Physics 21-Bio: University Physics I with Biological Applications
Syllabus for Spring 2012

Class Information

Instructor:	Prof. Mark Reeves (Samson 214, reevesme@gwu.edu 46279)
Office Hours:	Tuesday 4:30-5:15 pm, Monday 8:30-10:30AM, 3:30-5:00 PM in Samson 214
Teaching Assistant:	Ms. Xia Qi, Cor. 203, qixia@gwu.edu, 48129
Help Room Hours:	Wednesday 4:30-6:00 pm in Corcoran 212B
Meeting Place:	111 Monroe Hall
Meeting Time:	Tuesday, Thursday 2:30- pm–4:30 pm; Friday 12:30-1:30 pm
Credit:	4 credit hours
Prerequisite:	Math 31 or equivalent
Co-requisite:	Math 32
Required Materials:	*Physics for Scientists and Engineers with Modern Physics (2nd edition) by* Randall D. Knight with Mastering Physics and Student Workbook published by Pearson (Addison-Wesley)—ISBN:0321516370
Course Website:	http://blackboard.gwu.edu, www.gwu.edu/~phy21bio
Facebook account	Physics TwentyoneBio
MobileUploads	vat461vip@m.facebook.com
Class email	PHYSICS21BIO@hermes.gwu.edu
Homework Website:	http://www.masteringphysics.com Register using the access code bundled with the textbook. Our course ID is PHYS21BIOS12 Includes a link to online tutorials**:** ActivPhysics Online
Physics Help Room:	Corcoran 212B with networked computers

Laboratory/Recitation

Physics 21 is conducted in a **collaborative mode** of instruction, where students work together in teams on all classroom activities. The lecture and lab components of the course are fully integrated, so that there is no "separate" lab or recitation session. However, the

dates on which we anticipate that the main lab measurements will be done are shown on the Schedule page.

Physics 21-Bio Course Description

Introduction

Physics 21 is the first of a three-part calculus-based University Physics sequence intended for those who major in science and engineering. Physics 21 focuses on Classical Newtonian Mechanics, Fluids, and Thermal Physics; Physics 22 covers Waves, Electromagnetism, and Optics; Physics 23 deals with Modern Physics (Relativity and Quantum Physics). What is special about our section is that we will focus on problems that look at the physics of biological systems, in discussion, readings, classwork, homework, and exams.

Course Objective

- To help students develop analytical, graphical, and reasoning skills
- To help students understand the fundamental concepts of physics
- To enable students to apply these concepts qualitatively as well as to solve problems in their fields of study quantitatively
- To particularly highlight the linkages between quantitative modeling in physics and understanding biological phenomena, particularly at the molecular level.

Textbook

The required textbook for the course is *Physics for Scientists and Engineers with Modern Physics (2nd edition) by* Knight. We will cover chapters 1–13, 15-19 this semester in Physics 21. Additional readings with content specific to biological problems will be assigned and made available on-line. There is a Student Workbook that we will be using extensively in this collaborative section of Physics 21. There is also an optional Student Study Guide that is available from the same publisher.

Course Administration

We will use the *Blackboard* website http://blackboard.gwu.edu which you can access using the userID and password of your GW email account. From the blackboard website, you can access the course website http://www.gwu.edu/~phy21bio. The class website contains news and announcements, the course syllabus, homework IDs, and other useful information. Bookmark it and check it often.

Mathematics Background

A knowledge of simple differential and integral calculus, together with algebra, geometry, and trigonometry, is needed for this course. Therefore, a passing grade in Math 31 or the equivalent and co-registration in Math 32 is **required**. If you do not meet these criteria, you will not be allowed to take the course. If you are in doubt about this requirement, please talk with the instructor on the first day of class.

Warning: If your grade in Math 31 was lower than C, you have extra review work to do. See Appendix A of your textbook for a brief outline of such a mathematics review, at the level of understanding expected of you for this class. You should do this review the first week of the semester, and get help with any material that gives you difficulty.

Classroom Activities

We will follow the class schedule provided in the course calendar, which is on the class webpage. The nature of the collaborative section is such that it is critically important that you come to class prepared to work on the material each day. This preparation will be encouraged through *Warmup* exercises that will be done before each class period. After you have read the textbook for a given class, we will spend our class time supplementing the ideas in the textbook and applying them to well-defined problems that you will have to think about in class, which will help deepen your understanding of the basic underlying physics concepts. Our in-class activities will include written worksheets, computer simulations, and hands-on lab experiments.

Warmups

These are exercises that you will access through *Mastering Physics* as a prelude to each class period. The questions will mostly be conceptual in nature, to give you a means of gauging your progress and understanding of the reading material. The *Warmups* are intended to provide a context and framework for your reading and to offer a preview of the important points that we will be covering in class. There are about 5 exercises in each warmup assignment, weighted according to length and difficulty.

Homework

We will have weekly homework assignments, handled through the *Mastering Physics* online system which is tied to the textbook. This system will give you immediate feedback as to whether or not your answer is correct and hints if it is not correct. You will have up to 5 tries for most problems. Most of the homework problems are taken from the end-of-chapter problems, which are both numerical and conceptual. There will be 20 equally weighted problems in each homework assignment. You will be required to do 18 of them for full credit; the other two are for extra credit. Feel free to discuss the problems with other students; however, you are responsible for submitting your own answers. Since the homework answers can be submitted at any time while the set is active, from any location where you have Internet access, no extensions can be granted for any reason.

Warning: Since the homework system allows multiple attempts, it doesn't really simulate exam and quiz conditions where you are given only one chance. Try to minimize the number of tries that you use. You will be assigned practice problems that have only one try, which you can use for exam and quiz preparation.

Weekly Friday Quiz

Our Friday class time is only 1 hour (compared with 2 hours on Monday and Wednesday) and it will be used primarily for two purposes: (1) a quiz on the week's activities and (2) finishing or enhancing material from the week. The quiz will be a short (15-minute) exercise, not more than 2 problems.

Exams

There will be 3 closed-book exams for this course; 2 during the semester plus the final exam. Each midterm exam will be 2 hours in length and will be scheduled outside of class on the evenings of Friday Feb. 18 and April 1. This will allow us to give common exams to all three sections of the course. The final exam will also be 2 hours long. Each midterm exam will cover about 1/3 of the course material; the final exam will be comprehensive. Each exam will consist of a combination of conceptual and numerical problems; some of which will be multiple choice and others will require you to show your work. The numerical values of some useful fundamental constants will be provided. In addition, a formula sheet will accompany each exam. It will list every formula that appears in all the relevant chapter summaries from the textbook.

Team Work

Almost all of your in-class work will be conducted in groups of 3. There is heavy emphasis on the group dynamics in this course, and therefore it is very important that all groups function well as a team. At the start of the semester, each team will draw up a "group contract", an example of which can be found on the web site, outlining the effort that is expected of each team member and any other terms and conditions of their team. Any issues or problems within the group will initially be handled by the means explained in the group contract. Lab experiments performed in class will require detailed lab reports that are to be done by the group as a whole. If for any reason, you are experiencing difficulties in your group, you should bring this to the attention of your instructor. The smooth operation of the team is central to our collaborative effort.

The teams will be changed once during the semester, about half way through.

Student's Responsibility

Your attitude toward the course should be one of ***self-responsibility***. You will get out of the course exactly as much as you put in to it. Your responsibilities include:

- Come to every class and participate actively in all of the collaborative work.
- Consult Appendix A of the textbook to assure yourself that you possess the mathematical skills (algebra, trigonometry, and calculus) needed for the course.
- Read the textbook and assigned readings carefully and gain a reasonable familiarity with the day's material ***before*** you come to class. Come with questions in mind!
- Work on the homework problems early and finish them on time.
- Check the course website regularly for updates and course information.
- Participate fully in all of the classroom activities (we said this already, but it is important

enough to mention twice!).

If you are struggling, seek assistance ***early*** so that you won't fall behind for even just one week.

Help Resources

In addition to normal classroom activities:

- The Physics Help Room (Corcoran 212B) is open twice a week for Physics 21.
- A tutoring service is provided by the SPS (Society of Physics Students). Please email me for details. You may also hire advanced or graduate students as personal tutors.

Any student who needs an accommodation based on the impact of a disability should contact your instructor privately to discuss specific needs. Please also contact the Disability Support Services office at 202-994-8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to http://gwired.gwu.edu/dss/.

Excused Absences

All requests to have an absence excused must be substantiated with documentation.

There will be no makeup exams given after the fact. If you know of an issue for an upcoming exam, it is up to you to discuss it with your instructor ***in advance*** of the exam.

Examples of valid excuses are personal illness (documented by a signed medical report), a death in the family (documented by an obituary), or a religious holiday (in this case you must notify the instructor during the first week of the semester). Examples of invalid excuses are vacation trips or extensions of the Spring break.

Academic Dishonesty

Any acts of academic dishonesty will be dealt with according to the University's Code of Academic Integrity. Cheating compromises the integrity of our course and is unfair to those students who earn their grade through honest work. We have a zero-tolerance policy regarding cheating. Any cheating behavior will be prosecuted to the fullest extent.

Physics 21 Grading Policy

In order to foster cooperation and collaboration among all of you, the course will be graded on an ***absolute scale*** (there will be no "curving" of grades). This means that helping your fellow students does not in any way jeopardize your own grade, and in fact, is likely to help you, since explaining things to others will help you understand things better yourself. Moreover, there will be various "group incentives" during the semester, and so it is also in your best interest to maximize the effort and performance of your group.

The grading system used in this course is a tried and proven measure of the effort you put into the course AND your understanding of the physics. The detailed scale is:

100.00 - 94.000	A
93.999 - 90.000	A–
89.999 - 86.000	B+
85.999 - 82.000	B
81.999 - 78.000	B–
77.999 - 74.000	C+
73.999 - 70.000	C
69.999 - 66.000	C–
65.999 - 62.000	D+
61.999 - 58.000	D
57.999 - 54.000	D–
55.999 - 0.000	F

There are several components in the course, designed to maximize your learning and to assess that learning. Each component has its own weight in the overall grading scheme. The breakdown of these components is:

Midterm Exam 1	18%
Midterm Exam 2	18%
Final Exam	24%
Homework Assignments	11%
Lab Reports	10%
Weekly Quizzes	6%
Warmups	5%
Concept Tests	4%
Peer Evaluations	4%
Total	**100%**

Note that the exams count for 60% of your total grade and the combination of in-class and at-home aspects of the course count for the other 40% of your total grade. This means that you have a great deal of control over your own grade. If you make the effort to earn the non-exam points, you will build a safety net for yourself in the event that you stumble in the exams.

Exams: The exams are closed-book, although constants and formula sheets will be provided. Each midterm exam covers about 1/3 of the course material, with the final being

cumulative, but with an emphasis on the last third—see the schedule for dates. ***No makeup exams will be given***, so you should try your best to avoid missing any exams.

Homework: Homework assignments are your opportunity to work with and learn the material. You are encouraged to work with each other on assignments, but be honest with yourself about how much you are helping or relying on your fellow students. There will be approximately one homework assignment due each week, with closing time at midnight on Thursday (usually) or Tuesday (sometimes)—see the Schedule for these dates. *Strong hint*: Do not wait until the day the homework assignment is due to get started! Rather, do the bulk of your homework during the weekend that it is assigned.

Laboratory: The laboratory assignments will involve both measurement and computational techniques, and will require you to be able to express results graphically and to produce appropriate error bars and understand their meaning. A lab report is required for each lab by each team, due one week after the data are obtained, which should contain the purpose of the experiment, the procedure you used, the results, including uncertainties, and a discussion of these results and uncertainties and to what extent they fulfill the purpose of the experiment. Your individual responsibilities for the lab work should be clear, based on your group contract.

Weekly Quizzes: A short quiz consisting of two problems will be given at the start of each Friday class. No makeup quizzes are given, so you must arrive in class on time in order to take the quiz.

Warmups: These conceptual exercises are to be done through *Mastering Physics* before every class period on Tuesdays and Thursdays. They are due at 1:30 pm on the day of the class. There will be no Warmup due before the Friday classes, because you have a quiz on that day.

Peer Evaluations: Each of your team members will evaluate your contribution to the team at mid-semester and at the end of the semester. Clearly, it is to your advantage to take your team responsibilities seriously.