# PHYS 253 – Foundations of Physics I (CRN 34957), Spring 2015

## SYLLABUS

*Updated April 7, 2015 (this document subject to change)*

<table>
<thead>
<tr>
<th><strong>INSTRUCTOR</strong></th>
<th><strong>TEACHING ASSISTANTS</strong></th>
<th><strong>UNDERGRAD ASSISTANTS</strong></th>
<th><strong>CLASS TIME</strong></th>
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</thead>
<tbody>
<tr>
<td>Prof. Benjamin McMorran, PhD, UO Department of Physics</td>
<td>Dileep Reddy (graduate SLP fellow, 1:30 tut.) Email: <a href="mailto:dileep@uoregon.edu">dileep@uoregon.edu</a> Office (basement are by Wil 76): Wed 1-2 pm Drop-In Help Center: Wed 10-11 am</td>
<td>Nathan Wilson (4:00 tutorial) Email: <a href="mailto:npw@uoregon.edu">npw@uoregon.edu</a> Reading Room: Tue 3pm</td>
<td>MWF 9:00-9:50 am, 100 Willamette Hall</td>
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<td>Email: <a href="mailto:mcmorran@uoregon.edu">mcmorran@uoregon.edu</a> Office (Willamette 174): Mon 10-11am, Thu 2-3pm W 11-noon (tentative)</td>
<td>Fehmi Yasin (GTF, 12:00 and 1:30 tutorials) Email: <a href="mailto:fyasin@uoregon.edu">fyasin@uoregon.edu</a> Office (Wil 155A): Tue 4-6pm Drop-In Help Center: Tue 3-4pm</td>
<td>Alex Schachtner Email: <a href="mailto:aschacht@uoregon.edu">aschacht@uoregon.edu</a> Reading Room: Wed 10am</td>
<td>Attendance is not strictly required, but note in the Grading section that there is a participation component to your grade.</td>
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<td>Gabriel Barello (GTF, 5:30 tutorial) Email: <a href="mailto:gbarello@uoregon.edu">gbarello@uoregon.edu</a> Office (Wil 453): Tue 3-4 pm Drop-In Help Center: Mon 11am-noon</td>
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<td>Gene Krasnitskiy (GTF, 9:00 tutorial) Email: <a href="mailto:ykrasnit@uoregon.edu">ykrasnit@uoregon.edu</a> Office (Wil 231): Wed 3-5 pm Drop-In Help Center: TBD</td>
<td>Tom Wolken (5:30 tutorial) Email: <a href="mailto:twolken@uoregon.edu">twolken@uoregon.edu</a> Reading Room: Tue 2pm</td>
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<td>Maira Amezcua (GTF) Email: <a href="mailto:mamezcua@uoregon.edu">mamezcua@uoregon.edu</a> Office (Wil 175): Wed 5-6 pm Drop-In Help Center: TBD</td>
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## WEBSITE

Course materials will be distributed on Blackboard ([https://blackboard.uoregon.edu/](https://blackboard.uoregon.edu/)).

## EMAIL

**You must use your uoregon.edu email address** when corresponding with the instructor and GTFs by email. Please mention PHYS 253 in the subject line. Email will be checked only during normal work hours.

## TEXTBOOK

*Physics for Scientists & Engineers with Modern Physics, 4th Ed.*, by Douglas Giancoli

A reading schedule for the course is available in a separate document. Two textbook copies are reserved at the Science Library (call # SB MCMORRAN).

This year, I am evaluating a new textbook, *Principles and Applications of Physics* by Eric Mazur. If you are interested in using this textbook as an alternative, I have a very limited number to loan out for the year.

## PRE/CO-REQ

PHYS 252, MATH 253 (Calculus) or equivalent. PHYS 290 is a completely separate course, though it is aligned with the material. It is recommended, though not required as a co-req (but it is required for a physics major).

## SCOPE

This course applies the quantitative thinking and problem-solving skills you learned in PHYS 251 and 252 to analyze electricity and electromagnetism. The following topics (Ch. 21-31) will be covered:

- Electrostatics – electric charge, electric field, Coulomb’s law, Gauss’ law
- Electric potential
- DC and AC circuits – resistors, capacitors, inductors, Ohm’s law
- Magnetism – magnetic fields
- Electromagnetic Induction - Faraday’s law, transformers
- Electromagnetic waves
OBJECTIVES
The primary goal for this course is to prepare students for further study of the physical sciences. In order of importance, this training involves:

1. Learn how to learn a new, difficult scientific concept. While a component of this involves learning from experts in the field (your instructors) in the traditional manner, this course will also use active learning techniques designed to engage you, the student, in the material. These techniques are proven to not only help you learn physics better, but more importantly train you how to teach yourself scientific concepts.
2. Gain a solid conceptual understanding of basic physics principles, such that you can qualitatively predict the behavior of simple physical systems.
3. Learn how to quantitatively analyze physical situations (i.e., problem-solving skills).
4. Learn how to communicate your physical analysis, through both verbal and written communication.

Solving and discussing lots of physics problems (assigned homework at the very least) is the only way to master these skills.

The primary personal development objectives of this course:
- Increase your puzzle-solving skills and “working memory”.
- Learn to extract deep insights and enjoyment through deep contemplation of seemingly mundane things, like simple machines or the positions and movement of everyday objects.
- Develop a tolerance (perhaps even an enjoyment) of being confused and confronted with a seemingly intractable problem.
- 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.

COURSE STRUCTURE
In this course, instead of you passively learning (i.e., me guessing what you already know, dictating what you ought to learn, and you falling asleep in your seats and expecting to somehow understand and retain every word I say), we will make use of active learning techniques (i.e., clicker-based class discussions, in-class activities, student-guided learning). Why? Many studies have shown that you learn science concepts much better in a class that uses active learning – for an excellent review on this, see S. Freeman et al., “Active learning increases student performance in science, engineering, and mathematics” Proceedings of the National Academy of Science 111, 8410–8415 (2014) [http://www.pnas.org/content/111/23/8410]. Also, it is more fun.

SCHEDULE
A schedule for the course is in an accompanying document. It includes a list of dates, topics covered, and required reading. This schedule will be changed as needed, so look to Blackboard for the updated schedule.

GRADING
The following grading scheme is adopted to accomplish the goals discussed above. It is also designed to help you get a better course grade by diversifying what you are graded on.

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<th>Activity</th>
<th>Weight</th>
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<tr>
<td>Participation (P)</td>
<td>10%</td>
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<tr>
<td>In-class clicker-based discussions and polls (no penalty for 3 skips)</td>
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<tr>
<td>Tutorial (T)</td>
<td>10%</td>
</tr>
<tr>
<td>Collaborative meetings on Tuesdays (no penalty for 1 skip)</td>
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<tr>
<td>SmartPhysics (SP)</td>
<td>15%</td>
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<tr>
<td>Online exercises due by 8:00am most MWF (lowest 3 scores dropped)</td>
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<tr>
<td>Homework (HW)</td>
<td>15%</td>
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<tr>
<td>Written problem solutions due by 6:00pm Wednesdays (lowest score dropped)</td>
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<tr>
<td>First Midterm Exam (MT1)</td>
<td>15%</td>
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<tr>
<td>Wednesday, Apr 29, 6:00 PM, Willamette 100</td>
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<tr>
<td>Second Midterm Exam (MT2)</td>
<td>15%</td>
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<td>CLICKERS</td>
<td>In general, vibrant class participation enhances all students’ learning experiences – we will use a “clicker” audience response system in class to mediate discussion. Clickers can be purchased at the UO bookstore or online, or borrowed from a friend. Both i&gt;Clicker 1 and i&gt;Clicker 2 will work for this course (there should be many i&gt;Clicker 1’s available on the use market). Register your clicker on the Blackboard course website under ‘Course Information’, not the i&gt;Clicker website. Make sure you use the same clicker each class period, bring an extra set of batteries with you, and make sure your clicker answers are logged. You are expected to enter in your own answers. Clicking in for someone else who is not present is academic misconduct (see below).</td>
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<td>TUTORIAL</td>
<td>All tutorials are on Tuesdays in 112 Willamette. Tutorials are smaller meetings consisting of interaction with a graduate TA and small groups of other students. Tutorial attendance is not strictly mandatory, but each tutorial contributes roughly 1% to your final grade.</td>
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<td>SMARTPHYSICS</td>
<td>SmartPhysics is an online physics learning tool. There are three components to each learning module: PreLectures, CheckPoints, and Exercises. You are expected to interact with all three components before 8 AM on the assigned day of the associated lecture. Each SmartPhysics unit will be made available one week in advance. A full-featured DEMO version of SmartPhysics is available for 30 days, after which you must pay $38 twice during the year to retain access thereafter.</td>
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<td>HOMEWORK</td>
<td>Homework will be a set of written problems. The primary purpose of assigned problems is for you to practice and then demonstrate that you have learned 1) how to determine the fundamental physical principles that are involved in a described situation and 2) how to apply</td>
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those principles in a disciplined and orderly fashion. Of course, if you have learned how to do these things, you should expect to get the right answer too, but that is - really - of secondary importance. More often then not, students spend too much time and energy scouring over pages of notes, books and worked problems to "get the answer" without the slightest understanding of what they are doing. Please resist doing this; it is a complete waste of your time because it does not prepare you for exams, in which you must apply the skills developed in homeworks and tutorials in order to solve new and interesting problems.

For each homework, you must clearly communicate your analysis through a presentational solution. Follow the style of presentation in the example problems in your book. By this we mean that each solution should be readable by someone who does not have access to the problem statement. It should include written explanations and thoughtful comments about what you are doing and why you are doing it! You should also use well-defined and consistent notation (such as subscripts and superscripts) and neatly draw and carefully label any relevant diagrams. Finally, your solutions should flow in a logical and orderly progression down the page. You should find yourself using more space for the written explanatory information than for the mathematics! Your solution should not include lengthy, multiple-step, purely mathematical manipulations because it only serves to obscure the physics. Do this kind of work on scratch paper and simply say something like "Solving equations 1, 2, and 3 for x, y, and z, we obtain ..." and give the result. Each week, the problems that must be done in this presentational format will be marked accordingly. However, we encourage you to solve every problem in this way, as it helps you to thoroughly understand the material.

We will not “check” your homework solutions in a serious fashion; it is up to you to check them against the solutions that we will post online and to get answers—from us or others in the class—to any remaining questions you have. Instead, you will be graded out of 10 points each week. For every problem skipped, you will lose one point and be marked ‘-1’. If your explanation lacks detail and thorough understanding as described above, the problem will be marked with a ‘?’ and you will lose 1/3 of a point. If you get the wrong answer, the problem will be marked with an ‘X’ and you will lose 1/3 of a point. Each correct solution will receive a ‘✓’.

Turning in complete homework on time is crucial to getting a good grade in the class. Working (and struggling) on problems yourself provides the only opportunity to gain insight into the concepts you're learning and prepare for the exams. Furthermore, the exercises are designed to convey more material than what can be covered in class. Homework is due each Wednesday before 6:00 PM, in the appropriately labeled box in the basement of Willamette. Late homework turned in Thursday gets a 25% penalty, and after Thursday gets a 50% penalty. In calculating final grades, the lowest homework score of the term will be deleted, assuming the homework has been turned in and valid attempts have been made at all the problems. Thus, even if homework is late (even after Thursday) you are encouraged to turn it in so that it can be checked for completion and the low score can be removed during final grading.

You are expected to make your best attempt at solving every problem by yourself before consulting with others. Thereafter, you are highly encouraged to work with others. However, the work you submit should be your own – never just copy, try to add your own comments and observations. You are discouraged from looking for solutions to problems online, but if you do you MUST cite your source (e.g., URL) and include your own additional comments and details. If you get the solution from somewhere else, you must include additional information (further analysis, filled-in details, comments, etc) showing that you thoroughly understand the solution. Simply copying solutions and/or not citing sources will be treated as a violation of the
Academic Code of Conduct. Solutions to all the problem sets will be posted – **study** these. Grades will be posted to Blackboard on or by the Monday after homework is turned in. Please check your Blackboard account regularly and report any discrepancies or possible errors as soon as you notice them. 

**Note:** There will be a homework assignment due during Dead Week.

**Midterm Exams**

There will be two midterms, one at **6:00 PM on Wednesday, April 29**, and the second at **6:00 PM on Wednesday, May 27**. Both will take place in **Willamette 100**. There will be no makeup exams. If there is a serious (e.g. involving illness) and well-documented (e.g. with a doctor’s note) reason for missing the midterms, the final exam score will count extra, in place of the missed tests. *In the event you score better on the Final than on either of the Midterms, your final exam score will replace your lowest midterm exam score.*

**Final Exam**

As mandated by the Registrar’s Office ([registrar.uoregon.edu/calendars/final_exam](http://registrar.uoregon.edu/calendars/final_exam)), the final exam will take place at **10:15 AM - 12:15 PM on Friday, June 15**. You must take the exam at this time (no exceptions). Bring a calculator to the Final.

**How to Do Well in the Course**

- **Do all the homework**, turn it in on time, and study the solutions.
- Participate in class. Do not be aloof (i.e., don’t isolate yourself in the back rows).
- Read the suggested textbook sections before coming to class. Work through examples. Know that physics textbooks must be re-read multiple times for it to sink in.
- Complete the SmartPhysics activities before coming to class.
- Participate in discussions in class and on the forum (both talking and listening)
- Work on understanding all the concepts and example questions discussed in the lectures and the homework. “Understanding” does *not* mean “it sounds like it makes sense to me,” but more deeply, “I could explain this concept to one of my classmates.”
- Come to office hours (especially with questions you think you should know!)

**Forum**

Questions about the course or homework can be directed to the Course Discussion Forum on the Blackboard. If you do not find the answer already there, then post your question. Others will probably have similar questions, and here they can be answered all at once.

**Physics Drop-In Help Center**

The Physics Drop-In Help Center in 147 Willamette is staffed by physics TAs during normal business hours. Specifically, PHYS 252 GTFs will also be available in The Drop-In center at the times specified above, but other GTFs will be available pretty much any time during normal working hours. Please notify Prof. McMorran if the room is unattended by a GTF.

**SPS**

The U of O has an active chapter of the Society of Physics Students (SPS). This is a good thing to be a part of if you wish to hear more about physics research and how to get involved. See [http://physics.uoregon.edu/~sps/](http://physics.uoregon.edu/~sps/) for more information.

**Students with Special Needs**

If there are aspects of the instruction or design of this course that result in barriers to your inclusion, please notify me as soon as possible. You are also welcome to contact Disability Services in 164 Oregon Hall, 346-1155.

**Laptops and Phones in Class (None)**

The use of laptop computers and phones in class is highly discouraged. Why? See [http://web.stanford.edu/class/linguist156/laptops.pdf](http://web.stanford.edu/class/linguist156/laptops.pdf). Several studies show that students using laptops in class spend a great deal of time on non-class-related activities (texting, FB, playing games, etc.) and that these distractions negatively impact both learning and grades. This alone isn’t a reason to ban laptops – you’re responsible for your own performance in class. However, studies have shown that laptop use distracts and impacts the learning of other students nearby. (E.g. Fried, C. B. *Computers & Education* 50, 906-914 (2008).) Plus, students have complained about the environment created by their classmates’ laptop use. Taking notes by hand, by the way, is shown to be more effective in cementing concepts in your mind (H. Hembrooke, H. and Gay, G., *J. Comput. High. Educ.* 15, 46–64 (2003) and Mueller, P. A., Oppenheimer, D. M.,
**Psychological Science**, 0956797614524581 (2014)). You can always take a quick photo of your notes if you want a digital copy.

### Academic Misconduct

Students have the responsibility to behave honorably in an academic environment. The University Student Conduct Code (available at conduct.uoregon.edu) defines academic misconduct. Academic dishonesty, including cheating, fabrication, facilitating academic dishonesty, and plagiarism, 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. All incidences of suspected academic misconduct will be reported to the Office of Student Conduct and Community Standards. The procedures for handling academic misconduct cases are outlined in Oregon Administrative Rule OAR517-021-0215.

You must work by yourself on exams. On homework and in tutorials, you are allowed (and encouraged) to work with other students, your TA and your instructor. However, you should **not** just directly copy from them. Doing so is not only academically dishonest, but will hurt your ability to do the problems on the exams.

### Sexual Discrimination and Harassment

The UO is committed to providing an environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic and dating violence and gender-based stalking. If you (or someone you know) has experienced or experiences gender-based violence (intimate partner violence, attempted or completed sexual assault, harassment, coercion, stalking, etc.), know that you are not alone. UO has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more.

Please be aware that all UO employees are required reporters. This means that if you tell me about a situation, I may have to report the information to my supervisor or the Office of Affirmative Action and Equal Opportunity. Although I have to report the situation, you will still have options about how your case will be handled, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

If you wish to speak to someone confidentially, you can call 541-346-SAFE, UO’s 24-hour hotline, to be connected to a confidential counselor to discuss your options. You can also visit the SAFE website at safe.uoregon.edu.