

PHY 305:Modern Physics I, Fall 2014

The Mind is not a vessel to be filled, but a fire to be ignited- Plutarch

Text: *Modern Physics 3rd ed.*, Krane

Instructor: Dr. Matt Marone Room 243 Science and Engineering Building

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Assistance outside of class: W 3:15-4:15 SEB 243, please contact me if you plan to come. Outside of these hours please make an appointment. You may email me your questions as well.

Lecture: MWF 2:00-2:50, SEB 140

Prerequisite: Phy161,162 Mat 191,192

General:

This is an advanced course in physics. In the early part of the twenty century we discovered that many of the ideas of classical physics “failed” or behaved in unexpected ways when we performed experiments probing the atomic scale. This time period marks the beginning of special relativity and quantum mechanics. Relativity and nuclear physics are more extensively treated in physics 306. In this class we will discuss topics such as the wave-particle duality of light, the Schrodinger equation, elementary quantum mechanics, the Bohr model of the atom, many electron atoms, molecular structure and solid state physics. In order to understand how they contributed to our modern understanding of physics, we will examine these topics mathematically, experimentally and in their historical context. Since I am an experimentalist, we will also attempt a few in-class experiments. These will be more than a demonstration but less rigorous than one would conduct in a course in experimental physics. Such experiments may include spectroscopy, Photoelectric Effect, Electron Diffraction, Superconductivity, and I-V Characteristics of a diode. The actual number of in-class experiments will be determined by the time available and how we progress through the material. I expect you to ask questions and I will ask questions as I am lecturing. Lack of attendance will most likely cause you to do poorly in the class. Your grades will be determined based on the factors shown below and not on any other factors or considerations.

Grades:

A (90 and above), B+ (85-89), B (80-84), C+ (75-79), C (70-74), D (60-69) F (below 60)

The actual number of tests will be determined by the number of chapters we cover. Your Final class grade will be derived from the following percentages

Average of Tests (50%)

Quiz (5%)

Homework (15%)

Final Exam (20%)

In-class experiments (10%)

You will **not** be graded on a “**curve**”. Extra Credit will only be available on in class exams, **if** available at all.

In-class experiments: The in-class experiments will have a short summary that will be factored into your grade. The format of these summaries will be discussed more thoroughly in class. They will generally consist of a paragraph or two explaining why phenomena is important, how it affected physics and some analysis of our data.

Electronic Submission of Assignments: Students bear sole responsibility for ensuring that papers or assignments submitted electronically to a professor are received in a timely manner and in the electronic format(s) specified by the professor. Students are therefore obliged to have their e-mail client issue a receipt verifying that the document has been received. Students are also strongly advised to retain a copy of the dated submission on a separate disk. Faculty members are encouraged, but not required, to acknowledge receipt of the assignment

Tests: Make-up exams will only be given to students with valid excuses as defined by the university handbook (illness, emergency, class trips with prior notification). The make-up exam may be harder or easier than the regular in-class exam. Any disputes concerning a test grade must be resolved within one week from the time the tests are returned or from the time the grades are made known to the class. Partial credit will be awarded depending how many steps were done correctly in a multi-step problem. The amount of credit will be at the discretion of the instructor. *No equation sheets are permitted.* A list of useful equations and constant will be provided with the test. If you are late to class and arrive while the test is in progress you will have only the remaining time to complete your test. If you come in after the test, you will not have the opportunity to make it up. Do not be late!

Illness: If you are ill and will miss class please contact me. We can make arrangements to make up the missed work and I can inform you what material you need to read. If you are ill, please do not come to class. Students are advised to call or email the Student Health Center (301-2696 or shcmacon@mercer.edu) to report influenza-like symptoms. Students judged to have influenza-like symptoms will be instructed that they should not attend class, avoid contact with others as much as possible, and return to their normal schedule after they are free of fever (100°F or 37.8°C), or signs of a fever without the use of fever-reducing medications.

Quizzes: There will be a 5-10 minute quiz every week. This quiz will cover any material discussed in class up to that point of time. There may be questions related to an example problem from the text or an assigned homework problem. Make-up quizzes are subject to the same conditions as make-up tests. The Quiz will usually be on Friday. It may be necessary to change the day and the change will be announced. Tests and quizzes will start on time. If you are late to class and arrive while the quiz is in progress you will have only the remaining time to complete your quiz. If you come in after the quiz, you will not have the opportunity to make it up. Do not be late!

Final Exam: The final exam may include **any** material discussed in class. Make-up exams will be subject to the same conditions as make-up tests. If you are late to class and

arrive while the exam is in progress you will have only the remaining time to complete your exam.

Homework: These problems are not group work. You must work them out on your own. Looking up solutions on line or having other students working out an equation for you is considered cheating. You may discuss general ideas but not details with your fellow students. Feel free to ask me for help.

Honor code: You are bound by the Mercer honor code. The College's academic misconduct policy will be followed. All work, for which a grade is received, must be the **original** work of the **student** without aid or assistance of another party, or any printed and or electronic data/information. Academic misconduct cases will be referred to the honor council and the student will automatically receive a grade of incomplete (IC) pending a ruling by the honor council.

Cell Phone and Pager Usage: Out of courtesy for all those participating in the learning experience, all cell phones and pagers must be turned off before entering any classroom, lab, or formal academic or performance event

Classroom etiquette: You are expected to conduct yourself as a mature student, respectful of your classmates and instructor. You may be asked to leave the room if your behavior is disturbing the instructor or your fellow students. You may use a laptop to take notes or access the e-book during class. Please do not use a computer for any other purpose such as facebook, twitter, myspace, social networking, email, stock trading and the like.

Documented Disability

Students with a documented disability should inform the instructor at the close of the first class meeting or as soon as possible. If you are not registered with Disability Services, the instructor will refer you to the Student Support Services office for consultation regarding documentation of your disability and eligibility for accommodations under the ADA/504. In order to receive accommodations, eligible students must provide each instructor with a Faculty Accommodation Form from Disability Services. Students must return the completed and signed form to the Disability Services office on the 3rd floor of the Connell Student Center. Students with a documented disability who do not wish to use accommodations are strongly encouraged to register with Disability Services and complete a Faculty Accommodation Form each semester. For further information please contact Disability Services at 301-2778 or visit the website at http://www.mercer.edu/stu_support/swd.htm.

Evaluation forms: In an ongoing effort to improve the quality of instruction, each student enrolled in this course is required to complete an end-of-semester course evaluation.

Material To Be Covered and Test Dates (Tentative)

Ch. 1 The Failures of Classical Physics

Ch. 3 The Particle Like Properties of Electromagnetic Radiation

Ch. 4 The Wavelike Properties of Particles

----- Test 1 -----

Ch. 5 The Schrodinger Equation

Ch. 6 The Rutherford-Bohr Model of the Atom

Ch. 7 The Hydrogen Atom in Wave Mechanics

----- Test 2 -----

Ch. 8 Many-Electron Atoms

Ch. 9 Molecular Structure

Ch. 11 Solid State Physics

----- Test 3 -----

Note: we will not cover every section of each chapter listed above. You will be informed of the relevant sections as we progress.

Important Dates

First Day of Class August 18

Late Registration & Drop/Add January 19-20

Holiday – Labor Day September 1

Mid Term October 10

Fall Break October 2-3

Last Day for Course Withdrawal October 24

Thanksgiving Break November 26-28

Last Class Day December 5

*****Final Examination, December 8 2:00 a.m. - 5:00 p.m.*****