Physics 222—General Physics II with Calculus
Spring 2003

Syllabus

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My educational philosophy is that you learn best when you are actively engaged with the subject through activities such as reading (and answering questions about what you read), discussing, experimenting, and solving problems. Lectures are useful for motivation, but for most students listening to lectures and copying lecture notes is an ineffective method to learn. It's when you study individually (or sometimes in a small group), think deeply about the subject, and subsequently dialogue with classmates and the professor that you learn the most. My role as the professor is to create an environment that promotes active-learning, to assess your learning, and to provide guidance and mentorship along the way.

Lecture: MWF 12:00PM–12:50PM, HHSC 325 **Sections:** 01 (Lab: M 2:00–5:00PM); 02 (Lab: TH 2:00PM–5:00PM), HHSC 130

Office and/or Lab Hours: MWF 10:00AM–11:00AM, whenever my office door is open, or whenever you find me in the physics lab.

Course Description: A calculus-based study of electricity and magnetism, geometrical and physical optics, relativity, atomic and nuclear physics, and quantum theory. Prerequisites: PHY221 and MTH241.

Textbook(s): *Understanding Physics, Preliminary Edition*, vols. III and IV, by Karen Cummings, et. al.

Grading Scale (min%): A+ (96), A (92), A− (88), B+ (84), B (80), B− (76), C+ (72), C (68), C− (64), D+ (60), D (56), D− (52), F (<52).

Grade Determination: lab (25%), homework (25%), quizzes (30%), mid-term exam (10%), final exam (10%). The lowest quiz will be dropped. This is effectively a "get out of quiz free" card. There will be approximately one quiz per chapter.

WebAssign: Homework will be delivered, collected, and graded on WebAssign at

http://www.webassign.net/v4.html

Homework will include WarmUps (pre-lecture assignments) and Practice assignments (end-of-chapter exercises and problems).

Lab: Lab work will consist of experiments and computer simulations. Weekly reports (written in Microsoft Word using Microsoft Excel for graphing and graphical analysis), presentations, posters or WebAssign assignments may be collected.

Expectations: Expect to work hard (probably 3–4 hours outside of class for each hour in class or lab), to be challenged, to learn, to work together, and to have fun.

Accomodations: If you need accomodations due to a disability, please notify Dr. Titus before the end of the first week of class. If you must reschedule the mid-term or final exam due to serious illness, death in the family, participation in official school events, or another such valid reason, please alert Dr. Titus before the event or as soon as possible after the event. Extensions on homework are allowed under these same circumstances, including technical difficulties. Make-up quizzes are not allowed, but rather, the lowest quiz will be dropped.

Learning Objectives: Since we did not finish the topic of sound last semester, it will be included this semester. You should be able to

1. describe the nature of a sound wave, what properties of the medium affect the speed of a sound wave, and interactions of sound waves including interference, standing waves in a pipe, and beats.
2. understand the Doppler effect, both conceptually and mathematically.
3. know the definitions of temperature and heat energy, apply conservation of energy (1st law of thermodynamics) to thermodynamic systems, and understand the mechanisms of heat transfer.
4. develop a model of an ideal gas and use the kinetic theory to explain macroscopic properties of the gas.
5. analyze thermodynamic processes using entropy and the second law of thermodynamics; apply the laws of thermodynamics to engines and refrigerators
6. describe interactions of charged objects (i.e. electrostatic interactions) using Coulomb's law.
7. understand the concept of a field and calculate gravitational and electric fields due to mass or charge configurations.
8. apply Gauss' law to analyze distributions of charge and to understand the concept of electric flux.
9. calculate electric potential energy (and electric potential) for a configuration of charge and to apply conservation of energy to systems of charge.
10. describe a flowing charge using concepts of current, resistance, voltage, and power.
11. analyze DC circuits resistive circuits.
12. describe the physics of capacitors, analyze capacitive circuits, analyze RC circuits.
13. understand the effect of a magnetic field on moving charges.
14. describe the magnetic field produced by moving charges.
15. understand induction and use Faraday's law, describe self-inductance, analyze RL circuits.
16. develop a model for understanding magnetism of matter.
17. state Maxwell's equations.
18. analyze AC circuits, namely RLC circuits.
19. describe light as an electromagnetic wave and understand some interactions of light and matter namely reflection and refraction.
20. use a geometric model (called geometric optics) of light as rays to analyze formation of images by mirrors and lenses.
21. use a physical model (called physical optics) of light as a wave to analyze interference and diffraction (single slit, circular aperture, double slit, x-ray diffration)

Schedule				
week	**dates**	**topics**	**book**	**lab**
1	1/8/03	sound waves	18-2–18-5	no lab
	1/10/03	beats, the Doppler Effect	18-6–18-8	
2	1/13/03	Temperature, heat transfer, heating and cooling	19-1–19-5	worksheet, simulations
	1/15/03	Heat energy, First Law of Thermodynamics	19-6–19-8	
	1/17/03	review; quiz	ch. 19	
3	1/20/03	King Lecture: Dr. Arnetta Beverly		26 - Current,
	1/22/03	Kinetic theory	20-5–20-10	resistance,
	1/24/03	Kinetic theory	20-1–20-4	Ohm's law
4	1/27/03	Entropy, Second Law of Thermodynamics	21-1–21-3	27 - series
	1/29/03	Heat engines, refrigerators	21-4–21-7	and parallel
	1/31/03	review; quiz	ch. 20–21	resistance
5	2/3/03	Electrostatics	22-1–22-6	Kirchoff's
	2/5/03	Coulomb's Law	22-7–22-10	laws
	2/7/03	review; quiz	ch. 22	
6	2/10/03	Fields	23-1–23-5	28
	2/12/03	Electric fields, dipoles	23-6–23-10	capacitance
	2/14/03	review; quiz	ch. 23	
7	2/17/03	Gauss' Law, flux	24-1–24-4	RC circuits
	2/19/03	Application of Gauss' Law	24.5–24.8	
	2/21/03	mid-term exam	ch. 18–24	
8	2/24/03	Electric Potential Energy, Electric Potential	25-1–25-6	33
	2/26/03	Electric Potential due to various charge configurations	25-7–25-11	AC circuits
	2/28/03	review; quiz	ch. 25	
Spring Break				
9	3/10/03	Magnetic Fields	29-1–29-5	
	3/12/03	Effect of magnetic fields on moving charges	29-6–29-11	AC circuits
	3/14/03	review; quiz	ch. 29	
10	3/17/03	Magnetic fields generated by currents	30-1–30-4	31 - Induction
	3/19/03	Ampere's Law	30-5–30-7	Faraday's law
	3/21/03	review; quiz	ch. 30	
11	3/24/03	Magnetism of Matter	32-1–32-8	RL circuits
	3/26/03	Maxwell's Equations	32-10–32-11	
	3/28/03	review; quiz	ch. 32	
12	3/31/03	Electromagnetic waves	34-1–34-6	33
	4/2/03	Interaction of waves and matter	34-7–34-12	AC circuits
	4/4/03	review; quiz	ch. 34	
13	4/7/03	Geometric optics, mirrors	35-1–35-35-4	LC circuits
	4/9/03	lenses	35-5–35-8	
	4/11/03	review; quiz	ch. 35	
14	4/14/03	Physical optics, interference I	36-1–36-36-4	RLC circuits
	4/16/03	Double slit, thin films	36-6–36-8	
	4/18/03	Good Friday (No Classes)		
15	4/21/03	Diffraction	36-1–36-4	no lab
	4/23/03	Applications	36-5–36-9	
Final Exam: 5/1/03, 1:30 PM				