PHYS 234: Introductory Computational Physics

Instructor: Dr. Jeff Gu
CCIS Room 3-107
Email: ygu@ualberta.ca
Office hours: Mon 2:00-3:20 pm, or by appointment via phone, email, etc. The best way: email!
Class time: Mon, Wed, Fri 12:00-12:50 pm
Lab sessions: Tues 2:00 – 4:50 pm, Thurs 2:00 – 4:50 pm
Classroom: CAB 265
Website: www.ualberta.ca/~ygu/courses/phys234/index.html

Objective:
This course introduces common algorithms for scientific data analysis. The main goal is to demonstrate numerical solutions to problems in physics and geophysics using regression, interpolation, polynomial fitting, sorting, and monte-carlo methods. This course introduces students to scientific programming languages, primarily in MATLAB and Python.

Reference text (not required, mostly go by course notes):
1. The Numerical Recipes
   By Press et al.
2. Introduction to Numerical Methods and MATLAB programing
   for engineers
   Young and Mohlenkamp, 2018

Course weights:
1. Assignment: 10%
2. Midterm Exam(2): 1) Feb 12 (tentative), 2) second half of March, total =28%
3. Lab (required): 10%
4. Lab Exam (last lab): 12%
5. Final Exam : 40%

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this
respect. Students are particularly urged to familiarize themselves with the provision of the Code of Student Behavior (online at www.ualberta.ca/secretariat/appeals.htm) and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

**Assignments**

The assignments will consist of Matlab/Python algorithms to test your knowledge of the theory and to find numerical solutions to given problems. To learn a computer language (Matlab and Python in this course) and to become comfortable with ideas of numerical computation, you need practice. That’s what the Lab times will be for. Lab times are a setting where you can get help from part of each weekly assignment will have to be completed during lab time. Assignments are due at 5:00 p.m. on the date they are requested.

**Exams**

Exams will consist of writing algorithms to find numerical solutions to given problems, similar to assignment questions. The exam formats are to be determined by the instructor. You will not be allowed to use the web or send emails or chat during exams. There will two midterms and a final exam, at dates to be determined.

**Labs and Lab Exam**

There will be weekly labs (total = 9-10) to be completed at home or at the designated lab rooms in CCIS. Students can work with their own laptops/desktops, but their basic familiarity with the lab computers will be needed since a final lab exam (the last lab of the term) will be conducted on them. Details of the lab exam will be provided during the semester.

**Course outline:**

The main objective of this course is to provide a solid foundation for scientific computation in physics. The following main topics will be covered in the course.

- Basic computing arithmetic, binary, errors
- Introduction of computer languages and programming concepts
- Matlab programming
- Introduction to numerical algorithms, integration, differentiation, root finding
- Python programming
Radomization, system of linear equations, inversions, sorting

The course emphasizes applications of numerical methods in Physics, (e.g., kinematics, harmonic oscillations, seismic ray tracing)

Statement on academic integrity

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Grading in Undergraduate Courses

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