Physics 222—General Physics II with Calculus
Spring 2009
High Point University

Syllabus

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My personal mission is to encourage you to be a life-long, interdisciplinary learner. If you are teachable, curious, and motivated, you will be successful.

I expect you to learn the tools of scientific exploration that we will use in this class, including vector algebra, numerical analysis using VPython, and laboratory sensors and technology. I also expect you to read the textbook, do homework assignments, pay attention in class, do all experiments, ask questions, and dialogue with others. All of these elements are deemed important in learning the material.

My educational philosophy is that we all teach ourselves. For the rest of your life, you will teach yourself, utilizing whatever resources are available to you. My role as your teacher is to help you teach yourself by providing helpful resources, answering questions and, more importantly, asking you questions that make you think deeply and resolve misconceptions. My role is also to motivate you, inspire you, and help you make observations you perhaps would not have otherwise noticed.

I reserve the privilege to change this syllabus based on feedback from you and what I determine is best for the course. If the syllabus is changed, you will receive a printed copy of the updated version.

Lecture and Lab (integrated): MWF 12:00 PM–1:50 PM, HHSC 130.

Office Hours: MF: 2–3 PM; TTH: 11AM–noon and 2–3 PM.

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): Matter & Interactions vol. II: Electric & Magnetic Interactions, 3rd edition, by Ruth Chabay and Bruce Sherwood.

Course Web Site: <`http://linus.highpoint.edu/~atitus/courses/phy222/`>

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 (15%), homework (10%), class participation (5%), quizzes (50%; 5 quizzes, 10% each), final exam (20%).

WebAssign: Homework will be delivered, collected, and graded using WebAssign. To get to WebAssign, you should first log in to Blackboard at the address shown below, select the link to this class, and then click on the link to WebAssign. (Right-click the link to WebAssign if you want to open it in its own window.)

<`http://blackboard.highpoint.edu/`>

Check WebAssign once per day to check for new homework assignments.

Class Participation: We will use a classroom polling system (i.e. clickers) during every lecture in order to help you practice applying concepts taught in class. *You are required to own a clicker, and you are required to bring it to every lecture.* Specifically, we will use the TurningPoint ResponseCard RF by TurningTechnologies (http://www.turningtechnologies.com/). Each lecture will have numerous conceptual questions that must be answered in class with the clicker. For full credit, you must be present and you must answer all questions. Your grade will be your total percentage of responses. Correctness will not be counted, but rather you will receive full credit merely for responding to question(s). Worksheets may also be sometimes used as in-class activities and may count toward your grade.

During lectures and lab, use of cell phones and computers for social purposes is strictly forbidden. Violation of this policy will result in loss of your cell phone for the remainder of the class or lab. Repeated violations will result in a deduction of points for in-class activities at the discretion of the professor, possibly resulting in a zero for the semester for class participation.

You may use phones and computers for learning physics and communicating physics in class. For example, you may tweet questions to the professor during class, and you may view class presentation slides on the computer or look up a topic in Wikipedia that is being presented in class. If you are texting during class or receiving texts, the professor will ask to see the text to verify that it is related to lecture or lab.

You must be engaged with the material being presented in class and lab. Do not work on assignments for other classes. Do not use lab time to socialize. Stay engaged with this material, otherwise do not come to class. There is zero tolerance for unfocused and disengaged students in this class. If you are unfocused, then you will prevent others from learning to their full potential.

Quizzes: There will be six quizzes. Your lowest quiz score at the end of the semester will be dropped, and the average of your five highest quizzes will be computed and will have a weight of 50% of your overall course grade. Quizzes will be 1-2 hours and will be administered on the dates shown in Table 1. A missed quiz for ANY reason will count as a zero. If more than one quiz is missed due to a school activity or a medical condition that requires surgery or hospitalization, then the final exam grade will substitute for the (missed) quiz grade. Absences due to a school activity must be approved by the professor prior to the quiz.

Table 1: Tentative Schedule of Quizzes

Quiz No.	Date	Description
1	Wed, Feb. 3	Ch. 13–14
2	Wed, Feb. 17	Ch. 15
3	Wed, Mar. 3	Ch. 16
4	Wed, Mar. 24	Ch. 17–19
5	Wed, Apr. 7	Ch. 20-21
6	Fri, Apr. 23	Ch. 21-23

Lab: Lab will consist of a pre-lab lecture and simulations, experiments, and/or other types of "hands-on" activities. For each lab, you will record all measurements, observations, and graphs in a lab notebook. You will submit your data and results in a lab report on WebAssign. The lab report is due approximately one week after the completion of the experiment. Your lab grade will consist of your grade on the lab report, submitted labwork and/or lab participation, and a lab practical. If you do not stay on task, if you goof around during an experiment, or if you act dangerously, you will be penalized on your lab grade or on class participation by an amount that is at the discretion of the professor.

Lab partners will be assigned by the professor. Be prepared to work with various lab partners throughout the semester.

Lab is integrated with the lecture; however, we will do at least the experiments shown in Table 2.

Course Overview: Physics 222, which includes electricity, magnetism, and physical optics, is the second course in a two-semester sequence of introductory calculus-based physics for science majors. This course largely deals with electric and magnetic interactions, which are central to the structure of matter, to chemical and biological phenomena, and to the design and operation of most modern technology.

The general purpose of this course is for you to engage in a process central to science–to attempt to model a broad range of physical phenomena using a small set of powerful fundamental principles.

The specific focus of the course is an introduction to field theory, in terms of the classical theory of electricity and magnetism ("E&M"). The course also emphasizes the atomic structure of matter, especially the role of electrons and protons in matter. Relativity and quantum theory were taught in General Physics I last semester and will not be taught explicitly in this course. Topics that will be covered this semester include:

1. electric field
2. matter and electric fields, polarization of atomic matter

Table 2: Experiments

Description
Write a VPython simulation to calculate the electric field due to a proton (at any point in space around the proton).
Write a VPython simulation to model the motion of a charged particle in an electric field.
Write a VPython simulation to calculate the electric field due to a charged plate (and a capacitor)
Write a VPython simulation to calculate the electric field due to a charged rod.
Measure electric potential around a conductor and calculate electric field (i.e. field mapping).
Write a VPython simulation to calculate magnetic field due to a moving proton.
Measure the magnetic field due to current in a long, straight wire.
Measure the magnetic field due to current in a coil.
Measure the magnetic field due to a magnetic dipole; calculate the dipole moment of a magnetic dipole.
Measure current and voltage for a charging and a discharging capacitor.
Investigate Ohm's law for both ohmic and non-ohmic devices; use Kirchhoff's laws to analyze DC circuits and verify results with current and voltage measurements.
Write a VPython simulation to model the motion of a charged particle in a uniform magnetic field.
Determine the relationship between momentum arm and torque; apply to calculating torque on a magnetic dipole.
Investigate Faraday's law by measuring the change in magnetic flux through a coil and the induced emf across the coil; relate current induced in a secondary coil to the AC current in a primary coil.
Investigate and verify the lensmaker's equation for various systems of lenses; measure the focal length of a lens.

3. electric field of distributed charges, setting up physical integrals, numerical integration
4. electric potential
5. magnetic field, atomic model of ferromagnetism
6. a microscopic view of electric circuits, surface-charge model
7. capacitors, resistors, and batteries, macroscopic view of electric circuits
8. magnetic force, including motional emf
9. patterns of a field in space (Gauss' law and Ampere's law)
10. Faraday's law, with emphasis on curly electric field
11. electromagnetic radiation, including production by accelerated charges and re-radiation due to charges accelerated by radiative electric fields (classical interaction of light and matter)
12. electromagnetic waves and physical optics
13. geometric optics

Learning Objectives: You should be able to

1. apply a small set of fundamental physical principles to a wide variety of physical situations.
2. use these principles to explain a wide variety of physical phenomena, including at a microscopic level.
3. use these principles to predict the behavior of a variety of physical systems.

4. model complicated physical systems by making approximations and idealizations in order to be able to apply fundamental principles.

5. create a 3D, animated computer model of a physical situation involving electric and magnetic fields.

6. use basic laboratory skills to build or assemble apparatuses, make measurements, graph and interpret data, and report uncertainty and error in measurements.

This course uses the Matter & Interactions curriculum by Ruth Chabay and Bruce Sherwood and closely imitates in content and style calculus-based physics courses at North Carolina State University, Georgia Tech, and Purdue who also use this textbook.

Final Exam: The final exam is comprehensive and will last approximately three hours. It will be given on Tuesday, May 4, from 8:30 AM–11:30AM. *The final exam can NOT be taken at any other time for any reason.* It will be exclusively multiple choice.

Help: Our class will meet for an optional review session before each quiz in Rm 130 HHSC, time to be determined.

Academic Services Center has both individual and group tutoring available for HPU students. Individual tutoring is for those students who need one-on-one assistance with a course and is appointment based. To make an appointment contact Craig Curty, Director of Academic Services Center, by phone (336) 841-9014 or via e-mail ccurty@highpoint.edu. Group tutoring is available for specific courses certain days and times during the week and no appointment is necessary. All tutoring takes place in the lower level of Smith Library. For further information regarding tutoring and updated tutor walk-in schedules, please check the website http://www.highpoint.edu/academics/asc.

Expectations: Expect to work hard, to be challenged, to learn, and to work together. Expect to break through any struggles, doubts, and challenges to gain new abilities, accomplish new tasks, and develop new analytical reasoning skills.

Accomodations: Students who require classroom accommodations due to a diagnosed disability must submit the appropriate documentation to Ms. Irene Ingersoll, Coordinator for Disability Support, 405 Smith Library. Please inform her of your need for accommodations at the beginning of the semester. It is your responsibility as a college student to advocate for yourself. Accommodations are not retroactive.

Attendance: If you have more than six unexcused absences, you can be withdrawn from the class. *Absences are measured by your lack of response to in-class questions.* I reserve the right to choose whether to withdraw you or not for lack of attendance.

Course Evaluations: All students are expected to complete course evaluations in the week preceding final exams. These evaluations, which are delivered online, are an important part of High Point Universitys assessment program, so your cooperation in completing them is greatly appreciated. As the end of the semester or academic session draws near, you will receive information from the Office of Institutional Research and Assessment about how to complete the online evaluations. IMPORTANT NOTE: All communications from the Office of Institutional Research and Assessment will be sent to your High Point University e-mail account, so please be sure to check and maintain your account regularly.

Schedule: A tentative schedule of lectures is given in Table 3.

Table 3: Tentative Schedule of Lectures

Day No.	**Date**	**Chapter**
1	1/13	13
2	1/15	13
3	1/20	14
4	1/22	14
5	1/25	14
6	1/27	15
7	1/29	15
8	2/1	15
9	2/3	Quiz 1
10	2/5	15
11	2/8	15
12	2/10	16
13	2/12	16
14	2/15	16
15	2/17	Quiz 2
16	2/19	16
17	2/22	16
18	2/24	17
19	2/26	17
20	3/1	17
21	3/3	Quiz 3
22	3/5	18
23	3/15	18
24	3/17	19
25	3/19	19
26	3/22	19
27	3/24	Quiz 4
28	3/26	20
29	3/29	20
30	3/31	20
31	4/2	21
32	4/7	Quiz 5
33	4/9	21
34	4/12	21
35	4/14	22
36	4/16	22
37	4/19	22
38	4/23	Quiz 6
39	4/26	23
40	4/28	23