Physics 220: Modern Physics
Spring 2009

Instructor: Elizabeth George, BDKSC 308B, 327-7854, egeorge@wittenberg.edu
Office hours: See schedule on my door and online
Course web page: http://userpages.wittenberg.edu/egeorge/Phys220.html
Required course materials: *Modern Physics for Scientists and Engineers*, Taylor, Zafiratos, and Dubson (2nd ed.).
You will also need a bound, quadrille ruled lab notebook and a scientific calculator.

Grading policy:

3 exams, 14% each	42 %
comprehensive final exam ..	18 %
laboratory work	20 %
assignments/participation....	15 %
quizzes …….....	5 %
TOTAL	100 %

Letter grades will be assigned according to the percentage of possible points you have accumulated at the end of the semester. You are guaranteed that the divisions between grades will be no higher than the following: 90%≤A≤100%, 80%≤B<90%, 70%≤C<80%, 60%≤D<70%, F<60%. In borderline cases, attendance, class participation, and trend in exam scores will be used to decide whether to award the higher grade.

Exams: Exams will cover material from the readings, assignments, and in-class work, including labs. The exams will comprise two types of questions: quantitative questions, and qualitative (conceptual) questions. If you have a legitimate conflict with a scheduled exam, or are ill the day of the exam, you must let me know ahead of time (leave a message or send email if I'm not in) to be eligible for a makeup exam. "Legitimate conflict" means a University-sanctioned event or other unavoidable and documented event.

Lab work: This portion of the grade will be based mainly on lab reports and your laboratory notebook, though participation and effectiveness in lab will also be considered.

Assignments: Homework will be assigned about once a week. Late homework will be accepted until the graded assignment is returned or solutions are made available (typically the next class period), but with a 25% penalty (unless negotiated ahead of time). You are encouraged to talk about homework problems with each other, but the work you turn in must be your own. The lowest homework assignment score will be dropped. Points will also be awarded for answering reading questions, asking good questions and contributing to the classroom discussion, and/or answering feedback questions at the end of class.

Quizzes: Each Thursday (when there isn't an exam) there will be a brief quiz during class. The quiz will cover fundamental concepts. The lowest quiz score will be dropped. No makeup quizzes will be given except in the case of excused absences.

Writing-Intensive Course: As you probably know, this is a writing-intensive course. Thus, we emphasize clarity and precision not only in doing physics, but also in writing about it. Assignments and exams will include questions that require a verbal response; feedback and grades on these questions will be based in part on how well you communicate your understanding of the physics involved. In addition, you'll receive direction and individual assistance in keeping your lab book and preparing and revising reports on your laboratory experiments. Because the peer review process is so important to written scientific communication, peer review will also be used to provide constructive criticism to you as you write and revise your work.

Friendly advice: Physics isn't something you learn primarily by reading and memorizing; the way to learn physics is to do it! Read the text with pencil in hand to jot down notes and questions and try the examples. Ask questions in class. Work as many examples and problems as you can. You should approach the study of physics as you would approach playing a sport or a musical instrument--you need to keep actively working and practicing. You should spend 2-3 hours working outside of class for every hour you spend in class.

Disabilities: If you have a documented disability and need to arrange reasonable accommodations, please contact me as soon as possible. Retroactive accommodations will not be given. Please contact Melinda Finkle, Academic Coordinator, mfinkle@wittenberg.edu, 327-7924, Room 203 Recitation Hall, to coordinate accommodations and receive self-identification letters for each professor.

Tentative Schedule:

week of	Tuesday class	Thursday class	Lab (Thurs; Mon 1 week later)
Jan. 12	review and overview; special relativity; elements, atoms, and molecules (3.1-3.4)	Atomic mass, Avogadro's number, how we know about the atom (3.5-3.12)	Introduction to Mathematica; Microwave Michelson interferometer
Jan. 19	Quantization of light (4.1-4.5)	Bragg diffraction and the Compton effect (4.4-4.6)	Electron charge and mass
Jan. 26	Quantization of atomic energy levels (5.1-5.5)	The Bohr model (5.6-5.10)	Microwave Bragg diffraction
Feb. 2	Matter waves: deBroglie relations (6.1-6.3)	Wave functions and the uncertainty principle (6.4-6.9)	Rotating labs: electron diffraction; Franck-Hertz; photoelectric effect; isotope shift; superconductivity
Feb. 9	Catchup/review	**Exam 1** (Ch 3-6)	Rotating labs: electron diffraction; Franck-Hertz; photoelectric effect; isotope shift; superconductivity
Feb. 16	Standing waves and stationary states (7.1-7.4)	The time-independent Schrödinger equation; the rigid box (7.5-7.6)	Rotating labs: electron diffraction; Franck-Hertz; photoelectric effect; isotope shift; superconductivity
Feb. 23	The free particle; the nonrigid box (7.7-7.8)	The simple harmonic oscillator; tunneling (7.9-7.10)	Rotating labs: electron diffraction; Franck-Hertz; photoelectric effect; isotope shift; superconductivity
Mar. 2	The two-dimensional Schrödinger equation (8.1-8.3)	Two-dimensional problems (8.3-8.4)	No lab
Mar. 9	SPRING	BREAK	!
Mar. 16	Three-dimensional problems (8.5)	Quantization of angular momentum (8.6)	Rotating labs (2 week labs): NMR; nuclear spectra; optical tweezers
Mar. 23	**Exam 2** (Ch 7, 8)	The hydrogen atom (8.7-8.8)	Rotating labs (2 week labs): NMR; nuclear spectra; optical tweezers
Mar. 30	Electron shells; spin (8.9-8.10, 9.1-9.2)	Magnetic moments; Zeeman effect; MRI (9.3-9.8)	Rotating labs (2 week labs): NMR; nuclear spectra; optical tweezers
Apr. 6	Multielectron atoms; Pauli exclusion principle (10.1-10.4)	Multielectron atoms: systematics, the periodic table (10.5-10.8)	Rotating labs (2 week labs): NMR; nuclear spectra; optical tweezers
Apr. 13	Atomic transitions and radiation (11.1-11.3, 11.6)	Spontaneous emission, selection rules, and lasers (11.7-11.9)	Rotating labs (2 week labs): NMR; nuclear spectra; optical tweezers
Apr. 20	Catchup/review	**Exam 3** (Ch 8-11)	Rotating labs (2 week labs): NMR; nuclear spectra; optical tweezers
Apr. 27	Topics (class choice)	Topics (class choice)	Scanning electron microscope and x-ray identification of elements
May 4	Topics (class choice)	READING DAY	

Final exam (Topics and comprehensive): 12-3 p.m. Friday, May 8