Dalhousie University

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.[1]

Faculty of Computer Science / Department of Community Health and Epidemiology (Faculty of Medicine)

Syllabus
CSCI2202: Introduction to Programming with Applications for Scientists
Winter 2024-2025

Lecture: Mon 13:05-14:25, 1016 Kenneth C Rowe Management Building
Lab: Tues/Thurs 11:35-12:55, 301A Sir James Dunn Building

COURSE INFORMATION

Instructor Information

- **Instructor:** Finlay Maguire (finlay.maguire@dal.ca)
- **Office:** 4242 Mona Campbell Building, Studley Campus
- **TAs:** Ehsan Baratnezhad (ethan.b@dal.ca); Precious Osadebamwen (precious.osadebamwen@dal.ca)
- **TA Office Hours:** Thursday 13:15-14:30 (following lab session)
- **Course Website:** https://maguire-lab.github.io/scientific_computing

Course Description

This is an introductory, project based, programming course for science majors. The course focuses on programming techniques useful for students in their scientific pursuits. The course introduces basic programming in Python and then goes on to guide students through using simulations, modelling and data-driven analysis. Practical examples will be taken primarily from the fields of microbiology, genomics, neuroscience, and chemistry among others.

Class Format

This class is primarily based around 2 lab practical sessions per week (Tuesday & Thursday) with solutions due before the start of the next week's practical. This will be supported by a weekly lecture (Monday) that will explain the python programming (and any general scientific concepts) that the associated labs are based upon. Assessment will be primarily through lab reports and an in-person midterm & final exam that focus on interpreting code and planning computational solutions to scientific problems.

Minimal Technical Requirements

This course will require access to an internet-enabled laptop capable of installing and running the Anaconda

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python distribution.
A free version of this distribution can be installed from here: www.anaconda.com/download/success

Course Pre-requisites, Co-requisites, Exclusions and/or other Restrictions
Students should have familiarity with basic university level maths (or formally to have successfully completed 3.0 credit hours of MATH courses at the 1000-level e.g., MATH1000, MATH1215, MATH/STAT1060 or equivalent). It is also worth highlighting that the introductory programming aspects of this course is nominally redundant to CSCI1105.

Course Learning Outcomes
The aim of this course is to prepare students to represent scientific questions as computational problems and apply python-based programming solutions. Specifically, by the end of the course students will be able to:

1. Read, test, and debug small to medium-size python programs.
2. Plan and develop computational solutions to practical scientific problems.
3. Perform basic data processing and visualization using widely-used python libraries
4. Apply basic ideas of computational complexity and optimisation to create more efficient programs.
5. Understand best practices for performing reproducible computational analyses with high quality code.

Required Text(s)
None, however, there are many useful texts available online to help learning basic python and scientific methods. For example:

- Matthes, Eric. *Python crash course: A hands-on, project-based introduction to programming 3rd Edition*. no starch press, 2023.
- Shaw, Zed A. *Learn Python the Hard Way*. Addison-Wesley Professional, 2024.
- Lin, Johnny Wei-Bing, Hannah Aizenman, Erin Manette Cartas Espinel, Kim Gunnerson, and Joanne Liu. *An introduction to Python programming for scientists and engineers*. Cambridge University Press, 2022.

Important Dates

- Classes begin: **January 6th**
- Last day to register or add/drop without penalty: **January 20th**
- Last day to drop without a "W": **February 3rd**
- Munro Day - University Closed**: February 7th**
- Nova Scotia Heritage Day - University Closed**: February 17th**
- Winter Study Break**: February 17-21st**
- Last day to drop with a "W": **March 5th**
- Last class**: April 7th**
- Exam Break**: April 8th**
- Exam Period: **April 9-26th**
- Good Friday: **April 18th**

Tentative Course Schedule

Week	Date	Day	Topic	Format
1	*2024/01/06*	Monday	*Introduction, Variables & Data Types*	Lecture 1
		Tuesday		Lab 1.1
		Thursday		Lab 1.2
2	*2024/01/13*	*Monday*	*Conditionals, Functions, Strings, Lists, & Loops*	Lecture 2
		Tuesday		Lab 2.1
		Thursday	***Student check-in***	Lab 2.2
3	2024/01/20	Monday	*Modules, Notebooks & Reproducible Research*	Lecture 3
		Tuesday		Lab 3.1
		Thursday		Lab 3.2
4	2024/01/27	Monday	*Functional Programming*	Lecture 4
		Tuesday		Lab 4.1
		Thursday		Lab 4.2
5	2024/02/03	Monday	*Classes/Object Oriented Programming*	Lecture 5
		Tuesday		Lab 5.1
		Thursday		Lab 5.2
6	2024/02/10	Monday	*Files & I/O*	Lecture 6
		Tuesday		Lab 6.1
		Thursday		Lab 6.2
7	**2024/02/17**	**Monday**	**Nova Scotia Heritage Day**	**No Class**
		Tuesday	**Winter Study Break**	**No Lab**
		Thursday	**Winter Study Break**	**No Lab**
8	2024/02/24	Monday	*Pre-Mid-Term Review*	Review
		Tuesday	***Mid-Term***	Exam
		Thursday	*Post-Mid-Term Review*	Review
9	2024/03/03	Monday	*Dataframes and Visualisation*	Lecture 7

		Tuesday		Lab 7.1
		Thursday		Lab 7.2
10	2024/03/10	Monday	*Probability*	Lecture 8
		Tuesday		Lab 8.1
		Thursday		Lab 8.2
11	2024/03/17	Monday	*Regression*	Lecture 9
		Tuesday		Lab 9.1
		Thursday		Lab 9.2
12	2024/03/24	Monday	*Machine Learning*	Lecture 10
		Tuesday		Lab 10.1
		Thursday		Lab 10.2
13	2024/03/31	Monday	*Future Topics*	Lecture 11
		Tuesday		*Make-Up Lab*
		Thursday	*Pre-Final Review*	Review

Course Assessments

This course's assessment is split 50:50 between lab practicals (reports will be due by 23:59 on the day before the start of next week's lab practicals i.e., Monday night) and in-person written exams aimed to assess your ability to understand, explain, and plan python-based scientific programs.

Assessment	**Date of Evaluation**	**Weight**
Lab 1	Jan 13th	0%
Lab 2	Jan 20th	50%
Lab 3	Jan 27th	
Lab 4	Feb 3rd	
Lab 5	Feb 10th	
Lab 6	Feb 24th	
Lab 7	Mar 10th	
Lab 8	Mar 17th	
Lab 9	Mar 24th	
Lab 10	Mar 31st	
Lab 11	Apr 7th	
Mid-Term	**Feb 25th**	**20%**
Final	**TBD**	**30%**

Lab Practicals

Lab 1 is formative and will be your primary opportunity to ensure you are able to correctly get the required software working on your system and understand how to correctly submit your work. The remaining 10 practicals are collectively worth 50% of your grade. Your 2 lowest scoring practicals will be dropped and not count towards your grade but not student declarations of absence will not be accepted. You can use whatever resources you like to complete these assignments but **MUST** provide sources (including the specific **prompt, model and version** for LLMs) using in-line comments for generated or web-derived code. Failure to do so will be considered plagiarism and an academic integrity offence.

Written Exams
Mid-term and final exams will be handwritten closed-book exams and will focus on evaluating that you can recognise and explain how examples of python code will run.

Grading: This course uses the standard Dalhousie grading scheme: (https://www.dal.ca/campus_life/academic-support/grades-and-student-records/grade-scale-and-definitions.html)

Submission: Assignments must be submitted via Brightspace.
Late Policy: Late assignments will be penalised at 20% per day. Assignments submitted more than 5 days late can still be evaluated for feedback but the final grade will be 0. Late submissions without penalty will be considered **only for** reasons of recognised accommodation.

Student declarations of absence: These will not be accepted for this course, the dropping of the lowest 2 scoring practical assignments should assist with dropped from your grade.

TA Office Hours: The primary time to get help from the TAs is during the 2 practical sessions each week, if you attend these and still have issues there will be office hours immediately following the Thursday practical. In order to get access to regular TA office hours it is **required** that you attend the practicals.

UNIVERSITY STATEMENTS

Territorial Acknowledgement:
Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq.

We are all Treaty people.[2]

Internationalization
At Dalhousie, "thinking and acting globally" enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders."

Academic Integrity
At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect. As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Accessibility
The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation.
If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that

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result in barriers to your inclusion please contact:

- the Student Accessibility Centre (for all courses offered by Dalhousie with the exception of Truro)
- the Student Success Centre in Truro for courses offered by the Faculty of Agriculture

Your classrooms may contain accessible furniture and equipment. It is important that these items remain in place, undisturbed, so that students who require their use will be able to fully participate.

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2).

aCode of Student Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Fair Dealing policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie.

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work, and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method.

UNIVERSITY POLICIES, GUIDELINES, AND RESOURCES FOR SUPPORT

Dalhousie courses are governed by the academic rules and regulations set forth in the Academic Calendar and the Senate.

University Policies and Programs

- Important Dates in the Academic Year (including add/drop dates)
- Classroom Recording Protocol
- Dalhousie Grading Practices Policy
- Grade Appeal Process

- Sexualized Violence Policy
- Scent-Free Program

Learning and Support Resources

- Academic Support - Advising Halifax, Truro
- Student Health & Wellness Centre
- On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond)
- Indigenous Student Centre. See also: Indigenous Connection.
- Elders-in-Residence: The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803.
- Black Student Advising Centre
- International Centre
- South House Sexual and Gender Resource Centre
- LGBTQ2SIA+ Collaborative
- Dalhousie Libraries
- Copyright Office
- Dalhousie Student Advocacy Service (DSAS)
- Dalhousie Ombudsperson
- Human Rights & Equity Services
- Writing Centre
- Study Skills/Tutoring