Franklin & Marshall College - Physics and Astronomy Department
Foundations 111V: Energy Issues in Science and Society
F. Crawford
Spring 2013 General Course Information and Policies

Welcome

Welcome to the Spring 2013 edition of Foundations 111V: Energy Issues in Science and Society, taught by Froney Crawford. The web page for the course is `http://venus.fandm.edu/~fcrawfor/teaching_spring_2013_fnd111.html`. Assignments and announcements will be posted here, so you must check it regularly.

Overview and Course Goals

Our modern civilization uses vast amounts of energy, inviting a number of questions, issues, and potential problems. Is this energy use "sustainable"? What consequences does this have for our global environment? How can we make informed decisions about the generation and use of energy?

We will explore these issues, and we will approach the discussion using some quantitative rigor. That is, we'll investigate the underlying physics behind energy and use real numbers in our investigation and characterization of energy use. Why is this? It is because, as Richard Wolfson puts it in the preface of the textbook, "any serious study of energy and the environment has to be quantitative". It is pointless to get excited about a possible alternative energy source, for instance, if there is no way it can be physically or economically viable as a significant energy source for our needs. The way to determine whether it is viable is, in part, through a quantitative understanding. It is also impossible to make informed and sensible decisions about these issues without quantitative data to back up these decisions.

In order to make quantitative assessments, **we will use math in this course at the level of algebra and fractions (no trigonometry or calculus), so you must be prepared for that.**

My hope is that as future decision-makers (business people, policy makers, voters, etc.) you will be better positioned to make good, informed choices regarding complex issues involving energy after having taken this course. Plus, you may learn some interesting things as well in this course just for the sake of knowing them.

The course is divided into three main themes which connect to each other:

1. **Energy Basics** (Wolfson Ch. 1-4)
2. **Energy Options** (Wolfson Ch. 5-11)
3. **Climate and Energy** (Wolfson Ch. 12-15)

These three themes are broken down into smaller topics, which you can identify from the Course Schedule and the individual book chapters.

We are going to try to cover all of these chapters and topics, so the fast pace we will take will require you to stay focused and on top of the reading and classwork throughout the semester.

Additional Course Aims

Apart from the general course goals expressed in the previous section, there are a number of specific skills that I'd like you to try to develop as we proceed. These skills are widely applicable (i.e., they aren't just "science" or "math" skills but have value in business, politics, medicine, etc.).

1. *The art of quantitative estimation; developing a sense of scale; facility in roughly calculation of quantities*

   These skills are widely used in a variety of contexts (e.g., case studies for management consulting). Order of magnitude or back of the envelope estimates are often important first steps in any kind of further detailed analysis.

2. *Creation, interpretation, and understanding of graphical data*

   Usually, quantitative results and trends are visually presented. You need to know how to decipher and understand data presented in this way (example: a logarithmic plot. Do you know how to interpret this? Why is a logarithmic plot even used at all?)

3. *Development of critical and quantitative reasoning skills*

   This is what "science" is (it's not just memorizing a bunch of facts). For example, exponential growth is a concept that appears again and again in the natural world. Simple quantitative relationships can be manipulated to reveal a lot of powerful information.

4. *Development of research and writing skills; being able to acquire useful and accurate data; interpretation of same; assessing the useful limits of such data*

   These skills are useful no matter what kind of professional path you end up taking. Having some quantitative chops is a big asset in many fields, and companies will often place a premium on this.

Location and Times

- The class meets Mon and Wed 2:30 - 3:50 p.m. in Hackman 412.
- It is essential that you come to all classes to master the concepts and material in this course. All absences, for any reason (including illness, athletic events, etc.) should be discussed *in advance* with the instructor. **Excessive absences can result in a significant lowering of your grade or failure/removal from the course** (see the Participation and Attendance section below – I'll use my judgment as to what "excessive" is here).
- Also, please leave the laptops at home – you won't need them while you are in class. If we are doing an in-class workshop on a particular day when you might need a laptop, I'll let you know.

Instructor Contact Information

Instructor:	Froney Crawford
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Office Hours:	Tue 2-4 p.m., Wed 4-5 p.m. (or just drop by)

Please, let's all use first names. Call me Froney.

Come see me anytime. Please do not hesitate to contact me; no question or topic is too small. If you are having a lot of trouble with the assignments or understanding the material, be sure to come to see me as *soon* as possible. A good way to get together is to arrange a mutually agreeable time with me, either by email or in person after class. I expect you to read your email and check the course web page regularly as I will make announcements and might answer some questions in this way. You should feel free to send me email when you have a question or comment. If you have concerns about the course or ideas about how to make it better, you should let me know immediately, either in person or by email. Don't wait!

Textbooks, Computer Resources, and Supplies

- *Energy, Environment, and Climate (2nd edition)* by Richard Wolfson is the textbook for the course. This textbook is available in the bookstore.
- You should be somewhat capable of navigating the internet. You should also be able to plot data using a computer package (Microsoft Excel is fine for this, but you may use another package if you prefer).
- A pocket calculator will be needed for some parts of the homework/research assignments and the midterm exam.

Grading

Homework/Research Assignments	40%
Writing Assignments	30%
Midterm Exam	20%
Participation and Attendance	10%

- Grades will be "curved" in the following sense. At the end of the semester, I will compute the overall final grade (out of 100) for each student, based on the above formula. Then I will choose a scale to translate these number grades into letter grades.
- Note that **you must have a passing grade in every area of the course in order to pass the course** (but I'll be more lenient with the exam criteria here).

Homework/Research Assignments

- These are investigative questions, quantitative exercises, and research problems. For some of these you will need to use computer resources like the web, find outside sources, make plots, etc.
- We may have periodic "workshops" during class time in which you can use laptops to make progress with the assignments with my help, but the majority of the work for the assignments will have to be done outside of class time (I can still help you, of course).
- No late homework/research assignments will be accepted. If there is a serious illness or other similar situation which warrants special consideration, accommodation can be made in consultation with the house prefect or the dean only.

Writing Assignments

- We will have three writing assignments during the semester. More details will follow when the writing assignments are given out.
- No late writing assignments will be accepted. If there is a serious illness or other similar situation which warrants special consideration, accommodation can be made in consultation with the house prefect or the dean only.

Midterm Exam

- We will have an in-class midterm exam on Wed Mar 27 which will cover roughly the first half of the course. More details to follow nearer to exam time. There will be no final exam.
- You may get an extension on an examination only with an excuse from the house prefect or the dean.

Participation and Attendance

- The participation grade is based on your questions and comments, either in class or after class, your attendance record, and your demonstrated effort to do the best you can in the class. Essentially, being present prevents you from losing points, and sustained active participation and involvement in the course as a whole on top of being present will help you gain points. Active participation in class will be noted and rewarded.

Academic Misconduct

The important guiding principle of academic honesty is that you must never represent the work of others as your own. Cheating and plagiarism are very serious offenses that can have dire consequences. The following guidelines should govern your behavior in the course; please request clarification if you find yourself in any doubtful situations.

- You may seek assistance from me, or your fellow students in doing the assignments and preparing for class discussions. I encourage you to visit the writing center to get assistance with the writing assignments. You may also work together with other members of the class on the homework/research assignments (unless specified otherwise), and this is often quite beneficial. For your own good, avoid situations in which you are either contributing either too much or too little to such collaborations. *Just copying someone else's work is clearly a representation of another student's work as your own and is a violation.* This applies to copying down results worked out on a blackboard by other students as well as solutions written down on paper. Please be cautious about loaning your work to others, since this can also lead to problems for both parties.
- Exams must be entirely your own work. Detailed instructions will be given on the exam itself and discussed in advance. You must use only those materials allowed in the instructions given on the exam. No collaboration of any sort is allowed once you start an exam.

Advice

This is designed to be a challenging course!

You may need to improve your study habits in order to do well in this course. I have the following suggestions to help you do well:

- *Review* your class notes between lectures, and come prepared to ask questions. Annotate your class notes as you read them. When you take notes in class, *don't just write down equations*! Qualitative information is often essential!
- *Stay up to date* on the reading; preferably read the assigned material twice; for example, once before the relevant lecture, and once after.
- *Read with pen in hand* to work out things described only briefly in the text or lecture. Ask yourself what is the main point of each section, and answer the question. Highlighting the text as you read is no substitute for this exercise in thinking and reinterpreting what you have read!
- *Make drawings* of the physical situations we discuss in class or the ones you encounter in the text or assignments (and real life!). This helps you understand just what is going on much more than merely thinking about it.
- Don't spend an excessive amount of time (a few hours?) on a single homework problem. Show clearly where you're stumped and just move on. Don't feel bad if this happens occasionally, or worry about the effect on your grade. Consistency in this regard is more important.
- Try the homework first yourself, but do get help from me if you need it. That's one of the reasons why I am here.
- Do stop in to see me if you have questions or suggestions.
- Study for the exam *in advance*. Your brain tackles problems differently if you have given it time to mull over new material and new approaches to problem-solving. You really think differently (and better) once you have literally slept on new ideas.
- Remember that if the material is new or unfamiliar for you, learning will take time, just as learning a new language takes time. Try not to become discouraged if the going is rough at times, and don't prejudge your ability to master the material.