PHYS/ECE 3740: Introduction to Relativity and Quantum Mechanics

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Prereq’s: PHYS 2220, MATH 2250

Lectures: M, W, F, 10:45 - 11:35 AM in L126 WEB (Warnock)
Presentations: T# 10:45 - 11:35 AM in L114 WEB (Warnock)

Topics:

**Introduction to Special Relativity**: Space-time diagrams, Lorentz transformations, the invariant Interval, 4-vectors and 4-momentum;

**Quantization of light**: Planck black-body radiation, the photoelectric effect and x-rays, Bragg diffraction;

**Basic Quantum Ideas**: Wave-particle duality, uncertainty relations, wave packets;

**Introduction to Quantum Mechanics**: Schrödinger equation in one, two, and three dimensions, square-well barriers, harmonic oscillator, hydrogen atom;

**Quantum Properties of Spin and Angular Momentum**: Zeeman effect, Stern-Gerlach experiment, atomic and molecular structure, covalent bonding; multi-electron atoms and the Periodic Table;

**Introduction to Classical and Quantum Statistics**: Maxwell-Boltzman, Fermi-Dirac, Bose-Einstein, Pauli exclusion principle;

**Applications to Solid-State Physics**: Band theory, introduction to magnetic resonance


Other books on reserve in the Marriott Library:

# This is a 3-credit class, so I will not lecture on Tuesdays. However, Tuesdays are not optional!!!

**Website:**  [http://www.physics.utah.edu/~jgerton/3740.html](http://www.physics.utah.edu/~jgerton/3740.html)

Homework assignments, announcements, video lectures, lecture notes, and supplemental material will be posted on the course website. **Check it every day!** Your grades will be posted on WebCT.

**Homework:** Weekly homework assignments will be posted on the course website. Your solutions are due at the BEGINNING of class on Tuesday of the following week. LATE HOMEWORK WILL NOT BE ACCEPTED! However, there will be 13-14 homework assignments during the semester: your lowest 3 scores will be automatically dropped before computing your average.

**In-Class Problems:** There will be 1-2 problems assigned every day in class (M,W,F). You will work on these assignments in small groups and your solutions will be graded as a group. **You must work in groups - peer instruction is an effective learning strategy!**

**Exams:** There will be two midterm exams: the 1st will be about 5 weeks into the semester, the 2nd about 6 weeks later. Midterm exams will be held on Tuesdays. **Your final exam is scheduled for Wednesday, December 14, 10:30 - 12:30 AM. I cannot change this time: plan ahead now.**

**Student Presentations:** The historical development of Special Relativity and Quantum Mechanics is very rich and there were a number of very influential (seminal) experiments. The best way to learn and appreciate this history is to research these topics for yourself and discuss them with your peers. Thus, each of you will be required to pick a topic (from a list) and make a short (10-minute) presentation to the class. To accommodate everyone, we will need to do about 4 per week, mostly on Tuesdays.

**Grading:**

- **Homework:** 25%
- **In-Class Problems:** 10%
- **2 Midterms:** 30%
- **Final:** 30%
- **Presentation:** 5%

**Honor Code and Collaboration:** Collaboration on exams is not permitted. Collaboration on homework (and of course on group problems) is encouraged, provided that all members of a group contribute. Each of you must turn in your own unique solutions to homework problems even if you worked through the problems collaboratively. Copied homework is easy to detect and is considered cheating. If we detect cases of copied homework solutions, all students
involved will receive no credit for that assignment: so don’t lend out your solutions!

ADA Compliance:
The University of Utah Physics Department seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, http://disability.utah.edu/ 162 Olpin Union Bldg. Call 801-581-5020 to make arrangements for accommodations.