

PHYSICS 251

FOUNDATIONS OF PHYSICS

WINTER 2024

PROFESSOR RAGHUVVEER PARTHASARATHY

DEPARTMENT OF PHYSICS

THE UNIVERSITY OF OREGON

SYLLABUS

Welcome to Physics 251! – Prof. Parthasarathy

Please note that aspects of the syllabus may change. If so, I'll inform everyone in class and through Canvas.

Time and Place

Lecture (CRN 25898): Monday and Wednesday 2:00 - 3:50 pm, Willamette 110

Tutorials (CRN 25899, 25900, 26978): Thursday or Friday, 80 minutes. Willamette 112.

Instructors and Contact Information

Professor Raghuvveer Parthasarathy (pronounced **Par**-tha-sa-ra-thē)

Email: raghu@uoregon.edu (use Canvas to contact!)

Office: Willamette 362; *Office hours:* W 4:00-4:50 pm, Th 1:00-1:50 pm, Willamette 362

Graduate Teaching Assistants:

Hunter Barndt: tutorial Thurs 1400-1520

Office hours: Mon - 11am - 12pm and Tues - 10am - 11am; location: Price Science Commons Library – A table next to the information desk, near the stairs.

Drop-in center hours: 4pm-5pm on Monday.

Connor Burns : tutorial Thurs 0830-0950

Office hours: Tuesday 9-10am and Wednesday 1-2 pm; location: Willamette 218 (“Binney Lounge”)

Drop-in center hours: 1pm-2pm on Monday

Sam Philliber : tutorial Friday 1630-1750

Office hours: Friday 2-4 pm; location: Willamette 72

Drop-in center hours: tbd

Drop-in Center. The Physics department staffs a drop-in tutoring center in the Price Science Library, Room B010. Starting in Week 2, I think, there will be a graduate student there Monday-Friday 9am-5pm (except Thursday, -4pm).

Make use of office hours! Even if you don’t have specific questions, feel free to drop by and chat!

Office hour times may change, both by request (if particular times are not good for many students) and due to scheduling conflicts that arise.

Communication / Email: The strongly preferred method of communication is through Canvas, using the Canvas Inbox to send mail to all instructors (the professor and graduate teaching assistants). If you must send a “normal” email, please send it to Professor Parthasarathy, Cc’ing the teaching assistants. Address your message to “Prof. Parthasarathy.” We may not reply to emails that begin “Hey” or that are incoherent.

Textbook

Physics for Scientists and Engineers: A Strategic Approach with Modern Physics, 5th Edition, by Randall Knight. I expect that most of you will get the e-book. There’s a physical book as well – it weighs a lot but is perhaps easier to read! I have put the (physical) 4th edition of Knight on reserve at the Science Library (Price Science Commons).

Mastering Physics. All students will need to access the online “Mastering Physics” system. (I believe a 2-week trial is available if you are uncertain about your enrollment in this course.) Sign up **through Canvas** (click on “Access Pearson”).

Course Platform: Canvas

All course communication will be done through Canvas. Here, you may also view announcements, course materials, homework assignments, and your grades. Please regularly check your email / Canvas notifications for course information.

If you have questions about accessing and using Canvas, visit the [Canvas support page](#). Canvas and Technology Support also is available by phone or live chat: [541-346-4357](tel:541-346-4357) | livehelp.uoregon.edu

Equipment Required

Each student will need a computer to access the course materials. We will be using Canvas to communicate (see above).

You will also need the iClicker Cloud app **or** a physical iClicker (which you can purchase from the Duck Store). For the iClicker Cloud app, “join” the course via <https://join.iclicker.com/COSM>. If you’re using a physical iClicker, you’ll still have to set up an iClicker account, but you won’t have to pay for the online account; register your physical iClicker remote ID within your iClicker Cloud student account. A limited number of physical iClickers will be available in class to borrow for the term – please let me know if you’d like one!

Course Description and Learning Goals

This course is the first of a three-term sequence on foundational physics. The first term (this course) will focus on the nature of motion. Usually termed Newtonian Mechanics, we will understand how to describe motion and will learn how forces and changes in motion are related through Newton’s laws. At the end of the quarter, we will see how we can use ideas of symmetry to expand Newton’s laws to more convenient and more powerful 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.

Absences

This course follows the university’s policies on absences, described at <https://provost.uoregon.edu/course-attendance-and-engagement-policy>. Please note the “reason neutral” policy: **instructors “shall not ask for reasons for absences and shall not distinguish between ‘excused’ and ‘unexcused’ absences.”** Attendance is not mandatory but succeeding in the class without consistent attendance will be very difficult. **Please contact me through Canvas if you will miss class due to extended illness or other issues.** Some university policies are included at the end of this document.

I realize that it is unavoidable that people will have to miss a few classes, for example due to illness. I will therefore **drop certain scores and rescale various grade components** as described below in “Course Components.”

There will be no makeup assessments (quizzes or exams). You may not miss an assessment except for reasons beyond your control.

Please let us know by the end of week 2 of the term if you need a testing-related accommodation so we can make the appropriate arrangements.

In case of instructor illness, lectures or office hours may be held via Zoom (see link below) or a lecture recording may be provided.

Course Learning 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.*
- *Explain how to solve problems to peers by motivating the process, describing the steps, and identifying pitfalls.* You will know that you understand something when you can teach your peers how to solve problems.

These two principles emphasize a type of learning that will carry over to your upper division courses, other science courses, and your careers. We don't need to memorize details – the real world has Google and Wikipedia. Being able to apply and 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.
- 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 “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 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. (We won't explore this a lot, but over the three-term series you'll gain exposure to this.)
- Learn about what it is like to be a professional scientist. (We won't explore this a lot, but over the three-term series you'll gain exposure to this.)

Course Components

I'm fond of having a variety of tools for fostering and assessing student learning, rather than just high-stakes exams. (There's a lot of educational research literature that supports this approach.) There are therefore several components to the coursework:

Pre-lecture Questions: Reading the textbook and interacting with the material on your own before class enhances your mastery. The pre-lecture questions are designed to do just that. We will spend minimal lecture time presenting "facts" and instead will use the time to help you synthesize the concepts and work on the building blocks toward solving problems. *Your lowest two pre-lecture assignment scores will be automatically dropped; see "Absences."*

Participation and Engagement. In-person attendance in lectures and tutorials is strongly recommended, and active participation will enhance your learning and aid you in achieving the course learning goals noted above. In lecture, we will use iClickers for polling questions, responses to which will be noted to count participation, *not* the correctness of responses. (Please see the "equipment required" section.) Participation in tutorials will be noted by in-class worksheets or evaluations by the teaching assistants. *Full credit will be awarded for participation in 90% of clicker questions and 90% of tutorial sessions.*

Quizzes. There will be several short in-class quizzes, roughly 20 minutes in duration. They won't be surprises; you'll get advance notice of at least one class. We'll use these to assess understanding of key points without the heavy weight of an exam. Some of the quiz questions will closely mirror the homework. Each student's **lowest quiz score will be dropped** from the total. There won't be any make-up quizzes; if you miss one, this will be the dropped quiz. (See "Absences.")

Homework. There will be homework assignments approximately every week. Most will have two parts: an online part (through Mastering Physics) and an "on-paper" part (turned in at the homework box in the basement.) Typically, online homework will be due Sunday at 11:59 pm, and on-paper homework Monday by 2:00 pm, but there will be exceptions (including Week 1).

Feel free to discuss the questions with others, but of course, *the work you submit should be your own*. Solutions will be posted; study these. **No late homework will be accepted.** Each student's **lowest score will be dropped** from the overall total. We will not comment in detail on your homework when grading it. It is therefore important to study the homework solutions.

Midterm Exam. There will be one midterm exam, in class on Wednesday, Feb. 5.

Final Exam. The final exam is scheduled for Wednesday, March 19, 2025, 2:45-4:45 pm. (Final exam times are set by the Registrar's office; see <https://registrar.uoregon.edu/calendars/examinations>.)

Overall Grade

The weights of the components are:

- Pre-lecture questions (Mastering Physics): 10%
- Participation & Engagement (lecture): 5%
- Participation & Engagement (tutorial): 5%
- Homework (Mastering Physics and Written): 25%
- Quizzes: 15%
- Midterm Exam: 20%
- Final Exam: 20%

OVERALL LETTER GRADE:

A 90% to 100%

B 80% to 90%

C 70% to 80%

D 60% to 70%

F lower than 60%

The lower boundaries of the overall course grade ranges may be adjusted downward at the end of the term to account for variations in the difficulty of exams; plusses and minuses will be assigned within these ranges. The exact ranges will be determined after the final assessment, though they will never be moved up compared to these ranges. **It is possible for every student in the course to earn an A grade.**

Alternative grading: By request, I may offer a grading option that is more heavily weighted toward quizzes and (especially) exams. If you're interested in this, feel free to contact me!

Student Workload and Time Use

This is a 4-credit hour course, so the University's expectation is that you'll spend about 120 hours on course-related work over the term, or 12 hours per week on average, which includes time in class. My estimate for time allotments for an average week is below – some weeks may have shorter or longer time commitments either by design or due to course scheduling.

- In-class meetings: 4 hours
- Pre-class reading and assignments: 1.5 hours
- Tutorial session: 1.5 hours

- Homework: 5 hours

I hope these time estimates help you plan for success. Of course, keep in mind that all these numbers are averages, and what matters is your grasp of the material; this may take more or less time for different individuals.

How to do well in the course

Plan ahead and start early! This applies to everything in the course but especially the homework. It will be crucial to keep up with the course and not fall behind; later topics build on earlier ones.

Make use of resources. If you have questions about anything, come to office hours! Make use of tutorials and teaching assistants as well!

Sleep! Many studies show that sleeping helps memory and understanding. More broadly: physics is a subject that rewards **spaced learning** – a concept may seem unclear at first glance. Then, remarkably, thinking about it again a day later it may suddenly make sense, and a day after that may seem obvious!

Generative Artificial Intelligence (GenAI) Use

Students in this class can use GenAI tools such as ChatGPT to help with certain aspects of course work. This includes asking GenAI tools for explanations of terms or concepts, keeping in mind that the explanations might be incorrect. GenAI will probably be able to answer pre-lecture questions or possibly homework questions correctly, and you can use this to assess your answers, but you should **not** use this as a substitute for answering questions yourself – the aim of these tasks is to develop your own skills, and you will be assessed on your skills in in-class quizzes and exams.

Be advised, in accordance with UO policy, if I believe you've handed in work created whole or in part by GenAI tools, I may submit a report of suspected academic misconduct to the Office of Student Conduct and Community Standards for that office to make a determination of responsibility and, if warranted, assess a grade penalty. So, if you are in doubt or have questions about a particular GenAI tool and if its use is okay, check in with me and let's discuss!

University Policies (in alphabetical order)

Some of this text is quoted from <https://provost.uoregon.edu/standard-university-syllabus-language>:

ACADEMIC DISRUPTION DUE TO CAMPUS EMERGENCY

In the event of a campus emergency that disrupts academic activities, course requirements, deadlines, and grading percentages are subject to change. Information about changes in this course will be communicated as soon as possible by email, and on Canvas. If we are not able to meet face-to-face, students should immediately log onto Canvas and read any announcements and/or access alternative

assignments. Students are also expected to continue coursework as outlined in this syllabus or other instructions on Canvas.

ACADEMIC INTEGRITY

The University Student Conduct Code (available at conduct.uoregon.edu) defines academic misconduct. Students are prohibited from committing or attempting to commit any act that constitutes academic misconduct. By way of example, students should not give or receive (or attempt to give or receive) unauthorized help on assignments or examinations without express permission from the instructor. Students should properly acknowledge and document all sources of information (e.g. quotations, paraphrases, ideas) and use only the sources and resources authorized by the instructor. If there is any question about whether an act constitutes academic misconduct, it is the students' obligation to clarify the question with the instructor before committing or attempting to commit the act. Additional information about a common form of academic misconduct, plagiarism, is available at <https://researchguides.uoregon.edu/citing-plagiarism>.

I will report misconduct to the Office of Student Conduct and Community Standards—consequences can include failure in the course.

ACCESS AND ACCOMMODATIONS

The University of Oregon and I are dedicated to fostering inclusive learning environments for all students. The Accessible Education Center (AEC) assists students with disabilities in reducing barriers in the educational experience. You may be eligible for accommodations for a variety of disabilities – apparent disabilities, such as a mobility or physical disability, or non-apparent disabilities, such as chronic illnesses or psychological disabilities. If you have or think you have a disability and experience academic barriers, please contact the Accessible Education Center (Location: 360 Oregon Hall; web site aec.uoregon.edu; phone 541-346-1155; Email uoaec@uoregon.edu) to discuss appropriate accommodations or support. The details of your disability will be kept confidential with the AEC and you are not expected to share this information with others. However, I invite you to discuss any approved accommodations or access needs at any time with me.

Pregnant and parenting students are eligible for academic and work modifications related to pregnancy, childbirth, loss of pregnancy, termination of pregnancy, lactation, and related medical conditions. To request pregnancy-related modifications, students should complete the Request for Pregnancy Modifications form on the OICRC website. OICRC coordinates academic and other modifications for pregnant and parenting students to ensure students can continue to access their education and university programs and activities.

ACCOMMODATIONS FOR RELIGIOUS OBSERVANCES

The University of Oregon respects the right of all students to observe their religious holidays, and will make reasonable accommodations, upon request, for these observances. If you need to be absent from a class period this term because of a religious obligation or observance, please fill out the Student Religious Accommodation Request fillable PDF form and send it to me within the first weeks of the course so we can make arrangements in advance.

BASIC NEEDS

Being able to meet your basic needs is foundational to your success as a student at the University of Oregon. If you are having difficulty affording food, don't have a stable, safe place to live, or are struggling to meet another need, visit the UO Basic Needs Resource page for information on how to get support. They have information food, Physics 251 Fall 2024 housing, healthcare, childcare, transportation, technology, finances (including emergency funds), and legal support. If your need is urgent, please contact the Care and Advocacy Program by calling 541-346-3216, filling out the Community Care and Support form, or by scheduling an appointment with an advocate.

INCLEMENT WEATHER

It is generally expected that class will meet unless the University is officially closed for inclement weather. If it becomes necessary to cancel class while the University remains open, this will be announced on Canvas and by email. Updates on inclement weather and closure are also communicated in other ways described here: <https://hr.uoregon.edu/about-hr/campus-notifications/inclement-weather/inclement-weather-immediate-updates>

MENTAL HEALTH AND WELLNESS

Life at college can be very complicated. Students often feel overwhelmed or stressed, experience anxiety or depression, struggle with relationships, or just need help navigating challenges in their life. If you're facing such challenges, you don't need to handle them on your own--there's help and support on campus. As your instructor if I believe you may need additional support, I will express my concerns, the reasons for them, and refer you to resources that might be helpful. It is not my intention to know the details of what might be bothering you, but simply to let you know I care and that help is available. Getting help is a courageous thing to do—for yourself and those you care about.

University Health Services help students cope with difficult emotions and life stressors. If you need general resources on coping with stress or want to talk with another student who has been in the same place as you, visit the Duck Nest (located in the EMU on the ground floor) and get help from one of the specially trained Peer Wellness Advocates. Find out more at health.uoregon.edu/ducknest.

University Counseling Services (UCS) has a team of dedicated staff members to support you with your concerns, many of whom can provide identity-based support. All clinical services are free and confidential. Find out more at counseling.uoregon.edu or by calling 541-346-3227 (anytime UCS is closed, the After-Hours Support and Crisis Line is available by calling this same number).

REPORTING OBLIGATIONS

I am a designated reporter. For information about my reporting obligations as an employee, please see Employee Reporting Obligations on the Office of Investigations and Civil Rights Compliance (OICRC) website. Students experiencing sex or gender-based discrimination, harassment or violence should call the 24-7 hotline 541-346-SAFE [7244] or visit safe.uoregon.edu for help. Students experiencing all forms of prohibited discrimination or harassment may contact the Dean of Students Office at 541-346-3216 or the non-confidential Title IX Coordinator/OICRC at 541-346-3123. Students are not required to participate in an investigation to receive support, including requesting academic supportive measures. Additional resources are available at investigations.uoregon.edu/how-get-support.

I am also a mandatory reporter of child abuse. Please find more information at Mandatory Reporting of Child Abuse and Neglect (<https://hr.uoregon.edu/mandatory-reporting-child-abuse-and-neglect>).

RESPECT FOR DIVERSITY

You can expect to be treated with respect in this course. Both students and your instructor(s) enter with many identities, backgrounds, and beliefs. Students of all racial identities, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, citizenship statuses, ability and other visible and non-visible differences belong in and contribute to this class and this discipline. All students are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. Class rosters are provided to instructors with students' legal names. Please let me know if the name or pronouns I have for you are not accurate. It is important to me to address you properly.

YOUR WELLBEING

Life at college can be complicated. Students often feel overwhelmed or stressed, experience anxiety or depression, struggle with relationships, or just need help navigating challenges in their life. If you're facing such challenges, you don't need to handle them on your own--there's help and support on campus. University Health Services helps students cope with difficult emotions and life stressors. If you need general resources on coping with stress or want to talk with another student who has been in the same place as you, visit the Duck Nest (located in the EMU on the ground floor) and get help from one of the specially trained Peer Wellness Advocates. University Counseling Services (UCS) has a team of dedicated staff members to support you with your concerns, many of whom can provide identity-based support. All clinical services are free and confidential. Find out more at counseling.uoregon.edu or by calling 541-346-3227 (anytime UCS is closed, the After-Hours Support and Crisis Line is available by calling this same number).