Physics 1422, General Physics I-A
Section 01, Fall 2006

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Textbooks:

A.P. French, Newtonian Mechanics, W.W. Norton, 1971

Douglas Giancoli, *Physics for Scientists & Engineers*, Vol. 1, 3rd Edition, Prentice Hall, 2000

L. McDermott, P. Shaffer, *et al.*, *Tutorials in Introductory Physics*, Prentice Hall, 2002

Lab Manual for 1408 / 1422 / 1425

Welcome to section 01 of **Physics 1422, General Physics I-A** for science and engineering students! This course is an introduction to the physical concepts of mechanics and thermodynamics. By the end of the course, you should be familiar with Newton's Laws, forces, work and energy, momentum and inertia, rotational motion, oscillation and waves, and some aspects of thermodynamics. The purpose of this course is to introduce you to the ways in which a physicist models nature using mathematics, and uses these models to understand our world. In the process, you will also gain facility with problem solving in mechanics and thermodynamics.

This course differs from PHY 1425 in that it requires only concurrent enrollment in Calculus 1 (MTH 1321), not previous completion of a calculus course. Thus, physics and calculus are learned together, as is appropriate, since Newton invented calculus for the purpose of formulating his laws of mechanics. But physics is more than just an application of mathematics. It is a framework for understanding our universe. I hope you will come to see physics as more than just a series of equations to be memorized, but rather as a set of ideas that can be used to precisely model our world.

Physics is a hands-on subject!

You cannot do well in this course by watching your professor work problems on the board, or by asking your friends to show you how they did them. The problems are designed to help you discover the ways in which the concepts of physics apply to a variety of situations. There is absolutely no substitute to struggling through the problems yourself. Do not leave the problems to the last minute. Most of them are intended to require too much thought to be done in a rush, as if they were simple exercises to be worked while sitting at the computer. Those who do this normally do not learn the material well, and have disappointing performance on the exams. The due dates will be kept close to the completion date for each chapter to encourage starting the problems early.

Your grade in the course should largely reflect the amount of effort you put into the homework. However, it is a mistake to make completing the homework your only goal. The real goal is to understand the material, and to do this well, you must first read the chapter, and not blindly try to start on the problems, hoping you can skim the material for the right equations to use. That approach may get you through the homework more quickly, but without the understanding you will need to apply your knowledge in new contexts, including the exams. If you have trouble with one of the problems, go back and read the chapter some more, or try some different problems and come back to it.

The mathematical tools we will use include algebra, trigonometry, geometry, and vector algebra. Everyone should have a comfortable working knowledge of algebra, geometry and trigonometry, since these used extensively on a daily basis. In physics, mathematics is not just a means of solving problems, but the language in which the fundamental ideas are expressed. Any weakness in these areas will have a strong impact on your understanding of physics. You should consider a tutor if you feel you need one. Vector algebra is needed any time we want to describe quantities that have a direction. If you are not already familiar with vectors, you will be soon.

Calculus was invented to describe the kind of physical problems we will be considering, and is essential to express physical laws, as Newton first realized. This course should be taken concurrently with a calculus course, and you should find that the two forces help to reinforce each other. Seeing calculus a physical context will help you understand the concepts of differentiation and integration more fully and intuitively. Some calculus concepts may appear here first. In those cases, we will try to give enough of an explanation to be sure these concepts are understood. Just because a concept appears later in a mathematics course does not necessarily mean it is harder.

Grading

Your grade for the course will be determined by a combination of factors weighted as indicated below. The minimum passing grade is a final total of 60.0%, including a laboratory grade of at least 60.0% as well. **Failing laboratory grades are unacceptable.** If you fail the laboratory, you fail the course as well. **Attendance is required** in all Baylor courses. Excessive absences (more than 10, excused or not) will result in failure of the course.

You may view your grades on the **Blackboard** system (**my.baylor.edu**). Homework grades can be viewed while logged into the **CAPA** system (**capa.baylor.edu**).

Hour Exams	35%	90.0 – 100.0	A
Comprehensive Final	15%	85.0 – 89.9	B+
Homework	25%	80.0 – 84.9	B
Laboratory*	25%	75.0 – 79.9	C+
	100%	70.0 – 74.9	C
* Must have passing laboratory grade.		60.0 – 69.9	D

Laboratory

Each of you should be enrolled in one of the laboratory sections associated with this course. The laboratory experiments illustrate some of the concepts we will be studying, and will serve to remind you that physics is an observational science, grounded in experiment. Some of the laboratory sessions will be used as tutorials, which are exercises you will work through together to enhance understanding of the conceptual elements of the material being covered in the textbook and lectures.

Laboratories begin the first week of classes. Note that for safety reasons, no food or drink is allowed in the laboratories, and closed-toe shoes must be worn for experiments.

You will be assigned a laboratory grade by your laboratory instructor. **You must have 60% or better in the laboratory to pass the course**, independent of any other grades. Note that this cutoff is a bare minimum: 59.9% is *never* a passing grade in this course. Since laboratory instructors have varying standards, the laboratory grades will be adjusted to an average of 85% in sections with a lower average.

Exams

Three exams will be given during the term. A comprehensive final exam will be given at the end of the course.

Calculators may be used on these exams, but not notes. You will need to remember certain equations for the hour exams. These equations appear on the review sheets which are posted on the **Exams** page of the course web site. If you do not have a scientific calculator, you should get one before the first exam.

Missed Exams

To allow for emergencies or unavoidable conflicts, one makeup exam will be given at the end of the course. It will contain a cross-section of questions similar to those on the previous exams, but not identical to them.

You must make every effort not to miss the final exam, since there is no makeup final. In case of a missed final, Baylor policy requires an incomplete, which must be resolved in the next semester. A complete schedule of final exams is published on the Baylor web site **`schedule.baylor.edu`**. Baylor policy permits the schedule to be changed if three final exams are scheduled on one day. If you have a conflict, you must resolve it by mutual arrangement between the professors of the courses involved. Normally, exams for non-major electives will be rescheduled before exams in major or required courses. Check your final exam schedule now! **Any requests to reschedule the final exam must be received at least 30 days before the exam.**

Exam Structure and Strategy

The exams will normally have two or three multi-part homework-style problems, plus some multiple choice or verbal questions which will test your understanding of the concepts in the chapters covered. The homework-style questions will be closely modeled on assigned problems of medium difficulty, but will not duplicate them exactly. To do well on these, you should be sure to understand the reasoning behind the solutions to each problem, not just memorize which equations were used. The conceptual questions will not require much computation, but will focus on central concepts covered in the course.

You should write your answers as neatly as possible to achieve the greatest possible credit. Be complete, and show all equations used. If you are not sure of the equations, try explaining what you would do in words. Just because you are stuck on a problem does not mean you should panic. Use strategy to get as much

credit as possible on the problem. Do not turn in blank problems if you can avoid it. Partial credit will be awarded generously on exams, if you provide enough information to merit it. The final exam will be entirely in multiple choice format, so partial credit is not applicable. The problems on the final exam will be shorter to allow all topics to be covered.

Exam Grading

Be sure to write something for every question, since even a wrong answer can receive some credit if the explanation is good. On the problems, write enough to show your reasoning process. Correct equations are more important than correct numbers, but they must be written clearly enough to tell what you are doing. Even if your answer is wrong, you can still get almost full credit if the steps leading to it are conceptually correct.

Exam scores are normalized so that the minimum passing grade (60%) corresponds to slightly more than 1/3 of the points on the exam. This is done to acknowledge the fact that working problems is more difficult under a time constraint. This is not a curve in the usual sense, since the rescaling is independent of the average on the exam.

Preparation for Exams

The best exam preparation is to put a serious effort into the reading and homework, doing as much of the work yourself as you can. Working through someone else's solution is no substitute for puzzling through the problem on your own. Those frustrating moments (or hours) when you can't figure out which equations apply, or when you don't seem to have all the variables you need, are the same moments when most of your learning is occurring. The effort you put into homework will pay off when you take the exams.

A good way to prepare for exams is to review your old homework, both the problems and conceptual questions, and also any examples worked in class. The exam problems will generally be similar to these. Concentrate on the early set-up parts of the problem, since this is usually what causes the most trouble in a timed situation. You must practice to be able to identify the relevant concepts in a problem quickly. Try doing this without looking at the answers. If a certain type of problem continues to cause trouble, try working it repeatedly, after waiting a few days between attempts.

Homework

How much you learn in this course will depend most strongly on how much time and effort you put into the homework.

Some of the homework will be turned in for grading, and some will be graded using the **CAPA system**. This system provides individualized problems for each student. You will find a set of help links at the right. These are also available from the CAPA login page and from the CAPA main menu after you log in. Answers will be posted after the set is due.

CAPA problems are always due at **noon** on the due date, according to the computer clock, unless otherwise noted. **The cutoff is absolute.** Late homework cannot be accepted for any reason. However, the lowest homework score of the semester will be dropped, which will effectively provide an exception for one emergency per student.

Some of the problems in each set will be turned in and graded by hand. These problems are due the same day as the CAPA problems, and are to be turned in at the beginning of class. Problems may be discussed during the class in which they are due, so late problems will not be graded.

Homework Strategy

You should not think of homework as a task to be completed, but as a task which is essential to your learning. It is the process that matters most, not the answer. Your approach to the homework is probably the biggest factor which will influence your success in the course.

Homework begins with reading the textbook. You should always try to read the sections being discussed in class ahead of time, so that you will not be confronting new material in the lectures. The goal isn't to memorize new equations, but to understand the physical concepts mathematically. Most of the equations are easy to remember once you fully understand them. Physics should be read with a pencil and paper at hand, so that you can work through the examples and be sure you understand any difficult points. You can then come to the lectures prepared to ask questions about anything you couldn't understand on your own. If you get behind on the reading, the course can become much more difficult than it has to be. It often helps to read the material more than once. You should find that you understand much more of the reading after you have done the problems.

After you have read the sections being discussed in class, you should start on the homework from those sections. You should start on the appropriate problems immediately, and not wait until just before they are due. Working the problems will help you understand the rest of the chapter much more completely. You may find it useful to work in groups, but be careful not to let your collaborators do too much of the work for you. It is important to be able to solve the problems yourself.

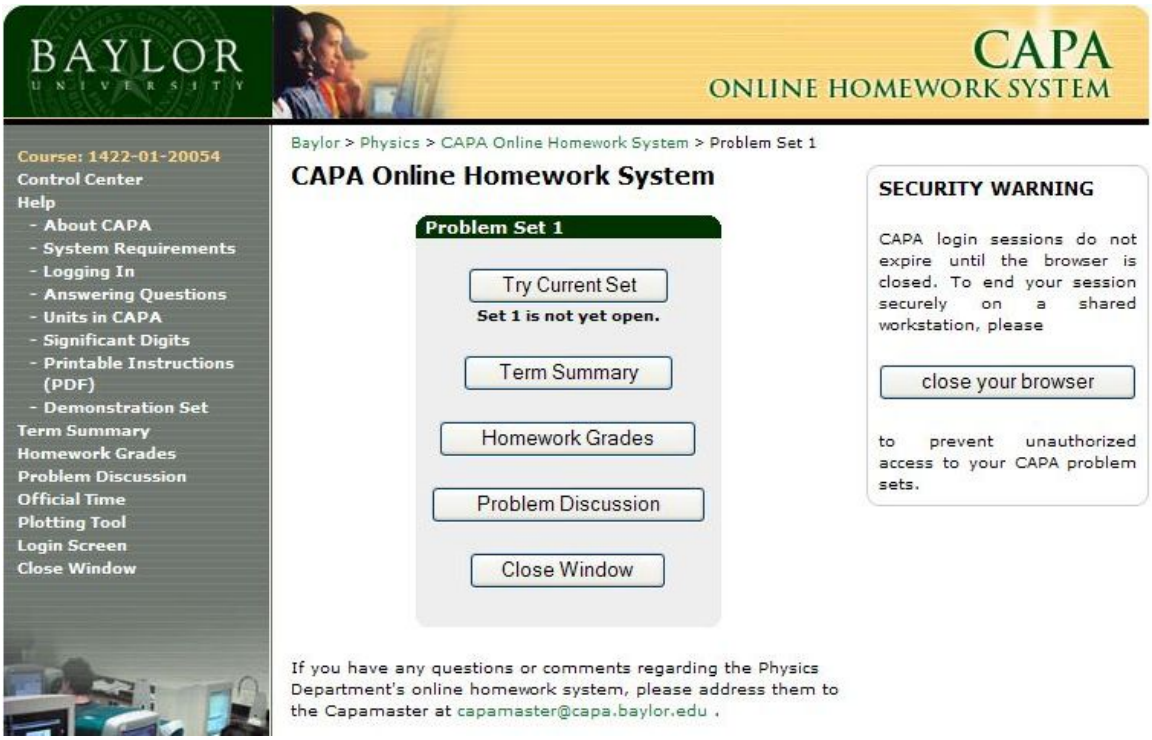
If you find yourself having difficulty on the homework, do not let yourself get too far behind before seeking help. You should come to the office hours, and ask the Physics Department office about tutors as soon as you begin having difficulty. The department provides free tutors in the third floor E wing of the Baylor Sciences Building. A schedule is on the wall near the windows.

The CAPA System

Homework will be assigned online using the CAPA system, which provides individualized problems for each student. To access it, go to the page http://capa.baylor.edu using a web browser. Click on the **CAPA Login** button to see the login screen. Select the course PHY1422-01 from the pull-down menu, and enter your student ID (either the 9-digit number on your ID card, or your Bear ID). You also must enter a "CAPA ID", which is a four digit number unique to each student and problem set. If you don't know the CAPA ID for a set, you may request one using the buttons below. Once you know the CAPA ID, you can enter it and press the **Enter CAPA** button.

Once in the system, you will see the CAPA Main Menu, which permits you to work problem sets, view their grades, and participate in online discussions.

- **Try Current Set** is the most important link, for working an online problem set.
- **View Previous Set** shows the answers to a closed set.
- **Term Summary** is a list of scores on each problem in each set.
- **Homework Grades** shows the grades on each set, plus graphic information on the overall class performance.
- **Problem Discussion** is a problem-related discussion board, for requesting or posting help on individual problems.
- **Close Window** ends a session securely by closing the window.



CAPA Main Menu

When an answer is graded, answer code shows whether the answer is correct, whether the units are right, and whether the number of significant digits is correct. Answers are checked in the order of units, then significant figures, then correctness. Incorrect units or significant figures will not deduct from the allowed number of tries. If the units and significant figures are right, then the problem is graded, and any incorrect answers will count against the allowed number of tries.

The answer codes are:

- **Y** correct answer.
- **N** incorrect answer.
- **U** wrong units.
- **S** wrong number of significant digits.

Avoid using the "Back" button on your browser: most browsers automatically repost the previous data, which can lead to the loss of one of your tries for any incorrect answers. Always use the navigation buttons and links on the web page.

Most problems will require considerable thought, and should not be done as if they were simple exercises, while sitting at the computer. Draw pictures and set up the problems algebraically on paper first. Put in numbers only after you have completed the necessary algebraic work. It is much easier to find errors in algebra than in numerical calculations.

Calendar

This is a schedule for the Fall, 2006 semester of Section 1 of Physics 1422, General Physics I. The schedule shows the dates when the lectures will cover each chapter. Chapters are denoted by an author's initial and chapter number, so that F1 means chapter 1 in A.P. French's text, G15 means chapter 15 in D. Giancoli's text, *etc*. The dates marked Set 1, Set 2, ... are when these online homework sets are due.

Week	Monday	Wednesday	Friday
Aug. 21 - 25	Syllabus, G1	G1, F1	F2 , Set 1
Aug. 28 - Sept. 1	F2	F3 , Set 2	F3
Sept. 4 - 8	**Labor Day**	F4, Set 3	F4
Sept. 11 - 15	F4	F5, Set 4	F6
Sept. 18 - 22	F6, Set 5	**Exam 1: F1-F6**	F7
Sept. 25 - 29	F7	F7-F8, Set 6	F8
Oct. 2 - 6	F9	F9, Set 7	F9
Oct. 9 - 13	F10, Set 8	F10	F10, Set 9
Oct. 16 - 21	F11	F11, Set 10	**Exam 2: F7-F11**
Oct. 24 - 27	G15	G15-16	G16
Oct. 30 - Nov. 3	G10, Set 11	G10	G11, Set 12
Nov. 6-10	G11	G13, Set 13	G13
Nov. 13-17	G13, Set 14	**Exam 3: G10,11,13,15,16**	G17
Nov. 20 - 24	G17-18, Set 15	**Thanksgiving Break**	
Nov. 27 - Dec. 1	G19	G19, Set 16	G20
Dec. 4 - 8	G20, Set 17	**Final Exam: TBA**	

Exam dates will not change. Try to adjust your schedule around them. The makeup exam will be scheduled after Thanksgiving break. Requests to reschedule a final exam must be made at least 30 days before the exam.

Topics Covered

G1 Introduction, Measurement, Estimating

F1 A Universe of Particles (overview, orders of magnitude, estimating)

F2 Space, Time and Motion (vectors, reference frames, velocity)

F3 Accelerated Motions (including projectiles, circular motion)

F4 Forces and Equilibrium (balancing forces and torques)

F5 The Various Forces of Nature (fundamental forces, contact forces, …)

F6 Force, Inertia and Motion (overview of Newton's Laws and inertia)

F7 Using Newton's Laws ($F = ma$, resisted motion, air resistance, simple harmonic motion)

F8 Universal Gravitation (Kepler's Laws, orbits, weightlessness)

F9 Collisions and Conservation Laws (momentum and impulse)

F10 Energy Conservation in Dynamics; Vibrational Motions (work, kinetic and potential energy, small oscillations, energy diagrams)

F11 Conservative Forces and Motion in Space (vertical circular motion, pendulum, orbits, escape velocities)

G15 Wave Motion (wave speed, energy, boundary conditions, superposition)

G16 Sound (sound waves, musical instruments, decibels, interference)

G10 Rotational Motion about a Fixed Axis (torque, moments of inertia, rolling)

G11 General Rotation (rigid body motion in three dimensions, collisions)

G13 Fluids (density, pressure, buoyancy, Bernoulli equation)

G17 Temperature, Thermal Expansion and the Ideal Gas Law

G18 Kinetic Theory of Gases (internal energy, phase diagrams)

G19 Heat and the First Law of Thermodynamics

G20 Second Law of Thermodynamics; Heat Engines, Entropy