PHYS 140: Physics for Future Leaders
MWF 1:00 – 1:52 (Olin 275)
Lab W 2:00–4:52 pm (Olin 274)
Spring 2017

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OFFICE HOURS: Mon 11:00 – 12:00   *I am also happy to schedule appointments at other times!*
(tentative)   W 10:00 – 11:00   Please visit me early with questions, confusions, or
                                Th 3:00 – 3:50   concerns, but I have an open door policy and encourage
                                F 10:30 – 11:30   you to stop by at any point.

REQUIRED TEXT: *Energy for Future Presidents,* by R.A. Muller
                                (W.W. Norton, 2013. ISBN 978-0393345100)

OPTIONAL TEXT: *Physics for Future Presidents,* by R.A. Muller
                                (W.W. Norton, 2009. ISBN 978-0393337112)
                                We will likely draw material from this book after discussing energy. It is an interesting
                                read and can be found for only $10 on Amazon and under $2 on half.com

If you had a scientific question... Should we be fracking in PA? Are the chemicals leaching out of plastic water bottles going to kill you? Should I worry about the high voltage lines? First off, a standard Physical Science textbook is not going to tell you the answer, but you also would never reach for that textbook five years from now (and neither would I). The topics I consider relevant for us as citizens and the broader goal of seeking out useful information online don't lend themselves to Physical Science textbooks.

Much of the basic science will be presented in class and summarized online in a set of course notes. A lot of additional information will be found by you, online. We will also draw readings from other sources, which will be posted on Moodle. *It is a very good idea to keep clear notes.*

COURSE LEARNING OBJECTIVES:

In this course, we will study physics (and science more broadly) and its connections to our lives. We will learn a number of concepts covered in introductory physics classes, though we will in fact cover a number of topics not typically covered. The driving force will be the context of current, real-world issues. These include topics such as alternative energy, nonlinear dynamics/complexity, climate change, and space travel. An approximate schedule of topics will also be posted on Moodle.

Key goals are
        —*to be able to approach a scientific question, seek useful resources, and make informed decisions of*
                these issues in context and
        —*to be informed and engaged with specific issues facing us as a society.*

Far from being an academic exercise, science influences our political decisions and our health, leads to technologies we encounter every day, and is used in pop culture from marketing to entertainment. That being said, this is a science class and the material can be challenging. We will cover technical information, formulas, and equations since they are important aspects of the language of science. However, there is no prerequisite science or math knowledge—a little enthusiasm and collaboration will go a long way in this course!

In addition, we will aim to achieve a number of CCC Learning Goals. Beyond the Natural Science Learning Goals, these include:

Laboratory Science

...develop a unified understanding of scientific theory and practice in modern natural science.

...demonstrate an understanding of the development of science as an intellectual pursuit and of the ways in which scientific ideas are formulated, modified, and come to be accepted.

...demonstrate skill in the application of scientific techniques and methods, including the collection, analysis, and interpretation of data, and communication of results.

Quantitative Reasoning

...apply basic mathematical and/or statistical techniques at a college level of sophistication in the analysis and modeling of real-world questions or problems.

...formulate questions and propositions for quantitative analysis, translate the question into a form appropriate for the chosen quantitative model, and interpret and evaluate the results of the model in ways meaningful to the problem at hand; assess the validity and limitations of quantitative models and an understanding of the role of the assumptions made in the construction of these models.

Environmental Connections

...analyze, evaluate, and synthesize complex interrelationships between humans and the natural world.

...evaluate critically their personal connections to the natural world.

...apply knowledge of the physical, cultural, or social connections between humans and the natural world, according to their interests and disciplinary preferences.

ASSIGNMENTS:

• **Participation:** Arguably the most important requirement for this course is being an active and engaged participant. It's expected that you will be in class and participate for full credit.

• **Reading assignments and responses:** There will be short reading assignments for most classes. You must do the reading before class; this will allow us to spend our time as a group working together through the more interesting concepts. You may also be asked to find outside sources of information or current events and submit occasional journal entries on the course Moodle site with brief summaries and reactions to the reading.

• **Analysis session:** At the end of major units, we will engage in a summary activity in which we will synthesize information learned in a specific context. You will be expected to find and summarize information from online sources to engage in an effective classroom dialog.

• **Laboratory:** The course includes one three-hour lab scheduled per week. We will have labs on most weeks, including a couple field trips scheduled during lab time. They will complement course content with the explicit goals of engaging with science as an experimental discipline and understanding the roles of measurements, data, and uncertainties. Since these sessions are experiential, completion of all labs is

required – a deduction of one grade step (e.g., A to A-, B+ to B, etc.) will be applied to your final course grade for each lab not completed, up to a maximum of three missed labs. In case of an issues (e.g. illness, etc.) please contact me as soon as possible and I will make every effort to make alternate arrangements.

• **Homework:** Homework will be assigned on each week for which there is no exam. There will be approximately 8 assignments over the course of the semester. There will be a 20% penalty for late assignments and assignments will not be accepted after the solutions are posted. You are encouraged to work together. You should also feel free to stop by my office hours after you've made a solid effort.

• **Exams:** There will be two in-class exams during the semester, tentatively scheduled for Friday, Feb. 24 and Friday, April 7. If there are any unavoidable conflicts, you must contact me before the exam date to make alternate arrangements. The final exam will be comprehensive and will take place at the official time to be announced by the registrar.

• **Presentation/Report:** At the end of the semester, you will be asked to explore in greater depth a topic that interests you... for instance, you might apply course material to a topic relevant to your anticipated major/career, explore another aspect of a prior course topic, or just look into something that you find compelling. You will be expected to write a brief report and present your findings to the class. The primary goals are to seek quality information, synthesize the material, and summarize your findings.

GRADING POLICY:

2 exams	20%	100 pts	
Final exam	15%	75 pts	
Homework	16%	80 pts	
Lab	16%	80 pts	
Moodle (reading) Journal/Participation	10%	50 pts	
Analysis sessions	8%	40 pts	
Presentation/Report	15%	75 pts	= 500 pts total

The "standard" grading scale will be used, with weighted averages of at least 70, 80, or 90 corresponding to at least a C−, B−, or A−, and for instance 83.0–87.0 corresponding to a B with B− and B+ below and above this range. *The easiest way for you to get a lower grade than you think you deserve is by not handing in assignments.*

ACCESS STATEMENT

Any student who may need an accommodation based on the impact of a disability should contact Heather Fowler, Director of the Office of Accessibility Resources at 570-577-1188 or hf007@bucknell.edu who will help coordinate reasonable accommodations for those students with documented disabilities.