

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 C. For those students who have never programmed in C there will be some tutorials to quickly cover the important differences between Java and C.

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 22nd August, 12noon - 1pm	10
Three assignments	20 (in total)
Friday 12th August	7
Friday 23th September	7
Friday 14th October	6

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%.

Lectures

Lectures are held in the Old Government House Lecture Theatre on Mondays at noon, Thursdays at 10am and Fridays at 1pm.

Occasionally throughout the semester the Friday lecture time will 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 Tuesdays at 10am in Clock Tower 039. The first tutorial is in the **second week of semester**, Tuesday the 26th 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/.

There is a class forum for both courses at forums.cs.auckland.ac.nz.

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/2011/3-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 <http://www.auckland.ac.nz/uoa/cs-academic-honesty>.

Textbook

The textbook is *Operating System Concepts* by Silberschatz, Galvin and Gagne, 8th Edition. Published by John Wiley & Sons, Inc. 2009

People

Lecturers

Dr Robert Sheehan

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Office hours: 2pm - 4pm Monday, 11am - 1pm Thursday and 2pm - 3pm Friday.

Tutors

Sandeep Patil

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Preliminary lecture schedule

N.B. There is no lecture on Friday the 17th of September - Software Engineering Part IV Project Exhibition Day

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 - Common security protocols, security glitches and authentication

Lecture 28 - Kerberos
Lecture 29 - Device drivers
Lecture 30 - Linux modules and general device services
Lecture 31 - Disks as special devices, disk scheduling