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Physics 1321
Computational Methods in Physics

- **Where:** 102 Thaw Hall (or WEB (Zoom))
- **When:** Monday, Wednesday, and Friday: 10:00-10:50 am
- **Textbook:** Computational Physics by Mark Newman
- **Grade Breakdown:**
  → 35% In class assignments
  → 65% Homework

- **Office Hours:** Monday and Wednesday 1:30-2:30pm (or by appointment) via Zoom – please let me know if you plan to attend)
  Zoom link: https://pitt.zoom.us/j/97209680803
- **Website:** Standard CANVAS site (https://canvas.pitt.edu/courses/283068)**:** At this site you'll find all class materials – assignment links, due dates, topic for lecture period, and anything else I think may be useful.

Course Description:

Introductory physics courses are full of simplifications: projectiles fly without air resistance, pendulums swing only at small angles, no more than two particles move at any time, etc. These kinds of simplifications are necessary and appropriate when you're first trying to understand the basic laws of nature, but the real world is far more complex, and far more interesting (and mathematically difficult). Fortunately, computers make it possible to perform extremely lengthy calculations in a negligible amount of time. In this course we will present several computational techniques and apply them to different problems in physics. Examples will be drawn, as time permits, from several different areas of physics and or astronomy.

Course Goals:

After completion of this course students should be able to:
1. Find approximate solutions of typical nonlinear equations using various numerical algorithms.
2. Evaluate derivatives to an expected accuracy using finite difference methods.
3. Perform numerical integration using various algorithms.
4. Formulate numerical algorithms for the solution of single and multiple variable ordinary linear and non-linear differential equations in Physics, such as simple harmonic motion, large angular motion of a pendulum.

5. Formulate numerical algorithms for the solution of common second order linear partial differential equations in Physics, such as Laplace equation, Poisson equation, Fourier equation of heat flow etc.
6. Write computer programs to implement the formulated numerical algorithms and output the calculated values of selected physical quantities to suitable data files.

Course Policies:

• Academic Integrity:

Students in this course will be expected to comply with University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

Honor Code:

Students are expected to uphold the University's standard of conduct relating to academic honesty. Students assume full responsibility for the content and integrity of the academic work they submit. Students shall be guilty of violating the honor code if they:
1. Represent the work of others as their own
2. Use or obtain unauthorized assistance in any academic work
3. Give unauthorized assistance to other students
4. Modify, without instructor approval, an examination, paper, record, or report for the purpose of obtaining additional credit
5. Misrepresent the content of submitted work

Any student violating the honor code is subject to receive a failing grade for the course and will be reported to the Vice President of Academic Affairs.

• Disabilities:

If you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and Disability Resources and Services no later than the second week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations. To notify Disability Resources and Services, call (412) 648-7890 to schedule an appointment. The Disability Resources and Services office is located at 140 William Pitt Union, and is open Monday-Friday from 8:30AM to 5:00PM.

• Diversity and Inclusion:

The University of Pittsburgh does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin,

ancestry, genetic information, marital status, familial status, sex, age, sexual orientation, veteran status or gender identity or other factors as stated in the University's Title IX policy. The University is committed to taking prompt action to end a hostile environment that interferes with the University's mission. For more information about policies, procedures, and practices, see: : https://www.diversity.pitt.edu/civil-rights-title-ix-compliance/policies-procedures-and-practices. I ask that everyone in the class strive to help ensure that other members of this class can learn in a supportive and respectful environment. If there are instances of the aforementioned issues, please contact the Title IX Coordinator, by calling 412-6487860, or e-mailing titleixcoordinator@pitt.edu. Reports can also be filed online: https://www.diversity.pitt.edu/civil-rights-title-ix-compliance/make-report/report-form. You may also choose to report this to a faculty/staff member; they are required to communicate this to the University's Office of Diversity and Inclusion. If you wish to maintain complete confidentiality, you may also contact the University Counseling Center (412-648-7930).

• Statement on Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written(or electronic) permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

• No Use of Generative AI Permitted

Intellectual integrity is vital to an academic community and for my fair evaluation of your work. All work completed and/or submitted in this course must be your own, completed in accordance with the University's Guidelines on Academic Integrity. You may not engage in unauthorized collaboration or make use of ChatGPT or any other generative AI applications at any time.