Physics 300 (Spring 2024)

Mathematical methods of Physics

- Instructor: Dr. Kalum Palandage
- Office: MC 224A
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- Textbook: *Mathematical Methods in the Physical Sciences by Mary Boas (Wiley, 2006)*
- Class dates & time: M/W/F 11.00 am – 11.50 am.
    location (TBA)
- Office Hours: Mon/Tue 4 pm – 5 pm Tuesday 11 am – 1 pm or by appointment

- Prerequisite: C- or better in Physics 231L and Mathematics 231.

Course Description

This course focuses on mathematical methods essential for expressing and applying the laws of physics. It is designed to offer a mathematical background for other upper-level physics courses and research. Topics to be discussed may include elements of vector analysis, differential geometry, linear algebra, functions of a complex variable, Fourier analysis, and some special functions of mathematical physics. Moreover, this course uniquely integrates the modeling of physical systems and the derivation of numerical solutions using Python and Jupyter notebook. Time permitting, supplementary topics such as an introduction to group theory may be explored, enriching the overall mathematical toolkit for aspiring physicists.

Textbook

Mathematical Methods in the Physical Sciences 3rd Ed, Mary L Boas (Wiley, 2006)

Homework

The purpose of homework in this course is to help you develop a practical understanding of the concepts of mathematical physics and its applications. Problems will be assigned periodically (bi-weekly). To receive full credit for a homework problem, your solution must be (1) complete (i.e., you must arrive at a solution), (2) printed neatly with intermediate steps shown, and the final answer boxed or underlined, and (3) turned in by uploading to Moodle or by hand at the start of class by the due date. Assignments, solutions, and a link to upload your work will be posted on Moodle, and as needed, discussed in class. Students may discuss homework problems with one another, but each student is to write up his or her own set of solutions. For computational assignments, please ensure that you upload the **".ipynb**" file format. This format is essential for the proper evaluation of your work. Be sure to follow the specified naming conventions and guidelines outlined in the assignment instructions. If you encounter any difficulties with the upload process, don't hesitate to seek assistance during class.

Exams: There will be three Exams
    Two mid-term Exam, Dates: 2nd week of March and 3rd week of April
    and the Final Exam

Mathematical Software (for modeling physical systems and Numerical solutions)
Python-Jupyter notebook

Grades: Tentative weighting (subject to change): Exams 80%, Homework, and class participation 20%
Your course letter grade will be determined as follows.

Final average	Grade
90 - 100	A- to A+
80 - 89	B- to B+
60 - 79	C- to C+
40 - 59	D- to D+
39 – below	F

Physics 300 Topics (subject to modification depending on time constraints)	Approximate period
Numerical methods	1 week
Power series	1 week
Complex numbers	2 weeks
Linear Algebra (matrices and determinants)	2-3 weeks
Vector analysis	2-3 weeks
Fourier analysis	3 weeks
Functions of complex variables	1 weeks

Academic integrity

In accordance with the Trinity College Student Integrity Contract, students are expected to abide by the highest standards of intellectual honesty in all academic exercises. Intellectual honesty assumes that students do their own work and that they credit properly those upon whose work and thought they draw. It is the responsibility of each student to make sure that he or she is fully aware of what constitutes intellectually honest work in every examination, quiz, paper, laboratory report, homework assignment, or other academic exercise submitted for evaluation in a course at Trinity College.
(Trinity College Student Handbook, p. 13)

Accommodations

Trinity College is committed to creating an inclusive and accessible learning environment consistent with the Americans with Disabilities Act. If you have approval for academic accommodations, please notify faculty during the first two weeks of the semester or a minimum of 10 days prior to needing your accommodations. Please be sure to meet with me privately to discuss implementation.