EECS 3215 Embedded Systems

COURSE CALENDAR DESCRIPTION

Introduction to the design of embedded systems using both hardware and software. Topics include microcontrollers; their architecture, and programming; design and implementation of embedded systems using field programmable gate arrays. Prerequisites: cumulative GPA of 4.50 or better over all major EECS courses (without second digit "5"); LE/EECS 2031 3.00, LE/EECS 3201 4.00. Course Credit Exclusion: LE/CSE 3215 4.00.

Course Instructor

Instructor: James Andrew Smith, PhD, PEng.

Office: Lassonde Building, office 2006

Email: drsmith@yorku.ca Twitter: @jasmith_yorku

Office hours: (*to be determined*)

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In the first few weeks of class, due to registration issues for some students, announcements will be made both the Moodle course page and occasionally on Twitter (hashtag #EECS3215 via @jasmith_yorku)

Course Outcomes

After taking the course, students will be able to ...

1. select and utilize appropriate parallel, serial and analog interfaces
    i. Use specialized engineering knowledge of design specific components, systems or processes to solve engineering problems *(CEAB Knowledge Base Graduate Attribute 1a)*
2. design embedded software and hardware systems to address problems in important application domains under tight constraints
    i. Demonstrate skills in computer programming, data analysis and graphical visualization *(CEAB Knowledge Base GAI 1c)*
3. design, implement and interface with standard and custom peripherals
    i. Conceive design solutions to solve the defined problem *(CEAB Design GAI 4b)*
4. prototype embedded systems using microcontrollers and field programmable gate arrays (FPGAs)
    i. Integrate design sub-systems into a complete system *(CEAB Design GAI 4h)*
    ii. Decompose complex systems into smaller, more manageable sub-systems. *(CEAB Design GAI 4g)*
5. understand embedded microcontroller architecture, development, debugging and testing
    i. Use specialized engineering knowledge of design specific components, systems or processes to solve engineering problems *(CEAB Knowledge Base GAI 1g)*

GRADED ASSESSMENTS

The weight distribution of the course components is as follows:

1. Labs 10%
    a. One per week, weight distributed equally throughout the semester
    b. Demo in lab (during last half of the lab)
2. Flipped Classes 5%
    a. Up to five during semester
    b. Read a selected text, or watch a video to prepare
    c. Do work (socially, collaboratively) in class (iClicker / Scantrons)
3. Midterm in two stages 5+25%
    a. Stage 1 on 13 February (tentative) 5% (Scantron)
    b. Stage 2 on 27 February (tentative) 25% (Scantron + short answer)
4. Project 20%
    a. One written abstract summary & diagram due approx. two weeks after Reading Week
    b. One five minute video on April 6, 2020
    c. One five page report by April 6, 2020
5. Final Exam 35%
    a. Date not known
    b. Scantron + short answer + long answer

The final grade for the course is obtained by combining the scores of the tests and converting this total to a letter grade according to the following table.

≥ 90	≥ 80	≥ 75	≥ 70	≥ 65	≥ 60	≥ 55	≥ 50	≥ 40	< 40
A+	A	B+	B	C+	C	D+	D	E	F

Course Text & Software

1. Primary General Reference textbook, Computers as Components by Marilyn Wolf (3rd ed; 2012), is available as a free eBook from the York Library via the Library's Skillsoft subscription. (not the newer 4th/2018 edition)
2. Secondary Processor-specific Reference textbook, Definitive Guide to the ARM Cortex M0/M0+ (2nd ed; 2015) by Joseph Liu, is available as a free eBook from the York Library.
3. Optional Tertiary General Reference textbook, Microcontrollers and Microcomputers by Frederick Cady, 2010 (2nd Ed), is available as a paper book in the York Library.

Students will use MCUXpresso for programming their microcontroller boards, as well as software provided in the labs for programming the Altera DE2 FPGA boards. Students will use the DE2 boards provided by the department for two labs, and will be required to purchase a microcontroller kit for the remainder of the labs and project.

Missed labs, tests and other assessments: Students with a documented reason for missing an assessment, such as illness, compassionate grounds, etc., will have the weight of the missed assessment(s) shifted to the most relevant assessment category. For missed labs, the weight will be transferred to the remaining labs.

For missed lab tests or in-class assessments, the weight will be transferred to the remaining lab tests or in-class assessments, respectively. If there are no more assessments in the term, the weight in question will be shifted to the final exam. All other assessments, including midterms, will have their weight shifted to the final exam.

The only accepted documentation for missing a lab or test due to illness is a completed an official York University "Attending Physician's Statement". However, once a student begins writing a test, the weight of that test will not be shifted for any reason. Thus, if a student is not feeling well, it is recommended that the student not attend the test, seek the advice of a physician, and submit a completed an official York University "Attending Physician's Statement" to the instructor as soon as possible.

Academic Integrity

Except where explicitly told by the instructor (such as during a group component of a two-stage exam), during tests, quizzes or exams students are expected to do their own work. In those contexts, looking at someone else's work, talking, using aids not permitted (such as a phone), and impersonation are all examples of academically dishonest behaviour. As this is an important aspect of the university experience, students are expected to read and understand the Senate Policy on Academic Honesty. If you have any questions or concerns please let the Dr. Smith know.

ACADEMIC INTEGRITY LINKS

- Senate Policy on Academic Honesty - http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/
- Academic Integrity - http://lassonde.yorku.ca/academic-integrity

STUDENT LINKS

- Student Rights and Responsibilities - http://oscr.students.uit.yorku.ca/student-conduct
- Religious Observance - https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/wa/regobs
- Academic Accommodation for Students with Disabilities - http://secretariat-policies.info.yorku.ca/policies/academic-accommodation-for-students-with-disabilities-policy/
- Student Accessibility Services (SAS) - https://accessibility.students.yorku.ca/
- York University Racism Policy and Procedures - http://secretariat-policies.info.yorku.ca/policies/racism-policy-and-procedures/
- York University's Policies on Sexual Violence - http://secretariat-policies.info.yorku.ca/policies/sexual-violence-policy-on/
- York University's Policies on Gender/LGBTQ*/Positive Space - http://rights.info.yorku.ca/lgbtq/

LAND ACKNOWLEDGEMENT

- We acknowledge our presence on the traditional territory of many Indigenous Nations. The area known as Tkaronto has been care taken by the Anishinabek Nation, the Haudenosaunee Confederacy, the Huron-Wendat, and the Métis. It is now home to many Indigenous Peoples. We acknowledge the current treaty holders, the Mississaugas of the

New Credit First Nation. This territory is subject of the Dish With One Spoon Wampum Belt Covenant, an agreement to peaceably share and care for the Great Lakes region.

- The Indigenous Framework for York University: A Guide to Action can be found here: http://indigenous.info.yorku.ca/
- Meaning of a land acknowledgement: http://healthydebate.ca/opinions/indigenous-land-acknowledgements