Physics 133 – Physics IIb: Thermodynamics and Waves
Section 1, MWF 8:00 – 9:50 AM
Course Description – Fall 2014

Instructor: Brad Antanaitis (Dr. A)
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Course Website: We will use Moodle – http://moodle.lafayette.edu. “PHYS 133.01- Fall 2014 Thermodynamics and Waves” should be in your list of current courses. Handouts, homework assignments/solutions, supplemental articles, exam solutions, etc., can be downloaded from this site. Taking a few moments to explore the site at the beginning of the semester can be a richly rewarding experience and is highly recommended.

Course Locations and Times:

Class: Hugel Science Center 100
Monday, Wednesday, Friday; 8:00 – 9:50 AM

Labs: Hugel Science Center 123
You should be registered for one of the following lab times:
Wed. 7 – 9:50 PM, Thurs. 8 – 10:50 AM or 1:10 – 4:00 PM.

Office Hours: Typically, I will hold one weekly help session on Wednesday afternoon from 4:10 to whenever you run out of questions. The SI for this course, Sinan Dundar, will usually have a help session on Thursday and be available at other times as well. You may also drop in any time you see a free period in my schedule. Interacting with students is one of my favorite activities and a source of considerable satisfaction. So, don’t be shy, just call, e-mail or stop by whenever a question arises or you wish to discuss material in greater depth than we have had time for in class. If I’m not in my office, look across the hall in the Biophysics lab or upstairs in the NMR lab. If that fails, talk to Debbie, our secretary, upstairs in room 124 – she usually knows where I am.
Classes on Snow Days and Other Emergencies: If I am unable to make it to class (I live in Morrisville, PA, about 55 miles from Easton), I will send the class an email via Moodle.

Description: This course is a calculus-based introduction to the foundations of classical physics, designed primarily for science and engineering students. We will study thermodynamics, harmonic motion and wave propagation, including electromagnetic waves, ray optics and physical optics, as well as some useful topics in electrical circuits.

Goals: This course will enable you to understand, identify and apply the fundamental principles of classical thermodynamics, wave theory and simple circuit theory to a wide variety of situations, including knotty, multi-faceted problems that currently plague mankind, for example, global warming. It will emphasize both qualitative reasoning and quantitative problem-solving. A secondary goal is to introduce the student to the process of doing physics, vid., developing and testing models, solving problems and communicating results in a clear and coherent way. Many of the skills developed in this course will be readily transferable to other fields of study, especially biology, chemistry, engineering, geology, medicine, neuroscience and environmental studies.

Student Learning Outcomes:

- Students will be able to apply the laws of thermodynamics to a wide variety of situations, including those encountered in everyday life.

- Will recognize and repudiate the fallacies of so-called perpetual motion machines of the first or second kind.

- Will be able to extract thermodynamically meaningful information from the side panel of a box of cereal or any other kind of food for that matter.

- Will be able to modify a physical model, e.g., a simple harmonic oscillator, to suit a realistic situation.

- Will be able to distinguish clearly, particle from wave-like behavior in the classical world.
• Will be able to describe and predict the behavior of mechanical, sound and electromagnetic waves.

• Will be able to build and analyze optical systems using thin lenses and mirrors.

• Will be able to build and analyze simple DC circuits.

• Will acquire or sharpen the mathematical skills necessary to describe and analyze wave phenomena, oscillatory systems and DC circuits.

• Will sharpen critical thinking skills and continue developing their analytical skills as they analyze ever more complicated physical systems.

• Will appreciate the foundational nature of Physics and its relationship to other related disciplines as well as its connection with the solution of real-world problems.

**Prerequisites:** Physics 131 or equivalent. Math 161: Calculus I, or equivalent. **Corequisite:** Math 162.

**Texts:** *University Physics with Modern Physics 13th Edition, by Young and Freedman* along with an online homework component, *Mastering Physics*. You can purchase this as a single package from the bookstore or buy it online at: [http://www.masteringphysics/](http://www.masteringphysics/). Our course ID is MPANTANAITIS133F14. You will also need the *Physics 133 Laboratory Manual*, available in the bookstore.

**Your Responsibilities:** Your textbook is a critical resource for this class – it is a source of definitions, facts, concepts, explanations, derivations and worked examples. I do not intend to waste your time simply by parroting exactly what is in the text. Instead, I will devote class time to discussing key ideas, providing unifying insights, answering questions, giving demos and practicing the application of those ideas to richly varied physical situations. Many of these explorations will focus on interdisciplinary topics, e.g. biological or medical physics, while others will involve engineering applications.
Accordingly, you should read the text prior to coming to class. You can anticipate topics for discussion by appealing to the course syllabus.

**Ask questions.** If you are confused, feel free to interrupt the class and ask a question. Chances are good that your confusion is shared by others and they will welcome your question.

**Do all assigned work.** A useful rule of thumb for any college course is that you should spend approximately two hours out of class for every hour in class. For this course that means devoting an average of six hours per week outside of class (not including lab). Do yourself a favor and plan ahead! Don’t wait until the night before an assignment is due to start it.

**Participate in class.** Class time will be used to go beyond what can be gleaned from reading your text alone. Active engagement during class can and should play an important role in helping you master the material. To encourage your active involvement, I will often initiate discussion of the physics behind a demo or a toy brought to class. Class time will also be used to announce changes to the syllabus. It will be your responsibility to keep up.

**Tests:** There will be three hour-long in-class tests on the dates marked on the syllabus. There will also be a cumulative final exam on a date to be determined by the registrar, *vide infra*.

**Equation Sheet:** An equation sheet will accompany each test. A copy has been included with the course description packet so that you can use it as you study and do homework problems. The idea is that you will use your study time to focus on the fundamental ideas and practice doing physics rather than just memorizing formulas.

**Homework Problems:** Homework assignments will be due at the beginning of class on the dates indicated in the syllabus. Some assignments will be given and graded on the Web using Mastering Physics, an on-line system with quick feedback, hints and guided tutorials. Other assignments will be pencil-and-paper problems and these problems will often focus as much on the methods of solving problems as on getting the right numerical or symbolic answer. These problems will usually be graded by student graders. Your lowest homework grade will be dropped at the end
of the semester. All assignments and other relevant course information will be available on Moodle (Physics 133 – Thermodynamics and Waves).

- Problems will be due at the beginning of class. **Late homework will normally not be accepted**, since solutions will posted on Moodle after the assignment is due.

- For written homework, please staple your pages together. This assures they won’t get separated or lost. **Also, do not record homework on torn out spiral notebook pages, such frayed papers will not be accepted.**

- **Illegible papers will not be accepted.** If I or the graders can’t read or follow your work, it may be returned to you ungraded for resubmission. You may resubmit a legible version (along with the original) by the next class meeting, but that version must not have any new content – it must simply be a legible version of the original.

- Please look at the homework problems ahead of time and ask questions about them either in or out of class. I will be happy to give you whatever help you need, but eventually you must learn to solve these problems on your own. After all, that is precisely what you will be expected to do on exams and more importantly, later in life.

**Academic Honesty:** Working with others is often a helpful way to learn physics. I encourage you to collaborate with each other on homework, but the work you turn in must be your own. If, in fact, you do collaborate with fellow students, be sure to include their names at the top of your homework paper. You should read the department’s Academic Honesty policy for rules regarding collaboration (available on the course Moodle site). If some point is unclear, be sure to ask me for clarification.

**Laboratory:** The laboratory is an essential part of this class, and its successful completion is required to pass this course. You are responsible for completing all of the assigned experiments at the scheduled times. If you can’t make it to your scheduled lab, please try to come to one of the other lab sections for this course. There are three laboratory sections for this course: Wed. 7 - 9:50 PM, Thurs. 8 - 10:50 AM or 1:10 – 4:00 PM. You can’t count on the equipment being available outside of the scheduled lab times.
**Final Exam:** There will be a comprehensive final exam at a time to be determined by the registrar. *Please don’t make travel plans that conflict with the scheduled final exam.*

**Grades:** Your course grade will be based on homework (25%), tests (30% total), the final exam (20%) and the laboratory (25%). The lowest homework grade will be dropped. Feel free to ask me how your grade is determined and how you are doing at any time during the semester.

**Meeting Federal Credit Hour Standards:** The student work in this course is in full compliance with the federal definition of a four credit hour course.