PHY355 Introduction to Modern Physics

First Day Handout Fall 2018

Class: Unique number 56125 Meetings MWF 10-11 in BUR 224

Instructor: Greg O. Sitz, Office: RLM 10.313, Office Hours: Monday and Thursday 1-2 or by appointment. Phone: 471-0701, email: `gositz@physics.utexas.edu`

Grader: TBA

Prerequisites: PHY316, PHY317L or PHY303L.

Text - *Modern Physics from α to Z^0*, by *J. W. Rohlf.*

Course Content This course is an introduction to modern physics and thermodynamics. It covers the foundations of post-Newtonian physics inluding special relativity, atomic spectra, photoelectric effect, blackbody radiation, Compton scattering, atomic structure, matter waves, quantum mechanics, the Schroedinger equation, and statistical physics.

Grading - The breakdown is: Homework 25% (assigned approximately weekly), pre-class online quizzes 5%, In-class exams (2): 15% each, Final Exam 40%. Homework, quizzes and test scores will be weighted as just described and a composite score (S) of between 0 and 100 for the course will be calculated. The final grades for the course will be determined using this composite score as follows: $S \geq 85 \Rightarrow$ A; $85 > S \geq 70 \Rightarrow$ B; $70 > S \geq 60 \Rightarrow$ C; $60 > S \geq 50 \Rightarrow$ D; $50 > S \Rightarrow$ F. The composite score will not be rounded, that is 84.99 is less than 85. Plus/Minus grading may be used for final scores close to the cutoffs given.

Homework - Homework will be assigned approximately weekly and distributed via Canvas. You are encouraged to discuss homework with anyone you wish; however, all written homework must be prepared independently (by you). Homework is due at the beginning of class on the specified day. Homework that is between 1 minute and 1 week late will be accepted with a 50% penalty. Homework later that this will not be accepted.

Pre-class Quizzes - Prior to each lecture, there will be a few multiple choice questions administered through Canvas related to assigned reading for that day's lecture. These questions are to be answered before class and their availability will be cutoff before class starts. These are intended to get you to read the material *before* it is covered in class and attend class. The material covered in this class is not mathematically difficult; it is, at times, conceptually subtle and it helps to go over it several times.

Exams - There will be two in-class exams, tentative dates: Friday, September 28 and Friday, November 2, plus a comprehensive final. The final is required. It is scheduled for Monday December 17, 9-noon. If you are absent from a examination for the observance of a religious holy day you may complete the work missed within a reasonable time after the absence, if proper notice has been given. Notice must be given at least seven days prior to the exam.

The exams will be closed book and closed notes, and no calculators, smart phones, tablets or other aids of any type are allowed. A cover sheet with relevant formulas and constants will be provided. This cover sheet will be available in advance of the exams. The final exam will be cumulative, and the best way to prepare for the final is to keep up with the material as it is covered in class. This means being prepared for and taking the in-class exams.

If your final exam score is greater than one of your mid terms and you have a homework average greater than 50%, your final exam score will replace the lowest of your mid terms.

Academic Dishonesty: You are encouraged to seek and provide assistance freely in working on homework assignments. However, the work that you submit should clearly be your own. DO NOT COPY from any source and submit it as your own work.

Other: The last day to drop the course for academic reasons is November 1.

If you are absent for the observance of a religious holy day you may complete the work missed within a reasonable time after the absence, if proper advance notice has been given.

Unless a *substantial* illness or family emergency is documented with a note from a physician or the dean's office, no make-up exams will be given. Any potential absences must be discussed with Dr. Sitz *prior* to the exam in order to have a make-up.

The University of Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, see:

`http://ddce.texas.edu/disability/about/`

or contact Services for Students with Disabilities at 512-471-6259.

Syllabus

Week of August 27:	Introduction, Special Relativity, spacetime
September 3:	Special Relativity, transformations and invariants
September 10:	Special Relativity, energy & momentum
September 17:	Special Relativity, applications
September 24:	Finish relativity, and Test 1 on 9/28
October 1:	Statistical and Thermal Topics
October 8:	Thermal radiation, Planck's constant, Photoelectric effect
October 15:	X-rays, line spectra, discovery of the electron
October 22:	Atomic structure, Bohr model, Rutherford scattering
October 29:	Matter waves and Test 2 on 11/2
November 5:	The Schrodinger wave equation
November 12:	One-dimensional problems, barriers
November 19:	One-dimensional problems continued, The Hydrogen atom
November 26:	Electron spin and quantum statistics
December 3:	Particle physics and current questions
December 10:	wrap up

Quotes

"The interpretation of these results is that there is no displacement of the interference bands" -A. A. Michelson (1881)

"In classical physics it was always assumed that clocks in motion and at rest have the same rhythm, that rods in motion and at rest have the same length. If the velocity of light is the same in all coordinate systems, if the relativity theory is valid, then we must sacrifice this assumption. It is difficult to get rid of deep-rooted prejudices, but there is no other way." - Albert Einstein (1938)

"What led me more or less directly to the special theory of relativity was the conviction that the electromotive force acting on a body in motion in a magnetic field was nothing else but an electric field" - Albert Einstein (1952)

"In the autumn of (1905) ... Einstein published a paper which set forth the relativity theory of Poincare and Lorentz with some amplifications, and which attracted much attention" - E. T. Whittaker (1953)

"How often have I said to you that when you have eliminated the impossible, whatever remains, however improbable, must be the truth?" - Authur Conan Doyle