PH102: General Physics II
Summer 2011
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1 Course Description

PH 102: General Physics II. Four hours.
Prerequisite: PH 101.

A non-calculus-based introductory course including electricity and magnetism, optics, and modern physics. Lectures and laboratory. Students will be introduced to the essential conceptual and mathematical structure of electricity, magnetism, optics, and modern physics (including quantum, atomic, and nuclear physics). Laboratory experiments will augment lecture- and discussion-based learning, and introduce students to key experimental techniques and analysis. The course will stress a conceptual understanding of everyday phenomena and recent technologies in terms of their basic underlying physical principles.

2 Course Objectives

General Learning Outcomes for 100- and 200-level courses

1. Scientific method: Students will understand the scientific method and critically evaluate scientific information.[knowledge, evaluation, analysis]
2. Effective teamwork: Students will develop skills in working together in team activitie

Anticipated Learning Outcomes for this Course

Upon completion of this course you should have a basic understanding of electricity (including electric circuits), magnetism, optics, special relativity, quantum physics, and atomic and nuclear physics. Expected learning outcomes include but are not limited to the following.

1. . Conceptual understanding of forces: Students will understand concepts which require a solid knowledge of electrical and magnetic forces and formulate solutions to physical problems.
2. Conceptual understanding of fields and potential: Students will understand concepts of electric fields and electric potential to and apply these to relevant problems.
3. Knowledge of electrodynamics: Students will understand the dynamical relationships between electric and magnetic quantities and use them to formulate solutions to physical problems.
4. Analysis of electric circuits: Students will analyze electric circuits and predict their function.

5. Knowledge of optics: Students will solve problems which require the knowledge of ray optics and optical image formation.
6. Identify the basic principles of special relativity and their consequences
7. Identify the basic principles of quantum physics and their consequences
8. Knowledge of basic atomic and nuclear physics, and identify their relevance to the macroscopic properties of matter and current technologies

2.1 Assessment of Learning Outcomes for this Course

1. A concept inventory test administered at the start and completion of the course
2. Homework questions which encourage students to think through the principles they have learned rather than making rote application of basic equations and standard approaches. This includes questions which require in part or in whole discursive answers.
3. Weekly quizzes designed to encourage students to keep up with the course and to provide experience in responding to exam–like questions.
4. Hour examinations periodically during the semester to assess the students' cumulative knowledge of the material to date.
5. A comprehensive final examination at the end of the course.
6. Rigorous application of a reasonable academic standard which encourages students to make the necessary effort to achieve the objectives of the course.

3 Course Topics

Physics 102 covers a great deal of material, much of which is directly relevant for the Medical College Admissions Test (MCAT). Below is a broad list of topics we will cover, in roughly the order in which we will cover them:

- Relativity
- Electric forces and fields
- Electrical energy and capacitance
- Current and resistance
- dc circuits
- Magnetism
- Electromagnetic induction and ac circuits
- Electromagnetic waves & the nature of light
- Reflection and Refraction
- Mirrors and Lenses
- Wave optics
- Quantum physics
- Atomic physics
- Nuclear physics

4 Course Format

Each day, we will meet for 2 hours for lecture. During these class periods there will be a mix of lectures, hands-on demonstrations, and possibly quizzes. During the class period immediately before a homework set is due, extra time will be spent working through homework problems. Three days per week (MWR), there will be a separate laboratory for approximately three hours each day. These meetings take place in a specially designed learning space where students have access to computers, electronic data-collecting apparatus, and three instructors. Instructors have access to video cameras, two LCD projectors, the Internet, and considerable software.

After completing this course, the student should have both a conceptual and a quantitative understanding of the description of the topics listed above. This will include the ability to set up and solve simple problems relating to electrical and magnetic forces, fields, circuits, lenses and mirrors, interference, relativity, quantum mechanics, and related concepts. The student should be able to analyze problems in both one and two dimensions, both qualitatively and quantitatively.

It is expected that the students read the appropriate textbook section before each class. This is essential for being able to follow the class and for achieving a good grade. You have to think of the book being not just a support for the class, but as the starting point for your own studying. Because of time limitations, lectures are necessarily brief, students should use class time to clarify questions regarding the reading material. This can happen through discussions with their peers or the instructor.

The understanding of basic mathematics, as covered in Math 113 or 115 for example, is thus an essential class pre-requisite. It is expected that the students are familiar with algebra, quadratic equations, and systems of equations, trigonometry, powers and logarithms. Knowledge of calculus is not required to follow this class.

5 Required and Recommended Items

5.1 Primary text

Hugh D. Young, *Sears & Zemansky's College Physics* (Vol II), 9th edition. The combined two-volume textbook (which you may have already from PH101) is also acceptable, but you need only volume II for this course.

5.2 Class Notes

The class notes are meant as a supplemental text for the topics included, somewhat closer to the way the material will actually be covered in lectures than the primary text. The notes include,

among other things, the instructor's own favored explanations for most topics, example problems with solutions, and minimally mathematical derivations of most of the phenomena study. The full course notes are freely online either of the following sites. For the latter, follow the link on the right side of the page.

`http://faculty.mint.ua.edu/~pleclair/ph102/Notes/`
`http://ph102.blogspot.com`

5.3 Calculator

A basic scientific calculator with trigonometric and logarithmic functions is required. Nothing more complicated (such as a graphing calculator) will be of much additional help.

6 Course Web Site

In an attempt to make things easier for everyone, we have been using a "blog" format to make available all course information as rapidly as possible. It will be constantly updated, for example to provide homework hints, laboratory procedures, schedule updates, and various announcements, *etc.* The course blog can be found at:

`http://ph102.blogspot.com`

There are a lot of reasons for doing this. Here are a few.

- the easier it is for the instructor to post information, the more often it will happen.
- atom/rss feeds so you don't have to constantly look for updates
- you can post comments and give feedback ... and you will get a reply

Bookmark this blog, as it will be your main source of information for PH102 this semester. A few other points about the course web site:

- all course content (quiz/homework solutions, labs, *etc.*) will be posted as links to PDFs
- inappropriate comments will be deleted
- all past posts will be archived and searchable, e.g., for retrieving links to old notes
- since this blog is publicly viewable, no grades or personal information will be posted here or anywhere else. your privacy will be preserved
- since this blog is publicly viewable, think before you post personal information
- anonymous comments will be allowed, so you can ask questions without hesitation

6.1 Other On-line Resources

Further attempting to go paperless, this semester's complete course calendar is available as a Google calendar, links for which can be found in the course blog. You can simply view the calendar (which is also embedded at the bottom of the blog), or subscribe to it if you are a "gmail" user. This will allow you to be notified automatically when you have homework due, for example.

The course calendar will include due dates for homework, the material you are expected to read before class, lab dates, exam dates, *etc.* Clicking on individual events (such as a lecture) will give you more information (such as the chapter covered that day).

In addition to the course blog, this section of physics 102 has a facebook group. It is a closed group (you need to request membership or be approved) and restricted to the Alabama network. The group page can be found here:

`http://ua.facebook.com/group.php?gid=6915747971`

or accessed from the course blog. Someting to note: using the 'feed friend' facebook application, you can subscribe to a news feed for the course blog, and thereby get all of your ph102 info via facebook alone. You are free to contact Dr. LeClair through Facebook if you like, either with a direct message or using the 'chat' feature. Dr. LeClair is also at times available through AOL instant messaging,

AIM handle: `uaphysics`

Finally, the laboratory hardware and software used for many of the experiments is a system currently under development by Dr. LeClair. An overview of the system, including a 'wiki' software and hardware manual, can be found here:

`http://code.google.com/p/bamalab/`

On this site, or included in the course notes packet, you will find a paper we have recently written about the laboratory hardware and software, which can give you an overall background about the system's capabilities and features. Some of the information is a bit technical, but the overall picture should be clear.

Table 1: *Grading Breakdown*

Component	**Sections**	%
In-class work	Labs & Exercises†	20
Outside work	Homework problems†	20
Hour Exams	Exam I	20
	Exam II	20
	Exam III	20

† The lowest grade will be dropped.

7 Grading

Broadly, the in-class course work will consist of lab experiments, in-class exercises, quizzes, and an in-class personal response system. There will also be two in-class exams as well as a comprehensive final exam during the end-of-term exam period. Outside work will include weekly written homework problems, and a term paper. Each of these components is described in more detail below, their relative weights in determining your overall grade are shown in Table 1, and the grading scale used is detailed in Table 2 at the end of this document.

7.1 Exams

There will be three "hour" exams, each covering several thematically consistent chapters, and one comprehensive final exam. The "hour" exams will be administered during laboratory periods, and will in reality take approximately 90 minutes, while the final exam will be administered during the usual period at the end of the session. For all exams, you are allowed *only* the following items:

- Writing implement(s)
- Calculator (no cell phones or PDAs)
- One or two prepared 8.5 × 11 inch formula sheet(s)[i]

The hour exams will have slightly different formats, but each one is worth 20% of your total grade. See Sect. 8 for policies regarding missed exams. **Ignorance of these exam dates when booking travel arrangements is not a valid reason for rescheduling.**

7.2 Labs & Exercises

In-class exercises (simulations or calculations) and laboratory procedures will be a major part of each laboratory period. There will be either a laboratory write-up or exercise due after *every single*

[i] Whether you get one or two depends on the particular exam.

lab period, and they will count as 15% of the course grade. Both labs and exercises will be done in groups of 3-4 students. You are free to form your own groups, and even vary them from week to week if you choose, so long as you are productive and share the work load. Should your self-assembled groups be deemed dysfunctional, new groups will be assigned.

The two lowest labs/exercises will be dropped at the end of the semester. This policy is meant to allow you the flexibility to miss a limited number of class periods when the situation calls for it. Don't miss too many, make them count. Whenever possible, contact Dr. LeClair in advance about absences – certain circumstances merit unquestioned and fully excused absences (see Sect. 8). The lowest single homework and quiz grades will be dropped.

7.3 Homework

Homework problems typically are due every second or third lecture period, through the "MasteringPhysics" online homework system. You may collaborate on problem sets, and are encouraged to, but each student must turn in their own work.

8 Attendance Policies and Making up Missed Work

No makeup of in-class exercises or laboratory procedures will *generally* be given. If you have a legitimate and acceptable reason for missing a class(*with documentation*), then the missed in-class work will not be counted for or against you. In short, if the absence is properly documented, you get a "bye."

Missed quizzes with an acceptable, documented reason should be made up before the absence if at all possible, either directly after the preceding class, or by appointment. Depending on the reason, a make-up quiz may be scheduled during the following week.

If you have a **legitimate** *reason for missing a major exam*, then you must inform the instructor as soon as possible **before the exam occurs**. If the reason is acceptable, either the exam will be dropped for you, and the final exam will count proportionately more, or you may make up the exam at a slightly earlier or later date. We reserve the right to administer a modified make-up exam slightly differing from the exam the rest of the class has taken. **There is no makeup possible for missing the final exam.**

Acceptable reasons must be documented, if possible in advance, and *may* include but are not limited to: prior athletic commitments, medical issues, off-campus academic commitments, prior commitments to on-campus academic events, band travel, standardized testing, graduate school interviews, and certain personal/family issues. Unacceptable reasons are fairly numerous. Among

the least likely to be accepted are oversleeping, leaving early for academic breaks, and fan travel to 'away' athletic events.

As described above, the lowest grades on labs, in-class exercises, and recitation work will be dropped. This will allow a limited number of missed classes (regardless of the reason).

9 Office Hours

Dr. LeClair is generally available on an hour's notice most days, and will arrange time by appointment whenever possible at various locations around campus. Email and phone requests can usually be accommodated within a couple of hours. Meeting times are best arranged at *your* convenience – just call or email to arrange a meeting time, and you will be readily accommodated. Dr. LeClair is generally available for email/blog comment responses until the very early hours of the morning, particularly nights before homework due dates or exams. Comments posted to the course blog or Facebook group (see Sect. 6) will be answered swiftly.

Dr. LeClair' official office hours in addition to specific appointments will be the hour following class each day 1-2pm in **110 Gallalee**. His contact info (email/office phone/cell) will be made available during the first class periods.

10 Academic Misconduct

Students are expected to follow the Code of Student Conduct, as laid down by The University of Alabama. All acts of dishonesty in any work constitute academic misconduct. In particular each student is expected to do his/her own work on quizzes and exams. Suspected violators of this policy will be referred to the Arts and Sciences Dean's Office. On homework, however, students are encouraged to work together.

11 Disability Accommodations

To request disability accommodations, please contact Disabilities Services (348-4285). After initial arrangements are made with that office, contact Dr. LeClair.

Table 2: *Grading Scale*

Grade			
Letter	Numerical	Min. %	Description
A+	4.33	97%	Superior ability or attainment significantly beyond all minimum expectations
A	4.00	93%	
A-	3.67	90%	
B+	3.33	87%	Good ability or attainment which meets and exceeds many minimum expectations
B	3.00	83%	
B-	2.67	80%	
C+	2.33	77%	Ability or attainment which is acceptable and meets all minimum (required) expectations
C	2.00	73%	
C-	1.67	70%	
D+	1.33	67%	Ability or attainment which does not meet all minimum (required) expectations
D	1.00	63%	
D-	0.67	60%	
F	0.00	0-59%	Attainment of some, but not a number of minimum expectations. Not appropriate for a minimum professional level of performance