will be some tutorials to quickly cover the important differences between Java and Python.

### Contents of the course

- Introduction to operating systems
- Operating system history
- Processes, threads and process states
- Real-time processes
- The problems of concurrency and some of the solutions
- Communicating processes
- Deadlock
- Devices
- Memory management
- Virtual memory
- File systems
- Networked operating systems
- Distributed operating systems
- Protection and Security

### Assessment

Type	% of final mark
Exam	70
Test: Monday 26th August, 11am - 12noon	10
Three assignments	20 (in total)
Monday 19th August	6
Friday 27th September	7
Friday 18th October	7

The Operating Systems course is classed as a practical course. This means you have to pass both the practical component - the assignments, and the theory component - the test and exam, as well as getting an overall pass, to pass the paper.

The pass mark for the practical component is 0%, i.e. you can pass the course without doing the assignments. Of course this is a difficult thing to do as your test and exam mark then has to be around 62.5% in order to pass overall. You also miss out on any learning benefit you would have had from doing the assignments. Also the test and final exam always have significant questions taken from the work done in the assignments.

The pass mark for the theory component and the overall pass marks are approximately 50%.

Cecil will be used for the submission of assignments.

## Lectures

Lectures are held at the following times and places (as of the time this document was prepared):

Monday	11am	ENG1401
Tuesday	11am	ENG1401
Wednesday	10am	ENG1401

Occasionally throughout the semester the Wednesday lecture time may be used as a tutorial time.

A list of the lecture topics is appended at the end of this document.

## Tutorial

There is a tutorial on Mondays at 2pm in ENG1401. The first tutorial is in the **second week of semester**, Monday the 29th of July.

## Online presence

Coursework marks for assignments and tests will be available for both COMPSCI 340 and SOFTENG 370 on Cecil.

Lecture notes, assignment handouts and other documents will be available for both courses at [www.cs.auckland.ac.nz/compsci340s2c/](http://www.cs.auckland.ac.nz/compsci340s2c/); this is also accessible from the Cecil area of both courses.

Video and audio recordings of the lectures will be available from the Knowledge Map section of the courses' Cecil areas.

There will be a class forum for both courses at [forums.cs.auckland.ac.nz](http://forums.cs.auckland.ac.nz).

## What to do about missed lectures

If you miss a lecture, you should catch up as soon as possible by reading the relevant lecture notes, viewing the recorded lecture on Cecil and reading the sections of the textbook specified in the lecture.

## Handling illness or absence

- If you must leave for family emergencies etc., PLEASE talk to the lecturer, or somehow get a message to the department. Very few problems are so urgent that we cannot be told quite quickly.
- For problems affecting assignments or tests, see the lecturer, as soon as reasonably possible.
- Always sit the test and examination if at all possible.
- For illness during exams (or other problems that affect exam performance) students MUST contact the Examinations Office within ONE WEEK of the last affected examination, to apply for an aegrotat pass (for illness) or compassionate pass (other problems).

THE ONE WEEK LIMIT IS STRICTLY ENFORCED.

Refer to the "Aegrotat and compassionate consideration" section of the Computer Science Undergraduate Handbook for further information. <http://www.cs.auckland.ac.nz/webdav/site/cs/shared/handbook/2013/Academic%20Information.pdf>

## Exam

Please read the examinations handbook when you receive it and double-check (triple-check?) the examination timetable. Every year some students turn up at the wrong time for exams.

## Policy on Cheating and Plagiarism

The University of Auckland will not tolerate cheating, or assisting others to cheat, and views cheating in coursework as a serious academic offence. The work that a student submits for grading must be the student's own work, reflecting his or her learning. Where work from other sources is used, it must be properly acknowledged and referenced. This requirement also applies to sources on the world-wide web. A student's assessed work may be reviewed against electronic source material using computerised detection mechanisms. Upon reasonable request, students may be required to provide an electronic version of their work for computerised review.

Please refer to the University Information on Academic honesty and plagiarism:

<http://www.auckland.ac.nz/uoahome/about/teaching-learning/honesty>

## Textbook

The textbook is *Operating System Concepts* by Silberschatz, Galvin and Gagne, 9th Edition. Published by John Wiley & Sons, Inc. 2013

This textbook is available either in hard copy from the University Book Store or in electronic form from <http://os-book.com>. The electronic form requires installation of a special app on most platforms.

## People

### Lecturer

Dr Robert Sheehan

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Rm 303.488

Office hours: Monday 12 to 1pm, Tuesday 2 to 3pm and Wednesday 11am to 12 noon.

### Tutor

TBA

## How to Seek Assistance

Utilise the class forum (see *Online presence* above). Contact the tutor or lecturer either during their office hours or by email. There are many other resources available within the University, e.g. the Student Learning Centre, the library, DELNA (to identify where you may need help with your academic English) and ELSAC (a free self-study facility to help you improve your English).

## Preliminary lecture schedule

Lecture 1 - Introduction to the course - OS structure

Lecture 2 - History of OSs - up to batch systems

Lecture 3 - History of OSs - time-sharing systems, PCs, the Web and smaller OSs

Lecture 4 - C programming and Operating Systems

Lecture 5 - Virtualization, Processes and threads - implementation

Lecture 6 - PCBs, Process states, Process creation

Lecture 7 - Running, waiting and stopping

Lecture 8 - Scheduling  
Lecture 9 - Real-time scheduling  
Lecture 10 - The problem of concurrency - locks and semaphores  
Lecture 11 - Readers/writers, monitors  
Lecture 12 - Dining Philosophers, Equivalence of concurrency constructs  
Lecture 13 - IPC, Distributed concurrency control  
Lecture 14 - Deadlock  
Lecture 15 - File Systems  
Lecture 16 - Representing files on disk  
Lecture 17 - File allocation techniques  
Lecture 18 - Versioning File Systems  
Lecture 19 - Distributed File Systems  
Lecture 20 - NFS & AFS  
Lecture 21 - Distributed services.  
Lecture 22 - Memory management, Pages, Segments  
Lecture 23 - Virtual memory, page faults  
Lecture 24 - Page allocation algorithms  
Lecture 25 - Protection and the access matrix  
Lecture 26 - Capabilities and Access Control Lists  
Lecture 27 - Intro to mobile security  
Lecture 28 - Kerberos  
Lecture 29 - Device drivers  
Lecture 30 - Linux modules and general device services  
Lecture 31 - Disks as special devices, disk scheduling