

Carleton University
School of Computer Science
COMP 4004A: Software Quality Engineering
COMP 5104/HCIN 5406: Object-Oriented Software Development
Fall 2020
Last Updated August 30th, 2020

Class Logistics

Lectures: **offered online asynchronously**

Material will be posted online with a deadline by which you should have gone through it. This deadline is likely to be each Friday at 14:30.

Expect the material for each week to be posted by Friday the week *before*. Early in the term, Q/A sessions will be held **synchronously** each Friday, typically in the second half of the office hours, to answer questions about the posted material.

Once the team project starts, office hours (and very likely other time slots) will mostly be used by the instructor to discuss progress **synchronously** with each team. All team members will be expected to participate in each of these short team meetings.

Fall Break: October 19-23 (no office/TA hours that week)

‘Office Hours’ will be held ONLINE starting the week of September 7th and run until at least the week of Dec 4th.
Please note: December 11th follows a Monday schedule

Instructor Info

Jean-Pierre Corriveau
email: jeanpier AT scs.carleton.ca
course/office hours: Friday 14:30-17:30 + meetings with teams

Course Website

<http://people.scs.carleton.ca/~jeanpier//5104F20/>

No textbook is used in this course

cuLearn will be used for announcements and for assignment submissions.
Most posted course material will be on the course’s web page.

TAs: names and emails

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Learning Objectives

- Understand the fundamental principles of agile development
- Understand the principles and limitations of TDD
- Gain experience with JUnit and TDD
- Understand behavior-driven development (BDD) and scenario-based testing
- Gain experience with BDD, scenario-based testing and Cucumber
- Gain experience with the Agile **team**-based quality-driven development and continuous integration
- Gain experience in **researching** and using OO software testing approaches and tools

additionally, for COMP 5104:

- Understand a representative subset of the Gang of Four (Go4) design patterns
- Know the essentials of UML 2.0

Detailed Course Description

It is widely acknowledged that *software quality* is of the utmost importance. Yet, despite recent advancements in program verification, automatic debugging, assertion deduction and model-based testing (MBT), Ralph Johnson (of Gang of Four design patterns fame) and many others still view software verification as a "catastrophic computer science failure".

In this course we first and foremost explore the issue of software **testing**, that is, the **execution** of software in order to find errors. A first pervasive concern will be *test automation*, which is necessary if testing is to be objective, systematic, and scalable. A second pervasive concern will be the *testing of scenarios* (as captured in use cases, user stories, use case maps, and/or message sequence charts).

We will start with a more code-oriented (industry-relevant) approach to testing, focusing in particular on test driven development (TDD) and the strengths and limitations of **JUnit** and unit testing. Later in the course, we will also discuss the challenges of *refactoring* (production *and* test) code and the usefulness of unit test patterns and code metrics.

We will consider scenario modeling, acceptance testing and Cucumber, at which point the team project will be discussed in detail.

Other topics include:

- state-of-the-art *model-based* approaches to software testing
- some of the theoretical foundations of validation and verification

COMP 5104 students will additionally be presented with material pertaining to UML 2.0 and to Go4 design patterns.

CULearn for U of Ottawa graduate students: for access, fill out [this form](#) and email it to Grad Studies.

Prerequisites

The student is assumed to have a **strong** background in object-oriented design and programming, as provided by COMP 3004 or an equivalent course. A student who does not meet this prerequisite is asked to withdraw or will be de-registered.

Programming for the *assignments* is in Java.

Project

No two teams will have the same project.

The minimal and maximal size of the team will be based on the number of students registered in the course at the time the project is first discussed in the first weeks.

Tentatively, a team will have 3 or 4 members.

The environment, programming language and software testing tools for each team project will be agreed upon by the team and the instructor.

Each team project will involve several deliverables, starting with a proposal that defines:

- the scope of the development and of the testing, including user stories
- the chosen characteristic(s) (see below) **and** the tools to be used

Each project will have to include *at least one* of the following characteristics:

- asynchronous concurrent networked behavior
- web or mobile app
- a graphical user interface (GUI)

Each proposal will have to explain the characteristics of that project and motivate the selection of tools to carry out validation and verification. A fundamental requirement of the project is that it be developed from an agile perspective (especially with respect to continuous integration). In particular, this entails justifying the use of any model and testing tool. You are expected to research which testing tools may be relevant to your project, learn them on your own, and illustrate their usage.

Each team will have to produce a detailed video illustrating their work, as well as ensure the instructor can get your system running on his computer. A TA and/or the instructor will also monitor on a weekly basis your team's repository to assess the contribution of each team member. An on-line demo may also be required.

Evaluation will include a significant comparative component. That is, the scope and results of your project will be compared to the one of other projects.

Beyond JUnit and Cucumber-like tools, tools that may be relevant to your project include Serenity, Squish, Postman, JDeodorant, JContract, log4j, Selenium, TestNG, Arquillian, Mockito and Powermock, the Grinder, JWalk and JTest.

Finally, please be aware that your individual mark for the project includes, among other factors:

- a peer-review component of your contribution
- a participation component (in the team meetings with the instructor and, *possibly*, in reviewing the work of another individual or team)

Software

For the assignments, students will be using Git, Maven/Java/Eclipse, JUnit, and Cucumber. **Students are expected to learn *by themselves* all tools used in this course.** Assignments must be submitted through cuLearn.

There are several tutorials available online for the tools we use, in particular for JUnit (<http://www.vogella.com/tutorials/JUnit/article.html>) and Cucumber.

All material created for this course (including assignments) remain the exclusive intellectual property of their author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).

Suggested *Optional* Readings

- 1) Robert Binder (good introduction to OOT)
Object-oriented Testing, Addison-Wesley 2000
- 2) K. Naik and P. Tripathy (pricey but excellent reference for s/w testing)
Software Testing and Quality Assurance, Wiley, 2008

Evaluation scheme

2 Assignments	30%	tentatively 15% each
1 project	70%	(distributed across several deliverables)

Late submissions WILL NOT BE ACCEPTED and will get a mark of 0. Assignments/project submissions are handled electronically through cuLearn and there is no "grace period" with respect to a deadline. Technical problems do not exempt you from this requirement, so if you wait until the last minute and then have issues with your connection, you will still receive a mark of zero. Do not expect extensions.

NOTES:

- 1) There will be NO supplemental or grade raising exam in this course.
- 2) No mark (or extra work) can be substituted for another!
- 3) You must pass, that is, obtain a grade greater than 49% on EACH assignment and on the project in order to pass this course.**
- 4) For each assignment, you will be submitting one or more files that contain source code, and these files must be given the correct filename and be provided in the specified format. Assignments that are incorrectly named or in the incorrect format will be penalized and may receive a mark of zero.
- 5) Assignments are to be done **individually** *without any sharing*. Collaboration between students is *not* permitted: all alleged plagiarism will be reported to the office of the dean of Science (ODS). Penalties for such offences can be found on the ODS webpage: <https://science.carleton.ca/academic-integrity/>. In particular, posting *any* work put in a public location (eg a GitHub public repository, or Chegg, CourseHero, OneClass) constitutes a form of sharing that enables plagiarism. As such, if your work is plagiarized from a public posting of yours, you will be considered to have participated in this offence!

Undergraduate Academic Advisor

The undergraduate advisor for the School of Computer Science is available in Room 5302C HP, by telephone at 520-2600, ext. 4364 or by email at undergraduate_advisor@scs.carleton.ca. The advisor can assist with information about prerequisites and preclusions, course substitutions/equivalencies, understanding your academic audit and the remaining requirements for graduation. The undergraduate advisor will also refer students to appropriate resources such as the Science Student Success Centre, Learning Support Services and the Writing Tutorial Services.

Science Student Success Centre (SSSC)

The Science Student Success Centre is a central advising unit for students in Science courses. We help students achieve their goals by providing access to resources, workshops and activities that enhance their academic and study skills, and help them make key connections with their peers. Mentors can help you customize an individual study plan which includes weekly and semester work or study schedules, and also help when you need information on developing a new study strategy, obtaining summer job opportunities, or clarifying ideas and concepts to better understand and cope with new course content. Science mentors can help you **learn how to learn what you need to learn** for your classes.

Drop by the Science Student Success Centre at 3431 Herzberg Laboratories or visit

<http://sssc.carleton.ca/>

University Policies

For information about Carleton's academic year, including registration and withdrawal dates, see [Carleton's Academic Calendar](#).

Pregnancy 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, visit [Equity Services](#).

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, visit [Equity Services](#).

Academic Accommodations for Students with Disabilities If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC 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 as soon as possible to ensure accommodation arrangements are made. For more details, visit the [Paul Menton Centre](#) website.

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 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: 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 [the policy](#).

Student Academic Integrity Policy. Every student should be familiar with the Carleton University student academic integrity policy. A student found in violation of academic integrity standards may be awarded penalties that range from a reprimand to receiving a grade of *F* in the course or even being expelled from the program or University. Examples of punishable offences include: plagiarism and unauthorized co-operation or collaboration. Information on this policy may be found [here](#).

Plagiarism. As defined by Senate, "plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own". Such reported offences will be reviewed by the office of the Dean of Science.

Unauthorized Co-operation or Collaboration. Senate policy states that "to ensure fairness and equity in assessment of term work, students shall not co-operate or collaborate in the completion of an academic assignment, in whole or in part, when the instructor has indicated that the assignment is to be completed on an individual basis". Please refer to the course outline statement or the instructor concerning this issue.

Medical Certificate

The following is a link to the official medical certificate accepted by Carleton University for the deferral of final examinations or assignments in undergraduate courses. To access the form, please go to https://carleton.ca/registrar/wp-content/uploads/med_cert.pdf
