

Physics 3700/3701: Modern Physics
Austin Peay State University
Department of Physics and Astronomy

Course Syllabus
Fall 2007

Instructor: Dr. Kevin Schultz
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Office Hours:
MWF 11:00AM-1:00 pm or by appointment.

Meeting Times:
MWF 10:10 – 11:05 am SSC B111, Tues 9:30 – 12:20 pm SSC B310
To be properly enrolled in this course, you must be registered in the lecture section (PHYS 3700, section 5, CRN 996, 3 credit hours) **and** the lab section (PHYS 3701, section 6, CRN 997, 1 credit hour).

Prerequisites: Prerequisite: PHYS 2120 or permission of instructor.

Text:
Modern Physics for Scientists and Engineers, Thornton and Rex, Thomson Brooks-Cole 2006. ISBN 0-534-41781-7. The labs will be handed out in class.

Course Description:
This class will introduce physics first developed in the 20th c. and which now form the basis for much of modern physics. Topics include, but are not limited to: Relativity, early atomic models, quantization of radiation, wave mechanics, Schrödinger's equation, wave functions, the quantum model of the hydrogen atom, atom-light interactions, electron spin, and multi-electron atoms, statistical physics, molecules, and particle physics.

The laboratory component will introduce students to more sophisticated lab apparatus and experiments than had been encountered in introductory physics. These labs will also help reinforce concepts introduced in lecture. Topics may include: the measurement of Johnson Noise, the optical Doppler Effect, the photoelectric effect, x-ray diffraction, spectroscopy of atoms and molecules, and spin resonance experiments.

Course Objectives:

The purpose of the course is to help students:

1. Develop scientific problem solving skills using calculus.
2. Develop an elementary understanding of relativity, quantum mechanics, and atomic, nuclear, and particle physics.
3. Develop an elementary understanding of the experimental results that lead to the above physical models.
4. **Develop critical and analytical thinking skills.**
5. **Develop appropriate scientific communication skills.**

Physics cannot be memorized! To be a successful student in physics (and elsewhere) it is required that you learn how to think effectively. In this course, you will be introduced to analytical thinking. This is not something that comes easy, or is something that is fully developed at the end of the course. It is something that you will hopefully hone for the rest of your life. It is hoped that at the end of the course, you will have some of the tools required for such an undertaking. Developing these skills requires you to read the textbook (including the examples presented in the book which are fair game for tests!), attend class, complete the labs, and practice, practice, practice (working problems). Although this may seem daunting, it is not beyond the capabilities of anyone in this class. *Finally, it is important to ask questions.* You can **never** be penalized for asking questions. This may be the most difficult thing to learn in this class, but if you get over your shyness you will find it to be the most helpful lesson.

Course Requirements:

Lectures – Each student is responsible for the material and announcements presented in the lectures. I intend to follow the text; however, I will not necessarily discuss topics in the same order as the text, and I intend to skip certain sections of the text. Also, lecture will include some topics not covered in the text as well as in-class demonstrations.

Homework – Objective sheets will be handed out on the first day of classes and immediately following each exam. The objective sheet will consist of reading assignments, and problem sets from the text. Each student must turn in a homework folder immediately before each exam. The folder should include (in this order):

1. Answers to any assigned conceptual questions. An explanation or description of why each answer is correct should be included.
2. Worked exercises. Complete work for each exercise must be shown for credit.

The folders will serve as study guides for the exams! **Late assignments will not be accepted.** Assignments may be worked on in groups, but each student must turn in or present his or her own solutions. Be advised that the number of problems assigned **may not** be sufficient for a thorough understanding of the material. You should work as many of the unassigned problems in the text as necessary for you to feel comfortable with the topic at hand.

Laboratories – There will be 5-6 laboratory exercises that must be performed in the course of the semester – one approximately every two weeks. While there is a scheduled 3-hour meeting time each week, we will only meet every week for approximately one hour. During that time, the lab assignment will be made and discussed, and each lab group will schedule a 3-hour block of time in which to perform the lab. You are required to purchase a lab book and record any and all notes regarding the lab. During the ‘off weeks’ when a new lab is not being discussed, we will use the class as an opportunity for discussions about the class, labs, or homework.

It is expected that you will have gone into the lab and performed the experiment by the end of the first week. During the ‘off week’ session, you will show me the lab book and ask any questions regarding the lab. If all is all right, you can proceed to the write-up stage of the lab. If we feel that you need to go back and take better data, you will do so and then finish the write-up. Failure to show your results after the first week will result in a letter grade reduction of your grade for that lab. At the end of the two-week period, a laboratory write-up must be turned in before the next lab is assigned. Each lab group should turn in one write-up. All write-ups will be journal-style and **must** be typeset using the LaTeX typesetting system (available on the computers in the classroom and for home use if you wish). An example of the write-up format as well as a LaTeX tutorial will be handed out in class.

All lab group members are expected to participate equally in both the experimental and write-up portions of the laboratory. Your write-ups should end with a statement to this effect signed by each member of the group. If either lab partner's signature is absent, dissention will be assumed and a meeting will be scheduled with the lab instructor.

The laboratory grade is integrated into the class grade – you will receive the same letter grade for both the lab and the lecture. Completion of the labs is mandatory. If you miss a lab for any reason, it must be made up. **Failure to complete more than one laboratory assignment will result in failure for the course.**

Presentation – Each student will be required to make one presentation 10-15 minutes in length during the lab session of September 18. The topics will be assigned at the first lab session and will include topics from Chapters 3 and 4 of the textbook. We will not have time to cover these important topics in lecture, but these topics are historically important and by researching these topics for your talks, it is hoped that you will get a deeper understanding of how physics is done and what led to these ideas. The talks will be 'lecture-style' and will be done without PowerPoint (you can use the overhead projector to show important graphs or data if you like). Your presentation will be weighted the same as a lab exercise with the same penalty for missing too many labs. Because, some of these topics will be important later in the class, make-up assignments will be allowed only under the most extreme circumstances. This lab period will most likely require the entire lab period, so make sure that day is free. Attendance is mandatory for the entire period! If you leave, your presentation grade will be lowered a half-letter grade.

Exams – There will be three exams during the semester as well as an exam during finals week. The exams will be one-hour exams, dates for which are given in the Outline. Each exam will cover approximately 4 weeks (11 meetings) worth of material. The date and time for the final exam are given on the outline. **The final will not be comprehensive.** The exams will consist of approximately 50% problem solving questions and 50% conceptual questions (multiple choice and short answer).

Grading – You may always submit an assignment for a re-grade if you believe I have made an error, but be warned, I reserve the right to re-grade the entire assignment. The final grade for this course will be determined using the percentages below and a standard 10-point grading scale. Your actual letter grade may be determined from a curve based on the overall class performance (don't worry, this curve can only better your grade).

Exams 15% each (60% total)
Laboratory and Presentation 25%
Homework 10%
Participation 5%

Attendance Policy:

APSU allows individual faculty members to set their own attendance requirements. Remember participation makes up 5% of your final grade. Also keep in mind that it is not enough to read the book, the professor has a roll in teaching as well. In addition, any assignments not turned in because of an absence, can be made up at my discretion. Do not assume, that missing a due date for a lab, homework, or a test, will result in an automatic makeup.

Academic Dishonesty: (p. 135, Student Code of Conduct, *Academic and Classroom Misconduct*) - Cheating is a serious breach of academic conduct; punishment for offenses range from a grade of "F" on the assignment to expulsion from the university. This includes unintentional plagiarism.

Plagiarism Policy: Plagiarism is using someone else’s words or ideas as if they are your own. Plagiarism or other forms of cheating will not be tolerated—and will result in a grade of zero for an assignment or failure of the course, at the discretion of the instructor. We will discuss plagiarism in more detail as “Academic Honesty.” You may also discuss it with the librarian who is assigned to our class. Learning to quote, paraphrase, and document sources of information correctly is the best way to avoid plagiarism.

Disability Policy:

Any student who has a disability that may affect his or her academic performance is encouraged to make an appointment with me to discuss this matter, or you may contact Disability Services at telephone 221-6230 voice, 221-6278 voice TTY.

Academic and Classroom Misconduct:

Students are expected to conduct themselves appropriately at all times. Academic and classroom misconduct will not be tolerated. Students must read the “Code of Student Conduct” in the current Student Handbook for an understanding of what will be expected of them within the academic setting.

You may not bring unauthorized materials of any kind to any of the quizzes or exams. This includes, but is not limited to, storing formulas in a programmable calculator. Blatant copying of any problem solution from any source is forbidden.

If you have any questions or concerns regarding a topic covered in this syllabus, please ask me to clarify!

(The above schedule and procedures are subject to change in the event of extenuating circumstances.)