

Assistant Professor John R. Stratton
Atlantic Cape Community College
5100 Black Horse Pike
Mays Landing, NJ 08330

A-141
Phone: 343-4981
Fax: 343-5122
stratton@atlantic.edu
[http://www.atlantic.edu/%7Estratton/
jshome.html](http://www.atlantic.edu/%7Estratton/jshome.html)

Basic Physics (PHYS 105) Fall 2005

Copyright © 2005 by John Stratton

Course Description

Prerequisite: ENGL080 and MATH074 (Introduction to Algebra), or ENGL080 and MATH 080 (Elementary Algebra).

Topics include measurement, motion, vectors, Newton's laws and equilibrium, work and energy, simple machines, rotational motion and rotational equilibrium, fluids, heat, waves, electricity, magnetism, and AC and DC circuits. Laboratory utilizes computers for data acquisition and analysis. Meets the general education requirement for science.

Course Focus

A single-semester algebra-based physics course is designed for students whose majors or professional programs would be enhanced by a conceptual or semi-quantitative knowledge of specific topics in physics. These include some technical and med-tech programs. While not technically rigorous, it provides a broad overview of a wide variety of topics in the discipline. If time allows, a unit on medical imaging and the structure of matter is included.

Text, References and Materials

Have the following at all class meetings:

- Required: "Physics for Career Education", 8th ed. By Ewen, Nelson, and Schurter (ISBN 0-13-110169-2)
- Required Course Pack: Basic Physics Lecture Notes & Laboratories (Bookstore)
- Required: Scientific Calculator, 3.5 inch floppy disk.
- Required: Lab Notebook (See criteria below)

Course Schedule

Room: A-152

Lecture:	Monday or Wednesday	2:00-4:45 PM
Laboratory:	Monday or Wednesday	2:00-4:45 PM
Office Hours:	Monday, Wednesday	5:00-6:00 PM
	Monday	12:00-1:00 PM

Other office hours are available. See the instructor.

For specific lecture and lab days, see the attached schedule.

Course Evaluation

Letter grades will be determined as follows.

90%-100%	A
80%-89%	B
70%-79%	C
60%-69%	D
< 60%	F

Lecture:		75%
	Exams (Equally Weighted)	65%
	Research Paper	10%
	In-Class Assignments	(+3%)
Lab:		25%
	Each Lab	100 pts toward total
	Notebook	100 pts toward total
	Penalty for misuse or absence of Notebook	-3 to -10 points
	Penalty for missing prelab assignment	-10 points

Students must have passing averages in both the exams and laboratories to pass the course.

For example, if a student earns a 77.0% exam average, an 82% on the paper, and an 88.0% lab average, the student's grade would be (excluding extra credit):

$0.770 * 65 =$	50.05
$0.820 * 10 =$	8.2
$0.880 * 25 =$	22
Total =	80.3 B

Attendance & Lateness

Students may miss one lab for a valid, documented excuse (medical, family emergency, flood, famine, nuclear holocaust, plague of locusts). Missing or not submitting more than 1 lab will result in a failing lab grade. If all labs are attended, the lowest lab grade will be dropped. Unscheduled activities that count as labs or quizzes may also occur on lecture days. In general, missed classes are difficult to recover from and will greatly affect a student's ability to succeed (i.e. missing a class puts you in a BIG HOLE!).

Points will be deducted for lateness in lab.

Extra Credit

Assignments done in class can add a maximum of 3% to the final grade. Points will be totaled over the entire semester.

An extra credit assignment may be done or a retest may be taken to bring up one test score (except the last exam). The instructor will choose the assignment and the conditions under which it is completed. The assignment or retest must be requested by the student and must be completed within one week. The makeup grade will be averaged with the test grade and the resultant grade will replace the test grade. This can only be done for tests with a grade lower than 65% and can bring tests up to a maximum of 65%.

Exam Makeups

Exams may only be made up if the student contacts the professor with a valid, documented excuse (see above) by phone, written note, or E-mail. The professor reserves the right to give a different exam that may be more difficult or to adjust the grading scale to account for the fact the student is taking the exam under different testing conditions.

Prelab Assignment

For every lab session, you will write a short summary of the lab that you are about to do. It should not be written in the lab notebook because it will be collected at the beginning of the lab. It cannot be late. Prelab assignments are worth 10% of a lab report's grade. See the criteria attached below.

Lab Makeups

If students need to miss laboratory for a valid, documented excuse (see above), the instructor must be notified before the scheduled class or immediately after as above. If this is done, a makeup may be possible. Students may miss one lab for a valid, documented excuse. Lab reports are due at the next lab meeting unless otherwise specified. Missing or not submitting more than 1 lab will result in a failing lab grade. If all labs are turned in, then the lowest lab grade will be dropped. Late labs will be penalized one half grade if they are turned in after the start of class on the same day they are due, and one grade thereafter. Labs will not be accepted after one week from the original due date or after the labs have been returned.

Academic Honesty

Students are expected to uphold the integrity of the academic process. In addition to personal acts of plagiarism or dishonesty, students are also obligated to report any act of cheating that they witness. Acts of dishonesty will result in disciplinary action as outlined in the Student Handbook. In essence, this means you will receive a "0" for the assignment OR an "F" in the course if the assignment is central to the course. A report will also be made to the Dean of Students. Two such infractions will result in dismissal from the college.

In this course, person does his or her own work. You may discuss and work on the laboratories together, but the report must be your own work. Blatant copying will result in a "0" for the lab. In general, this applies to any assignment that is collected for a grade unless otherwise specified. Papers that are plagiarized in any way will result in an "F" for the course.

Class Conduct

1. Don't be late. It's rude and it interrupts the class. If you miss a prelab discussion, points will be deducted.
2. Turn cell phones off!
3. Do not talk, sharpen pencils, staple or do anything else at times when it might be a distraction to your classmates.
4. I value your input, I want to have discussions, and I must hear your questions. However, you must raise your hand. Sometimes, I wish to let the class think, and you will ruin that if you call out the answer.

The Survival Guide: How to do well in a science course

1. Do all homework on time because
 - a. If you let it pile up, you will find it very difficult to do well on the exams.
 - b. Studying for a test involves doing the homework *again*, not the first time.
 - c. Review time is review. It is driven by your questions. A conceptual quiz will also occur!
 - d. Homework is like a weekly project. Attack it.
2. Read the appropriate sections in the text. If I said everything, you wouldn't remember it. In class, we learn to DO and APPLY. Read to round out your learning.
3. Do not understudy for the first exam. Although you get to do a makeup for one exam, you don't want to have to use it on the first exam.
4. Do not wait until the day that a lab is due to complete it because:
 - a. As time goes on, you will forget what was done in lab. Do it while it's still fresh in your mind.
 - b. If you have questions (and you will sometimes), then you will not be able to get them answered in time and will have to turn the lab in late. This results in a deduction of 5 to 10 points.
 - c. If you just decide to hand it in with a major mistake, then you will get it back to do again. Your grade *starts* at an 85 on the second try, and the second time is more difficult (see "a").
5. Keep a careful lab notebook. It is worth two lab grades.
6. Do not plagiarize or copy. It is dishonest and speaks to your character.
7. Have some fun and enjoy the course. This may be your only opportunity to take a lab science, so enjoy it and take away all that you can from this experience.

Course Goals

Students will

1. develop techniques to view, study and ultimately learn scientific material.
2. develop an appreciation for physics and an understanding of what it can tell us about the universe and how it relates to the students' careers. Students should see how physics can explain various phenomena that they encounter every day. Student understanding of his/her profession should be enhanced.
3. describe the scientific method of investigation.
4. use established scientific conventions when performing measurements and calculations.
5. practice critical thinking skills used to solve both quantitative and qualitative problems.
6. apply basic concepts of
 - a. the metric system
 - b. One dimensional motion
 - c. vectors
 - d. Newton's Laws and equilibrium
 - e. energy
 - f. simple machines
 - g. momentum
 - h. rotational motion and equilibrium
 - i. fluids
 - j. heat
 - k. electricity and magnetism
 - l. waves
7. work independently and in groups to solve problems.
8. gain practice in experimentation, data recording and data analysis.
9. use a computer for data acquisition and analysis.

Performance Objectives

Unless otherwise indicated, mastery of the following performance objectives is achieved by accurately defining and describing the specified concept, and applying this concept to assigned problems. Students will be allowed to bring in one 3 inch by 5 inch note card with handwritten notes on one side to the exam. Exams will consist of short answer questions and problems.

Laboratory

1. In most cases, a topic will be discussed in lecture before it is used in the lab. The student will apply concepts from lecture. Performance will be satisfactory if students demonstrate through preparedness, performance, and answers to questions that they understand how a given experiment is related to physical principles discussed in lecture.
2. The student will prepare for lab. Performance will be satisfactory if students arrive at the lab on time having read the experiment. Students will demonstrate their preparation by writing a short summary that describes WHAT is being measured or tested in the experiment and HOW it will be measured or tested. Students should know the purpose of the laboratory, be familiar with the procedure, and be able to vocalize any questions concerning the theory or procedure during the prelab discussion.
3. Students will be monitored during the laboratory. The student will demonstrate sound measurement technique. Performance will be satisfactory if students routinely participate as ACTIVE members of their laboratory groups and are observed to take measurements carefully and accurately.
4. Students will keep a proper laboratory notebook as described on the attached sheet. This lab book must be used for all laboratories.
5. The student will calculate using significant figure conventions. This is a graded part of every experimental calculation. Performance will be satisfactory if students routinely apply significant figure conventions to calculations based on experimental data to avoid overstating the accuracy of calculated results.

Lecture

1. Students will demonstrate proper techniques of measurement and computation. This includes proper use of the metric system and significant figure conventions. Students should be able to name the basic metric units, know the prefixes presented in class, and perform unit conversions using unit analysis. Students should be able to define and differentiate accuracy and precision.
2. Students will be able to add vectors graphically using the methods presented in class.

3. Students will define and differentiate vectors and scalars, and will be add vectors graphically using the methods presented in class. Students will find the components of a vector from a sketch on graph paper, and use them to find the components of the resultant.
4. Students will be able to define and differentiate distance and displacement, speed and velocity, and acceleration.
5. Students will apply the given set of motion equations to problems in uniformly accelerated motion.
6. Students will state Newton's laws and apply them to one-dimensional problems. This includes accurately describing and applying the concepts of friction. Students will define and differentiate mass and weight.
7. Students will define momentum. Students should know what it means for a quantity to be conserved and explain the demonstrations done in class.
8. Students will define equilibrium and concurrent forces, and solve one dimensional equilibrium problems. Students will describe the conditions for equilibrium in two dimensions and solve some simple 2-D equilibrium problems. (A 2-dimensional equilibrium problem will also be solved in laboratory).
9. Students will define torque and relate torque to rotational equilibrium (Nonconcurrent Forces). A more complicated rotational equilibrium problem will be solved in lab.
10. Students will apply energy concepts to problems. Students will define work, power, and energy, and differentiate types of energy. Students will describe what is meant by energy conservation and apply this concept.
11. Students will describe basic rotational quantities. Students should be able to define angular displacement and angular velocity, and relate angular displacement to arc length and angular velocity to tangential (linear) velocity. Students should also describe centripetal force.
12. Students will describe and apply the principles of simple machines. Students will define mechanical advantage and efficiency, and apply these definitions to a lever, wheel and axle, pulley, inclined plane, and screw. Students should also be able to discuss friction and actual mechanical advantage.
13. Student will describe fluids by defining pressure, applying Pascal's principle to hydraulic problems, and applying Archimedes' principle to buoyancy problems. Students should also define and differentiate laminar and turbulent flow.
14. Students will describe and apply principles of thermodynamics and thermodynamic properties

of matter. Students will define and differentiate temperature and heat, relate temperature to heat (i.e. using specific heat), and describe phase changes. Students will describe the three mechanisms of energy transfer. Students will also describe and apply principles of linear and volumetric expansion. (There may be insufficient time to treat all the aforementioned topics quantitatively.)

15. Students will learn basic concepts of electricity. Students will identify the subatomic origins of electrical forces, describe induction, and define and describe the nature of electric forces.
16. Students will describe simple DC circuits. Students will define "DC", voltage, current and resistance, and apply Ohm's law to simple circuits. Students will also define and differentiate series and parallel circuit elements in circuits, and calculate the equivalent resistance of these circuits. Students will find the current through and voltage across a resistor in a simple circuit.
17. Students will describe magnetic phenomena qualitatively. Students should define and describe magnetic lines of force, magnetic poles and magnetic induction. Students should be able to describe the principle of operation of a motor and a generator.
18. Students will be able to calculate the magnetic field due to a long straight wire and in the center of a solenoid.
19. Students will describe waves. This includes differentiating transverse from longitudinal waves; defining wavelength, period, and frequency and describing the relationships between them.
20. Students will define sound and describe sound waves with respect to speed and pitch (frequency). Students will differentiate intensity from intensity level.
21. Students will describe the electromagnetic spectrum. Students will describe electromagnetic radiation, and rank the types of radiation with respect to frequency, wavelength, and energy.
22. Students will use scattering to explain why the sky is blue, why the sunset is red, why the ocean is blue, and why clouds are white.
23. Students will describe the properties of waves by defining, describing and giving examples of the following phenomena: superposition, beating, reflection, refraction, diffraction, total internal reflection, the Doppler Effect, and the concept of resonance.

(Optional. Will be done as time allows.)

24. *Students will describe the structure of the atom by comparing electrons, protons, and neutrons with respect to charge, mass and spin.*

25. *Students will explain the role of the strong nuclear force in the nucleus of an atom.*
26. *Students will describe the electronic structure of the atom. Students will define the term “energy level,” and draw energy level diagrams.*
27. *Students will define absorption, emission and scattering, and be able to predict the possible absorbed or emitted photon energies from an energy level diagram.*
28. *Students will describe x-ray production, and define/differentiate characteristic x-rays from bremsstrahlung x-rays.*
29. *Students will describe the basis for image formation in a medical x-ray.*
30. *Students will describe a CAT scan, and the process by which a three dimensional image is formed.*
31. *Students will explain what it means for an energy level to be “split” using the example of a proton in a magnetic field and chemical shift.*
32. *Students will explain the behavior of a proton in a magnetic field in terms of the Larmor frequency and the interaction of the proton with radio waves.*
33. *Students will define and differentiate T_1 spin-lattice relaxation from T_2 spin-spin relaxation.*
34. *Students will explain the basis of image formation in MRI.*

Tentative Schedule

The instructor reserves the right to change the topics that are covered or their order.

Week	Date	Lecture/Lab /Exam	Topics
1	W 9/7	Chapter 1	Significant Figures & the Metric System
2	M 9/12	Lab	Measurement
2	W 9/14	Chapter 1	Cleanup "Measurement"
		Chapter 2 & Minilab	Vectors
3	M 9/19	Chapter 3	Motion
3	W 9/21	Lab	Uniformly Accelerated Motion
4	M 9/26	Review	Measurement, Vectors & Motion
		Chapter 4	Force
4	W 9/28	Exam 1	Measurement, Vectors & Motion
		Chapters 4 & 5	Force and Momentum
5	M 10/3	Lab	Atwood Machine
5	W 10/5	Chapter 5	Momentum
		Chapter 6	Concurrent & Parallel Forces
6	M 10/10	Lab	Rotational Equilibrium: The Elbow
6	W 10/12	Review	Force
		Chapter 7	Work and Energy
7	M 10/17	Exam 2	Force
		Chapter 7	Work and Energy
7	W 10/19	Chapter 8	Rotational Motion
		Minilab(?)	Rotational Motion
8	M 10/24	Chapter 9	Simple Machines
8	W 10/26	Lab	Simple Machines
9	M 10/31	Review	Work and Energy, Rotational Motion & Simple Machines
		Chapter 12	Fluids
9	W 11/2	Exam 3	Work and Energy, Rotational Motion & Simple Machines
		Chapter 12	Fluids

10	M 11/7	Lab	Buoyant Force
10	W 11/9	Chapter 13	Heat
11	M 11/14	Lab	Specific Heat
11	W 11/16	Review	Fluids & Heat
		Chapter 16	Electricity & DC Circuits
12	M 11/21	Exam 4	Fluids & Heat
		Chapter 16	Electricity & DC Circuits
12	W 11/23	Lab	Ohm's Law
13	M 11/28	Chapter 17	Magnetism
		Papers Due	Papers Due
13	W 11/30	Lab	Magnetic Field of a Solenoid
14	M 12/5	Review	Electricity, DC Circuits, Magnetism
		Parts of Chapters 15, 19, 20 & 21	Waves
14	W 12/7	Exam 5	Electricity, DC Circuits, Magnetism
		Parts of Chapters 15, 19, 20 & 21	Waves
15	M 12/12	Lab	Speed of Sound
		Parts of Chapters 15, 19, 20 & 21	Waves
15	W 12/14	Parts of Chapters 15, 19, 20 & 21	Waves
		Special Topic	Diagnostic Imaging; X-Ray, CAT, MRI
	TBA	Review	Waves (and Diagnostic Imaging)
	TBA	Exam 6	Waves (and Diagnostic Imaging)

Prelab Assignment Criteria

For every lab session, you will write a short summary of the lab that you are about to do. It should not be written in the lab notebook because it will be collected at the beginning of the lab. It cannot be late. Summaries are worth 10% of your lab grade.

The summary should address the following questions. Number them.

1. What is the goal?

Specifically, what is the result you will obtain at the end of lab? What will you have calculated, compared, measured, etc. by the end of lab? (Typically 1 to 3 sentences)

2. What specific measurements are you taking?

What measurements are you actually taking (length, mass, time of something...)? How or with what are you taking them? (A few sentences to a paragraph)

3. How is the result (goal) calculated or determined from the measurements?

How is the data being analyzed? Give the equations if known.

4. Anything else worth mentioning?

For example, are there safety issues? Also, after reading the lab, what questions do you still have? What is still unclear?

Laboratory Notebook

(A link to interactive sample notebook pages may be found on my homepage.)

Purpose: To provide a formal, organized work space/log in which one can record data and work through the calculations of an experiment. It will help you organize your thoughts and retain useful information.

General:

The pages should be fastened securely, so the laboratory notebook should not be spiral-bound or perforated. A string-bound composition notebook is a good example of an acceptable notebook. Carbon paper is not needed.

1. Write in pen. Neatly cross out mistakes. No white out!
2. The inside cover should have information such as your name, address, home phone number, instructor, etc. This will ensure that the notebook and all the data that you have worked so hard to obtain will always find its way back to you.
3. The third page is where you should start a table of contents. Update this as necessary.
4. Number the pages as you go, using both sides of each page.
5. The first experiment should start on about the 10th page.
6. Skip a few pages between experiments.
7. Keep the notebook in chronological order. Avoid leaving space for things and filling them in later.
8. If you miss a lab, you must still write the title and date of the experiment at the appropriate point in the notebook.
9. Use the last several pages for reference. Write universal constants, equations, and reminders that you find frequently useful.

10. Show your lab notebook to the instructor before leaving lab!

For each experiment, label the following sections:

1. Title, Experiment Number, Date, Lab Partners, etc.

2. Lecture Notes

Record any diagrams, mathematical derivations and procedural notes given by the instructor. The **purpose** of the experiment should be prominently displayed first. Everything mentioned in the prelab discussion should be here.

3. Data/Calculations (*Start a new Page*)

Any data you take goes here first!!! Data must be taken directly into the laboratory notebook as you acquire it. The laboratory report is a final draft only. I reserve the right to deduct points if you are not taking data directly into the notebook. Also, attempt all calculations in the notebook first. Again, the laboratory report is a final draft only. Your **results** should stand out!

Remember: Data is taken directly into the lab notebook. Your first attempts at calculations are also written there. You don't have to write everything twice, but make sure your calculations are correct in the notebook before attempting to fill in the lab report. *If you are observed not using your lab notebook, a penalty of 10 points off your lab grade will result!*

Basic Physics
Research Paper Requirements
(These criteria will be changed. More details will be distributed.)

1. Goal: To research a physics-related topic that is either of personal interest or applies to your career.
2. Topic
 - a. Anything physics.
 - b. The topic must be cleared by the instructor.
 - c. Explain your topic in as much detail as possible. Apply what you are learning this semester!
3. Length- 4 to 6 pages plus title page and references, typewritten & double-spaced.
4. Format-Use standard intro / body / conclusion format. Do not label these as sections.
5. References
 - a. Must have 3 or more sources other than the text.
 - b. Must use at least one internet source and one “paper” source (or a digital version of a paper source).
 - c. Use a standard format (e.g. MLA or APA guide at the library circulation desk).
 - i. Make a note about what format was used.
6. Due Date: 11/29
7. Evaluation (Subject to change)
 - a. 75% Subject Matter
 - b. 25% Format
 - i. Structure
 - ii. Grammar, Spelling & Punctuation
 - iii. Readability
 - iv. References
- 8. Plagiarized papers will receive a zero!**