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Course Number and Calendar Description

SYSC4805: Developing professional-level expertise in selected, important areas of the field by applying, honing, integrating, and extending previously acquired knowledge in team projects in the laboratory. Lecture periods are devoted to new knowledge required for the selected areas, to project-related issues, and to student presentations.

Prerequisites

SYSC 3303 and SYSC 3020 and fourth-year status in Computer Systems Engineering. Students who have not satisfied these prerequisites must either: a) withdraw from the course, b) submit a prerequisite waiver online at www.sce.carleton.ca/ughelp; or c) will be deregistered from the course after the last day to register for courses in the current term.

Course Objectives

This course builds on the existing knowledge about software and hardware interfacing, software modeling and software development process, systems development processes and testing, acquired during the program. It aims at enhancing the technical knowledge in the field of computer engineering by the use of various sensors, performing data fusion, and programming a microcontroller to acquire, process the data and make decisions based on it, with a practical application in mobile robots. It also aims at developing soft skills for the future engineers ready to embark in their careers by cultivating team work skills and entrepreneurial spirit. The goal is to develop a deeper understanding of the multifaceted process of managing and developing engineering projects.
Learning Outcomes

1. Define concepts of product design, development methodology and team-based (small) project management.
2. Design an embedded microcontroller-based system for an engineering problem involving hardware and software components.
3. Identify and adapt to realistic constraints.
4. Analyze potential solutions for an engineering project.
5. Use appropriate knowledge and skills to formulate, analyze and solve an engineering problem.
6. Apply scientific methods to evaluate and predict performance.
7. Define, plan and manage a moderately complex project.
8. Develop team work and entrepreneurial skills.
9. Develop communications skills through technical presentations and reports.

Graduate Attributes (GA's)

The Canadian Engineering Accreditation Board requires graduates of engineering programs to possess 12 attributes. Activities related to the learning outcomes listed here are intended to develop students' competence in GA1 (knowledge base), GA 2 (problem analysis), GA 4 (design solutions for complex, open-ended engineering problems), GA 6 (individual and team work) and GA 7 (communication skills).

Data will be collected from the quiz related to learning outcomes 1 and 2 to assess GA1 (GA1.5 Computer Systems) and the final report, in particular the code provided as part of the final report, to assess GA 1.8 Software.

Data obtained from the final report related to learning outcomes 4 and 5 will be collected to assess students’ progress towards achieving GA 2 (GA 2.2 – problem analysis: approach to the problem).

The final report will be as well used to assess progress towards GA 4 through the outcomes 1 (GA 4.4 – design solution) and 2 (GA 4.5 – design implementation).

The peer review of individual contributions will be used to assess GA 6 (GA 6.2 – individual and team work), related to outcome 7 and 8.

Finally, data collected on the final report and the final project presentation related to outcome 9 will be used to assess the students’ progress toward achieving GA 7 (GA 7.3 – communication skills; oral and written presentations).

Textbooks (or other resources) if applicable

No textbook is required for this course. Course material and all other instructional materials will be posted on the course webpage through CULearn.
Evaluation and Grading Scheme

The course work will be evaluated as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project proposal</td>
<td>10%</td>
<td>Team mark</td>
</tr>
<tr>
<td>Project progress report</td>
<td>10%</td>
<td>Team mark</td>
</tr>
<tr>
<td>Final project presentation</td>
<td>10%</td>
<td>Team mark</td>
</tr>
<tr>
<td>Final project demonstration</td>
<td>15%</td>
<td>Team mark</td>
</tr>
<tr>
<td>Final report</td>
<td>20%</td>
<td>Team mark</td>
</tr>
<tr>
<td>Quiz</td>
<td>10%</td>
<td>Individual mark</td>
</tr>
<tr>
<td>Peer review of individual contri</td>
<td>10%</td>
<td>Individual mark</td>
</tr>
<tr>
<td>Individual project contributions</td>
<td>15%</td>
<td>Individual mark</td>
</tr>
</tbody>
</table>

The students are responsible to verify their marks for the different components in CUlearn and report any potential problem within a week. Late complaints are not accepted.

Lectures & quiz:

- There is one two-hour lecture per week. During the first part of the term, lectures will cover issues related to design and development of microcontroller-based sensor systems, mobile robotics and project management. During the last part of the term, lectures will serve for student project presentations.
- The course will contain a quiz. There is no make-up quiz for the students that are absent when the quiz takes place.

Labs:

- There is one three-hour lab period per week.
- Full attendance to labs is mandatory and will be monitored throughout the term.
- The computer lab for this course is located in Canal Bldg. Room 5109. The lab is open 7 days a week, whenever the building is open. Except for those timetable slots when the room is reserved for specific courses, the lab can be used any time.
- During the first labs, the students will prepare the project planning and work on a series of guided exercises. During subsequent lab sessions, the students will work on their project: select their sensor system, learn how to use the data coming various sensors, design their solution, work on their project specific tasks and conduct demo sessions by teams.
- Each team is expected to demonstrate the lab exercises and the project milestones.
Project:

A major component of the course is a team-based project. The project must be related to a computer system design for a mobile robot application and is the choice of each team. A small mobile robot kit and components will be provided for those interested to work on a real robot, at the beginning of the course. Alternatively, teams can decide to work on programming and simulating mobile robot tasks in software. Students will be initiated to V-rep software through guided lab sessions. Each team is responsible for proposing a solution to a practical robot task and for planning and delivering a workable prototype. Each member of the team is expected to participate in all aspects of project planning, management and the design and development of the technical solution. The final grade will take into consideration team functioning aspects, the individual contributions, the quality of the project and of the submitted documents. For more details on the project, consult the document Project specification, available in CULearn.

Week-by-Week breakdown

1. Introduction (1 week)
2. Design and development process of an embedded system with microcontrollers (1-2 weeks)
3. Team-based project management (1 week)
7. Students presentations (2-3 weeks)

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

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](mailto: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/](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/](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](https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf)

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