



**Course Name:** Computer Programming for Life Sciences  
COMP 204 Fall 2021

**Instructors:** Section 1 - David Becerra

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### **Course Objectives:**

Welcome to COMP-204! 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.

### **Primary 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;

**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.

**Pre-requisites:** BIOL 112 and CEGEP level mathematics course.

**Restrictions:**

Credit can be given only for one of COMP 202, COMP 204, or COMP 208. COMP 204 cannot be taken for credit with or after COMP 364, COMP 250 or COMP 206. COMP 202 is intended as a general introductory course, COMP 208 is intended for students with engineering and physics background and COMP204 is intended for students in life science fields.

**Required Software:**

- Python IDE <https://wingware.com/downloads/wing-101>
- myCourses <https://mycourses2.mcgill.ca/d2l/home/532891>
- edStem <https://edstem.org/>

**Textbook:**

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/>

**Teaching Method / Course Delivery:**

- Weekly Video + Quiz x 12
- In-class live coding + examples (flipped class) x 12
- In-class problem solving (flipped class) x 12
- Weekly mini assignment x 10 = Programming x 10
- Assigned TA lab time with designated lab material x 12

This course will follow the flipped classroom format. What this means in our case is that lectures will be distributed to the student via videos. Each video will be posted on MyCourses every Friday at noon and will present the material for the following week. The student will watch the video over the weekend. Students can ask questions to the professors and TAs and help each other using Ed Discussion. Each video will end with a short quiz and a mini-assignment. The quiz must be completed before class time on Monday, for grades. The mini-assignment is due within 8 days, for grades. Class time will be a problem

solving and Q&A experience using the Zoom app. On Monday, David will present additional expanded material related to the video and then a couple of problems(examples) which will be solved together during class. There will also be live coding led by the instructor to show practical implementations of the theory explained in the video. On Wednesday, you will work in groups to solve problems and questions. The instructor and T.As will be there to help you with your questions. On Friday, optionally, you will have a laboratory whose problems are very similar to the ones asked in the mini-assignment. Since the course is conducted remotely, to enrich the student experience, we will use additional tools, like Zoom, edStem, along with traditional methods like myCourses quiz tool, assignments and tests.

It is important to mention that I will assume that the majority of our COMP204 students have never programmed before as we introduce you to the wonderful and exciting world of computer programming.

## Grading

Work	Weight	Comment
<b>Lecture Quiz</b> (12)	12 %	At the start of weeks 1 to 12, watch the videos and complete the quizzes. 1% each.
<b>Mini-Assignments</b> (10)	50%	By the end of weeks 3 to 12, complete a small exercise (assignment) to demonstrate your understanding. 5% each. Programming x 10
<b>Surveys</b> (2)	2%	These surveys provide information about your experience, and allow us to adjust the course to make your experience better. You will get a 2% credit once you complete *both* surveys
<b>Final exam</b> (1)	36%	Final exam, during the exam week.

## Tentative Course Outline

Week	Video (Friday 9 AM)	Flipped Class (Tu & Th)	Readings	Work (due Sat)
W Sep 1	N/A	Introduction to course	N/A	Get account for edStem, myCourses, Install Python, Install IDE
Sep 3	Python basics, Shell and Prompt, Statement, values, Expressions 1, Operator, Types, Errors (syntax), functions 1.	Exercise Arithmetic Operators. Exercise Types. Exercise Variables (swapping). Exercise Errors.	Binary numbers. Operator precedence. Memory model.	

Sep 10	Strings 1, variables, expressions 2, functions 2 (built-in and customized).	Exercise built-in functions. Exercise design functions. Exercise reuse functions (call) Exercise nested functions	Design of functions. Docstring. Debugging.	Survey #1
Sep 17	Functions 3, boolean, conditionals, Strings 2, indexing, slicing, How to debug.	Exercise booleans. Exercise if statements. Exercise strings operations Exercise strings methods.	String built-in functions	Mini 3 - Program
Sep 24	Iteration (while, for, recursion)	Exercise for loop over strings. Exercise while loops. Exercise, same problem using for, for range and while. Exercise nested loops.		Mini 4 - Program
Oct 1	Lists (normal, parallel, nested), mutable VS immutable, Dictionaries 1	Exercise for loops over lists. Exercise for List operations and methods. Exercise for parallel strings and lists. Exercise for nested lists.	Aliasing	Mini 5 - Program
Oct 8	Fall Break			
Oct 15	Dictionaries 2, Tuples and Sets	Exercise for dictionaries. Exercise for tuples. Exercise for sets.		Survey #2 Mini 6 - Program
Oct 22	Exceptions, Files IO, Libraries	Exercise for files. Exercise for exceptions.		Mini 7 - Program
Oct 29	Functions 4, Matplotlib, Numpy 1, Sorting, Search	Exercise Sorting. Exercise Matplotlib. Exercise Numpy		Mini 8 - Program
Nov 5	Numpy 2, OOP and Coding a full project	OOP exercise creating a "big" project.		Mini 9 - Program
Nov 12	Introduction to image processing in Python	Malaria Exercises		Mini 10 - Program

Nov 19	Introduction to machine learning in Python	Prostate Cancer Exercises		Mini 11 - Program
Nov 26	Introduction to Bioinformatics applications in Python			Mini 12 - Program
TBD	Final Exam			

## General Information

### Communication:

- **My Courses:** All official communication, including announcements, lecture material, assignments, grades will be found on My Courses.
- **Course Discussions:** The online tool, edstem.org, is used as our course discussion board. Please make sure to enroll in the Fall 2021 COMP 204 course on edstem. 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:** E-mail 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 e-mail to another e-mail 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 e-mail account.

### CommunicationAlgorithm() :

```
if (public) edstem(); // all will benefit
else if (about marks) emailTAPrivate();
else if (medical or special) emailProfPrivately();
```

### Assignments & Tests:

- **Assignments Delivery:** All assignments are picked-up from myCourses and edstem.
- **Late Policy:** You will be notified in advance of assignment due dates. All assignments are due on myCourses or edstem at the indicated time and date. Late assignments will lose 20% of its grade per day late. Assignments beyond 2 days late will not be accepted. You may not submit assignments via e-mail 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. It is completely forbidden to show or share your code. 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.

### 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.

### The material covered in the classroom will be used to supplement textbook readings.

Every chapter should be read twice. The first reading should be done prior to attending class and the second reading should be done after the class discussion of the chapter. The questions at the back of each chapter follow directly from the reading. Students should be able to answer these questions after a thorough reading of the material.

### Right to submit in English or French written work that is to be graded.

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.

**Academic Integrity:** *Code of Student Conduct*

McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see [www.mcgill.ca/integrity](http://www.mcgill.ca/integrity) for more information).

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site [www.mcgill.ca/integrity](http://www.mcgill.ca/integrity)).

**Final Exam Policy:** *Regulations*

Students should not make other commitments during the final exam period. Vacation plans do not constitute valid grounds for the deferral or the rescheduling of examinations. See the Centre Calendar for the regulations governing Examinations: <https://www.mcgill.ca/exams/regulations>

Students are required to present their I.D. Card (with photo) for entrance to their examination.

**Final Exam Policy:** *Conflicts*

If you are unable to write your final examination due to scheduling conflicts, you must submit a Final Exam Conflict Form with supporting documentation at least **one month** before the start of the final examination period. Late submissions will not be accepted. For details, <https://www.mcgill.ca/exams/dates/conflicts>

**Final Exam Policy:** *Exam Timetable*

Examination schedules are posted at the Centre and on the following page approximately 6-8 weeks before the examination period commences <https://www.mcgill.ca/exams/dates>

The Centre cannot provide examination dates over the telephone.

**Student Rights and Responsibilities:**

Regulations and policies governing students at McGill University can be downloaded from the website: <https://www.mcgill.ca/students/srr/>

**Students Services and Resources:**

Various services and resources, such as email access, walksafe, library access, etc., are available to McGill students: <https://www.mcgill.ca/studentservices/>

Various services and resources are offered to computer science students: <https://mcgill-csus.ca/>

**Minerva for Students:** <http://www.mcgill.ca/minerva-students/>

**Important Note:**

In the event of extraordinary circumstances beyond the University's control, the evaluation scheme in a Course is subject to change, provided that there be timely communications to the students regarding the change.

**Land acknowledgement:**

McGill University is on land which has long served as a site of meeting and exchange amongst Indigenous peoples, including the Haudenosaunee and Anishinabeg nations. We acknowledge and thank the diverse Indigenous people whose footsteps have marked this territory on which people of the world now gather. Please see here for more details: <https://www.mcgill.ca/edu4all/other-equity-resources/traditional-territories> .