COMP 208: Computer Programming for Physical Sciences and Engineering

Section 1: TR 08:30 - 09:55 ONLINE
Section 2: TR 13:30 - 14:55 ONLINE

Instructor

The instructor for this course is Dr. Chad Zammar.

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Office Hours: TR 17:00 Zoom or by appointment

Course Overview

Welcome to COMP-208! Please read this document carefully and keep it for reference throughout the term. This course introduces students to computer programming and is intended for those with little or no background in the subject. No knowledge of computer science in general is necessary or expected. On the other hand, basic computer skills such as browsing the Web, sending email and other such fundamental tasks will be necessary in this course.

The course uses the Python programming language. Python is an example of a programming language (as are Java, C++, and many others). A large part of this course will focus on the basic building blocks of programming, which provide the foundations to learning other languages such as Java or C++.

Learning how to program is not easy; it is not a set of facts that one can simply memorize. In principle, a computer program is simply a set of instructions that tells a computer to perform a task. However, finding the right set of instructions can be quite challenging. For that, one has to learn how to structure a larger problem into small subsets, and then find the solution to each particular subset. This course aims to teach students a way of thinking that will enable them to build non-trivial programs.

Learning Objectives

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

- Design and describe precise, unambiguous instructions that can be used by a computer to solve a problem or perform a task;
- Translate these instructions into a language that a computer can understand (Python);
- Write programs that solve complex problems by decomposing them into simpler subproblems;
- Apply programming style and structure conventions to make programs easy to understand, debug and modify;
- Learn independently about new programming-language features and libraries by reading documentation and by experimenting;
- Solve basic problems in scientific computing, including numerical methods such as root finding, numerical integration, and systems of linear equations.

What this course is NOT about:

This course is not about how to use a computer. It will not teach you how to send email, browse the Web, create word processing documents or spreadsheets, setup and configure a computer, use specific software applications (except those needed to complete coursework), design Web pages, or deal with operating system or hardware problems. However, the course offers introductory tutorials that provide instruction in aspects of computer usage necessary to complete coursework.

Prerequisites and restrictions

Pre-requisites: MATH 141 or equivalent
Co-requisites: MATH 133 or equivalent

Note: We assume you have knowledge in derivation, integration, and basic linear algebra.

Restrictions:
Credit can be given only for one of COMP 202, COMP 204, or COMP 208. COMP 208 cannot be taken for credit with or after COMP 250 or COMP 206. COMP 202 is intended as a general introductory course, while COMP 208 is intended for students with sufficient math background and in (non-life) science or engineering fields.

Textbook and software requirements

There is no primary mandatory textbook for this course. We will be using a flipped approach with a diverse set of materials and resources, which will be made available on myCourses.

If you would like to consult a free, online textbook, you can use the following:

Think Python 2e, by Allen B. Downey. Available at no cost under the terms of the Creative Commons Attribution-NonCommercial 3.0 Unported License at https://greenteapress.com/wp/think-python-2e/

Typically when programmers write code they use what is called an integrated development environment (IDE) to write programs. IDEs provide an editor that allows you to type your program, commands to compile and run it, and many other useful tools, all in one application.

We will be using an IDE called Wing, which you can download at https://wingware.com/downloads/wing-101.

There are many others out there, so if you prefer another IDE (such as VSCode or PyCharm) or using a text editor (such as Atom or Gedit) you are welcome to do so. Note that if you use a different editor, the teaching staff may not be familiar with your choice of editor.

Grading and Evaluation

1. **4 assignments worth 10% each (total 40%)**
2. **2 quizzes worth 10% each (total 20%)**
3. **Final Exam worth 40%**

You will have roughly two weeks to complete each assignment (this may vary slightly). As the purpose of the class is to familiarize you with the Python programming language, assignments will consist mostly of programming problems. An important component of any programming work is documentation, therefore you should use comments throughout the code to explain the reasoning behind your design choices. Both the quality and functionality of the code and the completeness and accuracy of your comments will be taken into account in the grading of assignments.

You are welcome to discuss assignments with your fellow students, but all submissions must reflect individual work.

Assignments must be submitted electronically via mycourses, by the due date.
The quizzes will be given in class, and will consist of a mix of short answer, programming and multiple choice questions. On quiz days, assume you will have about half the class time to complete the quiz. Please note that the time and length of the quiz is subject to change according to circumstances and following discussions in the class.

Each assignment or quiz will be worth 10% of the total final grade.

In accordance 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.

Approximate Schedule

Week	Topic	Due dates
1	Introduction, Computers, Binary numbers, general programming concepts	
2	Python basics, variables, conditionals	A1 out
3	Functions, for loops, while loops	
4	Lists, Tuples, list comprehension	A1 due
5	Functions, Dictionaries, Sets	
6	Exceptions, File IO	Quiz 1 - A2 out
7	Libraries, Search algorithms	
8	Sorting algorithms, Plotting with Matplotlib	A2 due - A3 out
9	Study break	
10	Object Oriented	A3 due
11	NumPy, Exercise creating a "big" project	Quiz 2 - A4 out
12	Numerical integration, system of equations	
13	Root of nonlinear equations, regression, curve fitting	A4 due

| 14 | Random numbers & walks, Monte Carlo methods | |

General Information

Communication

- My Courses: All official communication, including announcements, lecture material, assignments, grades will be found on My Courses.
- Course Discussions: MyCourses discussion threads are used as our course discussion board. Use this as your primary communication medium, since your questions are public and can help other students.
- Private Email: The professor and TA have private email accounts that you may also use, however these communication channels are for personal queries. For example: if you have a problem with your grade then email the TA who graded you directly, do not email the prof and do not use the course email address.
- Appointments: Please email directly the one you want to communicate with to book an appointment outside office hours.
- Office Hours: Please take a look at all posted office hours. Come to those times without appointment.
- After lecture: Some optional time will be available just after class to ask questions. I do not guarantee the length of this time since other constraints may interfere.
- Email Policy: Email is one of the official means of communication between McGill University and its students. As with all official University communications, it is the student's responsibility to ensure that time-critical e-mail is accessed, read, and acted upon in a timely fashion. If a student chooses to forward University email to another email mailbox, it is that student's responsibility to ensure that the alternate account is viable. Please note that to protect the privacy of the students, the University will only reply to the students on their McGill email account.

Assignments and Quizzes

- Assignments Delivery: All assignments are submitted to and picked-up from myCourses.
- Late Policy: You will be notified in advance of assignment due dates. All assignments are due on myCourses at the indicated time and date. Late assignments will lose 5% of its grade per day late. Assignments beyond 2

days late will not be accepted. You may not submit assignments via email without the permission of the instructor.

- **Additional Work:** Students with grades of D, F or J will not be given the opportunity to complete additional work to upgrade their grade.
- **Grading Policy:** No make-up tests or make-up assignments are allowed in this course. If you are not satisfied with the grading of an assignment or test, you may request a review within 7 days of return. Indicate in writing or during a meeting with the TA where and why you feel the marks are unjustified and give it back to your TA for re-grading. Note that the entire assignment or mid-term test will be re-graded, and your grade can go up or down (or stay the same) accordingly. The TA may forward the issue to the instructor.
- **Re-grading:** Mistakes can occur when grading. Not surprisingly, requests for re-grading always involve those mistakes in which the student received fewer points than they deserved, rather than more points than they deserved. With that in mind: if you wish me to re-grade a question on an exam or assignment, I will do so. I reserve the right to re-grade other questions as well.
- **Cheating/Collaboration:** Collaboration is encouraged but your discussions should be public in the sense that anyone including the professor should be allowed to listen in. Assignments are original works created by the student alone. You are permitted and encouraged to have conversations with other students concerning the contents of the assignments and how to do them, but your work must be original. If two or more assignments are found to be identical (or portions of assignments) then all parties will lose points. This includes the student who permitted their assignment to be copied. This includes written solutions and software source code.
- **Exam Policy:** Students are responsible for all materials for the tests and exams. Exams will be a combination of all types of questions based on all sources, and students may be required to integrate theoretical concepts from the text to substantiate their arguments. Crib sheets, calculators, dictionaries are not permitted during an exam or test unless specifically stated by the professor.
- A supplemental exam is possible to replace the grade of your final exam.
- **Calculators:** Only non-programmable, no-tape, noiseless calculators are permitted. Calculators capable of storing text are not permitted in tests and examinations.
- **Dictionaries:** Dictionaries are not permitted, but translation dictionaries are.
- **Handheld Devices:** Handheld devices capable of storing text and having calculator functionality (e.g. Palm, etc.) are not permitted.

Teaching assistants

- Each student is assigned a single TA who will be "their" TA for the entire course. This TA will be responsible for grading your assignments and this TA will hold weekly tutorials for their assigned group, which you can attend optionally.
- Regardless, you can attend any TA office hour for help.
- The full details about all the TAs of this course will be posted in myCourses.
- Your TA will contact you to determine the best time to hold the weekly tutorial. It might happen that a common time is impossible to find. In that case, the TA will find a tutorial time that maximizes the number of attending students. Do not worry if you cannot attend. These tutorials are optional, and the work is posted on myCourses, so you can do them on your own and then go to any TA office hour for help.

Additional information

The course slides are not meant as a complete set of notes or a substitute for a textbook, but simply constitute the focus of the lecture. Important gaps are left in the slides that are filled in during class, thus lecture attendance should be considered essential.
Note that minor changes in content, reading material, and times for tutorials, quizzes and assignments may occur. It is your responsibility to attend class and be aware of what content is being covered.

McGill Language Policy

In accordance 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.

Office for Students with Disabilities

If you have a disability and require accommodations, the Office for Students With Disabilities (https://www.mcgill.ca/osd/) is here to help you sort those out. OSD liaises with the instructor on your behalf to ensure that your accommodations are met.