

Carleton University
School of Computer Science
COMP 4004A: Software Quality Engineering
Fall 2022
Last Updated August 2nd, 2022

Class Logistics

Lectures: **Several, if not most, are in person on Wednesdays and Fridays**
Possibly, some will be posted and then discussed in class

Fall Break: week of October 24 (no office/TA hours that week)

‘Office Hours’ via zoom, **by email appointment only**

**** December 9th follows a Monday schedule ****

Instructor Info

Jean-Pierre Corriveau
email: jeanpier AT scs.carleton.ca

Course Website

<http://people.scs.carleton.ca/~jeanpier//Fall2022/>

No textbook is used in this course

Material will be posted to Brightspace.

Brightspace will also be used for announcements and for all student submissions.

uOttawa students are responsible for immediately gaining access to Brightspace

TAs: names, emails and office hours

will be announced in Brightspace

Learning Objectives

- ***Gain experience at learning tools, coding and testing BY YOURSELF***
- Understand the fundamental principles of agile development
- Understand the principles and limitations of TDD
- Gain experience with using JUnit and TDD
- Understand behavior-driven development (BDD) and acceptance testing
- Gain experience with BDD and scenario-based testing using Cucumber
- Gain experience with testing a web application

Detailed Course Description

It is STILL 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* (e.g., as captured in use cases, user stories, use case maps).

After a brief introduction to the theoretical foundations of validation and verification, we will consider a code-oriented approach to testing, focusing in particular on test driven development (TDD) and the strengths and limitations of **JUnit** and unit testing. We will then address acceptance testing and focus on model-based techniques and the use of Cucumber for it. We will conclude with a discussion of Smells and refactoring and their relevance to software testing, software metrics and of the state-of-the-art in software testing.

Prerequisites

A student registering in COMP 4004 is assumed to have a **strong** background in object-oriented design and programming. More specifically, a student should have taken COMP 2401, 2406 *and* 3004, or their equivalent. Because there are no exams, expect the assignments of COMP 4004 to be **time-consuming** and presuppose you **already** know how to develop:

- a) a client/server application
- b) a web application

These topics will NOT be reviewed in this course.

You are expected to work individually and autonomously (i.e. learning by yourself).

Attendance

You are expected to attend the in-class lectures, tutorials and exercises of this course AND to study material and lectures posted online.

In-class lectures will NOT be recorded.

Software

For the first exercise and for the assignments, students will be using a repository (e.g., Github), a dependency manager (e.g., Maven), an IDE (e.g., IntelliJ) and Java as well as Junit, Cucumber and other testing tools. Exact details are to follow in Brightspace.

Most importantly, students are expected to learn *by themselves* all tools used in this course. That is, lectures will NOT be discussing the technical aspects of the installation and use of the tools required by the assignments. Questions on these issues should be directed to the TAs and it must be emphasized that it is a key learning objective to have students tackle mostly on their own such issues. 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.

Suggested *Optional* Readings

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

Evaluation scheme

5 INDIVIDUAL in-class exercises **5% each**

- tentatively: **Sept 16 & 28, Oct 5, Nov 16 & 30**
- only exercise 1 is a programming one!

**** Sept 16: Java coding and testing exercise on your laptop ****

3 INDIVIDUAL Testing Assignments **25% each**

- actual practice of s/w testing approaches

A1: TDD of a networked *card game* for 2 to 4 players due: October 21st
• use of a repository, Maven and JUnit5

A2: acceptance testing for this game due: November 14th
• use of Cucumber

A3: Development and testing of another card game as a web app
• use of a web driver (Selenium or Cypress) due: December 9th

Logistics

Late submissions WILL NOT BE ACCEPTED and will get a mark of 0.

Exercise/Assignment submission is handled electronically 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.

Furthermore

- 1) There will be NO supplemental or grade raising exam in this course.
- 2) No mark or extra work can be substituted for another mark.
- 3) Should you be sick for an exercise or during an assignment, you must submit the appropriate form to the instructor BEFORE the exercise/assignment is due.
For an exercise: We will schedule another time for a **different** exercise.
For an assignment: You will get a new deadline for the current assignment BUT this will NOT grant you more time for the subsequent assignments.
- 4) **The Fall term ends December 9th and no submission is accepted after that date.**
- 5) **You must pass, that is, obtain a grade greater than 49% on EACH assignment in order to pass this course.**
- 6) **You must obtain a grade greater than 12 out of 25 for the total of your exercises.**
- 7) 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.
- 8) 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!

All material created for this course (including exercises and 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).

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 <https://calendar.carleton.ca/academicyear/>

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:

<https://carleton.ca/womensstudies/resources-and-links/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:

<https://carleton.ca/equity/focus/discrimination-harassment/religious-spiritual-observances/>.

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/cu-files/medical-certificate-form/>
