



LONDON SOUTH BANK
UNIVERSITY

Operating Systems: Scheduling & Storage

CCA-2-OSS

<http://myweb.lsbu.ac.uk/~bushm/teaching/oss>

Dept. of Informatics, Faculty of Business

2009/10

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1. UNIT DETAILS

Unit Title:	Operating Systems: Scheduling & Storage
Unit Level:	5
Unit Reference Number:	CCA-2-OSS
Credit Value:	1.0
Student Study Hours:	150
Contact Hours:	60
Private Study Hours:	90
Pre-requisite Learning (If applicable):	Computer & Communications Architecture
Co-requisite Units (If applicable):	
Course(s):	BSc Computing / Internet Computing
Year and Semester	2009/10 - Semester 1
Unit Coordinator:	M Bush
UC Contact Details (Tel, Email, Room)	Ext.7478, martin.bush@lsbu.ac.uk , N313
Teaching Team & Contact Details:	<i>To Be Announced</i>
Subject Area:	Informatics
Summary of Assessment Method:	60% coursework, 40% exam

2. SHORT DESCRIPTION

An operating system is a computer program that acts as an intermediary between users and their application programs and, on the other hand, the computer hardware. Operating systems are highly complex software artifacts. This unit begins an exploration into operating system design; it focuses on the management of processes and the organisation and management of both primary and secondary memory.

Before taking this unit, students are expected to already have a basic understanding of how computers work, especially from the point of view of the CPU and memory. They are also expected to have some experience of programming using Java, an object-oriented language. In this unit they will have the opportunity to gain a much deeper understanding of how computers work, and to extend their knowledge of the principles of software development.

3. AIMS OF THE UNIT

This unit aims to give students an insight into the design of operating systems. In particular, students will develop an understanding of how an operating system is able to handle multiple tasks at the same time, whether this concurrent activity is generated in the service of a single user or to provide multiple users with simultaneous access to the resources of the computer.

4. LEARNING OUTCOMES

4.1 Knowledge and Understanding

- ✓ Have a detailed knowledge of the concepts of process and shared memory, including the requisite hardware/software support.
- ✓ Be aware of a variety of approaches to process management and both main and secondary memory management.
- ✓ Have an understanding of how issues such as starvation, deadlock, scheduling, fragmentation and thrashing can arise and be minimised or avoided altogether.

4.2 Intellectual Skills

- ✓ Be able to analyse shell programs, system programs and application programs that use threads and collections.

4.3 Practical Skills

- ✓ Be able to construct simple shell programs, system programs and application programs that use threads and collections.

4.4 Transferable Skills

- ✓ Be able to locate relevant snippets/examples of code on suitable websites when faced with having to create a computer program in an unfamiliar programming language, and to adapt them as necessary in order to solve a given programming problem.

5. ASSESSMENT OF THE UNIT

This unit is assessed through a combination of coursework (worth 60% of the total unit marks) and an end-of-unit exam (worth 40% of the total marks). The coursework consists of a series of Multiple Choice (MC) tests. These tests are designed to assess the students' understanding of the tutorial exercises as well as the lecture material, and they have a negative marking element. There will be four tests in total – in weeks 4, 6, 9 and 11 – out of which the best three marks will be counted for each student. (There will also be extra tests in week 12 for anyone who has missed one of the original four tests *for a valid reason*.)

6. FEEDBACK

Feedback will normally be given to students within 15 working days after the submission of an assignment.

7. INTRODUCTION TO STUDYING THE UNIT

7.1 Overview of the Main Content

This unit provides a fairly typical (undergraduate level) introduction to the subject of operating systems, focussing on the issues of process scheduling and data storage.

7.2 Overview of Types of Classes

The schedule (given below) consists of a series of ten lectures that are designed to cover the material in a fairly intensive manner, with tutorial sessions focused on set exercises to complement the lectures. This is followed by three weeks of review and revision prior to the exam in which the students will have time to revisit and digest the material more fully.

7.3 Importance of Student Self-Managed Learning Time

Many students find this a subject a relatively hard to grasp, and so it is vital to spend sufficient time reading the handouts and textbook in addition to attending all of the lectures and tutorials!

7.4 Employability

A sound understanding of operating systems is to be expected of any computing professional.

8. THE PROGRAMME OF TEACHING, LEARNING AND ASSESSMENT

Here is the planned week-by-week schedule...

Lecture schedule	based on...	assessment...
Week 1: Introduction	[SGG]: Chap. 1	
Week 2: Operating System Basics	[SGG]: Chap. 2	
Week 3: Processes & Threads	[SGG]: Chap. 3	
Week 4: Multi-tasking/-threading	[SGG]: Chap. 4	MC Test 1
Week 5: Scheduling Algorithms	[SGG]: Chap. 5	
Week 6: Process Synchronisation	[SGG]: Chap. 6	MC Test 2
Week 7: Deadlocks & Starvation	[SGG]: Chap. 7	
Week 8: Memory Management	[SGG]: Chap. 8	
Week 9: Virtual Memory	[SGG]: Chap. 9	MC Test 3
Week 10: File Management	[SGG]: Chaps. 10,11	
Week 11: Review		MC Test 4
Week 12: Revision		
Week 13: (Exams)		
Week 14: (Exams)		

[SGG] refers to the textbook "Operating System Concepts" (7th Ed.) by A. Silberschatz, P. Galvin & G. Gagne, Wiley, 2005. There is also a newer "with Java" version of this textbook – see below – but the chapter numbers and headings are the same.

9. STUDENT EVALUATION

The students taking this unit last year and in previous years were generally happy with this unit and found it well organized. 100% of the Unit Evaluation Questionnaire respondents said that the lectures were acceptable or very acceptable, and 70% said that the unit "held their attention" totally or to a large extent. However, students found it hard to get high marks in this unit because the subject is quite difficult to grasp.

10. LEARNING RESOURCES

10.1 Core Materials

**Silberschatz, A., Galvin, P., & Gagne, G. Operating System Concepts with Java (7th Ed.)
Wiley, 2007; or alternatively...
Operating System Concepts (7th Ed.)
Wiley, 2005.**

Comment: This is a very comprehensive and up-to-date textbook that is the basis of numerous courses on operating systems in universities all around the world. It goes into rather more depth than we will have time for, but otherwise it fits the scope of this unit – and also the follow-on unit "Operating Systems: I/O and Networking" – very well. Roughly speaking, this unit will cover the first half of the book while the follow-on unit will cover the second half. (However, not all students taking this unit will go on to take the follow-on unit.) The 2007 edition is virtually the same as the 2005 edition, but it has a little bit of extra material and some additional Java exercises.

Note:

The unit will be based fairly closely on chapters 1 to 11 of this textbook. Students will be expected to read chapters from this book as indicated in the weekly teaching and learning

schedule above. Alternatively, students may read the equivalent sections of any of the textbooks listed below; these are just as authoritative and comprehensive, but the terminology may vary in certain cases.

10.2 Optional Materials

There are a variety of excellent textbooks on operating systems currently available, of which the following two are perhaps the most well known (in the UK at least)...

Stallings, W. **Operating Systems: Internals and Design Principles (6th Ed.)**
Prentice-Hall, 2009.

Comment: William Stallings is a very well known and well respected author of computer science textbooks, and like most of his books this one is very readable, comprehensive and authoritative.

Tanenbaum, A. **Modern Operating Systems (3rd Ed.)**
Prentice-Hall, 2008.

Comment: Andrew Tanenbaum is another very well known author, and like the Stallings book (above) this one is equally readable, comprehensive and authoritative.

Others include the following...

Hailperin, M. **Operating Systems and Middleware**
Cengage Learning (formerly Thomson), 2007.

Comment: This is an interesting textbook that covers the subject area in quite a modern way. It's very nicely written, with good diagrams.

Nutt, G. **Operating Systems: A Modern Perspective (3rd Ed.)**
Addison-Wesley, 2004.

Comment: This is another very up-to-date and authoritative textbook that – like either Stallings or Tanenbaum – would make a perfectly good substitute for the one chosen as the core reference for this unit (i.e. Silberschatz, Galvin & Gagne).

Stuart, B. **Principles of Operating Systems**
Cengage Learning (formerly Thomson), 2009.

Comment: This is yet another very up-to-date and authoritative textbook. It explains how various specific operating systems work – including Unix, Inferno and others – but in my opinion this makes the book relatively hard to digest. The reliance on code snippets to explain the operation of various operating system functions gives well-informed readers a good understanding of how things work, but I suspect that many readers of this textbook will find these code snippets difficult to understand.