

PHY 215: Classical Mechanics

Spring 2023

Aurelia Honerkamp-Smith
Department of Physics
404 Lewis Lab
auh216@lehigh.edu

Time and Location:

Monday, Wednesday and Friday 10:45 AM - noon, Lewis Laboratory Room 512

Office hours: Friday 9:45-10:45, Lewis Laboratory Room 404

Description

Text: Classical Mechanics, John R. Taylor, University Science Books

An additional useful reference: Mathematical Tables, such as Schaum's or CRC (or the internet).

We will cover the following topics:

- Chapter 1. Newton's Laws of Motion.
- Chapter 2. Projectiles and Charged Particles.
- Chapter 3. Momentum and Angular Momentum.
- Chapter 4. Energy.
- Chapter 5. Oscillations.
- Chapter 6. Calculus of Variations.
- Chapter 7. Lagrange's Equations.
- Chapter 8. Two-Body Central-Force Problems.
- Chapter 9. Mechanics in Noninertial Frames.
- Chapter 10. Rotational Motion of Rigid Bodies.
- Chapter 11. Coupled Oscillators and Normal Modes.

If time permits, and according to the wishes of the class we may also cover in part,

Chapter 12. Nonlinear Mechanics and Chaos.

Chapter 13. Hamiltonian Mechanics.

Chapter 14. Collision Theory.

Grading

There will be one midterm exam during week 7 (Monday, March 6) and one final exam (scheduled during finals week).

Grades will be computed as follows:

Homework: 50%
Midterm: 25%
Final exam: 35%

Notice that homework is the most important part! The purpose of this course is to expand your ability to attack problems with a variety of mathematical techniques, and consistent practice is the most important part of gaining this skill. Homework will be assigned weekly (on Fridays), and is due one week after it is posted. It is your responsibility to make sure you understand how to do the homework problems, but I encourage you to work together to complete the homework whenever possible. The homework problems are intended to be challenging, and to require substantial time and space to complete, so please start working on them as early as possible. You may turn homework assignments in online or on paper. After they are graded, homework problems can be re-submitted to make up 50% of any missed points.

After the due date, you may turn in a homework assignment or re-take an exam for 50% of the possible points. However, please contact me for an extension if something out of the ordinary occurs that prevents you from completing an assignment on time.

Class structure

I will post textbook reading assignments and homework assignments on the course site after each class. On most, but not all, lecture days, I will assign an in-class extra credit problem to be turned in (on paper only) by the end of the day. It is not possible to make up missed in-class problems. Extra credit points will be added to your homework score, increasing it by a maximum of 10% of the final grade. Class will take place in person. Zoom classes will only be held in

Initial Competencies

Prerequisites for this course are Physics 013, 021 or 023. Students should either already have taken Math 205, or be taking it concurrently.

Final Competencies

1. The goal of this course is to substantially expand the type and complexity of physics problems that you are able to solve using only paper and pencil. At the end of this course, you will be able to use Newton's second law to construct differential equations of motion to solve more complex problems than those encountered in freshman physics, including damped and driven oscillating systems. You will be able to use vector operations and multiple coordinate systems to solve advanced problems using conservation of energy, linear momentum, and angular momentum. You will be familiar with the use of and relationships between Newton's second law, Hamilton's principle, Lagrange's equations, and Hamilton's equations. You will understand how to develop equations of motion for a variety of physical systems using both Lagrangian and Hamiltonian dynamics.

Lehigh Community

Accommodations for Students with Disabilities: If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, University Center 212 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

The Principles of Our Equitable Community:

Lehigh University endorses The Principles of Our Equitable Community (http://www.lehigh.edu/inprv/initiatives/PrinciplesEquity_Sheet_v2.032212.pdf). We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.

The University strongly encourages (and, depending upon the circumstances, may require) students, faculty, staff or visitors who experience or witness harassment or discrimination, or have information about harassment or discrimination in University programs or activities, to immediately report such conduct.

Reports or inquiries should be made to: Karen A. Salvemini, Equal Opportunity Compliance Coordinator, Alumni Memorial Building / 610.758.3535 / eocc@lehigh.edu

In the event that the conduct involves the Equal Opportunity Compliance Coordinator, reports should be made to: Judy A. Zavalydriga, Human Resources Investigator, 428 Brodhead Avenue / 610.758.3897 / jaz308@lehigh.edu

Resources for students:

Counseling office:

Counseling and Psychological Services

36 University Drive
Johnson Hall, 4th Floor
Bethlehem, PA 18015
Phone: (610) 758-3880
Fax: (610) 758-6207
Hours: M-F, 8:00 AM - 5:00 PM
<http://studentaffairs.lehigh.edu/content/counseling-psychological-services-ucps>

Gender violence:
University Center C112 and C108
Phone: 610-758-1303
Fax: 610-758-6164
E-mail: ingves@lehigh.edu
<http://studentaffairs.lehigh.edu/content/gender-violence-education-support>