

Course Outline

COMP 250

Introduction to Computer Science

Fall 2019

section 001: MWF 14:35-15:25

LEA 132

section 002: MWF 14:35-15:25

ENGTR 1080*

*The classroom in Section 002 is very small, and we intend to use it for the first week only. We will record the Sec. 001 lectures (in the bigger room LEA 132), and so we expect there will be enough seating capacity in that room after the first week for those who prefer to attend the live lecture.

Instructors:

Michael Langer

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Office Hours: Mondays 12pm - 2pm or by appointment

Giulia Alberini

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Office Hours: Wednesdays 3:30pm - 5:30pm in McConnell 103 or by appointment

Teaching Assistants (T.A.)

T.A. office hours and contacts will be posted on mycourses Announcements.

1 Overview

This course introduces you to two core topics in computer science: data structures and algorithms. You will learn basic data structures for lists (arrays, linked lists, stacks, queues), trees (search trees, heaps), and graphs. You will also learn basic algorithms – both recursive and non-recursive – that use these data structures. You will also learn how to analyze such algorithms in terms of the amount of computation they use. These data structures, algorithms, and analysis tools all will be used heavily in subsequent CS courses.

The assignments in the course will use Java programming language. You will learn how to implement basic data structures and algorithms using Java. Java is an object oriented language, and so you will also learn some of the basic ideas of object oriented design such as how classes can be organized into hierarchies and how variables and methods defined in the classes of the hierarchy are related to each other.

2 Prerequisites

According to <https://www.mcgill.ca/study/2019-2020/courses/comp-250> the official prerequisite is “Familiarity with a high level programming language and CEGEP level Math.” Here are more details about the programming and math prerequisites.

2.1 Programming prerequisites

You need to know basic Java programming at the level of COMP 202.¹ All of the assignments will be in Java, and many of the examples in class will use Java. The first few lectures will not use Java, so if you don’t know Java coming in, then you must use the first two weeks to catch up. *By the third week of the semester when Assignment 1 is posted, you will need to know roughly as much Java as the students who have taken COMP 202.*

Here are some frequently asked questions (FAQ) about the programming prerequisite:

Q: I took COMP 208 and so I know some C but not Java. What am I missing?

A: If you know some C, then you are in a strong position to learn Java because you are very familiar with *types* already. However, you don’t yet know about objects and classes. You will need to learn about them, and how to use them in Java.

Q: I took COMP 204 in 2018–2019 or I took a programming course prior to coming to McGill in which we used one of Python/Matlab/JavaScript/R. What am I missing?

A: Python/Matlab/JavaScript/R and others are all powerful high level languages. However, if you have only programmed in these languages, then you are missing some important concepts. These languages do not require you to declare each variable to have a certain type before using the variable, and so you are not be used to thinking about *types*. Types are very important in Java (and C) so you will need to spend more time catching up than those who have taken COMP 208.

But before you do, be sure that you are comfortable with the other basics elements of programming from COMP 202, in particular, variables, expressions, and assignments, conditional statements (if-then-else), loops (while, for), methods/functions, data structures such as arrays and strings, input/output from a keyboard and to a console and from/to a file. *If you are not comfortable with these basics, then you should take COMP 202 or 204 or 208 this semester, instead of COMP 250.*

Q: I have not taken a programming course. Instead I learned programming on my own, e.g. online course. How much programming experience do I need?

A: You should have at least 50 hours experience programming in whatever language you do know. That is roughly the minimum amount of experience that a student who has taken COMP 202/208/etc already has. If you don’t have that level of experience, then you should not take COMP 250 this semester, and instead you should take an introduction to programming course, namely COMP 202 or 204 or 208.

¹COMP 202 is switching to Python in Fall 2019, but it was taught in Java in previous semesters.

Q: How can I learn Java?

A: Here are some suggestions.

- Scan through the lecture slides from COMP 202 and make sure you are aware what topics were covered in that course, e.g.

<http://www.cs.mcgill.ca/~cs202/2016-01/web/sec2.html>

For that course, all the material from January to March is core COMP 202. The material from April is extra.

- Learn java online with codecademy, sololearn, udemy, or others.
- Download the free online Java book “How to think like a computer scientist”. You will need to go as far as chapters 10 and 11 give a brief introduction to Objects and Classes, respectively.
- If you are a Python programmer trying to learn Java, you might try:
<http://interactivepython.org/runestone/static/java4python/index.html>
- Buy or borrow a book on Java programming and go through the parts of it that are covered in COMP 202. Don’t just read. Code! Two very good introductory texts (any edition) for Java are:
 - D. Liang, “Introduction to Java Programming,” Brief Edition, Prentice Hall.
 - Lewis and Loftus, “Java software solutions,” Addison-Wesley.

2.2 Math Prerequisites

The official prerequisite is “CEGEP level math”. This means specifically Calculus 1 and 2. Although COMP 250 will not use derivatives and integrals, some of the ideas from Calculus will be used. For example, we will use the limits of a sequence when we discuss the runtime of different algorithms and we compare one algorithm to another. We also will use sequences and series, and so you are expected to know the difference between an arithmetic versus geometric series. Another important concept from Calculus is logarithms. You need to know how logarithms are defined – namely a logarithm is the inverse of an exponential. You also need to know and understand the basic rules of logarithms. Finally, the course will require that you are able to think logically. Although most of you will not (yet) have studied formal logic, you will nonetheless be expected to understand at least intuitively what statements like “for all” and “for each” mean, and to understand intuitively how to negate such statements. Such mathematical thinking will come more naturally to those of you who are stronger in mathematics, but everyone is capable of such thinking to some extent – and it improves with practice. So if you haven’t yet taken Calculus e.g. if you are doing a B.A., then you should at least do Cal 1 before taking this course.

2.3 Recommended Co-requisites

If you are registered for COMP 250 in Fall 2019 and you are thinking of pursuing a program in Computer Science, then we strongly recommend that you ...

- take MATH 240 (for CS only programs) or MATH 235 (if you do Math & CS program). These courses will help you with the mathematical parts of COMP 250. Moreover, doing one of them now will help when you take COMP 251. You *must* take one of these two MATH courses either before or while taking COMP 251; we strongly recommend that you do it *before*.
- ... take Calculus 2, if you haven't done so already. See Math prerequisites above.
- ... do not attempt to take COMP 250, 206, 273 all in one semester, unless you have a lot of programming experience already. Instead just taking 250 and 206 and leave 273 for next semester.

3 Course Materials

3.1 Lecture Recordings

We will record the LEA 132 section, and make the recordings available on mycourses. The two sections will be merged on mycourses, and two sections will be treated as one single course – same assignments, same exams.

3.2 Lecture Slides, Lecture Notes, Exercises

There is no course textbook. Instead, we will have a set of slides, which will be made available on mycourses.

For details on the course content, see <http://www.cim.mcgill.ca/~langer/250.html> which lists the lecture topics we are covering this year. There is also a complete set of Lecture Notes and Exercises from Fall 2017 available <http://www.cim.mcgill.ca/~langer/250-2017.html>. Time permitting, we will update these materials to match the Fall 2019 lecture schedule and slide content, and post these materials in mycourses.

3.3 Copyright policy

You are not allowed to post any course materials on github, coursehero, any other websites. This includes PDFs of lecture slides, lecture notes, exercises, quizzes, assignment questions or anything else that we provide for you.

Stated more formally: “Instructor-generated course materials are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor(s). Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.”

4 Communication Policies

4.1 Course Announcements

Important information about the course will be announced in class and/or on mycourses. Please subscribe now to mycourses Announcements, if you haven't done so already.

4.2 Getting help from an instructor or T.A.

If you have a technical question about the course material or an assignment, *do not email the instructors*. Instead, in no particular order:

- See an instructor during their office hours or before/after lecture.
- See one of the T.A.'s dedicated to the assignment. They are listed on the assignment PDF. Their office hours will be posted on the PDF and/or updated on mycourses Announcements.
- For help with course material (but not assignments), ask at the CSUS Help Desk in Trottier 3rd floor.
- Post your question on the mycourses *Discussion Board*. (See Discussion Board policies below.)

4.3 Instructor email policy

Email the instructors *only if*:

- You have an urgent and important personal matter. In that case, assuming the matter is related to COMP 250, please email both instructors using cs250-prof@cs.mcgill.ca and one of instructors will get back to you as soon as possible. Be sure to send your email from your mcgill address and include your student ID.
- You notice a mistake has occurred such as a problem with a question on a quiz, missing slides or PDF on mycourses, or lecture recordings haven't been posted within 48 hours of the lecture, etc.

4.4 MyCourses Discussion Board Guidelines

The instructors and TAs will moderate the Discussion Board. You are also encouraged to help each other out by responding to posts. Guidelines for posting on the Discussion Board are as follows. *Posting that do not conform may be deleted.*

- Use the search feature to check if your question has been asked before by entering relevant keywords into the search box. Only post your question if you are sure it has not been posted before. If you are unsure how to use the search feature, then ask.
- Choose the appropriate folder (Topic) and an appropriate subject line, so that other students know what the posting is about.
- If you have multiple questions that are unrelated, then use multiple postings so others can more easily follow the thread.
- Proofread before posting. Ensure that what you have written makes sense before hitting Enter.
- If you would like your posting to be deleted, make a request within the thread.
- While it is nice for you to post a thank you note on mycourses when someone helps you out, please keep in mind that everyone subscribed gets notified which can be distracting, and may lead people to unsubscribe which we don't want. So please use some discretion.

5 Evaluation

5.1 Grade components and calculation

The final grades will be calculated using the following percentage breakdown, with one very important exception which is explained in the Final Exam bullet below:

- **Four Assignments: 40% total, each worth 10%**

- A1 to be posted around September 22
- A2 to be posted around October 5
- A3 to be posted around November 2
- A4 to be posted around November 16

You will be given approximately two weeks to complete each assignment.

If you do not do an assignment, then you will receive a grade of 0 for it. No exceptions.

- **Online Quizzes: 0% or 10%**

We will have five quizzes throughout the semester, each worth 2 % of your final course grade. The quizzes will be combination of multiple choice, true/false, etc.

These quizzes will be done online with mycourses. Each quiz will take less than one hour and you can do it anytime during the day from 8 AM to 8 PM, and from wherever you wish. We strongly suggest that you do them in a location where the internet connection is reliable.

The quizzes must be done entirely on your own. See policy below about “Cheating on quizzes”.

It is possible that you will not be available to write all of the quizzes. Therefore, we are making the quizzes optional in the following sense. You will receive a grade of 0/2 if you cannot write a quiz. However, when we calculate your final course grade, if your final exam percentage grade is greater than your quiz percentage grade including quizzes that you missed, then we will *automatically* make your final exam worth 60 % of your final grade instead of 50 %, and your quizzes will be worth 0 %.

The planned dates and topics covered by the quizzes are listed below. You will be informed at least a week in advance if these dates or topics change.

1. Fri. Sept 27 (logs and number representations, OOD basics)
2. Fri. Oct. 11 (lists, including stack & queue)
3. Fri. Oct. 25 (OOD interfaces, induction & recursion)
4. Fri. Nov. 8 (trees and heaps)
5. Fri. Nov. 22 (hashing, graphs, recurrences)

- **Final Exam: 50% or 60% (see Quizzes above) or 100% (failing grade policy)**

The Final Exam will be held during Final Examination Period. It will be *closed book*. No crib sheet or electronic devices are permitted. No calculators. No cell phones.

The Final Exam is a multiple choice exam out of 50 points. There will be four choices on each question. If you answer a question correctly, you get 1/1. If you do not answer a question

or if you answer a question incorrectly, you get 0/1. This means that you should never leave a question blank. If you have no idea how to answer a question, you should guess since you have a $\frac{1}{4}$ chance of getting it correct.

Failing grade policy: *You must get a score of at least 25/50 on the final exam to pass the course.*² If your score is below this threshold, you will automatically receive an F grade for the course, regardless of your scores on the assignments and quizzes.

When we calculate your final course grade, we will use a formula that rounds off to the nearest integer. If your grade is 84.4 then it rounds to 84 and you get an A-, whereas if it is 84.6 then it rounds to 85 and you get an A. If your grade is 84.5, our formula will round it up to 85. The same round off procedure holds for low grades. If your calculated final course grade is 49.4 then it rounds to 49 which is an F. We draw a very a hard line on this, so if you don't want to fail then you should stay far away from that line.

There are many factors that determine your course grade including how hard you work, how talented you are in this subject, how much time you have available because of other commitments, what your academic background is, what your health situation or family situation is, etc. *However, we do not consider these factors when we calculate your final course grade. Rather, we calculate your final grade automatically, according to the grading scheme specified above.* No exceptions.

At the end of the course, students often contact instructors with requests for a grade change. When the situation described in such requests are handled by the policies above, we will refer you back to these grading policies.

5.2 Supplemental/Deferred Exam

The Supplemental/Deferred exam will cover the same material as the Final Exam and it will replace the Final Exam grade, with the same grading policy as described above. For information on Supplemental Exams, see <https://www.mcgill.ca/science/student/general/exams/supplemental>.

5.3 Additional Work

If you receive a grade of D, F or J, you will *not* be given the opportunity to complete additional work to upgrade your grade.

6 Policies on Academic Integrity

6.1 Collaboration on Assignments

We encourage you to discuss the assignment problems with each other. There is no better way to learn than through discussion with your peers. We also encourage you to help each other out with debugging problems, especially with the basic mechanics of debugging such as how to make the best use of an IDE. Finally, we encourage you to pose questions on the Discussion Boards and to answer each other's questions there too.

That said, there are strict limits on this collaboration. Your discussion should never go so far that you are revealing the solutions to each other. *Sharing code is absolutely forbidden.* The solution code that you submit must be your work.

²This threshold of 25/50 will be applied only if the class median grade on the final exam is 35/50 or higher. If the class median grade turns out to be lower, then the threshold will be lowered also.

6.2 Plagiarism and text matching software

The solutions that you submit must be your own work. We will run software for detecting similarities between submissions, and we will conduct a manual code review in cases where similarity between two solutions is suspiciously high. *When the instructor suspects that plagiarism has occurred, the instructor will report the case to the Disciplinary Officer in the student's Faculty* (Science, Arts, Engineering, etc). For more details on the process, see Section III Articles A.37 (p. 10) and A.48 (p. 13) of the Code of Student Conduct and Disciplinary Procedures:

https://www.mcgill.ca/secretariat/files/secretariat/code_of_student_conduct_and_disciplinary_procedures.pdf

as well the web site listed below.

6.3 Posting assignment solutions on a website

We encourage you to use tools like github for version control systems. However, you must not share your assignment solutions by posting them on a public space such as your github account.

This rule extends beyond the duration of the course. The reason for the rule is that instructors occasionally recycle assignments from previous years, and if the old versions are easily accessible (github has a search feature) then this leads to plagiarism by others.

6.4 Cheating on quizzes

The quizzes will be online and we will let you do them with a 12 hour time interval, and wherever you like (from home, library, Trottier labs, etc). We will use the honour system here, namely you must do the quizzes entirely on your own just as if you were writing an exam in class. Any communication between two students about a quiz before the 12 hour time limit for finishing the quiz is complete is cheating and is absolutely forbidden.

6.5 McGill policy on academic integrity

“McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offenses under the Code of Student Conduct and Disciplinary Procedures. See

<http://www.mcgill.ca/students/srr/honest/>

for more information.”

7 McGill language policy

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

https://www.mcgill.ca/study/2017-2018/university_regulations_and_resources/undergraduate/gi_lang_policy