CS 106 Winter 2020

Course outline

CS 106 (Introduction to Computer Science 2) is a second-level introductory Computer Science course. In addition to this Course Outline, there is a website and course pages on LEARN.

- Course website: www.student.cs.uwaterloo.ca/~cs106/
- Course page on LEARN

Course Description

This course, together with its predecessor CS 105, offers a comprehensive introduction to practical computer programming for students with no background in the subject, and who will not normally go on to further study in computer science. The course is required by students in the GBDA program, and available to students from other programs on campus.

The course is taught using the “JavaScript p5” (https://p5js.org/) programming environment. When working on assignments, the reference (https://p5js.org/reference/) section will be especially useful.

While the main theme of CS 105 is to develop basic skills in imperative programming (variable declarations, control flow, loops, arrays, defining functions), in CS 106 we explore more general applications of programming in contexts of interest to visual artists and designers.

Course Objectives

The goal of CS 106 is to apply programming idioms in a practical context, using functionality available in built-in functions, and libraries that can be added on to it. Topics include input/output, user interface programming, procedural content generation, and text and structured data processing.

Textbooks

- We recommend the free ebook “Getting Started with p5.js: Making Interactive Graphics in JavaScript and Processing”. By Ben Fry, Casey Reas, Lauren McCarthy. This ebook is free to University of Waterloo students. It is available for free through UWaterloo's subscription to O'Reilly On-line Learning. Visit this page http://shop.oreilly.com/product/0636920032076.do, click "Start Your Free Trial", then enter your uwaterloo email address. This should give you instant access to the entire book! Note this may only work when you are connected to campus wifi or using a lab computer.
- Additional references are available on the course web page.

Course schedule

Lectures

CS 106 LEC 001: Mondays and Wednesdays, 8:30–9:50, MC 4021
CS 106 LEC 002: Mondays and Wednesdays, 10:00–11:20, MC 4021
CS 106 LEC 003: Mondays and Wednesdays, 11:30–12:50, MC 4020
CS 106 LEC 004: Mondays and Wednesdays, 1:00–2:20, MC 4020

Labs

CS 106 LAB 101: Mondays and Wednesdays, 10:00–11:20, MC 3003
CS 106 LAB 102: Mondays and Wednesdays, 2:30-3:50, MC 2062
CS 106 LAB 103: Mondays and Wednesdays, 2:30–3:50, MC 2063
CS 106 LAB 104: Mondays and Wednesdays, 11:30–12:50, MC 3003
CS 106 LAB 105: Mondays and Wednesdays, 11:30–12:50, MC 2062
CS 106 LAB 106: Mondays and Wednesdays, 11:30–12:50, MC 2063
CS 106 LAB 107: Mondays and Wednesdays, 1:00–2:20, MC 3003
CS 106 LAB 108: Mondays and Wednesdays, 1:00–2:20, MC 2062
CS 106 LAB 109: Mondays and Wednesdays, 1:00–2:20, MC 2063
CS 106 LAB 110: Mondays and Wednesdays, 2:30–3:50, MC 3003
CS 106 LAB 111: Mondays and Wednesdays, 4:00–5:20, MC 2062
CS 106 LAB 112: Mondays and Wednesdays, 4:00–5:20, MC 2063

Midterm

Friday February 28th, 6:30PM–8:00PM, rooms TBA

Final Exam

TBA

Course staff

All email addresses are @uwaterloo.ca.

Instructor: **Kevin Harrigan**

Email: kevinh@uwaterloo.ca

Office hours: Wednesdays 1:00-3:00 Room TBA

Instructor: **Michael Brooks**

Email: mlbrooks@uwaterloo.ca

Office hours: Mondays 3:00-4:00 and Wednesdays 10:00-11:00 in DC3102

Instructor: **Muddassir Malik**

Email: mm2malik@uwaterloo.ca

Office hours: Tuesdays 3:30-5:00 in DC2102

Instructional Support Assistants**: Daniel Huab, Ranran Zhao**

Email: cs106@uwaterloo.ca

Office hours: MC 4065

Instructional Support Coordinator**: Barbara Daly**

MC 4007

Email: barbara.daly@uwaterlo.ca

List of planned topics

JavaScript p5

A review of programming concepts from CS 105, in terms of the basic structure of JavaScript p5, and the Processing IDE development environment.

Arrays

High-level operations on arrays, including appending, concatenation, and removal. Built-in array manipulation functions.

Strings

Working with characters and strings. String comparisons. Printing and displaying text.

Input and output

Loading files in various formats (text, images, illustrations) into JavaScript p5, writing files.

Advanced Shapes

Drawing fancy shapes with beginShape() and endShape().

User interfaces

The model-view-controller architecture. Direct manipulation interfaces. User interface toolkits. Creating interfaces using JavaScript p5 and the DOM.

Geometric context

The use of translate(), rotate(), and scale() to modify a program's coordinate system. Building a hierarchy of transformations using push() and pop(). Order of operations.

Recursion and Fractals

Iterated function systems as a demonstration of recursion.

Randomness and Noise

The random() function in detail. Pseudo randomness. Applications of randomness. Introduction to noise().

Text processing

Decomposing text into tokens. Regular expressions. Unicode. Working with dates and times.

Structured data processing

Dealing with text, table-structured (CSV) and tree-structured (JSON) data. Processing live data acquired from web APIs.

Student Expectations

Assignments

There will be 9 assignments (due at 11:59pm Friday nights via LEARN), consisting primarily of programming questions. All assignments must be completed individually by students. Absolutely no late assignment submissions are permitted, and this course does not offer grace days. Each student's final assignment grade will be computed by dropping their lowest-scoring individual assignment.

Final Project

There will be one Final Project due at the end of the term.

Labs

There will be weekly labs (due Wednesday nights via LEARN), consisting of smaller exercises and coding walk-throughs. All labs must be completed individually by students, though students are invited to discuss lab questions and share ideas.

Exams

A 90-minute midterm is scheduled for Friday, February 28th at 6:30pm. A 150-minute final exam will be scheduled during the exam period at the end of the term.

Marking scheme

Participation: 5% (via responses to clicker questions)

Labs: 5%

Assignments: 24%

Final Project 6%

Midterm: 20%

Final exam: 40%

Students must pass the weighted average of the midterm and final exam in order to pass the entire course.

Course Policies

Collaboration

Group work is disallowed unless otherwise specified. Any excessive collaboration will be treated as a violation of academic integrity.

You are responsible for writing all the code in your assignments and labs. You may not receive code from anybody else, whether by email, by copying-and-pasting, by dictation, by having them type it into your Processing IDE window, or by any other means.

When working on assignments, please do not show your code to other students, or allow them to see it accidentally. You can discuss assignment problems in general terms, and perhaps work together on strategies for solving them, but do not go so far as to develop code in pairs or groups.

When working on lab exercises, we're more tolerant of students looking over each other's shoulders and seeing ideas for solutions. But in the end, the work you submit must still be your own.

Devices in Lectures

Aside from Clickers, please avoid unnecessary use of electronic devices during lectures. They are distracting to students around you, and educational research has shown repeatedly that they are harmful to your learning as well. Successful participation in lectures relies on nothing more than your focused attention, together with notes taken by hand and the occasional use of Clickers.

If you do have an electronic device out during lecture, please make sure you are using it only for looking at lecture notes or using JavaScript p5. Do not use it for outside communication, social media, games, or working on assignments or labs. Consider sitting towards the back of the class, and/or turning down your screen's brightness, to minimize distractions to others.

Late assignments

Late assignments will receive no credit; consequently, you should aim to finish early, to allow for unexpected delays. After an assignment due date has passed, you may still submit your work for feedback only (no marks) to the late folder and you must inform the CS 106 ISAs by email so they are aware of your submission and request for feedback.

Here is a non-exhaustive list of excuses that we will not accept for late assignments:

- "My computer broke." *Come to campus and finish the assignment in one of the computer labs.*
- "My internet stopped working." *Same as above.*
- "I tried to submit my assignment just before the deadline, but it didn't work." *Don't wait until the last minute to submit. Submit a partial solution every time you complete part of the assignment.*

Generally speaking, each student who works on their own computer is responsible for maintaining that computer, its network, and backups, to avoid any missed deadlines. Students who are uncomfortable doing so should use one of the on-campus labs.

On the other hand, LEARN is always up and running. Feel free to submit early and often—LEARN can be useful as a failsafe backup for partially completed assignments.

Missed assignments due to illness

With appropriate, authorized documentation (provided via a Verification of Illness Form), assignment work may be excused. If a missed assignment is excused, its weight is distributed over the remaining unexcused assignments. In the interest of understanding the course material for future assignments and exams, students who miss work are encouraged to complete it anyway, and submit it for feedback from the ISAs.

Remarking

If you have problems with the marking of an assignment, please contact the ISAs within two weeks of the date the assignment's mark was made available on LEARN. The email must include your name, student number, Quest user ID, and assignment number. We also require that you list the questions you feel were marked

incorrectly, and, for each of those questions, why you feel your mark should be changed. Please be aware that the assignment will be remarked in its entirety.

If you have problems with the marking of a midterm exam, please fill out a re-mark request form. Details will be provided after the midterm.

University Policies

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. Check the Office of Academic Integrity's website for more information.

All members of the UW community are expected to hold to the highest standard of academic integrity in their studies, teaching, and research. This site explains why academic integrity is important and how students can avoid academic misconduct. It also identifies resources available on campus for students and faculty to help achieve academic integrity in — and out — of the classroom.

Intellectual Property

Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof)
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides)
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams)
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this Intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.

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.

Discipline

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

Avoiding Academic Offenses

Most students are unaware of the line between acceptable and unacceptable academic behaviour, especially when discussing assignments with classmates and using the work of other students. For information on commonly misunderstood academic offenses and how to avoid them, students should refer to the Faculty of Mathematics Cheating and Student Academic Discipline Policy.

Appeals

A decision made or a 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.

Note for students with disabilities

The AccessAbility office is located in Needles Hall, Room 1401, 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 accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Mental Health

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support.

On-campus Resources

- Campus Wellness https://uwaterloo.ca/campus-wellness/
- Counselling Services: counselling.services@uwaterloo.ca / 519-888-4567 ext 32655 / Needles Hall North 2nd floor, (NH 2401)
- MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services: mates@uwaterloo.ca
- Health Services service: located across the creek from 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.