COURSE GOAL

To educate students on the basic concepts and components of operating systems, the relevant characteristics of hardware, and the tradeoffs between conflicting objectives faced by the OS.

OBJECTIVES

As much as operating systems are an essential part of computer systems, a course on operating systems is an essential part of any computer science or computer engineering program. This course is oriented towards exposing students to the essential concepts and issues that underly operating systems and their design.

Technical

Make students understand the key concepts and mechanisms of modern operating systems:

- processes and process management,
- memory management techniques aimed at optimising system utilisation and responsiveness,
- on-line storage methods (file systems),
- security and protection,
- concurrency issues,
- some of the issues arising from distribution.

Educational

Make students understand the reasons why operating systems are built the way they are, and what the implications and lessons are for other software systems. Specific learning objectives are:

- appreciation of design trade-offs and design decisions and their dependence on the target environment;
- appreciation of the distinction between mechanisms and policies, and why this is important;
- exposure to low-level code;
- exposure to current trends in operating systems research and development.

Professional

The tutorial formats will give students practice in the presentation of solutions to an audience of peers, and will challenge them to critique peer technical presentations. Furthermore, the whole course encourages critical examination and analysis of "standard" solutions.

PREREQUISITES

General

It is assumed that the student is familiar with the general organisation of a general-purpose computer (in particular, CPU, memory, bus, registers, machine instructions, interrupts/exceptions).

Students are also assumed to be competent in the C programming language.

Course Prerequisites

Course Exclusions

1. COMP9201/9283 Operating Systems (for COMP3231/3891)
2. COMP3231/3891 Operating Systems (for COMP9201/9283)

Constituents

Lectures

The lecture delivery (3 hours per week) and material covered is common for all operating system students, independent of the course code your enrolled under.

Lectures will cover roughly the following topics (although not in this order):

- **Introduction and Overview**
  Introduction to operating systems, computer systems structures, operating system structures
  - **Threads**
    execution abstraction, state, context, preemption, scheduling, synchronisation, deadlocks
    - **Process Management**
      resources, address spaces, multi-threading

- **Storage Management**
  memory management, virtual memory, file systems

- **Protection and Security**
  goals of protection, access matrix and its implementations, capabilities, authentication, encryption, design for security, security awareness

- **Case Studies**
  drawn from UNIX, Linux, Windows-2000 and OS/161 will be used throughout the course.

PHP Notice: Use of undefined constant COURSE_CODE - assumed 'COURSE_CODE' in /tmp_amd/adams/export/adams/1/cs3231/public_html/05s2/intro-content.php on line 174 PHP Notice: Use of undefined constant COURSE_CODE - assumed 'COURSE_CODE' in /tmp_amd/adams/export/adams/1/cs3231/public_html/05s2/intro-content.php on line 188 PHP Notice: Use of undefined constant COURSE_CODE - assumed 'COURSE_CODE' in /tmp_amd/adams/export/adams/1/cs3231/public_html/05s2/intro-content.php on line 197 PHP Notice: Use of undefined constant COURSE_CODE - assumed 'COURSE_CODE' in /tmp_amd/adams/export/adams/1/cs3231/public_html/05s2/intro-content.php on line 237

Tutorials

Tutorials start in Week Two. Part of the allocated tutorial time will be devoted towards solving problems and discussing solutions related to lecture topics, while the remaining time will be used to discuss topics relevant to assignments.

Students will be required to present tutorial problems (approx. 10 min/student) under the guidance of the tutor. Written submissions are required for some portion of the tutorials. Individual student contribution (presentation, critiquing solutions and suggesting alternatives) in tutorials will be assessed and forms part of the final mark for the course (COMP3231 only) . To obtain the tutorial marks, you have to attend your registered tute. Other tutors cannot award participation marks.

Note that tutorial marks will be based on participation only, there are no marks allocated just for attending.

Assignments

There will be three assignments, due approximately in weeks 6, 9 and 12. The assignments are done in groups of two. Assignments will use the OS/161 educational operating system running on a simulated MIPS R3000 computer called System/161. Both the operating system and the simulator were developed at by the Systems Research at Harvard group. The simulator is relatively platform independent, it runs on Unix as well as Windows systems. Assignment solutions will be submitted in C code. Details will be released in due course.

Assignments will generally have *advanced* options which provide a significantly higher level of challenge than the standard assignments (which most students find fairly challenging already). There will be bonus marks available for students solving the advanced parts. However, we want students to do the advanced assignments for the challenge rather than the marks, therefore the number of bonus marks is intentionally kept small compared to the amount of extra work required.

In order to minimise cheating we do not re-run unmodified assignments from earlier years. This implies that there are new assignment specifications. Even though we will not release the specifications until we have a prototype solution, this does not guarantee that there are no problems with the specification. In order to minimise the impact of specification problems to average students we will offer 5% bonus marks to students solving the assignment within 48 hours of release. Such submissions will have to be demonstrated and discussed with a tutor. This procedure should then help to iron out all problems with the spec before most students start on the assignment. These bonus marks can be used to make up lost marks in the same or other assignments (and are in addition to the early submission bonus below).

Students have, unfortunately, a tendency to underestimate the time required to do the assignments. Experience from the last few years show that the assignments in this course are considered challenging, and they consume a fair amount of time. It is important to start early. If you start on them on the weekend before the deadline you'll almost certainly miss the deadline.

In order to encourage students to start early, we are also offering 10% bonus marks for submitting *their final solution one week before the deadline* (i.e., you lose the bonus marks if you re-submit less than a week before the deadline). Such bonus marks will allow you to make up for missed marks in the same assignments (i.e., you cannot get above the full marks for the assignment that way).

Penalty for late submission of assignments will be 4% (of the worth of the assignment) subtracted from the raw mark per day of being late. In other words, earned marks will be lost. For example, assume an assignment worth 25 marks is marked as 20, but had been submitted two days late. *The late penalty will be 2 marks, resulting in a mark of 18 being awarded.* **No assignments will be accepted later than one week after the deadline.**

Cheating

We *always* check for cheating, and while we will never catch all cheaters, we *always* catch a significant number. We deal with them severely. Don't take chances!

This is no idle threat. We catch and penalise cheaters to protect the reputation and integrity of the University, and the

interests of those who get their marks through honest work.

COMP3231 Cheating Statistics

Session	**1998/S1**	**1999/S1**	**2000/S1**	**2001/S1**	**2001/S2**	**2002/S1**	**2002/S2**	**2003/S1**	**2003/S2**
enrolment	178	410	320	300	107	298	156	290	122
suspected cheaters	10(6%)	26(6%)	22(7%)	26(9%)	20(19%)	15(5%)	???(?%)	13(4.5%)	??(??%)
full penalties	2*	6*	9*	14*	10	9	5	2	1
reduced penalties	7	15	7	7	5	4	2	2	9
cheaters failed	4	10	16	16	10	12	5	4	1
cheaters suspended	0	0	**1**	0	0	**1**	0	0	0

* Note: full penalty was not 0FL prior to S1/2002.
+Application pending

Mid-Session Quiz

There will be **no** mid-session quiz.

Final Exam

A two hour written final examination will be conducted.

Supplementary assessments

Supplementary exams will only be awarded in well justified cases, in accordance with School policy, **not** as a second chance for poorly performing students. In particular, it is unlikely that a supplementary will be awarded to students who have actually sat the proper exam. **Make up your mind whether or not you are sick before attempting the exam!**

Supplementary exams will be **oral**. The supplementary final exam will be held after the written supplementary exams held for other courses.

Assessment

Tutorial participation PHP Notice: Use of undefined constant COURSE_CODE - assumed 'COURSE_CODE' in /tmp_amd/adams/export/adams/1/cs3231/public_html/05s2/intro-content.php on line 356 and assignments will determine the ``class mark'' component towards the final assessment. (Note that the class mark is capped at 100, irrespective of how many bonus marks you have accumulated.) The exam will be the second component of the final assessment. The weighted harmonic mean of the ``class mark'', $\boldsymbol{C}$, and the final exam mark, $\boldsymbol{E}$, is used to determine the final mark, $\boldsymbol{M}$, according to

- For COMP3231/3891:

  The harmonic mean is weighted 50/50.

$$\boldsymbol{M} = \frac{2\,\boldsymbol{E}\,\boldsymbol{C}}{\boldsymbol{E} + \boldsymbol{C}}$$

- For COMP9201/9283:

  The final mark will be $\boldsymbol{M} = \max(\boldsymbol{M1}, \boldsymbol{M2})$, where $\boldsymbol{M1}$ is a 50/50 weighted harmonic mean as above, and $\boldsymbol{M2}$ is a 20/80 weighted harmonic mean (20 class, 80 exam) as shown below.

$$\boldsymbol{M2} = \frac{5\,\boldsymbol{E}\,\boldsymbol{C}}{\boldsymbol{E} + 4\boldsymbol{C}}$$

  This method of weighting is to cater for postgraduates working full time who are unable to invest significantly in assignment work (hence 20/80 weighting), while not penalising postgraduates who do commit to the assignment component of the course (50/50 weighting).

For COMP3231 students the class mark is determined as the weighted arithmetic mean of tutorial participation (10%) and assignments (90%) plus bonuses.

For COMP9201/3891/9283 students the class mark is determined as the sum of the assignment marks normalised to 100 plus bonuses.

A final mark of 50% is required in order to pass, however, it is furthermore required for a pass that a minimum of 40% is achieved in the exam $\boldsymbol{E}$ component.

We reserve the right to scale mark components of the individual courses (COMP3231/9201/3891/9283) separately where appropriate.

More information on harmonic means in general is available here.

TEXT and REFERENCE BOOKS

Textbook

- A. Tannenbaum, *Modern Operating Systems*, 2nd ed., Prentice Hall, 2001

Reference Books

For Operating Systems:

- A. Silberschatz and P.B. Galvin, *Operating System Concepts*, 6th ed., Addison Wesley (2001)
- William Stallings, *Operating Systems: Internals and Design Principles,* 4th edition, 2001, Prentice Hall.
- A. Tannenbaum, A. Woodhull, *Operating Systems--Design and Implementation*, Prentice Hall, ???
- John O'Gorman, *Operating Systems*, MacMillan, 2000
- Uresh Vahalla, *UNIX Internals: The New Frontiers*, Prentice Hall, 1996

For the C language:

- B Kernighan and D. Ritchie, *The C Programming Language*, 2nd ed, Prentice Hall.
- S. Harbison and G. Steele, *C: A Reference Manual*, Prentice Hall.

Copies of lecture slides and other information can be found under the course's WWW home page at URL http://www.cse.unsw.edu.au/~cs3231/.

STAFFING in Session 1 2005

Name	Function	Consultation		
		Time	Room	Phone
Gabriele Keller	Lecturer in Charge	Tue, 14:00	Level 5, K17	56032
TBA	Administrator	TBA	TBA	TBA