Instructor Information and Office hours

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TA Information and Office hours

TBD

Course Number and Calendar Description

SYSC 3601 Microprocessor Systems


Prerequisites

ELEC2607 and SYSC2003 or obtain a prerequisite waiver by visiting the Engineering Undergraduate Academic Support Office.

Students must satisfy the prerequisites in order to remain registered in the course. Students who have not completed the prerequisites are required to withdraw from the course or they may be deregistered from the course after the last day for course registration.

Students without the prerequisites or a prerequisite waiver will be deregistered from the course after the last day to register for courses in the Summer 2018 term.

Precludes additional credit for SYSC 3320 or ELEC 4601.

Course Objectives

To familiarize students with microprocessor-based circuit design and embedded systems.

Learning Outcomes

The course deals with the applications, organization, architecture, and design of microprocessor systems. Topics covered include addressing, bus structures, memory and I/O interfacing, interrupt mechanisms, and related techniques at the hardware and assembly language levels.
Textbooks (or other resources) if applicable


Evaluation and Grading Scheme

- Lab work: 15%
- In-class participation and quizzes: 15%
- Mid-term Exam: 25%
- Final Exam: 45%

Breakdown of course requirements (labs, assignments, quizzes, exams, etc)

Assessment

Laboratories (15%)
There will be five (5) laboratory exercises. Each exercise requires the completion of a pre-lab component. Lab manuals will be posted on the course website a week before each lab. The TA will discuss and assess your work in the lab.

Late reports will not be accepted. A lab is considered late if submitted after 2:30 for laboratory section SYSC3601A-L10 on the day of the lab session (Monday) or it submitted after 11:30 or laboratory section SYS3601A-L2E on the day of the lab session (Friday).

Attendance at the scheduled laboratory periods is mandatory, except for reasons accepted by the Associate Dean’s Office (see Academic Regulations of the University), will result in a grade of 0.

Please note that the laboratory sections are on a fortnightly schedule.

Mid-term (25%)
There will be one (1) midterm examination. It will be a closed book written examination. The midterm exam is worth 25% of the final grade and will take place on Wednesday, February 13th during the lecture time from 04:05 PM – 5:25 PM. The location of the midterm exam will be
announced on cuLearn in due time. The midterm exam will cover the material from the lectures, labs, assignments, the required textbooks, and reading assignments.

Final Exam (45%)
The final exam will be held during the University's examination period in April and will be scheduled by the Registrar's office in the usual way. It will be three (3) hours in duration and will cover the material from the lectures, labs, assignments, the required textbook, and other assigned reading. The final exam counts for 50% of the final grade.

The final examination is for evaluation purposes only and will not be returned to students. You will be able to make arrangements with the instructor or with the department office to see your marked final examination after the final grades have been made available.

Week-by-Week breakdown

Tentative Course Outline
Please note that this course outline is subject to change as circumstances dictate.

- Background and Introduction
  - Microprocessor history, types, applications and selection
  - General microprocessor architecture
  - Review of number systems

- The Intel 80X86/88 Architectures and Programming
  - Registers and Internal Architecture
  - Address generation and addressing modes
  - Instruction set and assembly language programming
  - The SDK-86 System Development Kit

- The Intel 80X86/88 Bus and Buffering
  - 80X86/88 Pin functions, states, bus cycles and signalling waveforms
  - Clock generators (Intel 8284) and bus controllers (Intel 8288)
  - Latches (74373) and bus transceivers (74245)
  - Wait states and bus timing

- Memory Structures and Interfacing
  - Memory types and characteristics (DRAMs, SRAMs, ROMs, EPROMs)
  - Address decoding
  - Memory interfacing
• Input/Output Systems (I/O)
  – Programmed I/O structures
  – I/O ports design and address decoding
  – Programmable Peripheral Interface Chips (Intel 8255A)
  – Keyboard/Display Interface (8279)

• Interrupt Systems
  – Interrupt Types (HW, SW and Exceptions)
  – Interrupt structures
  – Programmable Interrupt Controllers (Intel 8259 PIC)
  – Programmable Counters/Timers (8253)

• Direct Memory Access
  – Introduction to DMA structures
  – Intel 8237 DMA Controller

• Introduction to Embedded Systems—The ARM processor
  – Introduction to ARM and philosophy.
  – The ARM architecture.
  – The ARM programmer’s model.
  – Pipelining and parallelism.
  – 3-stage pipeline and 5-stage pipeline.
  – ARM assembly language programming.
  – Data processing instructions.
  – Data transfer instructions.
  – Control flow instructions.
  – The ARM instruction set. The Thumb variant.
  – ARM addressing modes.
  – RISC vs. CISC architectures.
  – ARM instruction format.
  – Memory hierarchy.
  – On-chip memory.
  – Caches.
  – The ARM development kit.

Instructor Expectations, Policies, and Notes
1. **Missed assignment, lab, or exam**: As stated in the *Academic Regulations of the University*, students who claim illness, injury, or other extraordinary circumstances beyond their control as a reason for missed term work are responsible for immediately informing the instructor and for making alternate arrangements with the instructor. This must occur no later than three (3) working days after the term work was due.

2. **Labs**: Each group will have a three (3) hour lab session per week. Attendance at lab sessions is compulsory. You must attend your assigned session of the lab.

3. The instructor reserves the right to **assign extra grades** for extra work done by willing students. However, the work subject to extra grades will be advertised during the lectures to provide the opportunity to all students.

4. A **regrading request** of an assignment, lab, or exam is considered by the TAs and the instructor only if it is made within the two weeks that follow the return date of the majority of the concerned assignment, lab, quiz, or exam.

5. **No responsibility for loss of assignments or labs** can be assumed by either the instructor or the TAs. **Keep copies of your own assignments and labs.**

6. Students are responsible for ensuring that their assignments and labs are submitted correctly and without corruption.

7. Calculators are not needed for this course and their use will not be permitted during exams.

8. The lectures will not necessarily follow the order in which the topics are presented in the detailed course outline. Regular class attendance is required.

9. Significant study, reading, and group discussions outside of class are required. Looking at, or only reading the slides that are provided may not be enough to achieve the level of understanding required for the assignments and exams.

10. Students are expected to show professional behaviour. This includes being on-time for lecture and lab sessions, meeting assignment deadlines, and maintaining a suitable level of professionalism in oral and written (email) correspondence with the instructor and TAs.

11. Students that are having difficulty with the course content are expected to seek help early. Students are encouraged to ask questions in class and/or seek help during the instructor’s office hours.

12. Suggestions on how to improve the course and the instructor’s teaching methods are always welcomed.

**General Regulations**

**Attendance**: Students are expected to attend all lectures and lab periods. The University requires students to have a conflict-free timetable. For more information, see the current *Undergraduate Calendar, Academic Regulations of the University, Section 1.2, Course Selection and Registration and Section 1.5, Deregistration.*
**Health and Safety:** Every student should have a copy of our Health and Safety Manual. A PDF copy of this manual is available online: [http://sce.carleton.ca/courses/health-and-safety.pdf](http://sce.carleton.ca/courses/health-and-safety.pdf)

**Deferred Term Work:** Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work are held responsible for immediately informing the instructor concerned and for making alternate arrangements with the instructor and in all cases this must occur no later than three (3.0) working days after the term work was due. The alternate arrangement must be made before the last day of classes in the term as published in the academic schedule. For more information, see the current *Undergraduate Calendar, Academic Regulations of the University, Section 2.6, Deferred Term Work.*

**Appeal of Grades:** The processes for dealing with questions or concerns regarding grades assigned during the term and final grades is described in the *Undergraduate Calendar, Academic Regulations of the University, Section 2.7, Informal Appeal of Grade and Section 2.8, Formal Appeal of Grade.*

**Academic Integrity:** Students should be aware of their obligations with regards to academic integrity. Please review the information about academic integrity at: [https://carleton.ca/registrar/academic-integrity/](https://carleton.ca/registrar/academic-integrity/). This site also contains a link to the complete Academic Integrity Policy that was approved by the University's Senate.

**Plagiarism:** Plagiarism (copying and handing in for credit someone else's work) is a serious instructional offense that will not be tolerated.

**Academic Accommodation:** You may need special arrangements to meet your academic obligations during the term. You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at [http://www.carleton.ca/equity/](http://www.carleton.ca/equity/). For an accommodation request, the processes are as follows:

- **Pregnancy obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see [https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf](https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf)

- **Religious obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see [https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf](https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf)

- **Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-
6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult https://carleton.ca/pmc/students/dates-and-deadlines/ for the deadline to request accommodations for the formally-scheduled exam (if applicable).

- **Survivors of Sexual Violence**: As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton’s Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: https://carleton.ca/sexual-violence-support/.

- **Accommodation for Student Activities**: Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf

**Copyright on Course Materials**: The materials created for this course (including the course outline and any slides, posted notes, labs, project, assignments, quizzes, exams and solutions) are intended for personal use and may not be reproduced or redistributed or posted on any web site without prior written permission from the author(s).