PHY 215: Classical Mechanics
Spring 2024

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Time and Location:
Monday, Wednesday and Friday 10:45 AM - noon, Lewis Laboratory Room 514
Office hours: TBD, Lewis Laboratory Room 415

Description

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

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, we will also cover,
Chapter 12. Nonlinear Mechanics and Chaos.
Chapter 13. Hamiltonian Mechanics.

Initial Competencies

• Introductory Physics at the level of Physics 10/13 and 11/21
• Knowledge of calculus.
• Students should either already have taken Linear Methods (Math 205), or be taking it concurrently.

Final Competencies

• Expand the type and complexity of physics problems that you are able to solve (using paper and pencil or computers).
• Apply Newton's second law to construct differential equations of motion, including damped and driven oscillating systems.
• Use vector operations and multiple coordinate systems to solve mechanics problems using conservation of energy, linear momentum, and angular momentum.
• Learn how to apply Hamilton's principle, Lagrange's equations, and Hamilton's equations.
• Develop equations of motion for a variety of physical systems using both Lagrangian and Hamiltonian dynamics.

Grading

There will be homework, in class problems, two midterm exams and one final exam (scheduled during finals week). Grades will be computed as follows:

Homework: 45%
In-class problems: 5%
Midterm 1,2: 20%
Final exam: 30%

We will have 11 assigned homeworks. Notice that homework is a very 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. It is your responsibility to make sure you understand how to do the homework problems and you should submit your own work. However, you are encouraged you to work together to complete the homework whenever possible.

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

On certain lecture days, in-class quiz/problems will be assigned. You will be able to make up any missed quiz points in ways that we will announce in class.

Midterm exam 1 will cover the material of Homeworks 1-4 and Midterm exam 2 the material of Homeworks 4-8. The Final exam will cover all topics covered in the course. All exams will be open notes/book.

Slack, Course Site and Scheduling

We will use Slack for course announcements, questions, links, ideas, and group activities. Students are expected to check it regularly and submit any course-related communication

to the instructor or to other students there. It's much easier to quickly answer questions or requests on Slack. So please use Slack instead of email; if you send me a course-related email, I will respond back in slack!

Homework will be submitted and graded on Course Site.

Because of research presentations at the February Biophysical Society Annual meeting and the American Physical Society March meeting, we may have to cancel class on Feb 12, 14 and on March 4, 6. The time assigned to this class by the Registrar slightly exceeds that of a 4-credit course (even after taking out a 5 min break per class). We will use this extra time to make up for the any canceled lectures (approximately two lectures) and the rest by make up lectures, possibly by two pre-recorded lectures. A calendar will be posted on course site.

Python module

During the first week of class we will discuss adding a computational module to solve mechanical problems in python.

University Policies

Accommodations for Students with Disabilities:
Lehigh University is committed to maintaining an equitable and inclusive community and welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact Disability Support Services (DSS), provide documentation, and participate in an interactive review process. If the documentation supports a request for reasonable accommodations, DSS will provide students with a Letter of Accommodations. Students who are approved for accommodations at Lehigh should share this letter and discuss their accommodations and learning needs with instructors as early in the semester as possible. For more information or to request services, please contact Disability Support Services in person in Williams Hall, Suite 301, via phone at 610-758-4152, via email at indss@lehigh.edu, or online at https://studentaffairs.lehigh.edu/disabilities.

Bias, Discrimination, Harassment, Retaliation, and Sexual Misconduct:
Lehigh University upholds The Principles of Our Equitable Community and is committed to providing an educational, working, co-curricular, social, and living environment for all students that is free from harassment and discrimination on the basis of age, color, disability, gender identity or expression, genetic information, marital or familial status, national or ethnic origin, race, religion, sex, sexual orientation, or veteran status.
Harassment and discrimination, including sexual harassment and misconduct, not only disrupts this commitment and violates our principles, but may also violate University policy and applicable laws.
Lehigh University and its faculty are committed to providing an environment that is free from bias, discrimination, harassment, retaliation, and sexual misconduct (including sexual

harassment, sexual assault, stalking, dating violence, domestic violence, and sexual exploitation). If you have experienced, witnessed, or become aware of any of these behaviors, you are strongly encouraged to report the incident to the Lehigh University Police Department (LUPD) at 610-758-4200 or to the Equal Opportunity Compliance Coordinator/Title IX Coordinator (EOCC) at 610-758-3535 or at eocc@lehigh.edu.

If you would prefer to submit your report electronically, two online reporting forms are available and may be submitted to report the incident:

Gender Violence Incident Notification Form: https://cf.lehigh.edu/gves/auth/gvreport/

Discrimination, Harassment, Retaliation, or Bias Incident Reporting Form:

https://cm.maxient.com/reportingform.php?LehighUniv&layout_id=30

Please note that, while the University options to respond may be limited, the online reporting forms may be submitted anonymously. Every effort will be made to address concerns reported anonymously.

You can access support and resources even if you do not want to take any further action following the submission of a report.