

## Winter 2021, CS 116, Introduction to Computer Science 2

### Course Meet Times

#### Lectures:

LEC 041: Online  
LEC 042: Online  
LEC 043: Online  
LEC 044: Online  
LEC 045: Online  
LEC 046: Online  
LEC 047: Online  
LEC 048: Online

#### Tutorials:

TUT 141: Online  
TUT 142: Online  
TUT 143: Online  
TUT 144: Online  
TUT 145: Online  
TUT 146: Online  
TUT 147: Online  
TUT 148: Online

### Instructor Contact Information

Jeff Avery  
email address: [jeffery.avery@uwaterloo.ca](mailto:jeffery.avery@uwaterloo.ca)

Carmen Bruni  
email address: [cbruni@uwaterloo.ca](mailto:cbruni@uwaterloo.ca)

J.P. Pretti  
email address: [jpretti@uwaterloo.ca](mailto:jpretti@uwaterloo.ca)

Victoria Sakhnini  
email address: [vsakhnini@uwaterloo.ca](mailto:vsakhnini@uwaterloo.ca)

Stacey Watson  
email address: [stacey.watson@uwaterloo.ca](mailto:stacey.watson@uwaterloo.ca)

For instructor, instructional support assistant, and instructional apprentice office hours, please see the Office Hours page in our edX course shell.

## Instructional Support Assistant Contact Information

For general administrative course questions, the instructional support assistants may be contacted by email at [cs116@uwaterloo.ca](mailto:cs116@uwaterloo.ca).

## Course Description

CS 116 continues the development started in CS 115, transitions to imperative programming, and introduces important issues in Computer Science.

## Course Objectives

At the end of the course, students should be able to

- Given a clear and concise statement of a problem or task, write a program from scratch of up to a hundred lines of properly-formatted, tested, and documented Python code to solve the problem or carry out the task
- Use higher-order functions to improve the readability and efficiency of programs
- Use various forms of recursion (structural, accumulative, generative) in programs
- Use various forms of iteration (for, while) in programs
- Describe the basic memory model for mutation of basic types, lists, and objects in Python
- Distinguish between constant, linear, quadratic and exponential running times of algorithms
- Explain the relative advantages and disadvantages of lists and dictionaries
- Write useful Python programs using console and file input and output for practical tasks

## Topic Overview

Introduction to imperative programming (15 hours)

- Common features of imperative languages
- Basics of Python: assignment and introduction to mutation, basic console output and keyboard input, basic program structure, defining and using functions
- Relating concepts from Racket to Python: lists of basic types, if statements, including nested conditionals; basic structural recursion; abstract list functions and lambda
- Basic Python memory model, including lists

More advanced concepts from imperative programming (15 hours)

- Additional forms of recursion: accumulative and generative
- Iteration: bounded (for loop), guarded (while loop); simple and nested iteration; applications, including linear and binary search algorithms
- Investigating several sorting algorithms
- Dictionaries
- Basic use of classes (in comparison to Racket structures), introduction to object-oriented principles in Python, and mutation of objects

- Functions as parameters: extending the design recipe to include polymorphism
- File input and output: basic and structured file processing
- Additional topics, possibly including programming with real world data, web pages, etc.

#### Issues in Computer Science (6 hours)

- Basic introduction to run-time analysis and simple run-time classes (constant, logarithmic, linear, linearithmic, quadratic, exponential) through studied algorithms
- Discussion of design issues related to data structures (for example, choosing between lists and dictionaries) and effects on complexity and memory requirements

#### Grading Scheme

- Warm-up Quizzes: 5%
- Concept Checks: 10%
- Wrap-up Quizzes: 5%
- Assignments: 60%
- Final Project: 20%

#### Notes:

*Quiz Questions:* The quizzes will each have one attempt for non-programming problems and unlimited attempts for programming problems. The quizzes will be weighted equally (not according to how many problems solved per quiz as some quizzes might have more problems than others) so each quiz is worth 0.5% of your final grade.

*Concept Checks:* Your concept check grade is computed as the sum total of the top 90% of points earned over all problems completed divided by 90% of the total number of points for all concept checks in the entire course. Some modules have more questions than others and hence have more questions so to not overemphasize simpler modules like module 1, we want to weigh the concept checks questions equally throughout the course. Questions are also potentially worth different amounts so it is worth checking how much a problem is worth. The Concept Check questions will each have two attempts for non-programming problems and unlimited attempts for programming problems. This allows you to make mistakes while learning the content and still obtain a good grade. Some of these are intentional — questions that are a bit beyond what you can do in order to reinforce understanding and some are questions that have common misconceptions that are meant to trick you in order to resolve a misconception. Again, do not be worried about getting perfect on everything because you are not expected to. Mistakes are going to happen because you are learning and multiple attempts for these concept check questions is meant to allow for some of these mistakes to occur. If you follow through all of the coursework, start assignments early, and ask for help, you should be able to do really well in this course. Please note that Concept Check questions **will occur in required videos** and so you should also watch the required videos to obtain full marks on these problems. Videos must be watched from within the browser in order to activate the questions. Solutions to concept checks **will not be provided to students**. There are several reasons for this: 1. We often don't have solutions to the problems. (Most of our test cases are done using the check module). 2. Out of concern for academic integrity this term and across different terms, we

do not feel we should release either test data or solutions. 3. With respect to the above, more is learnt when you struggle to find the answer than is learnt when you quickly read a solution. In other words, active learning is far better than passive learning. Note that we will still post solutions to all assignments so you will get solutions to some problems. However it cannot be stressed enough that struggling to find the answer is worth more than being given it. This being said, staff is more than happy to help students get to the answer via office hours either before or after the due dates. In order to maintain a level of success in the course, students should not miss the completion of any modules.

*Progress:* There is a progress tab that you can find near the top left of this page to let you know how you are doing in the quizzes and Concept Check questions.

*Assignments:* Assignments will be submitted to MarkUs through our online platform. Once you submit an assignment to MarkUs, you will receive an email consisting of basic tests that you passed or failed. Students should check their basic tests email to ensure that the code meets the specification exactly. We will not accept submissions that do not match our test output exactly. There will be no extensions on assignments. If sick, please email our ISC a sick note to discuss alternate arrangements. Reweighting of assignments is not automatic even with a valid doctor's note and is up to the sole discretion of the instructor to allow for reweighting. Assignments are weighted evenly. We will also only take your best 8 assignments of the first 9 assignments so you can miss a week if your workload becomes too onerous. Remark requests for assignments can be made up to one week after the assignment has been returned.

*Final Project:* There will be a final project due Wednesday April 21st at 10:00am ET. More details to come at the end of the term. **Note:** The Final Project cannot be dropped and must count towards your final grade. However you need not pass the final project to pass the course.

*Missed Assignments:* **There will be no extensions on assignments and late assignments will not be accepted!** Make sure you understand what time zone you are in and when our due dates are in Eastern Time. If sick, please email our ISC a sick note to discuss alternate arrangements. Reweighting of assignments is not automatic even with a valid doctor's note and is up to the sole discretion of the instructor to allow for reweighting. We will only accept doctor's notes on at most 3 assignment components so make sure you are on top of your studies.

*Saving Work:* When you press on the **Run Code** button or the **Submit Code** button, your work will save. Please make sure you do this often! There is often no recourse if you fail to save your work so please run your code often!

*MOSS:* MOSS (Measure of Software Similarities) is used in this course as a mean of comparing students' assignments in order to support academic integrity.

## University Policies and Academic Integrity

### Submission Times:

Please be aware that the University of Waterloo is located in the Eastern Time Zone (GMT or UTC-5 during standard time and UTC-4 during daylight saving time) and, as such, the time that your activities and/or assignments are due is based on this zone. If you are outside the Eastern Time Zone and require assistance with converting your time, please try the Ontario, Canada Time Converter ([https://www.worldtimeserver.com/convert\\_time\\_in\\_CA-ON.aspx](https://www.worldtimeserver.com/convert_time_in_CA-ON.aspx)).

### Accommodation Due to Illness:

If your instructor has provided specific procedures for you to follow if you miss assignment due dates, term tests, or a final examination, adhere to those instructions. Otherwise:

#### Missed Assignments/Tests/Quizzes

Contact the ISC, **not your instructor**, as soon as you realize there will be a problem, and preferably within 48 hours, but no more than 72 hours, have a medical practitioner complete a Verification of Illness Form. Email a scanned copy of the Verification of Illness Form to the ISC of this course. In your email to the ISC, provide your name, student ID number, and exactly what course activity you missed. Further information regarding Management of Requests for Accommodation Due to Illness can be found on the Accommodation due to illness page.

#### Missed Final Examinations

If this course has a final exam and if you are unable to write a final examination due to illness, seek medical treatment and have a medical practitioner complete a Verification of Illness Form. Email a scanned copy to the Centre for Extended Learning (CEL) at [extendedlearning@uwaterloo.ca](mailto:extendedlearning@uwaterloo.ca) within 48 hours of your missed exam. Make sure you include your name, student ID number, and the exam(s) missed. You will be REQUIRED to hand in the original completed form before you write the make-up examination. After your completed Verification of Illness Form has been received and processed, you will be emailed your alternate exam date and time. This can take up to 2 business days. If you are within 150 km of Waterloo you should be prepared to write in Waterloo on the additional CEL exam dates. If you live outside the 150 km radius, CEL will work with you to make suitable arrangements. Further information about Examination Accommodation Due to Illness regulations is available in the Undergraduate Calendar.

### Academic Integrity:

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect, and responsibility. If you have not already completed the online tutorial regarding academic integrity you should do so as soon as possible. Undergraduate students should see the Academic Integrity Tutorial and graduate students should see the Graduate Students and Academic Integrity website. Proper citations are part of academic integrity. Citations in CEL course materials usually follow CEL style, which is based on APA style. Your course may follow a different style. If you are uncertain which style to use for an assignment, please confirm with your instructor or TA. Do not post your code or any questions from this course anywhere publicly online. This includes but is not limited to on Github, StackOverflow, Reddit,

CourseHero, Chegg and so on. You may create private repositories however to share with employers if you deem this necessary. Violators will be treated as academic integrity offenses and can carry penalties including -5% on your course grade. This penalty can even be applied for cheating that occurs on Concept Check and Quiz questions! Each assignment question will require you to digitally sign an academic integrity statement before you can view the questions. Failure to accept the statement will result in you not being able to view the assignments and hence result in your assignments and projects not being graded. Please note that we encourage high level discussion of your assignments but do not share code or precise details. When you write your final version of your code, you should do so without your notes to ensure that you've understood the material. We recommend posting on our discussion forum for help and framing your question in a way that it can be made public. Code posts on our discussion forum should always be private. MOSS (Measure of Software Similarities) is used in this course as a mean of comparing students' assignments in order to support academic integrity. For further information on academic integrity, please visit the Office of Academic Integrity.

### **Discipline:**

A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration, should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71 - Student Discipline. For typical penalties, check Guidelines for the Assessment of Penalties.

### **Appeals:**

A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances, (other than a petition) or Policy 71 - Student Discipline, may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 - Student Appeals.

### **Grievance:**

A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4. When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

### **Final Grades:**

In accordance with Policy 46 - Information Management, Appendix A - Access to and Release of Student Information, the Centre for Extended Learning does not release final examination grades or final course grades to students. Students must go to Quest to see all final grades. Any grades posted in Waterloo LEARN are unofficial.

### **AccessAbility Services:**

AccessAbility Services, located in Needles Hall, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodation to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term and for each course.

### **Accessibility Statement:**

The Centre for Extended Learning strives to meet the needs of all our online learners. Our ongoing efforts to become aligned with the Accessibility for Ontarians with Disabilities Act (AODA) are guided by University of Waterloo accessibility Legislation and policy and the World Wide Web Consortium's (W3C) Web Content Accessibility Guidelines (WCAG) 2.0. The majority of our online courses are currently delivered via the Desire2Learn Learning Environment. Learn more about Desire2Learn's Accessibility Standards Compliance.

### **Use of Computing and Network Resources:**

Please see the Guidelines on Use of Waterloo Computing and Network Resources (<https://uwaterloo.ca/information-systems-technology/about/policies-standards-and-guidelines/campus-network/guidelines-use-waterloo-computing-and-network-resources>).

### **Mental Health Support:**

The Faculty of Math encourages students to seek out mental health support if needed.

On-campus Resources:

\* Campus Wellness: <https://uwaterloo.ca/campus-wellness/>

\* Counselling Services: [counselling.services@uwaterloo.ca](mailto:counselling.services@uwaterloo.ca) 519-888-4567 ext 32655

\* MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services: [mates@uwaterloo.ca](mailto:mates@uwaterloo.ca)

\* Health Services: located across the creek from the Student Life Centre, 519-888-4096.

Off-campus Resources:

\* Good2Talk (24/7): Free confidential help line for post-secondary students.

Phone: 1-866-925-5454

\* Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247

\* OK2BME: set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

### **Diversity:**

It is our intent that students from all diverse backgrounds and perspectives be well served by this course, and that students' learning needs be addressed both in and out of class. We recognize the immense value of the diversity in identities, perspectives, and contributions that students bring, and the benefit it has on our educational environment. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups. In particular:

\* We will gladly honour your request to address you by an alternate/preferred name or gender pronoun. Please advise us of this preference early in the semester so we may make appropriate changes to our records.

\* We will honour your religious holidays and celebrations. Please inform of us these at the start of the course.

\* We will follow AccessAbility Services guidelines and protocols on how to best support students with different learning needs.

### **Copyright Information:**

#### UWaterloo's Web Pages

All rights, including copyright, images, slides, audio, and video components, of the content of this course are owned by the course author and the University of Waterloo, unless otherwise stated. By accessing this course, you agree that you may only download the content for your own personal, non-commercial use. You are not permitted to copy, broadcast, download, store (in any medium), transmit, show or play in public, adapt, or change in any way the content of these web pages for any other purpose whatsoever without the prior written permission of the course author and the University of Waterloo, Centre for Extended Learning.

#### Other Sources

Respect the copyright of others and abide by all copyright notices and regulations when using the computing facilities provided for your course of study by the University of Waterloo. No material on the Internet or World Wide Web may be reproduced or distributed in any material form or in any medium, without permission from copyright holders or their assignees. To support your course of study, the University of Waterloo has provided hypertext links to relevant websites, resources, and services on the web. These resources must be used in accordance with any registration requirements or conditions which may be specified. You must be aware that in providing such hypertext links, the University of Waterloo has not authorized any acts (including reproduction or distribution) which, if undertaken without permission of copyright owners or their assignees, may be infringement of copyright. Permission for such acts can only be granted by copyright owners or their assignees.

If there are any questions about this notice, please contact the University of Waterloo, Centre for Extended Learning, Waterloo, Ontario, Canada, N2L 3G1 or [extendedlearning@uwaterloo.ca](mailto:extendedlearning@uwaterloo.ca).