Computer Engineering

ECSE-322B

Winter 2008

COURSE INFORMATION:

Lectures:

MWF in ENGTR 0100, 11:35-12:25

Tutorials:

Monday ENGTR 1080, 1635-1825

Thursday ENGTR 0060, 1805-1955

Friday ENGTR 0060, 0835-1025

Class Tests:

Test 1: Monday, 28 January 2008, 1135 – 1225, ENGTR 0100 and ENGTR 1100

Test 2: Thursday, 20 March 2008,1135 – 1225, ENGTR 0100 and ENGTR 1100

Mid Term:

Friday, 22 February 2008, 1135, 1225, ENGTR 0100 and ENGTR 1100

Note that Thursday, March 20, 2008 follows a Monday Schedule

INSTRUCTOR: Professor D.A. Lowther: email: david.lowther@mcgill.ca.

Office: McConnell Engineering Building, Room 619. Tel: 398-7124.

Office hours: starting on January 7, Mondays 10:30 – 11:30, room to be given on WebCT. Otherwise by appointment.

Course information will be available on a WebCT site: http://www.mcgill.ca/webct/. Administrative information regarding the course will be posted there. Office hours of teaching assistants will also be announced there. You will need to establish a login for this page the first time you access it.

Note that it is intended to put recordings of the lectures up on the COOL website (www.cool.mcgill.ca)

Teaching Assistants:

Ngok Lam (ngok.lam@mail.mcgill.ca)
Jun Ouyang (jun.ouyang@mail.mcgill.ca)
Subhasis Ray (subhasis.ray@mail.mcgill.ca)
Sevin Al Assaad (sevin.alassaad@mail.mcgill.ca)
Min Li (min.li@mail.mcgill.ca)
Robert Rolnick (Robert.Rolnick@mail.mcgill.ca)

GENERAL: This course continues the subject matter of ECSE-221 (Introduction to Computer Engineering), but stresses computer structure and use at the system rather than at the component level. The emphasis of the course is on data communication and protocols, as well as data buffering, storage and structuring principles. These principles are motivated by the characteristics of peripheral devices and the requirements of applications driving these peripherals. The course covers system level issues spanning both hardware and software, and the confluence of software and hardware. This confluence is two-fold:

1. the similarity between hardware and software in issues of data communication, buffering and structuring;

2. the hardware/software interface: an overview of operating system principles.

PRE-REQUISITES:

ECSE-221

ECSE-200

The course is a pre-requisite for:

ECSE-425 (Computer Organization and Architecture)

ECSE-427 (Operating Systems)

ECSE-428 (Software Engineering)

ECSE-525 (Computer Architecture)

ECSE-526 (Artificial Intelligence)

ECSE-531 (Real Time Systems)

ECSE-532 (Computer Graphics)

ECSE-543 (Numerical Methods in E.E.)

ECSE-547 (Finite Elements in E.E.)

COURSE LEARNING OUTCOMES:

During this course, the student will acquire basic knowledge in, and should be able to apply, in a design context, the following aspects of computer systems:

- the major components of a computer system
- the requirements of typical I/O devices from the point of view of average and peak data transfer rates, transfer protocols, and memory buffering
- the classification and specification of simple bus protocols
- the structure of a simple, general purpose I/O controller
- the use of basic data structures and their associated algorithms
- the relation between abstract data structure concepts and hardware concepts
- the overall organization and general functions and mechanisms of operating systems.

INSTRUCTIONAL METHOD:

The instructional method is based on lectures and problem sets. The lectures are given in an interactive style, and the students are encouraged (through questions from the instructor) to consider different trade-offs and solutions to various design issues raised in the class. Students are expected to apply the theoretical and practical knowledge acquired in class through the problem sets. The problem sets are not marked and the solutions are distributed on WebCT after 1 week. Tutorials (3 hours per week, in addition to the 3 weekly hours of lecturing) cover difficult issues in the problem sets, as well as any questions that the students have. In addition, office hours are provided each day both by the professor and the teaching assistants.

The course also has a small project component. This is intended to be done in groups of 5 students and will research some aspect of computer structure. A more detailed description of the project will be given in a separate document. The aim of the project is to encourage group working amongst students, to promote background reading and research into the subject matter of the course as well as to develop a design for a component of a computer. The project should not require more than about one hour of work per week from each member of the group, giving a maximum of about 50 person hours available for the work.

Finally, the teaching assistants are available during their office hours to help with problem sets and with the course material.

For time budgeting purposes, it should be noted that three-credit courses in the Faculty of Engineering are considered to require nine hours per week of work during 13 weeks, or 117 hours (for an average student – i.e. one with a CGPA of around 3). 3 hours per week are occupied by lectures, 3 hours are expected to be used by the student for private study and/or research and assignments and tutorials are designed to take up to 3 hours per week.

COURSE CONTENT & SCHEDULE:

There will be 36 lectures. The approximate beginning dates and approximate numbers of lectures on each topic, as well as the class tests dates follow:

Date	Topic	Number of lectures
04-January	Introduction	1
07-January	Computer Engineering	2
11-January	Data structures	8

28-January	**Class Test 1**	1
1-February	Character Based Devices	7
18-February	Block Based Devices	5
22-February	**MidTerm**	1
10-March	Bus Structures	5
20-March	**Class Test 2**	1
26-March	Operating Systems	6
9-April	Review	21
Total Classes (including tests)		39

Note – the class tests and midterm are FIXED, the other dates and numbers of lectures on a topic may vary slightly.

PROBLEM SETS (ASSIGNMENTS):

A problem set will be assigned each week. Students are expected to solve these problems but they will NOT be handed in for marks. Instead, the quizzes and parts of the class tests will consist of problems similar to those in the problem sets. Tutorials each week will provide an opportunity for the solutions to the problem sets to be discussed. The solutions will also be posted on the web about 1 week after the problem set is handed out.

QUIZZES (8%):

There will be 5 equally weighted random quizzes during regular class hours. These are short examinations (10-15 min.) and consist mostly of multiple choice questions. The nominal weight of a quiz is: 2% each. There is no need to present medical notes to excuse absence at a quiz. The grading scheme will tolerate up to 1 absences by considering, for everyone (i.e., whether they missed quizzes or not), the best 4 out of 5 quizzes. Absences beyond 1 quiz will result in an unconditional 0 mark for that quiz.

Each quiz covers:

The material contained in previous three lectures, in the previous problem set, and in the tutorials. The questions may require some minor amount of calculation to determine the answer. In general, these questions should be easier than those in the problem sets.

CLASS TESTS (16%):

There will be 2 class tests, each for 8% of the final mark. For the material covered in class, the level of difficulty will be roughly the same as the more advanced questions in the problem sets. For the reading material that is not covered in class, the level of difficulty will be general understanding

Class Test #1: Will cover the material that was discussed in class and the material that was assigned for reading but not covered in class from the first day of class up to and including the date of the test (more about this later).

Class Test #2: Will cover the material that was discussed in class and the material that was assigned for reading but not covered in class in the modules covered after the first class test up to and including the material on the date of the second class test (more about this later).

More details about this will be given in class during the semester.

MIDTERM (16%)

MidTerm: Will cover all the material discussed in class from the first day of class up to and including the material on the date of the midterm (again, more about this in class). The format of the MidTerm will be different from that of the Class Tests and nearer to that of the final exam. It will consist of two sections – the first will be multiple choice and the second short answer questions.

PROJECT (10%):

The project is a group endeavour and encourages students to research and apply up-to-date technology to solve a problem at hand. The problem will probably be in the form of a design problem. The names of the members of each group should be submitted by email on or before January 30.

GRADING SCHEME:

The breakdown of marks is as follows: 50% for the final examination, 8% for the quizzes, 16% for the class tests, 16% for the MidTerm and 10% for the project.

TEXTBOOKS & COURSE MATERIAL:

No single book covers all topics of this course, however most of the material can be found in standard textbooks (see suggestions below). The WWW is also a good source for many of the technology-related aspects; interesting links will be initially provided and the students are encouraged to look for additional links and information.

The material delivered in the lectures will be detailed in a set of notes which will be handed out to the class.

Most of the material on data structures can be found in:

*Silvester, P.P.: Data structures for engineering software. Boston: Computational Mechanics Publications, 1993. 182pp.

Two books which differ in style but cover similar topics are recommended for reading on operating systems:

*Lister, A.M.: Fundamentals of operating systems. Second edition. London: Macmillan, 1979. ix+161 pp. (old but simple to understand..)

Tanenbaum, A.S. Modern Operating Systems, Second Edition, New Jersey, Prentice-Hall, 2001, xxiv + 951 pp.

Material on computer structure will be drawn mainly from the following group of books:

Vranesic,Z.G., Zaky,S.G.: Microcomputer Structures. New York, Saunders College Publishing, 1989. xvi+712 pp.

Tanenbaum, A.S.: Structured computer organization. Englewood Cliffs: Prentice-Hall, 1976. xix+443 pp. •Clements, A.: The principles of computer hardware. Oxford: Oxford University Press, 1985. xv+454 pp.

The books marked with "*" are the nearest to much of the course. However, to cover all aspects, lecture notes will be distributed. These are likely to suffice for initial reading, but will probably require support from the books above, or other similar texts. It may be wise to have good access to one or two of the books in each major area (e.g., to share them with a few friends). Numerous other textbooks cover the same topics. It is important that you spend some time reviewing texts in the area - most of these are available in the library. As mentioned above, you are highly encouraged to explore the WWW as a source of the latest information on some of the technology being discussed.

ACADEMIC INTEGRITY:

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see *www.mcgill.ca/integrity* for more information).