Physics 301 (Fall 2023)

Classical Mechanics

- Instructor: Dr. Kalum Palandage
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- Class dates & time: M/W/F 11 am – 11.50 am.
- Office Hours: Tuesday 4.30 pm – 5.30 pm, Wednesday 2.30 pm – 4.30 pm, or by appointment
- Prerequisite: C- or better in Physics 231L and either Mathematics 231 or 234.

Course Description
Physics 301 is an intermediate-level course that covers the fundamental principles of classical dynamics. Throughout the course, we will delve into mechanics at a more sophisticated and intriguing level compared to what you encountered in Physics 141. It's a captivating and elegant subject, considered one of the greatest intellectual achievements. As we progress, I hope you'll develop an appreciation for its beauty.

The content of the course includes Newtonian mechanics, which is built upon forces, and also explores the mathematically robust energy-based approaches of Lagrangian and Hamiltonian mechanics. We will discuss the significance of universal conservation laws such as energy, linear momentum, and angular momentum, and their profound connection with symmetry.

In addition, we will introduce mathematical tools like Green's functions and the calculus of variations when necessary for analyzing physical systems. These tools will help us gain a deeper understanding of various phenomena. I look forward to exploring the wonders of classical dynamics with you and uncovering the fascinating world of mechanics at this higher level of study.

Textbook
"Classical Dynamics of Particles and Systems" 5th edition by Thornton and Marion (Thomson-Brooks/Cole)

Homework
The purpose of homework in this course is to assist you in developing a practical understanding of the concepts and their applications. Problems will be assigned periodically, occurring bi-weekly. To attain full credit for a homework problem, your solution must meet three criteria: (1) completeness (i.e., arriving at a solution), (2) neat presentation, including clear display of intermediate steps and boxing or underlining of the final answer, and (3) submission by hand at the beginning of class on the specified due date. Assignments and solutions will be uploaded to Moodle and, when necessary, deliberated in class. While students are encouraged to collaborate on homework problems, each student is required to independently compose their own set of solutions.

Exams
- Two Mid-term Exams: October 16 and November 20 (in class, 1 hour)
- Final Exam: December 18 (in class, 3 hours)

Mathematical Software (for modeling physical systems)
Python-Jupyter notebook, Mathematica, MATLAB

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 301 Topics (subject to modification depending on time constraints)	Approximate period
Newtonian Mechanics -single particle	1 weeks
Oscillations	2 weeks
Gravitation	1 weeks
Calculus of Variations	2 weeks
Hamiltonian Principle- Lagrangian and Hamiltonian Dynamics	3 weeks
Central force motion	2 weeks
Dynamics of system of Particles/Rigid bodies	2 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.