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# PHYS 212: University Physics II – Spring 2014

**Required Text:** Understanding Physics by Karen Cummings, Priscilla Laws, Edward Redish and Patrick Cooney, (2004) John Wiley & Sons, Inc.

**Prerequisites:** "C" or better in PHYS 211 and credit or co-registration in MATH 211 or 221 (Calc. II) **Instructor:** Dr. Pete Nelson, <u>pHnelson@circle4.com</u> **Web Page:** http://circle4.com/biophysics

## **Course Objectives:**

PHYS-C212, is the second lecture course in a three semester calculus-based introductory physics sequence (including laboratory) for scientists and engineers. Physical science and engineering majors are expected to take PHYS-C211, C205, C212, C206 and C213. Biochemistry and Molecular Biology (BMB) majors are expected to take PHYS-C211, C205, C212, C206 and BIOL/CHEM/PHYS 323.

PHYS-212 is a lecture course loosely based on chapters 14 through 38 of Cummings that introduces the student to the basic principles of physics.

The three main course objectives are:

- 1. Gaining factual knowledge (terminology, classification, methods, trends)
- 2. Learning fundamental principles, generalizations, or theories
- 3. Learning to *apply* course material (to improve thinking, problem solving, and decisions)

To meet objective 1, we will gain the factual knowledge necessary to describe the physical world using classical physics concepts and the language of mathematics. To meet objective 2, we will learn the fundamental principles, generalizations and theories (physical laws) of how the physical world works. To meet objective 3, we will solve problems (mainly from the text) that require the application of these physical laws to everyday situations. These same laws are generally believed to apply to nearly everything:- from atoms to galaxies and beyond. Application of the scientific method has led scientists to generally believe that everything in the physical universe can be explained, understood and predicted using these simple physical laws.

The topics to be covered include fluids, oscillations, waves, entropy, electrostatics, magnetism, DC and AC circuits, electromagnetic waves, geometrical and physical optics. Emphasis will be placed on conceptual understanding, problem solving skills and the application of physics in other scientific disciplines such as biology, chemistry, engineering and medicine.

### Problem set homework (from Cummings):

Regular homework problem sets will be assigned approximately weekly, due dates will be posted on the class Desire2Learn (D2L) web page. LATE HOMEWORK PAPERS WILL NOT BE ACCEPTED. The purpose of the homework is to help you do well in the course. The only way to do well in this course is for you to work on the homework by yourself. The assigned problems are usually very difficult. The idea is for you to think about them yourself as you work through the problem solving method discussed in class (and outlined in the "Zen and the art of doing physics problems" document posted on D2L). As discussed in the Zen Physics: Guide to problem solving, homework will be graded both for "attempts" and for "correctness". For homework only, the "attempts score" will count towards your final grade. If you get stuck, consulting with others on your homework is acceptable and encouraged. However, you must write up and turn in your own paper representing your own solution. Partial credit for correctness will be given for each conceptual portion of your problem solution that is correctly worked out algebraically. No partial credit will be given for doing

"algebra with numbers" (AWN). Tests and the Final Exam will be graded for *correctness* only. See <u>Zen and</u> <u>the art of doing physics problems (http://circle4.com/biophysics/Zen\_Physics.pdf</u>) for more details.

#### Module homework

The module homework assignments and their due dates will be posted on the course Desire2Learn (D2L) page. These homework assignments are self-contained modules – written in the style of self-study guides. You might like to think of the modules as self-directed "Excel computer labs" that you can perform with any computer that has Microsoft Excel (see <a href="http://circle4.com/biophysics/modules">http://circle4.com/biophysics/modules</a>).

The modules are aimed at science majors. In the modules, we'll develop models that can be implemented in an Excel spreadsheet. Using the spreadsheet, we'll discover what the practical implications of the model are, and then we'll compare the model predictions with experimental data (if available). For example, in the early modules, we'll develop a simple (pharmacokinetic) model of how penicillin is eliminated from the body. While this model (and the other models we'll develop) are particularly simple (and are therefore easy to understand O), the molecular modeling approach is actually a cutting-edge research technique!

The modules serve both as textbook and lab manual (or workbook) that guide you through the activities. It is expected that students will read and work through them outside of regular class times as part of the weekly homework/lab assignments. The modules will typically take *more than four hours solid work*. Hence, it is *essential* that you keep ahead of the class discussions. Homework assignments will be posted on D2L. Assignments will be due at 6 am on the date posted on D2L. Assignments turned in turned in one full day early (by 6 am on the previous day) will receive a 4-point bonus (out of 20 points) and papers turning in up to one class period late will receive an 8-point deduction. LATER ASSIGNMENTS WILL NOT BE ACCEPTED. This grading scheme is intended to encourage you to free up the day before class so that you can begin work on the next module.

The regular class periods *will not be traditional lectures* where the course materials are spoon-feed to students! *You* are responsible for coming to class, prepared to participate in a discussion of the materials. To do this effectively, you'll need to start working on the assigned module **before** class. To encourage you to work ahead, a Word document of your draft answers (to the assigned in-class questions) are due before the beginning of each class and lab period. This pre-class assignment will be worth 2 pts per period. They will be graded for "attempts" rather than "correctness" – this will be explained in class.

The purpose of the homework assignments is to help you master the content of the course. You should therefore always attempt to answer each question by yourself. If you get stuck, consulting with others on your homework is acceptable and *encouraged*. However, you must write up and turn in your own paper that represents your own solution. Sharing Excel or Word documents with other students *is not permitted*. Each student must work on their own spreadsheets – from scratch. In order to prepare for class, please work on each module *before* class. Participation credit is available for in class discussion of the modules. Explaining where you got stuck gains maximum participation credit.

#### **Tests and Final Exam:**

The tests and final exam will include questions similar to the homework problems, and they will be graded in a similar manner to how the homework was graded for correctness. There will be three tests and one final exam. The final exam is comprehensive and will cover the entire course. ATTENDANCE FOR ALL TESTS AND THE FINAL EXAM IS MANDATORY. Exceptions will be made only for acceptable, documented reasons as determined by the instructor. Requests must be made via email *prior to the absence*. Exams will be closed book, with no extra materials except for a single side of a handwritten sheet of letter-sized paper. This sheet must be turned in at the end of the test. Telecommunications or data devices of any kind (e.g. phones, pagers, iPods, radios, PDA's, scanners, cameras, etc...) are **banned** from tests and exams. You should bring a calculator to tests and exams. In tests and exams, the memory of any device capable of storing *non*-numeric information (e.g. TI-83 Plus) must be zeroed at the beginning of the test.

Model solutions to the homework and test problems will be made available on D2L after they have been graded. As the test and final exam problems will be based (primarily) upon homework problems (and

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problems worked in class) it is extremely important that you understand the model solutions and how to maximize your partial credit potential.

## Attendance:

Attendance at lectures is REQUIRED. Attendance will be taken at the beginning of class and will count towards your class participation grade. If you find that you cannot attend class (or will be late) for any reason, you should contact the instructor via email before class. Students are expected to turn up on time to at least 90% of all classes and to attend all quizzes, tests and the final exam. Students are responsible for all announcements, assignments, and material presented in class – whether they are present or not. Attendance and participation in classroom activities are extremely important and extra credit is available for in-class participation.

## Grading:

Class Participation 5%,\* Homework 10%, Modules 5%, Tests 60%, Comprehensive Final Exam 20%<sup>†</sup> Grade Scale: A: 90.0 - 100%, B: 80.0 - 89.9%, C: 70.0 - 79.9%, D: 60.0 - 69.9%, F: 0 - 59.9%

\*In addition to 5% participation credit, there will be extra credit available for in-class participation. (participation credit can only be given for attendance at the class period for which you are enrolled). <sup>†</sup>Grades will be determined on the basis of both 100% (full course including extra credit) and 20 pts (just the final). The higher grade will be awarded.

# **TENTATIVE Course Schedule:**

In order to prepare for class, please complete each reading assignment *before* class. Reading assignments and in-class problems will be posted on the class D2L page. Participation credit is available for helping out with in-class problems. Explaining where you got stuck in a problem gains maximum participation credit. Students who help out in class usually do much better in this class!

Topics	Reading Assignment
Gravitation	Chapter 14
Fluids & Oscillations	Chapters 15 & 16
Transverse Mechanical Waves & Sound Waves	Chapters 17 & 18
Entropy and the Second Law of Thermodynamics	Chapter 21
Introduction, electrostatics, Coulomb's law	Chapter 22
Electric Fields	Chapter 23
Gauss' Law	Chapter 24
Electric Potential	Chapter 25
Current and Resistance	Chapter 26
Circuits	Chapter 27
Capacitance	Chapter 28
Magnetic Fields	Chapter 29
Magnetic Fields Due to Currents	Chapter 30
Electromagnetic Oscillations and Alternating Current	Chapter 33
Electromagnetic Waves	Chapter 34
Images	Chapter 35
Interference	Chapter 36
Diffraction	Chapter 37

## **Technology Requirements:**

This course makes extensive use of Desire2Learn (D2L) to distribute course materials electronically. Microsoft Excel is required for homework assignments and a calculator is required for tests and exams.