Physics 210: Modern Physics

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Text: *Modern Physics for Scientists & Engineers*, Thornton & Rex

Other recommended reading *(i.e., fun stuff to read, but only if you want to)**:***
The Elegant Universe, Brian Greene
Einstein's Dreams, Alan Lightman

Prerequisite: PHY 111

This is a course in physics as it has evolved since 1895. We will investigate the problems that faced physicists at the turn of the 20th century, and the advances that followed.

Use of Moodle: All course materials, assignments, and grades will be available on Moodle for this course. Most homework sets will likely be worked out on paper and can be handed in that way. Any warm-ups, homeworks, labs, projects, etc. that are done on the computer can be handed in online – I strongly prefer this to printed paper.

Office hours: Mon. 11 AM – 12 PM, Tues. 10 AM – 11 AM, Wed 4 – 5 PM
Feel free to communicate with me by email, or to set up an appointment at other times. Wednesday and Friday mornings are reserved for research and I will not be available. You are also welcome to stop by anytime I am in my office, but please be aware that at times other than the scheduled office hours or appointments, I may be interrupted by other obligations.

Grading:
40 % Homework – Warm-ups and Problem Sets
10 % Project Discussion & Report
25 % Midterm Exam
25 % Final Exam

Late Policy. Unless prior arrangements are made, late assignments will be accepted with a 10% penalty per calendar day, up until the time graded assignments are returned and solutions are posted. Graded homework will generally be returned within one week of its due date. The lowest homework score will be dropped at the end of the semester.

Problem-solving. Solving problems is critical to increasing expertise in physics. Collaboration is also a good way to increase understanding of a topic. Problems will be assigned regularly, in coordination with the in-class work. You may work together and use other resources to assist with the problems, but should write an individual solution to turn in. Solutions will be posted on Blackboard after graded assignments are returned, to help you review the material.

Problem sets may include setting up problems, solving the problem conceptually or with a numerical result, or writing a qualitative interpretation. Questions should be answered in clear,

complete sentences. Show all the steps in the problems and explain any assumptions you make in your problem solving. Most of the credit for the problem will be for the method and explanation. You will also be expected to occasionally present your homework problems to the class.

Experiments. Because Modern Physics arose from a series of critical experiments, conducting some of these experiments ourselves will enable deeper understanding of the results. Several experiments will be conducted throughout the semester in class or as homework assignments. You will be allowed access to the lab (BSC 109W) by a door code, but *please* keep the code confidential for your safety and the safety of the equipment.

Exams. There will be two exams in this class, an in-class midterm exam and a self-scheduled final. Exams will include problems (similar to those on the homework problem sets) as well as short-discussion questions. Questions may include material from the Nobel prize discussions and the labs.

Projects

The Annual Meeting of the Southeastern Section of the American Physical Society is being held in Atlanta this year. This gives us a wonderful opportunity to see some "modern" physics – work that is very current and relevant today. The meeting will be held near the airport Nov 11 – 14, 2009. I would like all of you to attend the meeting and so we will not have class on Thursday, November 12.

Your project for the semester will be to attend a talk given at this conference and present the topic to the class in more detail. More information on the expectations for the project will be posted on Moodle.

Course Evaluations

Near the end of the semester you will be notified by e- mail and provided with a link to follow to complete course evaluations on line outside of class. I want you to know that your feedback on the course is extremely valuable to me, the department, and the administration. In particular, I take your comments very seriously and use them to improve the course the next time I teach it. Please do fill out a course evaluation when you receive the e-mailed link at the end of the semester.

Events

In addition to the SESAPS meeting (see projects above), there will be a lot of really exciting events on campus this fall due to the International Year of Astronomy celebration. These will be very relevant to what we are covering in class and I do hope that you can attend as many as possible! I will keep you updated on Moodle on all upcoming events.

Tentative Schedule of Topics
(To be updated as the semester progresses)

Date	Subject	Reading
08/27	Introduction, Historical Context	Ch. 1
09/01	Special Relativity	2.1 – 2.2
09/03	Special Relativity	2.3 – 2.8
09/08	Special Relativity	2.9 – 1.14
09/10	Special Relativity/sneak peak at General Relativity	15.1 – 15.3
09/15	Experimental Motivation for Quantum Mechanics	3.1 – 3.5
09/17	Experimental Motivation for Quantum Mechanics	3.6 – 3.9
09/22	Atomic Structure	4.1 – 4.4
09/24	Atomic Structure	4.5 – 4.7
09/29	Atomic Structure / Wave Properties of Matter	5.1 – 5.4
10/01	Wave Properties of Matter	5.5 – 5.6
10/06	**Midterm Exam**	
10/08	Wave Properties of Matter	5.7 – 5.8
10/13	Schrödinger Equation, Expectation Values (Guest Lecturer)	6.1 – 6.2
10/15	***Fall Break—Enjoy!***	
10/20	Infinite Well, quantized energy	6.3 – 6.4
10/22	Finite well, Simple Harmonic Oscillator	6.5 – 6.6
10/27	Tunneling, Spherical Schrödinger Equation	6.7 & Start Ch. 7
10/29	Hydrogen	7.1 – 7.3
11/03	Hydrogen	7.4 – 7.6
11/05	Atomic Physics	8.1
11/10	Atomic Physics	8.2 – 8.3
11/12	***No Class – SESAPS Meeting***	
11/17	Atomic/Molecular Physics	Rev. Ch 8
11/19	Nuclear Physics	Ch 12
11/24	Nuclear Physics	13.4 – 13.5
11/26	***Thanksgiving Break—Enjoy!***	
12/1	**Project Presentations – Project Papers Due**	
12/3	**Project Presentations**	