

Syllabus PHY 102 Major Concepts of Physics Spring 2008

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| Professor | Simon Catterall E-mail: smc@physics.syr.edu Phone: 315-443-5978 Office: Room 309, Physics Bldg. |
| Office hours | Thursdays 2:00 – 3:00 P.M., otherwise by appointment. You are welcome to contact me by e-mail. |
| Prerequisite | PHY 101 – Major Concepts of Physics |
| Lectures | We will meet twice a week: Mondays and Wednesdays: 2:15 – 3:35 P.M., Lectures will be held in Stolkin Auditorium, Physics Bldg. It is important that you ATTEND and PARTICIPATE actively in the lectures. We introduce new ideas, concepts and demonstrate them by both demo experiments and computer simulations. |
| Workshops | Each of you must be registered for a lab meeting (Workshop), once a week (see schedule in Timetable/Miscellaneous). The labs will provide experiments that elucidate and support an idea or principle, which has been already discussed previously in the lecture. Workshops will provide a unique opportunity for enriching student understanding about conceptual physics by reinforcing difficult concepts, engaging them in cooperative learning activities, describing applications, and ultimately working through example problems. |
| Textbook: | “ Physics ” by Alan Giambattista, Betty Richardson, and Robert C. Richardson, <i>Volume 2</i> , Second Edition McGraw-Hill. This is a great textbook for conceptual physics. Furthermore, this is a MCAT-based book that the premeds should take full advantage of. Students must use the textbook to supplement lecture notes. |
| Quizzes: | There will be a number of quizzes that will be held during the lecture periods. <u>You will be graded on the best four out of these quizzes.</u> They will be ten to fifteen minutes in length, and will cover material from last two/three lectures and labs. The date of each quiz will NOT be announced. <u>No make-up quizzes will be given.</u> |
| Physics Clinic: | The Clinic is in Room 113, Physics Building. Every member of the staff of PHY 102 is committed to giving you every opportunity to succeed in the course. If you need help, please speak to one of us. We would also be happy to discuss any course topic in more detail, if required. The other members of the PHY 102 staff will announce their Physics Clinic hours shortly. |
| Grading Policy | You will be evaluated, based upon your commitment and accomplishments in the labs, on the assigned homework, and on the exams and quizzes. The final exam will count as 35%, and <u>the two highest scores on the three in-lecture exams</u> |

will count as 30%. The lab grade will count as 15%. The homework will count as 10%, and the quizzes will count as 10%. As you can see, the labs, homework and quizzes will make 35% of your grade, highlighting the importance of class attendance and participation. The lowest homework assignment grade will be dropped; the lowest lab grade will be dropped. This paragraph details how your net numerical grade for the course is computed. From the net numerical grade, a letter grade is computed. The grade limits will not be stricter than the following: 60% for a C-, 80% for a B-, and 90% for an A-.

Exams

The dates of Exams #1, #2 and #3, given in the lecture, are indicated in Timetable (see the web page of the course). The date of the final exam is Thursday, May 1st, 2008, in Stolkin Auditorium, 5:00-7:00 PM No make-up exams will be given. All material taught in this class, including lectures, labs, example problems and lecture demonstrations is subject to the mid-term and final exams.

Homework:

The homework assignments will be distributed typically every other week in workshop/lab. Homework will be normally due on the lab scheduled two weeks later. Solutions to the homework will be distributed after the problems have been collected. No late homework will be accepted! A deviation from this rule is permitted only in exceptional cases (e.g., you are excused due to an illness etc.) **Homework problems are a very important part of the course.** The only way to obtain a comprehensive understanding of conceptual physics in a quantitative manner is to practice it as much as possible. Working problems is the only way to obtain a deeper understanding of each topic.

Academic Integrity:

We encourage you to find other classmates with whom to study. Working with friends can be very helpful in learning a difficult subject like physics. However, **the final work you turn in must be your own.** There is a distinction between discussing the work, and merely copying someone else's work. The idea here is that you should communicate and help each other to understand the problems and the concepts involved; you will learn more, if you work on the assignments in *groups* and explain the methods and various approaches to each other. You must engage in your own effort on solving the problems.

Webpage/Timetable: <http://physics.syr.edu/courses/PHY102.08Spring/index.html>

The timetable regarding Lectures, Workshops, Exams etc. is presented in several sections of the web page of PHY 102 (Lectures, Timetable/Miscellaneous etc.).

Course secretary

Ms. Arlene Johnston (443-1915) is available in Room 111, Physics Building, from 8:00 A.M. to 4:30 P.M. weekdays. She is the person to see for signatures on add/drop forms, or for other administrative matters. If she is ever unavailable, please go to the Physics Department Main Office, Room 201 Physics Building, for assistance.

Course description

PHY 102 is a continuation of PHY 101. Physics is the study of how the world works. The instructor of this course assumes that most of the students have

already an exposure to introductory and conceptual physics through PHY 101, which was taught during the Fall semester. The course is a survey of introductory physics and its applications to a large number of sciences, including biology, chemistry, biotechnology, medicine, engineering, nanotechnology, geography and so on. The particular sub-fields of physics, which will be studied in PHY 102, are the following (chapters are from “College Physics”):

- a. Vibrations and Waves (Chapter 22)
- b. Electromagnetic Waves (Chapter 22)
- c. Heat and Thermodynamics (Chapters 14,15)
- d. Light: Geometric Optics (Chapter 23)
- e. The Wave Nature of Light (Chapter 25)
- f. Quantum Theory and Models of the Atom (Chapter 27)
- g. Quantum Physics (Chapter 28)
- h. Nuclear Physics and Radioactivity (Chapter 29)
- i. Radiation and Its Applications in Biology and Medicine (Chapter 29)

Please be aware that many of the chapters will not be entirely covered, or the course outline will slightly deviate from that of the textbook. In many situations, only a small fraction of the respective chapter will be employed during the lecture. I will show explicitly in due course which textbook fragments are relevant for the PHY 102 exams.

Primary goals for this course

What should you be getting out of your PHY 102 experience? Our primary goals for you are the following:

- A. Understand that the laws of nature are few in number and that a wide variety of phenomena are explainable by postulating just a few principles.
- B. Gain the skills to solve problems and to be able to predict a variety of physical phenomena.
- C. Acquire many of the skills necessary for critical thinking. This will be accompanied by a deeper understanding of the spirit of scientific reasoning.

These are, of course, broad goals. More **specific goals** are the following:

- A. To understand and be able to explain: (i) the nature of light and sound as waves; (ii) interference of waves; (iii) blackbody radiation; (iv) geometrical optics; (v) principles and applications of quantum mechanics.
- B. To be able to solve a variety of physics problems, such as the ones that we assign in the course. In addition, to be able to answer a variety of conceptual questions, such as those assigned (see Homework assignments).
- C. Develop your understanding of physics to such an extent that, after studying a chapter of our “**College Physics**,” you will be able to answer the conceptual questions and solve problems given at the end of the chapter.\

A note to premeds

We think that there is no better way to invest in MCAT preparation rather than using a great textbook structured and outlined for this major goal. Essentially, every topic covered in PHY 102 is covered on the MCAT exam. The converse, however, is not true. There are a number of topics covered on the MCAT exam that are not covered in either PHY 101 or PHY 102. It is simply not possible to discuss all of the material that may appear on the MCAT exam in a one-year course. The MCAT exam includes some traditional problems but typically the answers will be algebraic expressions. It rarely wants numerical answers. Always solve a problem algebraically first. Then, at the very end, if requested, put in the numbers. So, a thorough understanding of the basics is what will help you the most. As a result, all of the time that you spend in the lectures, labs, homework, and clinic will count. Furthermore, talking to students will help you do well on the MCAT exam.

General tips for making PHY 102 a success

Most lectures will build on previous material. For this reason, it is important not to fall behind. **Here is a recipe for making PHY 102 a success:**

Set aside time to study. Student surveys state that the average student spends six hours per week working on this course, outside of class. This number should be higher. You will do yourself a favor by scheduling at least 8 hours per week outside of class time, and sticking to that schedule. Read the study assignments and study the lectures that are put on the course web site.

Attend the lectures. The purpose of the lectures is to introduce new concepts and to relate them to more familiar ones. These connections are important. You need to identify these connections, and use them when necessary. If you simply memorize techniques to solve problems, then you will find physics to be an enormous and disconnected subject. On the other hand, if you learn to think of physics as governed by just a few rules (e.g., the conservation of energy), then you will find physics to be not only manageable, but also enjoyable.

Do the homework. Lectures and study assignments set the stage. But only by answering questions and effectively doing the problems does deep understanding arrive. Get help early and often. Falling behind will only make your everyday life with PHY 102 harder.

Participate actively in the labs. Test out your skills in a situation in which you can get feedback!

Use the Physics Clinic and my office hours. Personal help is always good. Make an appointment to see me if your schedule conflicts with my office hours.

If there is a problem: First, talk to your Teaching Assistant. Then, if necessary, consult me. I am available in Room 211, Physics Building, by phone at 443-5978 and by e-mail at smc@physics.syr.edu You can also set an appointment for office hours (see above).

We wish you the best of success with Physics 102 !