

# Course Outline

Introduction to Computer Science

COMP 250

Fall 2018

Course Web Page: <http://www.cim.mcgill.ca/~langer/250.html>

section 001: MWF 10:35-11:25      MCMED 522

section 002: MWF 14:35-15:25      LEA 219

(The two sections will be considered together as one course. You can attend either.)

## Instructors:

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## Teaching Assistants (T.A.)

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

## 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, which is a object oriented language. As such, you will also learn you some of the basic ideas of object oriented design. You will learn how classes can be organized into hierarchies, and how variables and methods defined in the classes of the hierarchy are related to each other. These relationships will be developed more fully in subsequent courses.

# Prerequisites

According to <https://www.mcgill.ca/study/2017-2018/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.

## Programming Prerequisite

You need to know basic computer programming at the level of COMP 202. In particular you need to know how to program in Java. 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 should 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 a programming course prior to coming to McGill in which we used one of Python/Matlab/Javascript/R. What am I missing?**

**A:** These 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 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?**

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 COMP 202.

## 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.

## 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.

## Other recommended McGill courses

If you are registered for COMP 250 in Fall 2018 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 be a huge help when you take COMP 251. You *must* take one of these two MATH courses either before or during COMP 251, and we strongly recommend that you do it *before* rather than *while* taking COMP 251.
- ... take Calculus 1, if you haven't done so already. See prerequisites above.
- ... do not attempt to take COMP 250, 206, 273 all in one semester, unless you have a lot of programming experience already. Taking 250 and 206 is fine though, as long as you have taken COMP 202 (or an equivalent course).

## Lecture Recordings

We will record the Sec. 002 (MWF 2:35-3:25) only, and make them available to all students in Secs. 001 and 002 on mycourses. The two sections will be merged on mycourses, and two sections will be treated as one single course – same assignments, same exams.

## Course Materials (slides, lecture notes, exercises)

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

There is a complete set of Lecture Notes and Exercises from Fall 2017 available from Prof. Langer's public course web page. Time permitting, we will update the public web page and possibly reorganize the lecture notes and exercises to fit the Fall 2018 schedule.

## Course Announcements

Please subscribe now to mycourses Announcements, if you haven't done so already.

## Instructor email policy

Emails about an *assignment* should be sent to the specific TA's that are handling it. These TA's and their email addresses will be specified on the assignment PDF.

If you have a technical question about the course material or an assignment, please *do not email the instructors* unless absolutely necessary. Instead:

- see a TA or instructor in person during their office hours (or see instructor before/after lecture);
- ask a student working at the CSUS Help Desk in Trottier 3rd floor;
- post your question on the mycourses *Discussion Board*.

If you must email the instructors – for example, if you have an urgent and important personal matter – then you can reach both instructors via [cs250-prof@cs.mcgill.ca](mailto:cs250-prof@cs.mcgill.ca) and one of instructors will get back to you as soon as possible.

## MyCourses Discussion Board Rules

Please help out by answering each other's questions on the Discussion Board. The instructors and TAs will try to moderate the Discussion Board. But the Discussion Board works best when students help each other out.

When posting to the Discussion Board, please obey the following. *Posting that do not conform may be deleted.*

- Choose the appropriate folder (Topic).
- Use the search feature to see if your question has been asked before.
- Choose a suitable subject line, so that readers know what the posting is about.
- If you have multiple questions that are unrelated, then use multiple postings so people can more easily follow the thread.
- Proofread before posting. Take an extra minute to ensure that what you write makes sense.
- If you would like your posting to be deleted, just add a request within the thread.
- It is nice for you to post a thank you note on mycourses when someone helps you out. However, please keep in mind that everyone subscribed gets notified, which can be a bit annoying if everyone sends them. So please use some discretion.

# Evaluation

Your final grade will be calculated using the following percentage breakdown.

- **Four Assignments (40 % total, each worth 10 %)**

- A1 to be posted around September 24
- 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. There are 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. The quizzes 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 'Collaboration versus cheating'.

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. Wed Sept 26 (logs and number representations, OOD basics)
2. Wed Oct 17 (lists, including stack & queue)
3. Wed Oct 31 (OOD interfaces, induction & recursion)
4. Wed Nov 14 (trees and heaps)
5. Wed Nov 28 (hashing, graphs, recurrences)

- **Final Exam (50 % or 60 %, see above)**

The Final Exam will be held during Final Examination Period.

It will be 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, you get 0/1. If you answer a question but your answer is incorrect, you will receive -0.2, that is, you will be penalized by 0.2 points. This penalty is meant to discourage you from guessing for questions in which you have no idea which of the four choices to make.

The final exam will be *closed book*. No crib sheet or electronic devices are permitted. (No calculators. No cell phones.)

We will use Microsoft Excel to calculate your final course grade, and we will use a formula that rounds off to the nearest integer. So 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, Microsoft Excel rounds it up to 85.

The same round off procedure holds for low grades. If your final course grade is 49.4 then it rounds to 49 which is an F. We draw a very hard line on this, so if you don't want to fail then you should stay far away from that line.

For other issues related to my grading policies, please see below. 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 below, we will simply respond with "Please see the grading policy in the Course Outline."

## Miscellaneous Policies

### **Collaboration on assignments (allowed, but see below)**

We strongly encourage you to discuss the assignment problems with each other, and to help each other out with debugging problems, especially with the mechanics of debugging. There is no better way to learn than through discussion with your peers. Also please pose questions and give help to each other on the Discussion Boards.

*However, there are limits to this collaboration.* You can give hints (and the TAs and instructors will give hints sometimes if you ask). However, your discussion should not go so far that you are revealing the solutions to each other. And you must never copy code from each other.

### **Collaboration on quizzes (not allowed)**

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 time limit

for finish the quiz is complete will be considered cheating. If you are taking screen shots during a quiz or looking over someone's shoulder, then you are cheating. So don't.

Note that our policy for collaboration versus cheating is very different for quizzes than for assignments. If in doubt, then ask.

### **Re-grading assignments**

Mistakes can occur when grading assignments. Not surprisingly, requests for re-grading are always in situations in which students feel they received fewer points than deserved, rather than more points than deserved. With that upward tendency in mind, please note that if you wish the instructor or the TAs to re-grade a question on an exam or assignment, we will do so. However, to avoid upward grade ratcheting, *we reserve the right to re-grade other questions as well.*

### **Supplemental/Deferred Exam**

It will cover the same material as the Final Exam and will replace the Final Exam grade. For information on Supplemental Exams, see <https://www.mcgill.ca/science/student/general/exams/supplemental>.

### **Final grade**

There are many factors that determine your final 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 (in fact, Excel calculates) your final grade according to the grading scheme specified above.*

### **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.

### **Github**

We encourage you to use tools like github for version control systems. However, please do not share your assignments from this or any other course. Instructors occasionally recycle assignments from previous years, and if the old versions are easily accessible (github has a search feature) then it makes cheating easy.

## **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](https://www.mcgill.ca/study/2017-2018/university_regulations_and_resources/undergraduate/gi_lang_policy)



## 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*