Carleton University
Department Of Physics

Phys 2801: Computational Methods in Physics

Fall 2024

Course aim

This course introduces students to the use of computers and computational methods in physics. This includes use of operating systems, programming, code repositories, data structures, numerical methods, statistical data analysis and machine learning relevant for physics.

Scheduled lectures

Monday and Wednesdays, 16:05-17:25

Student hours by appointment

Instructor

Dag Gillberg, dag@physics.carleton.ca

Textbooks

No required textbook. Slides and example interactive Python notebooks will be provided on the course Brightspace page.

Supplementary material

Numerical methods in physics with Python, second edition

Learning outcomes

1. Students will be introduced to standard operating systems, commands, shell scripts, and programming languages used in physics data analysis
2. Students will learn to utilize a variety of data formats and structures and be able to implement visualization techniques
3. Students will review probability concepts and commonly used distributions and learn to apply these in the context of analysis of physics data including error estimation
4. Students will learn to apply function fitting techniques for parameter estimation using function minimization and be able to evaluate the reliability of the fit and error estimation.
5. Students will gain an introductory level understanding of machine learning techniques in the context of physics data analysis

Prerequisites

PHYS 1001 **or** PHYS 1003 **or** PHYS 1007; and COMP 1005; **or** permission of the Department.

Marking scheme

- Assignments 45%
- Midterm exam 20%
- Final exam 35%

Midterm and final examination
The midterm will be an 80 minute written exam taken during a lecture slot.
The final exam will be a 3 hour written exam scheduled by the university.

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Plagiarism and other forms of cheating

Working through problems is essential in developing understanding of thermal physics. Students are permitted to discuss concepts and strategies related to solving the homework assignments. All work handed in, however, **must be their own**.

For more information, see:
https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/