MPhil in Advanced Computer Science
Advanced Topics in Computer Systems

Leader:	Steven Hand
Timing:	Michaelmas
Prerequisites:	Undergraduate Operating Systems Course.
	Familiarity with Computer Architecture & Distributed Systems.
Structure:	8× 2-hour seminar sessions (weekly)

AIMS

This module will attempt to provide an overview of "systems research". This is a broad field which has existed for over 40 years and which has historically included areas such as operating systems, database systems, file systems, distributed systems and networking, to name but a few. The course will thus necessarily cover only a tiny subset of the field.

Many good ideas in systems research are the result of discussing and debating previous work. A primary aim of this course therefore will be to educate students in the art of *critical thinking*: the ability to argue for and/or against a particular approach or idea. This will be done by having students read and critique a set of papers each week. In addition, each week will include presentations from two or more participants which aim respectively to advocate or criticise each piece of work.

SYLLABUS

The syllabus for this course will vary from year to year so as to cover a mixture of older and more contemporary systems papers. Contemporary papers will be generally selected from the past 5 years, primarily drawn from high quality conferences such as SOSP, OSDI, ASPLOS, FAST, NSDI and EuroSys.

As an example, the topics for 2009-10 included *OS Structure & Virtual Memory*, *Systems Virtualization*, *Security Architectures*, *Distributed Storage*, *Practical Byzantine Fault Tolerance*, *DataCenter Systems* and *Multicore Operating Systems*. You can take a look at the full schedule on-line at `http://www.cl.cam.ac.uk/teaching/0910/R01/`.

The full and final list for 2010-11 will appear on the course web page latest September.

The reading each week will generally involve a load equivalent to 2–3 full length papers. Students will be expected to read these in detail and prepare a written summary and critique. In addition, each week will contain one or more short presentations by students for each paper. The types of presentation will include:

- Overview: a balanced presentation of the paper, covering both +ve and -ve aspects.
- Advocacy: a positive spin on the paper, aiming to convince others of its value.
- Criticism: a negative take on the paper, focusing on its weak spots and omissions.

These presentation roles will be assigned in advance, regardless of the *soi disant* absolute merit of the paper or the preference of the student. Furthermore, all students—regardless of any assigned presentation rôle in a given week—will be expected to participate in the class by asking questions and generally entering the debate.

OBJECTIVES

On completion of this module students should have a broad understanding of some key papers and concepts in computer systems research, as well as an appreciation of how to argue for or against any particular idea.

COURSEWORK & PRACTICAL WORK

Coursework will be the production of the weekly paper reviews. Practical work will be presenting papers as appropriate, as well as ongoing participation in the class.

ASSESSMENT

Participants on this course will be awarded a percentage score which will be made up from the following two components:

1. 84% : for paper reviews submitted on-time each week; grades here will be fed back on a week-by-week basis; and
2. 16% : for your presentations, to be awarded by the course assessor at the end of the course.

As noted previously, all participants are also expected to attend and participate in every class.

RECOMMENDED READING

Most of the reading for this course will be in the form of the selected papers each week. However the following may be useful background reading to refresh your knowledge from undergraduate courses:

- *Operating Systems Concepts (5th Ed.)*
  Silberschatz, Peterson and Galvin, Addison Wesley 1998.
- *Modern Operating Systems (3rd Ed.)*
  Tanenbaum, Prentice-Hall 2008
- *Operating Systems*
  Bacon and Harris, Addison Wesley, 2003
- *The Design and Implementation of the 4.3BSD UNIX Operating System*
  Leffler, Addison Wesley 1989
- *Inside Windows 2000 (3rd Ed)* or *Windows Internals (4th Ed)*
  Solomon and Russinovich, Microsoft Press 2000 [2005]
- *Computer Architecture: a Quantitative Approach* (3rd edition)
  Hennessy and Patterson, Morgan Kaufmann 2003

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