Some Intellectual Goals

The attempt is made to acquaint the students with the remarkable successes over the last 400 years or so of the activity we now call **physics**:

> **The abstraction, from our complicated experiences with the physical world, of suitable concepts and relationships expressed in mathematical terms (which we call theories).**

This process has allowed us both to comprehend and to describe numerically these experiences for a vast range of physical phenomena. The foundations of our current technologies in these earlier quests for understanding is emphasized frequently.

An important example is the foundation of modern space-faring capabilities on the discoveries by Sir Isaac Newton about motion and gravitation. The following point is emphasized: It was an intense desire for understanding, rather than an explicit search for new technologies, which actually made possible their development.

The parallel is drawn for contemporary investigations of new phenomena in such areas as astronomy and astrophysics, relativistic gravitation, quantum physics and high-energy particle physics. (When making these observations, the current instructor views the students as future legislators!)

Demonstrations of Physical Phenomena

Physics is based on experiments and observations. It is very important therefore in the teaching of physics that the actual behavior of objects be experienced in simple situations before the abstract concepts which allow us to comprehend and describe the behavior are introduced. For this reason, many demonstrations are performed during the lectures.

The Physics Department is fortunate to have one of the world's best collections of demonstration equipment. The present instructor led the effort about 30 years ago to design and build a lecture hall complex with rotating stages and extensive storage space to facilitate the use of demonstrations

with just such a course as Physics 111 in mind. The lecture halls also have excellent audio-visual equipment with rear projection screens to allow easy viewing of slides, movies, video tapes and computer screens. These media are often used.

Use of Mathematics

The natural language of physics is mathematics. It is remarkably effective in providing clear, concise, and very accurate descriptions of phenomena. The reasons for this are obscure and deep, but it is a fact! Therefore it would be a fraudulent presentation of physics not to use this language. All that is required as a prerequisite is elementary algebra and some trigonometry. Although some students will not be comfortable with this language initially, it is a necessary part of understanding physics and we will not shy from its use.

The textbook itself concentrates on a rich presentation of the conceptual part of physics, but there is a supplement entitled *Problem Solving for Physics: World View*. We shall make use of this and sometimes go beyond it in providing some derivations, which the authors do not show. It is important to understand the individual mathematical and physical arguments that lead to useful equations.

Modern technology in the form of hand held calculators (which use integrated circuit chips containing huge numbers of transistors whose very existence was made possible by the understanding of the quantum mechanical behavior of electrons in crystals!) allow the easy numerical evaluation of equations, so such problems will be assigned.

Homework Assignments

"Be ye doers of the word, and not hearers only, deceiving your own selves" ***James*** **i,** ***22***

It is only by grappling with actual problems and solving them that the abstract concepts of physics are made real to students. For this reason

numerous problems are assigned at each meeting of the class, to be handed in at the next class. In addition, conceptual questions requiring written answers after some thought are included in each assignment.

The assignments are examined for completeness and serious attempts at solutions to problems and answers to questions. The limitations of teaching assistant time prevents each response from being read carefully and graded. However the goal is to do this for at least one problem and one question in each assignment. Each class meeting begins with a discussion of the questions and problems assigned for that day. This provides an additional opportunity to review concepts and sometimes to introduce and anticipate new material. Written answers and solutions to the homework assignment are prepared by the teaching assistants and instructor and copies are made available after the assignments have been handed in.

Statement about CORE Distributive Studies

You may have chosen this course as part of your CORE Liberal Arts and Sciences Program, the general education portion of your degree program. CORE Distributive Studies courses are designed to ensure that you will take a look at several different academic disciplines and the way they create and analyze knowledge about the world. A faculty and student committee apprived this CORE Distributive Studies course because it will introduce you to ideas and issues that are central to a major intellectual discipline and because it promises to involve you actively in the learning process. Please take advantage of the opportunities this course offers you.

Physics 111 **PHYSICS IN THE MODERN WORLD** Spring 2008

Professor:
Dr. C.O. Alley
Office: Physics-1324
Telephone: 301/405-6098
E-mail: coalley@physics.umd.edu
Office Hours: M, W: 11-12 AM
and by appointment

Teaching Assistants:
Moshik Shechter, Khalid Ismail

Office hours: To be announced
and by appointment

Lecture Demonstration Assistant:
To be announced

LECTURES: M, W, F, 9:00-9:50 AM, Physics Lecture Hall Z-1410

TEXTBOOKS REQUIRED:

Physics: A World View, by Kirkpatrick and Francis, 6th Edition, published by Brooks/Cole-Thomson Learning (2007). ISBN 0-495-01088-X

Problem Solving for Physics: A World View, by Kirkpatrick and Francis, 6th Edition, published by Brooks/Cole-Thomson Learning (2007). ISBN 0-495-01093-6

Knowledge and Wonder, by V. F. Weisskopf, 2nd Edition, MIT Press (1979). (Out of print. Xerox copies will be distributed to students without charge.)

Textbook Recommended:

Powers of Ten, by Philip & Phylis Morrison and the Office of Charles and Ray Eames, Scientific American Library, 3rd printing, 1999. ISBN 0-7167-6008-8

TESTS:

Three (3) 50-minute tests will be given. It is required that you take each test. Only for verifiable medical or other valid reasons will exceptions be made. No make-up tests will be given.

FINAL EXAMINATION:

The final exam is scheduled on Monday, 19 May 2008, from 8:00 to 10:00 AM. The location will be announced before the examination. Please verify this schedule during the last week of classes as it sometimes changes.

In order to pass this course you must take and pass the final examination.

HOMEWORK:

Daily homework assignments consisting of conceptual questions and numerical problems will be given and are due during the class on the date designated. Late homework will be accepted only with the permission of the instructor. Each homework assignment will be graded. Unexcused late homework assignments will be marked down. The total will count 25% toward your final grade.

Organize your homework solutions clearly so the grader can understand them, and so that you can understand them later when studying for the tests and the examination. Use a writing instrument with adequate contrast so the work is easily legible. (This remark applies even more strongly to your tests, quizzes and final examination.)

Xerox copies of solutions to homework problems and answers to the conceptual questions will be provided after the assignments are handed in.

QUIZZES:

Occasional short (10 to 15 minutes) quizzes will be given, and their average will count 10%

toward the final grade.

On the *examinaton, tests,* and *quizzes,* you must show your *steps, reasoning,* and *"working"* to get full credit.

GRADING SYSTEM:

Your course grade will be computed on the following basis:

30 points - Final exam.
35 points - Best two out of three tests.
25 points - Homework problem sets.
10 points - Quizzes.
---
100 points - Total

Adjustments will be made for any significant differences in the difficulty of different tests.

To complete the course and obtain a passing grade you *must*:

1) Take all three tests.
2) Take **and pass** the final examination.

The grade "I" (Incomplete) is very exceptional and will be granted only to students who have satisfactorily completed the major portion of the course and who are unable to complete the course because of illness or other circumstances beyond the student's control.

CALCULATORS:

An inexpensive scientific calculator is needed for homework problems and for all tests and the examination. In addition to the usual arithmetic operations, it should have at least 1 memory location, produce the value of Pi on demand, and have sine, cosine, exponential and log functions, as well as arbitrary powers and roots, especially the cube root, needed for Kepler's third law calculations. Parentheses, statistical functions, and radian/degree conversion are also very helpful. A suitable calculator can be obtained inexpensively.

A few calculators are available in the Lecture Hall preparation area if you forget to bring your own to a test or the examination.