CARLETON UNIVERSITY
Department of Systems and Computer Engineering
SYSC 3006 ***Computer Organization*** ***Fall 2011***

Course Outline

Instructor*:*
Professor Gabriel A. Wainer. Room 3216 VS

Course Description and Objectives:

This is a first course on the principles of microprocessor-based systems, covering: processor instruction set and addressing modes, input/output devices, and an introduction to concurrency through hardware interrupts. Emphasis is placed on techniques applicable to real-time computing, in which programs are designed to interact with the outside world in a time-critical manner.

Note that the course does not aim to produce expert assembly language programmers. The concepts covered in this course are applicable to a wide variety of microprocessor architectures (for example, the Motorola 68000 and PowerPC chip families), languages, and applications (for example, data communications and digital signal processing).

Prerequisites: Engineering SYSC 2002 and ELEC 2607. This course precludes additional credit for SYSC-2001 and SYSC-2003. Students who have not satisfied the prerequisites for this course must either a) withdraw from the course, or b) obtain a prerequisite waiver from the Registrar's office, or c) will be deregistered from the course after the last day to register for courses in the Fall term.

Textbook: Assembly Language for Intel-Based Computers (6th Edition). Kip Irvine.

Web Site

Course materials will be placed on the SYSC 3006* Web site. The URL for the SYSC 3006* Website is http://www.sce.carleton.ca/courses/sysc-3006/

Students are **not** permitted to use the laser printers in Systems and Computer Engineering and Electronics labs to print files obtained from the Web site. Students who do not follow this regulation may be withdrawn from the course.

Assignments and Laboratory:

There will be **six** graded assignments. Assignments will be posted on the course webpage. Each assignment must be handed in on (or before) the due date and time. Late assignments will not be accepted without a valid medical certificate.

The computer lab is open seven days a week, whenever the building is open. Except for those timeslots when the lab is reserved for other courses, you may use the lab at any time. Tutorial lab sessions are scheduled so that you may meet with your TA for assistance with assignments.

Exams:

There will be one mid-term test (closed book, no calculators). Arrangements for the mid-term test will be announced during the class. A closed book, no calculators, final exam will be held during the University's formal examination period. *The final exam is for evaluation purposes only and will not be returned to the students*.

Plagiarism:
Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offense that will not be tolerated. Please refer to the section on instructional offenses in the Undergraduate Calendar for additional information.

Students are encouraged to discuss design issues when working on assignments; however, they are expected to write their own programs individually. There is a fine line between cooperating with your colleagues (discussing problems and ideas) and copying program code (plagiarism). Students are warned that the assignments form a very important part of this course – doing the assignments (by oneself) is by far the best way of learning the material. In this context, it should be noted that copying assignments is a self-defeating exercise. Any student who resorts to copying is not likely to do well on the mid-terms or final exam.

Marking Scheme:

To pass the course, a student must pass the final examination (D- or better) AND obtain an overall passing average (assignments plus midterm plus final exam). Students who miss an assignment or midterm must present a valid medical certificate to the instructor within a reasonable time after the deadline or midterm; otherwise, the student will receive a zero for that item. For students who pass the final exam, the final grade will be calculated as follows:

Assignments:	24% (4% each)
Mid-term test:	25%
Final exam:	51%

Students with Disabilities:
Students with disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities for a formal evaluation of disability-related needs. Registered PMC students are required to contact the Centre, 613-520-6608, every term to ensure that I receive your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you require accommodation for your formally scheduled exam(s) in this course, please submit your request for accommodation to PMC by November 11th 2011 for Fall term (December exams).

Medical Certificates:

A medical certificate must adhere to the format required by the Registrar. The format is available as a PDF form through the Registrar's website http://www.carleton.ca/registrar/forms.htm. All medical certificates must be presented immediately upon return from the illness; they will not be accepted after the fact.

For assignments: Assignments are to be worked on throughout the week, not just the day they are due. If you miss an assignment, you will be given a mark based on your partial work if a valid medical certificate

is given. If you cannot provide your partial solution, you will be given zero unless you have a valid medical certificate showing prolonged illness.

If the midterm is missed, with a valid medical certificate, the Final exam mark will be given as the midterm mark.

Health and Safety

Every student should have a copy of our Health and Safety Manual. An electronic version of the manual can be found at:

http://www.sce.carleton.ca/courses/health-and-safety.pdf

Preliminary Week-by-Week Outline (week's starting dates are shown)

1 – Course objectives, organization and administration; computer system components, information encoding. Number systems, data representation in binary, hexadecimal, integer representations with signed and two's complement.
2- Number systems (cont.). Encoding text. Simple computer arithmetic (addition/subtraction, overflow and logical operations). Low-level machine concepts: programmer's model. Stored program concept. Registers and memory.
3 – Little endian/Big endian schemes. 80x86 register model and segment memory model. Instruction execution.
4 – The assembly process. Assembly program development with 80x86 assembly language. 80x86 instructions with simple addressing modes (register, immediate and memory direct); data transfer instructions; simple data manipulation instructions.
5 – Control Flow: jump instructions; processor flags: conditional jumps.
6 – Indirect Addressing & Looping structures; arrays ; if-then-else structures.
7 – A Simple Computer System: register model of peripheral devices.
8 – Parallel I/O. Procedures, parameter passing. Programming policies.
9 – Procedures, programming policies. Near and fall calls. Software interrupts and traps. 80x86 interrupt vector table.
10 – Hardware interrupts: vectored and prioritized. Programmable interrupt controller.
11 – The programmable timer.The keyboard. Hardware programming issues: Concurrency.
12 – Hardware programming issues: shared variables, mutual exclusion, and critical regions. Serial I/O; A/D & D/A conversion. Instruction Encoding. Review and wrap up
13 – Review and wrap up

Assignments due dates (approximately once every two weeks; subject to change)
Assignment 1 Due: September 21 @ 7:00 PM
Assignment 2 Due: October 5 @ 7:00 PM
MIDTERM 1: October 14 (during the lecture)
Assignment 3 Due: October 19 @ 7:00 PM
Assignment 4 Due: November 2 @ 7:00 PM
Assignment 5 Due: November 16 @ 7:00 PM
Assignment 6 Due: November 30 @ 7:00 PM.