Concordia University

Dept. of Computer Science & Software Engineering

SOEN228: System Hardware

Winter 2022 - Course Outline

Instructor: D. Davis

Lectures (in-person):

MW: 14:45 – 16:00 (section U) – H 937

Contact time 20 min before and 15 min after class.

Email: mcem352@yahoo.ca (use this for course related inquiries)

Tutorials and Labs:

Tutorials are an integral part of the course and will be used to discuss material relevant to the labs and projects.

Tutorials: You can attend any tutorial section.

Labs: You must attend your specific lab section.

Course Description: SOEN228 System Hardware (4 credits):

Prerequisite: MATH 203 or Cegep Mathematics 103, MATH 204 or Cegep Mathematics 105.

This course covers the following topics: Boolean Algebra, Digital logic and the design of logic circuits; CPU design; addressing modes; instruction sets and sequencing; design of datapath and control units; memory systems and types; cache memory levels; I/O devices and their interconnection to the CPU; assembly language, and Interrupts. Lectures: three hours per week. Tutorial: two hours per week. Laboratory: two hours per week.

NOTE: Students who have received credit for COMP 228 may not take this course for credit.

Textbook: *Computer Organization and Embedded Systems, 6th edition*. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, and Naraig ManjikianMcGraw-Hill, 2012, ISBN 978-0-07-338065-0.

Workload and Grading Scheme:

Components	Percentage (%)
Final exam	50
Mid-term exam	35
Labs	15

Additional Notes:

Final exam (50%): The exam is a closed-book exam. The final exam date will be set by the University Administration. The exam will cover material from the entire semester, including lectures, textbook, and tutorials. Passing the final exam is necessary for passing the course. There is no substitution for a missed final exam.

Mid-term exam (35%): The exam is a closed-book exam. and its date will be picked later (tentative date: week of 21 February). There is no substitution for a missed exam.

Labs (15%): A total of 3 labs experiments (60%) and one project lab (40%). Complete details about the labs are available on a separate document available on Moodle.

Passing Criteria and Grading Scheme: Please note, there is no standard relationship between percentages and letter grades assigned. The grading of the course will be done based on the relative percentages assigned to the assignments and the exams. For the reasons of fairness, the marks in a particular exam, or assignment, can be scaled up/down to ensure that all aspects of the course receive a fair weight. Any such "fine-tuning" will be made known to you before the final grades are assessed. Finally, there are no pre-set cut-off points for the final grades; the cut-off points will be decided based on an assessment of difficulty level, class performance, fairness, and instructor's wisdom from teaching and grading in the past. That is, there is no definite rule for translation of number grades to letter grades, and letter grade distribution will be based on the average of the class.
In addition to the course web page, the faculty web pages have a wealth of information pertaining to our computer systems and software, which includes simple user guides, and answers to many standard questions. You are encouraged to explore these help pages. Begin your exploration from the URL: http://aits.encs.concordia.ca/helpdesk/faq/faq.php/

Tentative Coverage and schedule

The coverage and schedule are **tentative** and might change anytime.

1) **Coverage from the book**: " *Computer Organization and Embedded Systems* "

Lectures	**Book chapters**	**Suggested questions***
Lecture 1: Basic Structure of Computers	Chapter1	
Lecture 2: Boolean Algebra and Digital Logic	Appendix A	A.2, A.3, A.4, A.5, A.6, A.7, A.8, A.9, A.11, A.12, A.13, A.14, A.15, A.16, A.17, A.19, A.20, A.22, A.23, A.24, A.25, A.26, A.27, A.28, A.29, A.30, A.31, A.32, A.33, A.34
Lecture 3: Arithmetic and Numbering system	Chapter9	9.2, 9.4, 9.5, 9.6, 9.13, 9.14, 9.15, 9.21 (for d, ignore division), 9.22, 9.23, 9.24, 9.31, 9.32
Lecture 4: Instruction Set Architecture	Chapter2, Appendix E	2.1 - 2.23, 2.24-2.33 (optional)
Lecture 5 : Basic Processing Unit	Chapter5	5.1, 5.2, 5.3, 5.4, 5.5, 5.9, 5.11, 5.12, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.24, 5.25, 5.26.
Lecture 6 : The Memory System	Chapter8	8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11, 8.12, 8.13, 8.20, 8.21, 8.25
Lecture 7 : Input/Output	Chapter3, Chapter7	7.1, 7.2, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10, 7.13, 7.14, 7.17, 7.19, 7.21

* Suggested questions are for you to practice. They will not be discussed or answered during the class.

2) Schedule

Week	Content
W1: 10 Jan – 14 Jan	Lecture1 (via zoom)
W2: 17 Jan – 21 Jan	Lecture2 (via zoom)
W3: 24 Jan – 28 Jan	Lecture2
W4: 31 Jan – 4 Feb	Lecture3
W5: 7 Feb – 11 Feb	Lecture3
W6: 14 Feb – 18 Feb	Lecture4
W7: 21 Feb – 25 Feb	**Midterm** Exam
28 Feb – 4 Mar	Midterm break
W8: 7 Mar – 11 Mar	Lecture5
W9: 14 Mar – 18 Mar	Lecture5
W10: 21 Mar – 25 Mar	Lecture6
W11: 28 Mar – 1 Apr	Lecture6
W12: 4 Apr – 8 Apr	Lecture7
W13: 11 Apr – 13 Apr	Review class

Academic integrity:
Students are encouraged to study in groups and discuss with each other. However, copying is strictly prohibited and all assignments, and projects suspected to be copies will not receive any mark. You always must indicate the names of the students with whom you had discussions for your assignments (or your projects). Academic honesty requires you to adhere to this policy. In addition, students should be aware and observe the *academic integrity* & the University's code of conduct (academic) as specified on the Undergraduate Calendar, especially the parts concerning cheating, plagiarism, and the possible consequence of violating this code. For more details, check out http://www.concordia.ca/programs-and-courses/academic-integrity/.

CEAB Graduate Attributes: As part of both the Computer Science and Software Engineering programs curriculum, the content of this course includes materials and exercises related to the teaching and evaluation of graduate attributes. Graduate attributes are skills that have been identified by the Canadian Engineering Accreditation Board (CEAB) and the Canadian Information Processing Society (CIPS) as being central to the formation of engineers, computer scientists and information technology professionals. As such, the accreditation criteria for the Computer Science and Software Engineering programs dictate that graduate attributes are taught and evaluated as part of the courses. This particular course aims at teaching and evaluating the following three graduate attributes that are incorporated in the course and evaluated through the assignments and examinations.

(1) Knowledge-base: Knowledge of proper mathematical modelling techniques and tools to analyze, implement and simulate control systems applicable to different Engineering areas, as detailed in the course description.

(2) Problem analysis: Use of mathematics and computer simulation tools and techniques to analyze control systems. Knowledge of applications of control systems in all Engineering disciplines.

(3) Use of Engineering tools: Use appropriate techniques and tools to model, analyze and implement control systems.

(4) Design: Practical use of low-level computer design principles using assembly language and logic circuit design.

(5) Individual and team work: Individual and team work on the design and physical realization of a logic circuit and the use of assembly language for various low-level programming tasks

Final note: Please note that in the event of extraordinary circumstances beyond the University's control, the content and the evaluation scheme in this course is subject to change.