PHY 115: Classical Physics III – Mostly Many-Bodied Physics

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Office Hours: Tu/Th 1:30 - 2:30 pm --- Zoom Link

Course Modality and Description

The course is a 100% in-person, face-to-face course.

The classical picture of our universe rests on the interplay between the microscopic world of simple Newtonian particles and the rich macroscopic world built out of them. What do microscopic balls and springs have to do with solid structure? How can we think of flowing fluids as a continuum of particles? What dynamical behaviors arise macroscopically from these microscopic models? And what do we do about the information that we cannot possibly track? What links uncertainty about the micro level to heat and entropy?

We will explore applications of these ideas to understanding sturdy versus brittle structures, stable and flowing systems, atmospheric dynamics, and climate change.

Health, Safety, and Our Responsibilities

Vaccination Requirement

- UMass Dartmouth requires all undergraduate and graduate students to be vaccinated against COVID-19 if they intend to live, learn, or physically come to campus. For more details, pllease see https://www.umassd.edu/covid/planning/
- Students are required to upload their proof of vaccination to the Health Services Portal
- Students claiming an exemption to the requirement must also submit either a written request for exemption upon religious grounds or medical exemption documentation from a healthcare provider.
- Follow these links on how to upload your COVID vaccine documentation guide to add your information to the Health Services portal

Personal Responsibility

- Every member of the UMassD community must do their part to protect one another, including:
    - Using face coverings in all public places on campus unless a medical exemption is obtained
    - Complying with the MA face covering requirement: students and faculty must wear a face covering at all times in classrooms and labs.
    - Practice good personal hygiene including handwashing per CDC guidelines
    - Avoiding eating and drinking in classrooms and labs
    - *Staying home or isolated if they feel sick or exhibit known COVID-19 symptoms*

Recommended Texts and Systems

Course website: http://phy115.sites.umassd.edu

OpenStax' University Physics Volume 1 [Ch. 12, 14 - 17]
OpenStax' University Physics Volume 2 [Ch. 1 - 4]
OpenStax' University Physics Volume 3 [Ch. 1 - 4, time permitting]

Helpful Resources

Cornell note-taking: http://lsc.cornell.edu/notes.html; https://youtu.be/w3pM5hEgBk4

Vector help: Name That Vector; Vector Guessing Game

Calculus help: Better Explained

Professor Leonard (math on YouTube): https://www.youtube.com/user/professorleonard57

NancyPi: https://www.youtube.com/channel/UCRGXV1QlxZ8aucmE45tRx8w

Course Objectives

- You will develop an understanding of core concepts at the heart of classical theories of solids, fluids, waves, and thermodynamics

- You will develop your analytical thinking abilities by learning how to apply problem solving skills. By the end of the course you will have learned how to:
    - Apply a systematic approach to thinking through physical scenarios
    - Employ analytical tools such as geometry, trigonometry, algebra, calculus for applications in physics
    - Analyze physical data and understand how they are modeled using physical principles
    - Understand how physical data confirm or refute physical theories
    - Communicate scientific information

- What are your goals? Come talk to me about them and develop a plan for how to achieve them.

University Studies Cluster 2A - The course objectives listed above satisfy the Cluster 2A University Studies outcomes. These are to:

- Recount fundamental concepts and methods in physics.
- Demonstrate an understanding of how scientific methods are used to produce knowledge.
- Successfully use quantitative information to demonstrate understanding of scientific knowledge.
- Use appropriate scientific knowledge to solve problems.

University Studies Cluster 2B - The course objectives listed above satisfy the Cluster 2B University Studies outcomes. These are to:

- Analyze and evaluate the use of scientific information in the context of social, economic, environmental or political issues.
- Apply scientific theories and knowledge to real-world problems.
- Effectively communicate scientific information in writing.

Course Components

Lectures:

I will typically introduce physical concepts using a minimal mathematics. Concept-oriented portions of lecture will often feature questions for you to grapple with individually or with your fellow students to help deepen your understanding. Interspersed with the conceptual content will be more quantitative analyses of physical scenarios, developing and applying the mathematical tools we need as we go along and demonstrating their use in analyzing physical scenarios.

Reading/Videos:

My lectures will emphasize certain topics, but readings or videos will round out these topics with other useful examples and concepts. Some derivations of important quantitative results will be left to reading/videos as well.

Homework:

Practicing physics problem solving at both conceptual and quantitative levels is essential for developing a firm grasp of the material in this course.

Course Project:

Before the middle of the semester, I will provide a list of topics to choose from. You will pick a topic from the list and write a report that incorporates some physical analysis of relevant data. The analysis should include a theoretical part, but can also incorporate computer simulation or calculations as well.

You will be assigned to a group of your fellow students who will form your "project committee". There will be a midterm project meeting where you will present an outline of your project idea to your committee and answer their questions. There will also be a final project meeting where you will give a short presentation of your finished project and again answer questions.

Topic Areas:

I believe that to encourage actual learning, you should be allowed to demonstrate improved understanding without penalties for making mistakes earlier in the course. I've divided the main material in this course into *topic areas* to help you keep closer track of your strengths and weaknesses. The division also helps me keep track of your progress, and ultimately forms the basis for your final grade in the course.

Below is a list of the topic areas:

Topic Areas:
T1: Statistical Physics
T2: Thermodynamics
T3: Solids
T4: Fluids
T5: Math of Oscillation
T6: Waves in Solids and Fluids

Assessment

Exams have “conceptual” and “quantitative” questions. Conceptual questions assess your grasp of core principles. Quantitative questions assess your application of mathematical techniques along with your conceptual understanding of the various topic areas to solve problems having to do with a physical scenario. These questions are organized and graded by topic area.

If you do better in a topic area on a later test (for example, if you improve your topic 1 score on the final) then the better score is used to determine your final grade. If you do *worse* in a topic area on a later test then I will deduct 20% of the difference between your original score and the new one.

Doing questions for earlier topics is optional. There is no penalty for skipping the earlier topics.

Grading

The specific grade in this course will be determined on the following basis:

- 25% Quantitative Scores
- 25% Conceptual Scores
- 25% Project
- 15% Homework
- 10% Recitation Participation

A+	98 to 100		C	70 to 73
A	93 to 98		C-	67 to 70
A-	87 to 93		D+	63 to 67
B+	83 to 87		D	60 to 63
B	80 to 83		D-	57 to 60
B-	77 to 80		F	0 to 57
C+	73 to 77			

NOTE: I reserve the right to adjust this grading scale should the need arise.

Communicating With Me

I enjoy personal communication with students, either face-to-face (when possible) or through email. In order to help facilitate the best email communication please note the following:

- Interact with me in a professional manner: I am easygoing, but aim to make a good impression.
- Make sure your full name displays properly in the "From" line of your emails.
- Use a concise, descriptive subject line for your email.
- When initiating a conversation, unless your professor explicitly says otherwise, address them as "Dear Professor [their last name],"
- Use good grammar, spelling, and punctuation
    - This is important for both clarity and the impression you give

You may find this document on email etiquette informative. I do not agree with all the points made in the article: in particular, I *prefer* to be emailed if you have an excused absence from class or lab. I am also happy to take questions about your academic standing in the course once or twice a semester.

Here is another good article on the subject of student/professor interaction.

Classroom / Online Meeting Policy

- I endeavor to start each class promptly at the scheduled time and to make sure we end on time.
- I will ask students who are disruptive to leave.
- I reserve the right to bar students who are late from entering that particular session.
- For in-person classes: laptops, phones, and other such devices should be switched off and stored in your bag or pocket once class has begun. All note-taking should be done in a notebook with pen or pencil.
- Please take a look at this article as an explanation for the previous policy.
- For online meetings: please refrain from having multiple windows featuring unrelated content open during our sessions.)

Academic Integrity

All UMass Dartmouth students are expected to maintain high standards of academic integrity and scholarly practice. The University does not tolerate academic dishonesty of any variety, whether as a result of a failure to understand required academic and scholarly procedure or as an act of intentional dishonesty.

A student found responsible of academic dishonesty is subject to severe disciplinary action which may include dismissal from the University. The procedure for responding to incidents of academic dishonesty may be found in Section III of this document. You may also refer to the Student Handbook for information about the judicial process.

A high standard of academic integrity promotes the pursuit of truth and learning and respect for the intellectual accomplishments of others. These are values that are fundamental to the mission of this University. Such values are undermined by academic dishonesty.

Academic freedom is a fundamental right in any institution of higher learning. Honesty and integrity are necessary preconditions of this freedom. Academic integrity requires that all academic work be wholly the product of an identified individual or individuals. Joint efforts are legitimate only when the assistance of others is explicitly acknowledged and deemed appropriate by the instructor of the course. Ethical conduct is the obligation of every member of the University community, and breaches of academic integrity constitute serious offenses.

Maintenance of the standards of academic integrity and the successful administration of this policy depend on the mutual cooperation of faculty and students.

Faculty cooperation is essential for successful application of the procedures defined by this Academic Integrity Policy. Faculty members promote academic integrity by making clear on their syllabi their expectations concerning homework assignments, collaborative student efforts, research papers, examinations, computer-based infractions, and the like. Efforts should be made to detect and to prevent cheating and plagiarism in all academic assignments. If faculty members have evidence of academic dishonesty, they are expected to report such evidence promptly.

Students must assume responsibility for maintaining honesty in all work submitted for credit and in any other work designated by the instructor of the course. Students are also expected to report incidents of academic dishonesty to the instructor or dean of the instructional unit.

The intent of this policy is to make clear the standards of academic integrity at UMass Dartmouth.

**For additional information on violations, infractions, and consequences visit the UMass Dartmouth Student Academic Integrity Policy at the link below.*

http://www.umassd.edu/studentaffairs/studenthandbookintroduction/studentconductpolicies/academicintegritypolicy/