Physics 103
General Physics - Spring 1998

Prerequisites:

- Algebra and trigonometry.

Materials Needed:

- Text: Serway & Faughn, *College Physics*, fourth edition.
- *Physics 103 Lab manual*, Hayden-McNeil (1997).
- Lab notebook: preferably hard bound with cross-hatched ruling. Bring to first laboratory meeting (week of Jan 26).
- Calculator: preferably with trigonometric, exponential, and logarithmic functions. Know how to use it, and make sure batteries are charged for exams.

Lectures:

- 11 am MWF in 1300 Sterling Hall.
- Prof. J. C. Sprott (3285 Chamberlin, 263-4449, sprott@juno.physics.wisc.edu).
- The lectures supplement but do not substitute for the reading.
- Read the assigned material before lecture.

Discussion sections:

- Your discussion section will be led by your TA who will be your prime contact and source of assistance.
- General questions about the homework are allowed before it is due, but don't expect your TA to work out the solutions for you in advance.

Electronic Aids:

- All of the instructors are available by e-mail, and there is an e-mail list for the entire class that will occasionally be used for important announcements.
- The course has a home page on the World Wide Web at http://sprott.physics.wisc.edu/phys103/ where you will find up-to-date course information and links to useful resources.

Laboratory:

- Follow the instructions in the laboratory manual.
- The experiments are to be written up during the laboratory period in the lab notebook.
- Have your lab instructor initial and date the work before you leave the lab.
- The lab notebook is not to be taken from the lab except with permission of your instructor.

Homework:

- The homework problems are assigned in the syllabus for each week and should be handed in at the beginning of the Monday lecture the following week.
- Late problem sets will not be accepted.
- Homework will count toward your grade.
- Feel free to discuss the homework with others, but make sure the paper you turn in is not simply copied from someone else.
- The solutions will be discussed in your discussion section and placed on reserve in the Physics Library (4220 Chamberlin).

Hour Exams:

- Exams will be given in class on the following Fridays:
  February 20 Chapters 1-4
  March 27 Chapters 5-8
  April 24 Chapters 9-12
- The exams will be closed book, but you will be allowed one 8.5 x 11-inch sheet of paper on which you may write anything you wish.
- The exams will be graded and handed back in your discussion section.
- Solutions will be discussed and placed on reserve in the Physics Library (4220 Chamberlin).

Final Exam:

- The final exam will be at 12:25 pm on Thursday, May 14 (room to be announced).
- It will cover the entire course (Chapters 1-14) with equal weight.
- You will be allowed two 8.5 x 11-inch sheets of notes.

Grading:

- The course grade will be made up of the following components:

3 hour exams	300 points
Final exam	200 points
Labs and homework	100 points
TOTAL	600 points

- Lab and homework grades will be assigned by your TA and will be normalized to the distribution on the hour exams.
- Letter grades will be assigned based on the total number of points accumulated.

Consultation Room:

- Room 2402 Sterling is staffed by TA's from Physics 103 during much of the week.
- See the schedule card on the door.
- You may ask questions of any of the TA's or come during the hours that your TA is there.
- You may also make an appointment with your TA at any mutually convenient time and place.

Study Groups:

- You are encouraged to form study groups in which you jointly work the homework and prepare for exams.
- If you don't know anyone in the class with whom you would like to study, you can leave your name and e-mail address at http://sprott.physics.wisc.edu/phys103/studygrp.htm.

Complaints and Concerns:

- If you have a non-subject-matter question or concern that cannot be resolved by your TA or professor, contact Jean Buehlman, Instructional Program Manager (afternoons in 2520 Sterling, 262-2629, buehlman@facstaff.wisc.edu).

Alternate References:

- To see the same topics explained differently, try the following on reserve in the Physics Library (4220 Chamberlin):
  - Blatt, *Principles of Physics*, 3rd edition
  - Cutnell and Johnson, *Physics*, 3rd edition
  - Giancoli, *Physics*, 4th edition
  - Jones and Childers, *Contemporary College Physics*, 2nd edition

General Advice:

- Physics is not something you read and memorize, rather it is something you learn how to do.
- Try the following study procedure:
  1. Read the chapter prior to lecture, so that you will know what it's about.
  2. Listen carefully to the lecture and take notes.
  3. This is crucial: Do not go back and read and re-read the chapter until you "understand it." Rather, start working problems, going back through the chapter to clarify points as they come up.

Physics 103
Spring 1998 Syllabus

References are to Serway & Faughn, *College Physics*, fourth edition.
Lab manual is *Physics 103 Lab Manual*, Hayden-McNeil (1997).

Week	Reading	Problems	Lab
Jan 19	Chap 1	1, 18, 30, 33, 40	no lab
Jan 26	Chap 2	15, 17, 27, 37, 56	M-1C
Feb 2	Chap 3	2, 11, 22, 28, 44	M-4
Feb 9	Chap 4	5, 20, 30, 50, 73	M-2
Feb 16	Chap 5	6, 16, 22, 38, 48 (Exam #1)	makeup
Feb 23	Chap 6	3, 17, 35, 46, 64	M-2C
Mar 2	Chap 7	8, 15, 22, 33, 43	M-3C
Mar 16	Chap 8	4, 10, 15, 17, 21	M-3
Mar 23	Chap 9	10, 17, 19, 32, 47 (Exam #2)	makeup
Mar 30	Chap 10	6, 11, 23, 33, 45	M-4C
Apr 6	Chap 11	9, 13, 25, 41, 47	H-1C
Apr 13	Chap 12	7, 11, 29, 37, 39	H-2C
Apr 20	Chap 13	3, 9, 15, 19, 39 (Exam #3)	makeup
Apr 27	Chap 14	7, 11, 15, 23, 31	S-1C
May 4	Review		makeup

May 14: Final exam Thursday, May 14, 12:25 pm, Chapters 1-14 (room to be announced).

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Evaluation Form

Optional:
- Check One: Required _____ Elective _____
- Intended Major: _____

1) What is your opinion of your instructor's teaching effectiveness in this course up to date? Comment on the strength and weaknesses of your instructor (e.g., organization of notes, mechanics of teaching, generating interest in the subject, answering students' questions, fairness of grading system, content of exams, etc.).

2) Comment on the strengths and weaknesses of the structure and content of this course (e.g., appropriate prerequisites, material challenging and worth learning, workload, suitable homework assignments, suitable textbook, organization and helpfulness of labs, etc.).

3) What changes in the course and in the teacher's methods and manner of instruction would you suggest?

ON MATHEMATICS AND HOW TO READ A SCIENCE TEXTBOOK

based on *Understanding the Universe*, by Philip Flower, 1990

Scientific subjects such as environmental problems, the energy crisis, AIDS, medicine, engineering, space exploration, etc., have become front page news. What we do about the problems existing on our planet and the way we react to the new developments affects, like it or not, not only our personal lives but also the lives of the rest of humanity. There are many magazines and books that explain in detail the recent advances in science, but a nonspecialist may find them difficult to understand because of the specialized and technical language they use, even though this same language helps scientists communicate efficiently.

Popularizations of the recent advances in science are contained in magazines such as *Science News*, *Scientific American*, *Astronomy*, *Sky & Telescope*, etc., and in some newspapers such as *The New York Times*. By simply reporting the results and what they mean, these popularizations avoid two main difficulties that a nonspecialist may confront in reading the more technical literature, i.e., the lengthy details of the calculations and/or experiments, and all the dreadful mathematics. While the first omission is welcome (sometimes even to a scientist working on another subject), the intentional omission of even the most basic mathematical calculations is not necessarily a blessing.

First of all, mathematics is the language of science and as such it has its own vocabulary, symbols, and syntax. So why is it any harder to learn than, say, Japanese or Spanish? Is it because the "math anxiety" most people have is not relieved by working out problems with paper and pencil (making mistakes at the beginning like everybody else)? You cannot gain confidence in your mathematical abilities unless you try to work out the simple mathematical examples you come across as you read. After all, the purpose of reading a book is not to become a mathematician but to understand the problem under consideration; it is not to accumulate information that you may or may not fully understand but to increase your understanding of the subject.

Secondly, why is it any easier to describe a phenomenon with words instead of using an equation? And what is the purpose of an equation anyway? Let us consider the following very simple example. You drive your car at 60 miles an hour for one hour. The distance you travel is, of course, 60 miles. If you travel twice as fast for an hour then you will cover a distance of 120 miles. This is indeed very easy and there is no need for anything more except words. But what if you travel at 60 miles an hour for 20 minutes? Or, at 72 miles an hour for 7.5 minutes? How do you find the

they are significant and why and, again, make sure you are convinced by the information and the reasoning presented to you. If you are confused about something, or if you think you need more information, ask your instructor.

The best way to work at the *analytical reading* level is with pencil in hand to write in and mark the text and express what you are reading in your own words. Find what connects the ideas presented in the different paragraphs and how they are in turn connected to the main point of the chapter, and write this down in your own words. As your various types of markings you can use: 1) underlining the main points of (but not all) the paragraph; using vertical lines or symbols (e.g., an asterisk *) in the margin to emphasize underlined statements or long but important passages; 2) using numbers in the margin to mark a sequence of arguments or observations made to support a theory; 3) making cross references when you notice that the same point is made again later in the book (usually with more details) and thus finding connections across the whole book. And again, the most important thing for you is to write important points in your own words. When you try to do that, you will find which ideas you do not understand. You can mark them and come back to them later, and at the end you will be able to review the important aspects of a section by looking at your own notes instead of having to read the section all over again.

You are not expected to become an expert of a subject by reading a book on it and following the suggestions presented here. Hopefully though you will be able to understand the subject, appreciate the problems that still exist, and with your knowledge be able to play, in your own way, a constructive role in the efforts for their solutions. As mentioned before, like it or not, our actions or inactions on some problems affect not only us but everybody else on the planet. In that sense it is our *duty* to make sure we understand the problems and take a part in the efforts to solve them.

How does one go about reading a science textbook? Nobody expects you to understand everything in the book by reading it once. You will probably find many descriptions of phenomena that seem incomprehensible. As a matter of fact, there are some descriptions that the scientists themselves do not fully comprehend. Our understanding of what happens in the cosmos evolves, and some of our ideas may be disproven in the future. Just as scientists learn by trial and error, experiments and theoretical models, you improve comprehension by developing your reading skills.

There are three levels of reading. The *elementary*, *inspectional*, and *analytical* reading levels. The first level requires only the skill of being able to recognize the words and understand their meanings when we read a paragraph. It is indeed very sad that in our age the number of people who cannot read is too large to be acceptable by any standards; and it becomes even more sad when one thinks of the reasons and/or excuses for the continuation of such a situation.

What you, the reader, should care about at the level of *inspectional reading* is familiarizing yourself with the book without worrying about the details and without stopping at difficult places. Discover what the book is all about and gain an overall view of the topics covered and their order. The most important thing at this level is to concentrate on the big points being made. How do you do all this? First, look at the table of contents to see what topics are covered and try to determine if there is a reason for their particular order. Second, find out if the book includes some appendices and a glossary (a dictionary defining some of the terms often used in the jargon of each discipline) which you may find useful as you start reading the chapters. Some books also include at the end of (almost) each chapter an essay where a specific idea, loosely related to the main subject of the chapter, is expanded upon (e.g., on the chapter about Earth you may find an essay on the Ice Ages, and on the chapter about Asteroids you may find an essay on Extinctions of Dinosaurs). Read the introduction and the summary of each chapter and get an idea of what the text is all about and what kind of reading is expected of you. And again, the most important thing: concentrate on the overall picture and do not worry about the details.

Analytical reading is active, and the more active your reading is the more you will benefit. A science textbook/magazine/article presents you with information about things you are probably not very familiar with, and it does not tell you what to do with this information. When you read a science textbook if you find yourself asking the questions: *What is this book about? What is being said in detail? Is what is being said true? So what?* then you are on the third level of reading. Your purpose here is to understand, to ask questions, to check the information and conclusions presented to you and to convince yourself that they make sense. Do not accept the things you read as facts, do not assume that the author presents the absolute truth unless you are convinced by the arguments. Discover the important points of each paragraph and how they are developed, find if

they are significant and why and, again, make sure you are convinced by the information and the reasoning presented to you. If you are confused about something, or if you think you need more information, ask your instructor.

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