

**Faculty of Science Course Syllabus (Section A)  
Department of Physics and Atmospheric Science**

*PHYC 2050*

*Computer Simulation in Science*

*Winter 2023*

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

***We acknowledge the histories, contributions, and legacies of the African Nova Scotian people and communities who have been here for over 400 years.***

<b>Instructor:</b>	Penghao Xiao (E-Mail: <a href="mailto:pxiao@dal.ca">pxiao@dal.ca</a> ; Office: Dunn 230)
<b>Lectures:</b>	Monday, Wednesday, Friday 8:35-9:25 AM (credit hours: 3)
<b>Office hours:</b>	Monday, Friday 9:30-10:20 AM Dunn building, Room 230
<b>Course delivery:</b>	In-person, Dunn Building, Room 302
<b>Tutorials:</b>	Wednesday 9:35-10:25 AM, by TA <u>Shivam Beniwal</u> ( <a href="mailto:Shivam.Beniwal@dal.ca">Shivam.Beniwal@dal.ca</a> ) Dunn Building, Room 114

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## **Course Description**

An introduction to computer programming and numerical computation. A modern programming language, Python, will be used to model simple physical systems. Numerical algorithms are introduced to solve the models.

## **Course Prerequisites**

PHYC 1190/1290 or MATH 1010 or equivalent.

## **Learning Objectives**

The goal of this course is to help you overcome the barriers to solve scientific problems by computers. By the end of the course, you will be able to:

1. Write code with the Python programming language.
2. Appropriately analyze, plot, and present data.
3. Conduct numerical integration and differentiation.
4. Solve differential equations numerically.
5. Solve linear and/or non-linear equations.

- Conduct stochastic simulations, including Monte Carlo and random walks.

### Course Materials

- Required textbook: “A student’s Guide to Python for Physical Modeling”, by J.M. Kinder and P. Nelson. (See <http://physicalmodelingwithpython.blogspot.com/>)
- Recommended reference textbook: “Computational Physics”, by M. Newman. (See <http://www-personal.umich.edu/~mejn/cp/chapters.html>)
- Others: Need to have access to Python3 on a computer. The easiest way to install is via Anaconda (<https://www.anaconda.com/>) or Miniconda (<https://docs.conda.io/en/latest/miniconda.html>).

### Course Assessment

Assessment	Weight (% of final grade)	Date
Midterm I	10%	Wed, Feb. 15
Midterm II	10%	Wed, March 15
Assignments	50%	Approximately biweekly
Final Exam	30%	(Scheduled exam period)
<i>Final exam will be cumulative</i>		100%

*Either the midterms and final exam will be added  $10+10+30=50\%$ , or the weakest midterm will be dropped and the final exam will be rescaled to  $40\%$  i.e.  $10+40=50\%$ , whichever is better for your grade.*

### Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (<50)
A- (80-84)	B- (70-72)	C- (55-59)	

### Course Policies on Missed or Late Academic Requirements

- Late assignments can be turned in until solutions are returned, but a penalty mark (20% per day) will be deducted. One missed midterm will be folded into a rescaling of the final grade, as noted.
- Students may use the Student Declaration of Absence form for late assignments to avoid the late penalty. The form can be used 2 times in this course.

### Course Policies related to Academic Integrity

You are encouraged to collaborate on assignments, but never to plagiarize. Never copy code without specific attribution: write your own code and comments! Midterms/exams must all be done without collaboration. Make sure that you explain what you are doing, which helps you earn more points. Also, leaving sufficient comments is the best practice in coding. It makes code maintenance much easier and debugging much faster.

**Faculty of Science Course Syllabus (Section B)***PHYC 2050**Computer Simulation in Science**Winter 2023***University Policies and Statements**

**This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate**

**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 (The Center for Academic Integrity, Duke University, 1999). 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.

**Information:** [https://www.dal.ca/dept/university\\_secretariat/academic-integrity.html](https://www.dal.ca/dept/university_secretariat/academic-integrity.html)

**Accessibility**

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

**Information:** [https://www.dal.ca/campus\\_life/academic-support/accessibility.html](https://www.dal.ca/campus_life/academic-support/accessibility.html)

**Student Code of 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.

**Code:** [https://www.dal.ca/dept/university\\_secretariat/policies/student-life/code-of-student-conduct.html](https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html)

**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

**Statement:** <http://www.dal.ca/cultureofrespect.html>

**Recognition of Mi'kmaq Territory**

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) ([elders@dal.ca](mailto:elders@dal.ca)).

**Information:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

**Important Dates in the Academic Year (including add/drop dates)**

<https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=117&chapterid=-1&topicgroupid=31821&loaduseredits=False>

**University Grading Practices**

[https://www.dal.ca/dept/university\\_secretariat/policies/academic/grading-practices-policy.html](https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html)

**Faculty of Science Course Syllabus (Section C)***PHYC 2050**Computer Simulation in Science**Winter 2023***Student Resources and Support****Advising****General Advising** [https://www.dal.ca/campus\\_life/academic-support/advising.html](https://www.dal.ca/campus_life/academic-support/advising.html)**Science Program Advisors:** <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>**Indigenous Student Centre:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)**Black Students Advising Centre:** [https://www.dal.ca/campus\\_life/communities/black-student-advising.html](https://www.dal.ca/campus_life/communities/black-student-advising.html)**International Centre:** [https://www.dal.ca/campus\\_life/international-centre/current-students.html](https://www.dal.ca/campus_life/international-centre/current-students.html)**Academic supports****Library:** <https://libraries.dal.ca/>**Writing Centre:** [https://www.dal.ca/campus\\_life/academic-support/writing-and-study-skills.html](https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html)**Studying for Success:** [https://www.dal.ca/campus\\_life/academic-support/study-skills-and-tutoring.html](https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html)**Copyright Office:** <https://libraries.dal.ca/services/copyright-office.html>**Fair Dealing Guidelines** <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>**Other supports and services****Student Health & Wellness Centre:** [https://www.dal.ca/campus\\_life/health-and-wellness.html](https://www.dal.ca/campus_life/health-and-wellness.html)**Student Advocacy:** <https://dsu.ca/dsas>**Ombudsperson:** [https://www.dal.ca/campus\\_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html](https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html)**Safety****Biosafety:** <https://www.dal.ca/dept/safety/programs-services/biosafety.html>**Chemical Safety:** <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>**Radiation Safety:** <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>**Scent-Free Program:** <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>**Dalhousie COVID-19 information and updates:** <https://www.dal.ca/covid-19-information-and-updates.html>