Instructor Information and Office hours

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Office hours: tbd

Calendar Information

Course Number: SYSC5105
Course Title: Software Quality Engineering and Management
Calendar description
http://calendar.carleton.ca/grad

Prerequisites

Students are expected to:

- Be able to program with a procedural programming language as well as an object-oriented programming language,
- Be able to trace the execution of such programs, that is understand the flow of control of programs,
- Be able to understand a high-level design, a specification with a (extended) finite state machine,
- Be knowledgeable in discrete mathematics.

Course Objectives

Software Verification and Validation (V&V) are two important activities of any software development. One of the main techniques used for V&V is called software testing.

Some data reported in literature indicate that software testing usually amounts for 30% to 40% of the total software development cost, and that for safety critical software this percentage can go up to 70%. Other anecdotal evidence of the importance of software testing is that in large projects, the amount of test code (for instance measured in number of lines of code) can be double the amount of application code! Although a lot of testing is conducted, there are still many defects in released software (verification issue) and software do not entirely satisfy customer needs (validation issue).
One of the main limits of today’s testing activities is that they are often not conducted in a systematic, repeatable way, using clear rationale. For instance, a study reported that open source software development projects lack “attention to basic, accepted, and mature testing techniques.”

The main purpose of SYSC-4101 is to introduce you to basic, well-accepted, systematic, mature software testing techniques so you become capable of using them wisely; to introduce you to the notions of validation, verification and testing so you can precisely understand what activity you conduct in practice; to introduce you to the challenges of using testing techniques and design software test harness.

**Learning Outcomes**

By the end of the course, students will be able:

1. to describe and discuss the concepts of verification, validation, testing, test model, test criteria;
2. to describe the benefits and limitations of software testing;
3. to understand results of a testing campaign in relation to the notion of faults, errors and failures, to the test scaffolding.
4. to apply testing techniques for unit testing, integration testing, and system testing;
5. to apply standard black-box and white-box testing techniques;
6. to discuss advantages and drawbacks of standard black-box and white-box testing techniques;
7. to describe the problem of regression testing;
8. to describe problems specific to procedural, object-oriented, distributed, or real-time software;
9. to describe the general notion of quality assurance;
10. to implement (design) test suites for standard black-box and white-box testing techniques;
11. to appraise alternative testing techniques, while accounting for their advantages and drawbacks, for specific software development contexts.

**Textbooks (or other resources) if applicable**


**Evaluation and Grading Scheme**

- two (closed-book) midterm exams, each worth 20%;
- a (closed-book) final exam worth 40%;
- a course project worth 20%.

To pass the course, an appropriate overall mark (D- or higher) must be obtained, a passing mark (D- or higher) must be obtained at the final exam, and a passing mark (D- or higher) must be obtained for at least one of the two closed-book mid-term exams.
Breakdown of course requirements (labs, assignments, quizzes, exams, etc)

Exams

The two mid-term exams are scheduled on October 7th and November 11th. The mid-term exams will take place in the classroom, unless otherwise specified.

The final exam will take place during the December exam period.

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.

Project

See project related material on the course web site for further information about the course project. Make sure to read that information ASAP. You must inform the instructor about your choice of project by the end of September. Should you require additional help to select a project or to discuss specifics of alternative projects, you are urged to get in touch with the instructor so discussions can take place.

The project is a semester long, significant endeavour. You can expect to dedicate on average four hours per week on the project.

The project is an individual work.

Week-by-Week breakdown

Week 1&2: Context and Definitions
Week 3: Category-Partition software testing
Week 4: Graph criteria
Week 5: Control flow graph (application of graphs)
Week 6: State based testing (application of graphs)
Week 7: Inheritance/Generalization and testing
Week 8: Integration testing
Week 9: Criteria for logic expressions
Week 10: Regression testing
Week 11: Drivers, stubs and oracles
Week 12: Other considerations, including empirical software engineering
General Regulations

Student Responsibility: It is the student's responsibility to remain informed of all rules, regulations and procedures required by their program and by the Faculty of Graduate and Postdoctoral Affairs. Ignorance of regulations will not be accepted as a justification for waiving such regulations and procedures.

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/. 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.

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 Graduate Calendar, Academic Regulations of the University, Section 9.3.

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/. For an accommodation request, the processes are as follows:

- **Pregnancy or Religious obligation**: 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/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). **Requests made within two weeks will be reviewed on a case-by-case basis.** After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC
website ([www.carleton.ca/pmc](http://www.carleton.ca/pmc)) 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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**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)

**Students from the University of Ottawa:** You can request to have access to cuLearn: please see [http://gradstudents.carleton.ca/forms-policies/](http://gradstudents.carleton.ca/forms-policies/).