Course Outline

Instructor
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Calendar Description:

Development of expertise in designing, implementing and testing industrial-quality, reusable software through team projects. Applying modern programming languages, design patterns, frameworks, UML, and current development processes (refactoring, iterative and incremental development, version control techniques) to medium-scale projects; for example, embedded or mobile applications.

Course Objectives

- Students will be able to use industry-standard processes and tools for working effectively in teams.
- Students will be able to use key software patterns for both system architecture and software design.
- Students will describe concepts of iterative and incremental systems development processes
- Students will be able to create unit tests, at both the architectural level and the class level.
- Students will be able to construct moderately complex systems composed both of embedded computing and web-enabled applications.
- Students will be able to communicate their design effectively to their peers in both oral and written forms in a collaborative and comparative environment.
- Students will be able to work cooperatively in groups, scheduling their own work within the time allocated and considering relevant design aspects as safety, performance, cost and product life cycle
- Students will be able to reflect on the work and challenges encountered
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Course Outcomes

This course is an introduction to the software development life cycle and to team project management. From a technical perspective the course is expected to draw from material covered in prior and concurrent courses, with lectures largely providing additional depth or considerations regarding scale and complexity. Complementary to the technical aspects and with equal importance are the challenges associated with working with a team to produce a project on schedule. Resulting from this course a student should see the technical importance of topics already covered in their degree program, have broader appreciation of the design process and aspects such as teamwork, discipline, scheduling and communication. Self reflection is a key aspect of professionalism and this is encouraged and examined within the course. The expected result will be a deeper appreciation of the importance of technical knowledge, the design cycle and professional skills which will be beneficial for, co-op placements, the fourth year project and final employment.

Prerequisites
SYSC 2100 and SYSC 2004, and third-year status in Computer Systems Engineering are the course prerequisites. 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.

Instructional Resources.

Course material, project requirements and lab exercises will be posted on the course website through CULearn.carleton.ca.

There is no course textbook designated for this course. A bibliography of references that are relevant to this course will be posted on the course Web site.
Lecture and Lab Periods

There is one two-hour lecture per week. Lectures are mandatory, some of the lectures involving class-wide exercises that will be graded.

There is one three-hour lab period per week. Labs are mandatory for your learning, and full attendance for the entire 3-hour period is demanded.

- During the first section of term, there will be a lab exercise associated with the current lecture. The lab exercise is to be completed individually and/or in pairs, and must be submitted before the end of the lab period for grading.
- During the remainder of the term, the labs are either:
  - Open work time for your group’s term project – while there is no explicit deadline, attendance is mandatory. It is a time when all members of the group must be available, and where the TAs and instructor can check in with interim progress.
  - Milestone demonstrations by the group to the instructor and TAs – if a team member is missing from the demo, that person receives zero for the demonstration.

Project

A major component of the course is a project that will lead you through the process of building a reasonably complex system. This will be a group project. Each team member must participate in all aspects of the project: design, coding, testing and debugging, etc. The project will be of the team’s own idea, yet must meet the universal technical requirements posted for the course. With guidance, the teams will plan the project as a series of milestones that progress incrementally and iteratively through the engineering lifecycle. The group’s work will be evaluated at several points, and feedback will be given. The final grade for the project will incorporate marks for both the “process” (how the group functioned over the term) and the “product” (the quality of the final system delivered). Individual marks will be given to each student reflecting their contribution as evaluated both through self and peer assessment. Groups will present their work and defend their work, in mid-term and at the end of term.
Evaluation and Grading Scheme

The final grade will be calculated as follows:

<table>
<thead>
<tr>
<th>Team Assessments</th>
<th>60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Proposal</td>
<td>10%</td>
</tr>
<tr>
<td>Project Design Review</td>
<td>15%</td>
</tr>
<tr>
<td>Project Testing (Review &amp; Demo)</td>
<td>15%</td>
</tr>
<tr>
<td>Project Final Product</td>
<td>10%</td>
</tr>
<tr>
<td>Team Evaluation</td>
<td>10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual Assessments - 40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Memo</td>
</tr>
<tr>
<td>Reflections (4)</td>
</tr>
<tr>
<td>Lab Work</td>
</tr>
<tr>
<td>Class Peer Reviews (3)</td>
</tr>
<tr>
<td>Code Review</td>
</tr>
</tbody>
</table>

Failure to work in a group can result in a failing grade.

Most of the work will be done in groups, so that there will be only one group report and joint group presentation that will be graded. When needed, individuals will be awarded separate marks commensurate with their contribution, including zero.

Special Arrangements

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation: write to 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 visit the Equity Services website: [http://www2.carleton.ca/equity/](http://www2.carleton.ca/equity/)

Religious obligation: write to 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 visit the Equity Services website: [http://www2.carleton.ca/equity/](http://www2.carleton.ca/equity/)

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 your instructor to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable) at http://www2.carleton.ca PMC/new-and-current-students/dates-and-deadlines/

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at http://www2.carleton.ca/equity/

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
Lecture Schedule (Tentative)

1. Course Introduction, Team Building & Trial Project Introduction, Embedded Hardware Introduction
2. Distributed Systems - Networking and JSON
3. I/O Systems - Sensors and Actuators
4. Term Project Proposals
7. Term Project Design Reviews
8. Introduction to Android through Design Patterns
9. Persistence (Properties, Relational, SQL)
10. Unit and Integration Testing: xUnit Testing Frameworks: xUnit, JUnit, STAF. Collaborative Development of Project Tests.
11. Embedded Design – Solving Problems through FSMs
13. Refactoring Strategies using core Design Principles (Coupling, Cohesion, Demeter)
14. Term Project Code Review
15. Term Project Poster Session