PHYS 353 (Spring 2015; 34967) Foundations of Physics II

PHYS 353               Foundations of Physics II               Spring 2015

Class times: M,Tu, 10-11:50am and Th, 10-11:50am          Location: WIL 110

Instructor: Miriam Deutsch   Office: 275 WIL   Tel: 6-5973   Email: miriamd@uoregon.edu

Office hours: Friday 3-4pm, or by appointment.

Note: I will not be holding office hours on April 10th, May 15th and June 5th.

TA: Saba Moslehi   Office: WIL 72   Email: sabamoslehi@gmail.com

Office hours: Tuesday 2-3pm, Wednesday 2-3pm, or by appointment.

TA: Bishara Korkor   Office: WIL 217   Email: bkorkor@uoregon.edu

Office hours: Monday 12:30-1:30pm, Wednesday 12:30-1:30pm, or by appointment.

Attendance policy: Attendance is not required, nevertheless recommended. Lectures will cover materials which are mostly in the textbook and follow the order of chapters in the book, but will address different approaches to solving problems, expand on examples in the text and solve problems not necessarily from your book.

Course text: The required text is *An Introduction to Thermal Physics* by D. Schroeder. This is the same textbook you used in PHYS 352 in Winter Term.

Course outline: This term will focus on Part III in the textbook, which addresses the fundamentals of statistical mechanics. We will cover Chapters 6 and 7 rather thoroughly, as they lay down all the necessary foundations of statistical mechanics. We will begin with the introduction of Boltzmann statistics, used for classical systems. Together with introducing fundamental concepts such as the partition function and the Maxwell distribution, we will also work through practical examples of how these concepts are implemented when analyzing atomic excitation spectra or magnetization of materials. We will then move on to Chapter 7, which addresses quantum statistics. Here we will introduce new terminology – that of Bosons and
Fermions – two fundamentally different properties which are used to describe the behavior of quantum particles. We will see that ensembles of Bosons and Fermions exhibit strikingly different statistics, resulting from their fundamentally different quantum properties. These behaviors and statistics are used to describe a great portion of the world around us – from the properties of solids to the glow emitted from hot objects. We will address these phenomena, using relevant examples and demonstrations whenever practical. The midterm exam will mostly cover materials in Chapter 6, as well as some material from Chapter 7. If time permits we will cover one topic from Chapter 8 – the weakly interacting dilute gas. This will serve as an example of using statistical mechanics to describe non-ideal, interacting systems (i.e. realistic gasses.)

**A note on tutorial sessions:** Three tutorial sessions are scheduled for the term. These will be held on the following dates: April 6, May 18 and June 4. The TAs will be conducting these sessions. On **April 6** the session will cover the first assigned HW set, as this will differ significantly from HW assigned in PHY 352. On **May 18** you will have a chance to go over solutions to the midterm exam. On **June 4** you will be able to review all previous HW problems, discuss any grading questions with the TAs, review again any open questions from the midterm exam, and complete any remaining work you plan to submit.

**Homework:** Homework will be assigned weekly and will be collected the following week. **Completed assignments should be placed ONLY in the labeled submission box in the basement of Willamette Hall** (not far from the teaching labs.) I will not be collecting your homework in class. **Assignments may not be submitted by email or through Canvas.** Solutions to the homework problems will also be provided through Canvas. It is important you review them, as they might hold additional information to what we do in class. You should always make an effort to submit your assignments on time. Homework submitted up to 24 hours late will **not** be graded and will receive 20% credit. Assignments submitted later than that will not be graded and will be recorded as missed (i.e. will receive a score of 0 points.) Special circumstances and emergencies may be accommodated on a case-by-case basis. In such cases you should contact me as soon as possible to discuss your specific needs. Do not assume you will receive a deadline extension without discussing the matter first with me. **Tests may only be taken during the scheduled time and date, and will NOT be available to make up or to take at alternate dates.**

**Students leaving before the end of term for REU:** You will **not** be able to take the final exam before you leave for your summer research program. You should plan on taking the exam at the same time and day it will be given here. If you know you will need to leave for your REU before the end of term, you will need to contact your host and request that arrangements be made for someone to proctor the exam on site during exam hours here. I require the contact information of that person, **two weeks before you leave here,** in addition to documented proof of the program’s start date. Your contact person for this purpose may be your hosting professor, a graduate student.
in your host’s group, REU program administrator at the hosting institution, or any other administrator directly affiliated with your hosting department. Once I’ve verified that all proper arrangements have been satisfactorily made for you to take the final exam at the remote location, I will email it directly to the contact person the day before the exam is scheduled. After taking the exam your proctor will scan it into a PDF file and email it to me immediately. In addition, the exam should be placed in an envelope and mailed to my Physics Dep’t mailing address via standard mail. This is the only acceptable arrangement for taking the final exam, with no exceptions, and it is only available for students who have been accepted to REUs (or equivalent summer research programs) with non-flexible starting dates, outside Oregon.

Course web site: [http://canvas.uoregon.edu/](http://canvas.uoregon.edu/) I will post homework assignments, course announcements and handouts. Solutions to homework problems will also be posted here. You will need to check Canvas regularly for updates.

Exams and grade determination: Exam and grade breakdown are as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Scheduled for</th>
<th>% Weight of final grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm Exam</td>
<td>May 14, in class</td>
<td>25%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>June 11, 10:15am, in class</td>
<td>35%</td>
</tr>
<tr>
<td>Homework</td>
<td>Weekly</td>
<td>40%</td>
</tr>
</tbody>
</table>

Your final grade in the course will be determined as follows:

<table>
<thead>
<tr>
<th>Final score (%)</th>
<th>Grade</th>
<th>86-100</th>
<th>71-85</th>
<th>56-70</th>
<th>45-55</th>
<th>Below 45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>F</td>
</tr>
</tbody>
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The broad number ranges will allow room for +/- grades. For example, a final average score of 90% may be a final grade of either A- or A, depending on the actual distribution of grades. If I find it necessary, I will curve the grades. Midterm grade distributions will be posted on Canvas.

Note: The highest grade of any standard curve will be A. I reserve the grade of A+ only to special cases, when a student’s performance is clearly above the norm. In statistics such cases are known as outliers. Hence an average score of 95%, for example does not guarantee you a final grade of A+.
**Tip for doing well in this class:** DO ALL YOUR HOMEWORK. There are two reasons this will help you succeed. The first is simple – homework assignments count for 40% of your final grade. The better you do on them the higher your final grade will be. The second lies in my tendency to regularly borrow from homework problems when I write my exams. Many of the homework exercises will address core problems in statistical mechanics. Practicing those will help you stay on track and avoid major surprises on the exams.

**Professionalism:** A scholar takes care with his or her learning and the products of his or her efforts. This pertains to all aspects of the work, including attention to written and oral directions, proofreading, spelling, turning off cell phones before class, etc. Additionally, students are responsible for completing their own work. Plagiarism (submitting someone else’s work and claiming it to be your own) will not be tolerated, and will be reported and disciplined according to student conduct guidelines.

**Academic Integrity:** All students are expected to complete assignments in a manner consistent with academic integrity. Students must produce their own work and properly acknowledge and document all relevant sources. Students can find more complete information about the University of Oregon’s Policy on Academic Dishonesty in the University of Oregon *Student Handbook*.

**Students with Disabilities:** The University of Oregon is working to create inclusive learning environments. If there are aspects of the instruction or design of this course that result in barriers to your participation, please notify me as soon as possible. You are also encouraged to contact the Accessible Education Center (formerly Disability Services) in 164 Oregon Hall at (541) 346-1155 or uoaec@uoregon.edu. If you are not a student with a documented disability, but you would like for me to know about class issues that will impact your ability to learn, I encourage you to come visit during office hours so that we can strategize how you can get the most out of this course.

**Discrimination and Sexual Harassment:** The UO is committed to providing an environment free of all forms of prohibited discrimination and sexual harassment, including sexual assault, domestic and dating violence and gender-based stalking. Any UO employee, myself included, who becomes aware that such behavior is occurring has a duty to report that information to their supervisor or the Office of Affirmative Action and Equal Opportunity (http://aaeo.uoregon.edu/). The University Health Center and University Counseling and Testing Center (http://counseling.uoregon.edu/) can provide assistance and have a greater ability to work confidentially with students.