Physics 251: “Foundations of Physics I”  
(CRN 15505)  
Pre-requisite: Math 112 or equivalent, Co-requisite: Math 251

Teaching Team

The preferred method of communication is through Microsoft Teams. If you must email us, please put [PHYS251] in the subject line.

Instructor:  
Prof. Tien-Tien Yu (she/her): please call me “Prof. Yu” or “Dr. Yu” tientien@uoregon.edu

Teaching Assistants:  
Matthew Ball: mball2@uoregon.edu  
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Logistics

When: Most of this course will be asynchronous. However, we will use the scheduled class time (MWF 9:30am - 10:30am) for in-person interviews and office hours. We will also utilize chat-based discussions via Microsoft Teams. Tutorials will be synchronous and meet at the scheduled times on Tuesdays via Microsoft Teams.


Mastering Physics: All students will need ModifiedMasteringPhysics access. This came with your textbook if you bought it through the UO bookstore or can be purchased separately. A 2-week trial is available if you are uncertain about your attendance in this course. Sign in at www.pearsonmylabandmastering.com and use course ID yu80653.

Course Platform:  
All course communication will be done through Microsoft Teams. Here, you may also view announcements, course materials including the pre-recorded lectures, homework assignments, and your grades at any time. Teams has a handy chat function that we will use heavily in this course. We will use Microsoft Teams and YouTube for submitting coursework.
Equipment Required:
Each student is required to have their own computer to access the course materials. We will be using Microsoft Teams to communicate. You can download this application with your UO account. UO has a limited number of loaner laptops and webcams available; you can find more information about this program at https://remote.uoregon.edu/students.

Overview:
This course is the first term of a three-term sequence of foundational physics. Fall quarter will be spent learning about the nature and reasons for motion. Usually termed Newtonian Mechanics, we will understand how to describe motion, and the relationship between forces and changes in motion through Newton’s laws. At the end of the quarter, we will see how we can use symmetry relations to expand Newton’s laws to more convenient concepts of momentum and energy. In addition to setting a solid conceptual foundation for future courses in physics, this course will also stress a systematic and organized approach to solving in-depth problems.

Course Objectives

This course is a mixture of different topics in physics. The unifying theme is the first principles approach we take to solving problems.

- Interpret what equations mean to describe physical phenomena. It will not be necessary to memorize any equations, but you will need to know how and when to use equations to answer questions about nature.

- Explain how to solve problems to peers by motivating the process, describing the steps, and identifying pitfalls. (Or: I don't care if you have a correct answer, I care if you can clearly explain a correct method.) You will know that you understand something when you can teach your peers how to solve problems.

These two principle emphasize a type of learning that will carry over to your upper division courses and your careers. We don't need to memorize details---the real world has Google and Wikipedia. Being able to communicate technical ideas, on the other hand, is a critical part of nearly every modern profession.

The physics learning objectives of this course:

- Understand fundamental concepts underlying mechanics of the universe.
- Learn to build simplified theoretical models of complex physical systems.
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- Apply fundamental physics concepts to find solutions to a wide range of problems.
- Learn how to analytically arrive at quantitative answers and interpret those results.
- Develop your ability to communicate technical ideas.
- Develop “numeracy”. Numeracy is the ability to communicate (read and write) using equations and numbers. It is an indispensable skill in modern life.

The primary **personal development objectives** of this course:
- Increase your puzzle-solving skills and “working memory”.
- Learn to extract deep insights through deep contemplation of seemingly mundane things, like simple machines or the positions and movement of everyday objects.
- Develop a tolerance for being confused and confronted with a seemingly intractable problem. Learn to be excited by this instead of intimidated.
- Learn to work effectively in diverse groups.
- Become part of the community of other physicists and scientists at the UO.
- Learn about research being done in the department.
- Learn about what it is like to be a professional scientist.

**Assessment and Grading**

Your course grade will be based on the following components:

- **Weekly Assignments and Mastering Physics.** [15%] These are short assessments where you reflect on the course content and provide feedback to the teaching team about what you need to succeed.

- **10 minute interview with instructor.** [15%] Once over the course of the quarter you will meet on Zoom with Prof. Yu to discuss your progress and for a short oral exam where you explain a problem.

- **10 minute Interview with TA.** [15%] Once over the course of the quarter you will meet on Zoom with one of the TAs to discuss your progress and for a short oral exam where you explain a problem.

- **Weekly 5 minute explainer videos.** [35%] Each week you will create five minute videos where you teach how to solve problems from the Knight textbook. Each video should be targeted to a hypothetical classmate who has asked you for help.
• **Peer critiques of explainer videos.** [15%] Each week, you will critique several students' explainer videos. You will grade them based on a rubric, give constructive feedback, and ask questions on steps that are not clear. Your critiques must reflect your own understanding of the material.

• **Peer critique responses.** [5%] You may write a brief response to your peer critiques to answer any questions, politely disagree, or acknowledge mistakes and suggest corrections. You may appeal for additional partial credit (maximum: 50% of the missing points) on your original explainer video if you have made major corrections.

• **Extra credit.** There may be additional assignments for bonus points; these will focus on peer critiques or explainers for extra topics in the course. Some credit may be given for high quality discussions in the Microsoft Teams channel that benefit the whole class. All extra credit opportunities will be announced to the whole class, do not ask for any extra credit assignments just for yourself.

Historically, scores above 90% have earned an A, scores above ~75-80% have earned a B, scores above ~60-65% have earned a C, while scores below ~50% have failed. Each year is slightly different, however, and the exact ranges for this course will be determined after the final assignments are due.

**Campus resources to support your learning:**

**Instructional Accommodations:** The Accessible Education Center ([http://aec.uoregon.edu](http://aec.uoregon.edu)) exists to help students achieve access to educational resources. If there are aspects of the instruction or design of this course that result in barriers to your participation, please contact me as soon as possible so we may discuss your situation.

**Counseling Center:** Call anytime to speak with a therapist who can provide support and connect you with resources. Located on the 2nd Floor of the Health Center (541) 346-3227.

**Policies:**

**Course load:** Per UO policy, 1 credit hour is approximately 30 real hours of student work, both in and out of class. This is a 4-credit course, which corresponds to about 120 hours over the fall term or 12 hours per week that you spend on lecture + discussion, reading course materials, asking questions, preparing your videos, and interviewing with the teaching team. This number will vary from student-to-student, and week-by-week.
However, if you find yourself spending significantly more time than this on the course, please contact the instructor.

**Inclusivity:** Open inquiry, freedom of expression, and respect for difference are fundamental to a comprehensive and dynamic education. We are committed to upholding these ideals by encouraging the exploration, engagement, and expression of divergent perspectives and diverse identities.

**Don’t be a jerk:** This course requires students to share work with one another; therefore, we must treat each other with respect in our constructive criticism and we will not share each others’ work without explicit and written permission. Bullying and trolling will not be tolerated by anyone in this course; the teaching staff reserves the right to punish misbehavior with zero credit on assignments or failure in the course.

**Academic Integrity:** All students are expected to complete assignments in a manner consistent with academic integrity. Academic dishonesty devalues the reputation of our institution, its faculty, its students, and the degrees we offer. Moreover, academic misconduct is particularly unfair for the students who do their work with integrity and honor. Students can find more complete information about the University of Oregon’s Policy on Academic Dishonesty in the University of Oregon *Student Handbook*. Suspected academic dishonesty will be reported.

**Homework:** *late homework will not be accepted.* The peer critique aspect of this course is only fair if your peers have access to your work in a timely manner. **Your lowest homework score will be dropped.**

If you are stuck on the homework:
1. Discuss with your classmates and/or ask a question on the discussion board.
2. If you and your colleagues are confused, contact the TA.
3. If you are all confused (or there's potentially an error on the homework), contact the instructor.

**Important Dates:** ([academic calendar](#))
- **Oct 3** Last day to drop without a “W”
- **Oct 5** Last day to add a class
- **Nov 15** Last day to withdraw (drop with a “W”) or change grading option to P/N

**Tentative Course Schedule:**
We will cover roughly one Chapter from Knight a week (Chapters 1-10).