Physics 253: Foundations of Physics

Updated: April 4, 2024 (this document subject to change)

Welcome to Physics 253. I am committed to our course—to supporting your learning, to getting to know each of you, to establishing a community with each other, and to encourage you to acquire the transferable skills that will serve you well as a physics student and in your future careers.

Our class will communicate primarily through our Canvas site. Please make every effort to check your email / Canvas notifications for course information regularly. In case of instructor illness, lectures or office hours may be held via Zoom (see link below) or a lecture recording may be provided. Please contact me through Canvas if you will miss class due to extended illness or other issues. Please see the full set of university policies for Spring 2024, including student support resources, under Pages / University Policies.

Teaching Team

The preferred method of communication is through Canvas. If you must email me, please put [PHYS253] in the subject line.

Instructor: Prof. Ben McMorran (he/him) – mcmorran@uoregon.edu
Office Hours: Thursdays 1:30pm-3:30pm WIL 174, or by appt

Teaching Assistants:
Carver Goldstein (he/him) carverg@uoregon.edu
Office hour: F 2-3pm, WIL 218
Drop-in Help Center: F 12-1pm
Malik Hollis (he/him) malikh@uoregon.edu
Office hour: M 3-4pm, WIL 218
Drop-in Help Center: M 2pm-3pm

Jimmy Lynch jlyn@uoregon.edu
Office hour: M 4-5pm, WIL 218
Drop-in Help Center: M 3pm-4pm
Aiden Dillon aidend@uoregon.edu
Office hour: M 10-11am, WIL 072
Drop-in Help Center: M 11-12am

Logistics

Lecture (CRN 34020): TuTh 10:00-11:50am in WIL 100
Tutorials (CRN 34021-34025) will meet at the scheduled times on Fridays in WIL 112

Primary Textbook: Physics for Scientists and Engineers: A Strategic Approach with Modern Physics, 5th Edition, by Knight. A digital copy is included with Mastering
Physics (see below) but a physical copy is recommended. Copies are available in the Price Science Library.

**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. **Please sign up through Canvas (click on “MyLab and Mastering”).**

**Course Platform:** All course communication will be done through Canvas. Here, you may also view announcements, course materials, homework assignments, and your grades at any time.

**Equipment Required:** Each student will need a computer to access the course materials. We will be using Canvas to communicate. We will also be using iClicker Cloud to foster interactive feedback in class. This term, you may use the iClicker Cloud app for free on your phone or other device. To get your iClicker Cloud app and connect to the course, please follow the instructions posted here: [https://teaching.uoregon.edu/resources/iclicker-cloud-student-set](https://teaching.uoregon.edu/resources/iclicker-cloud-student-set)

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**Overview**

This course continues the three-term sequence of foundational physics. Spring quarter introduces Electricity and Magnetism, starting with the electric force, then developing the idea of the electric field and electrostatic potential. After taking a look at simple circuits, we will explore magnetism and magnetic fields. We will finish with the concept of induction and a brief look at AC circuits.

**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.* 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.* 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 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.
- 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 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

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<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Pre-lecture questions (Mastering Physics)</td>
<td>10%</td>
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<tr>
<td>Participation (lecture &amp; tutorial)</td>
<td>10%</td>
</tr>
<tr>
<td>Homework (Written, and Mastering Physics)</td>
<td>30%</td>
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<tr>
<td>Exam 1 (in class)</td>
<td>15%</td>
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<tr>
<td>Exam 2 (in class)</td>
<td>15%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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**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 pre-lecture assignment score will be automatically dropped.*

**Participation & Engagement**: In-person attendance in lectures and tutorials is required. This will enhance your learning and aid you in achieving the course learning goals above. Please contact the instructor to make arrangements for any extenuating circumstances. *Full credit will be awarded for attendance at 80% of lectures and 80% of tutorial sessions.*

Your responses from iClicker will be used to record your engagement in lecture. Full points for the day will be awarded if you answer at least 75% of the opened polls. Being
correct on each poll is not required, but certain questions will be graded and used to award a small amount of extra credit.

**Homework:** Homework assignments will be assigned weekly, and will be composed of Mastering Physics problems, written problem sets to be uploaded to Canvas, and/or video explainers. No late homework assignments are accepted except in case of illness or by prior arrangement with the instructor. Please note that while discussing homework problems with other students is encouraged, copying the work of others and claiming it as your own is academic misconduct and will be treated as such. This includes copying solutions to problems found online. Since most of your course performance is determined by exam scores, and these exams will look a lot like your written homework problems, there is very little benefit and considerable risk to not fully engaging with the homework material. Homework is your chance to practice and to self-assess whether you are understanding the material in this course. Skipping this work will almost certainly impact your final grade. Your lowest homework score will be automatically dropped.

Homework help: For students looking for more intensive help, you are invited to any of the instructors’ office hours, or visits at the Drop-In Physics Center in Price Science Commons. If you need more one-on-one time, there is a list of tutors available for hire in the physics office. These are typically current UO physics graduate students or advanced undergraduates, and the list is made available by the department strictly as a helpful service (to both parties). All arrangements must be made directly with the tutors.

**Exams:** The two midterm exams will be given during class in WIL 100. The final exam will be given in WIL 100 during the scheduled final exam period. There will be no makeup exams. You may not miss an exam except for extreme reasons beyond your control, approved by the instructor. If a higher score is achieved on the final than one of your midterms, that lowest midterm grade will be replaced by your final score. This gives you a chance to revise and improve your learning. Please let us know by the end of week 2 of the term if you need an exam-related accommodation so we can make the appropriate arrangements.

**Final Grade:**

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<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90% to 100%</td>
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<tr>
<td>B</td>
<td>80% to 90%</td>
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<tr>
<td>C</td>
<td>70% to 80%</td>
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<tr>
<td>D</td>
<td>60% to 70%</td>
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<tr>
<td>F</td>
<td>lower than 60%</td>
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The key to getting a passing grade (C or above) is to participate fully and complete all assignments. It is possible for every student in the course to earn an A grade. A+ grades (i.e., “better than perfect”) are not awarded, but extraordinary effort or demonstrated knowledge may be noted on requested letters of reference.