I have found formal, fixed office hours to be essentially useless. They seem to fit no one who takes my courses, no matter when they are scheduled. So, if you would like to see me, you are most welcome to set up an appointment - but call or e-mail first to avoid a wasted trek across the East Campus tundra in case I am in a meeting or off campus. However, if you are in or near Riley-Robb and just want to stop by, please feel most welcome to do so. I do not mind unless you descend in threatening hordes... Feel welcome to email me with questions. I check email frequently at home during the evenings (but not too late because EZ-Remote access sometimes gets tough after about 8 pm...) and weekends.

We are fortunate this semester to have help with the course from Morghan Transue. Morghan is a senior in BEE, focused on energy technologies and policies, and is very knowledgeable about our course topics. Her email address is met39@cornell.edu. Morghan will help with grading and, as needed, will consult with you to help with homework exercises and other topics from the course.

BEE 401 will be offered in two lecture/discussion sections per week for the semester. We meet Tuesdays and Thursdays from 10:10 to 11:25 a.m. in Riley-Robb B15. Although we have much material to cover, I want to keep the course informal and strongly encourage questions and discussion. If I talk nonstop every day for 75 minutes, we will all collapse of boredom before the semester ends.

Especially me!!!!

Finding a suitable textbook for this course is a problem. From what I have found there are two types of textbooks that cover the subject matter of renewable energy. Some contain mainly arm-waving exhortations to use renewable energies but have no technical design information to tell you actually how to do it. Others are hard-core engineering/science books that delve into the physics and thermodynamics of energy conversion processes but are not very useful to design systems.

Twenty++ years ago, Sierra Club Books published a book titled “Other Homes and Garbage” (Why that title? Who knows? A 70s thing, I guess. It was, after all, the golden age of hippies.). It was written by engineers with a focus on renewable energy systems for the homestead. Despite its title and hokey illustrations, it was an excellent book. A second edition, published in 1981, was titled “More Other Homes and Garbage” but that version has been out of print for more than ten years. No third edition is planned, unfortunately.
However, after a certain amount of intense negotiations with Sierra Club Books about copyright charges, it is now available on-line through the Cornell digital library managed by Prof. J. Robert Cooke (of BEE). It can be read on-line or downloaded. It is unavailable through typical book stores or on-line sources.

The book is available through either of the following site routes:

http://ecommons.library.cornell.edu/handle/1813/1006
http://hdl.handle.net/1813/1006

The file is 34,887 kB in size and is in Adobe .pdf format. The link describes how you can order a “print on demand” copy, if you wish to purchase a hard copy for convenience, by sending an email to digital@cornell.edu.

There is another possible book: Energy: Principles, Problems, Alternatives by Joseph Priest, published by Addison-Wesley. This book touches on much of the material in 401, but more on a descriptive than design level. As a general statement, I suggest the academic level is about that of a good high school physics course. This is not to disparage the book; it is a good reference but its depth of system design is not parallel to 401. However, if you want to have a copy, on-line book sellers stock it and deliveries are generally rapid.

Finally, energy is a topic of frequent articles and editorials on the web. A somewhat eclectic collection of copies of articles from the past year or so will be handed out in class for your reading. Although they are meant as supplemental reading, they may lead to possible exam questions......

Homework: Ten homework exercises are planned. They will be typically assigned on Tuesdays and due the following Tuesdays in class. After that time, late homeworks will be penalized at a rate of 20% per day (Monday through Friday) for every class day or part of a class day late (yes, even an hour after the due day class ends). Homework a week or more late will not be graded.

Keys to homework exercises will be posted as documents on the course web site - just enroll in BEE 401 on Blackboard.

If you feel your homework or examination has been graded unfairly, or misunderstood, please put a note on it explaining your points and give it either to me, Morghan Transue, or to my administrative assistant, Ms. Debbi DeWeese, in Riley-Robb 324. Note: The option for regrading will be open for one week after each homework exercise or exam has been returned.

>>> Some homework exercises will involve extensive calculations. That is acknowledged but should be a hint that using a computer is a good idea. All that we will do in 401 can be accomplished easily using a spreadsheet. Matlab is another very nice option. Matlab is as easy as a spreadsheet (or perhaps easier for the types of data arrays we will deal with) and has very convenient graphing capabilities.

HOWEVER!!!! When you turn in your work, you should, in some way, show how you obtained the numbers (sample calculations, for example) and include labels and comments on the output. It is frustrating for us both if you turn in something that is cryptic, has the wrong numbers on it, there is no way to know what the problem is, and it must be graded without allowing partial credit (and this difficulty will not be eligible for
the regrading option). Moreover, the best way to really learn something is to explain it to someone else. That is what your homework should do – explain to me what you did. I would like everyone in this class to receive fair and full credit for what you have learned, and to do well.

An appendix to this handout contains a format for homework exercises.

The work we will cover may be more open-ended than you might be used to. That is, many of the homework exercises will not be tightly structured with everything completely specified. You will need to make some assumptions or approximations. This can be frustrating when you first encounter it but, when you leave Cornell, everything but your tax returns will become open-ended exercises so we might as well start here in Riley-Robb......

Homework is an exercise that should be designed to instruct. That is possible only if you are actively involved. If you do not understand the work, be sure to ask questions. Out-of-class consultation will be an important part of this course, so USE IT!

Homework Teams: I have found that working in teams is a much more effective way to learn than working as individuals. We will have (two person, I think) teams in this course that will be formed as soon as enrollment settles. The homework is to be handed in as a team effort – one copy per team, with the name of each team member on it.

Early homework exercises will contain several more-or-less independent questions. The rest will involve a single problem with sequential sub-questions. With the first type, I strongly suggest teams do NOT divide the work so that each person ignores the other's work. If your partner makes a mistake, it is equally your mistake. Second, you will not learn the material and any corresponding exam question will be a trial for you. Work together and help each other learn.

This process makes you depend on your partner. And vice-versa. I don't expect problems but the possibility of a difficulty always exists. If a team really is not working, please let me know and we will work something out.

Expectations: It should be understood very clearly that the focus of this course is on the quantitative design procedures for relatively small renewable energy systems. The general topic of renewable energy is so broad that this course could fill your entire schedule for the semester. I would like that. But you are taking other courses, I suppose....

I generally will not delve in detail about the social, political, economic, legal, environmental, etc., aspects of renewable energy systems because much of that material you can read yourself, or is available in other courses at Cornell. Some of our web reading assignments will cover these topics, and contain numerous links to similar materials. You can not as easily find web coverage of the technical information as will be presented in this course and, thus, I will concentrate there. That is, I plan the lectures to help you with the more difficult parts - for the easy parts you are on your own.

On the other hand, this course will not require more than an understanding of the heat and mechanics aspects of physics and some facility with at least spreadsheets.
Exams: Two preliminary examinations are planned and there will be a final exam. Prior to each exam there will be an evening review session. Example exams will be posted on the course web site as samples of format and types of questions. However – DO NOT STUDY ONLY FROM THE SAMPLES!!!!!! You can be very certain that none of last year’s questions will be on this year’s exams.

To a significant extent, exams will be based on homework exercises. I have observed that the best way to perform wretchedly on exams in this course is to avoid grappling with the homework. Moreover, even though homework keys will be posted, studying them without actually doing the work has never proved to be a successful substitute. Think - learning to ride a bike from (only) an Internet URL. Direct involvement (blood, sweat, struggle, grief, pain, angst, tears, crispy language; you know...) is the way to learn and understand the material.

Grades: Your course grade will be weighted based on the following components:

- Homework: 30%
- Prelims: 40%
- Final Exam: 30%

Suggested Useful Web Sites: Many exist. Three that are quite useful for general information are:

- http://www.renewableenergyaccess.com/rea/home. This is an on-line newsletter for which you can register. It arrives in your emailbox several times a week.

- http://www.homepower.com/. This is the site of Home Power magazine and contains many useful and interesting articles.


Skill Set: You can expect to accumulate some knowledge and skills as follow ... which are not necessarily in the order of presentation in the course and do not include every little topic we might cover:

- Understand the U.S. tax system basics and how deductions and credits impact investments in renewable energy systems.
- Compare investments in renewable energy systems based on concepts of the time value of money and net present value.
- Be comfortable with units conversions, the bane of all engineers...
- Organize presentations of engineering design information.
- Understand some practical aspects of heat transfer.
- Calculate heat losses from houses and other buildings.
- Calculate solar angles and solar availability.
- Understand how solar collectors work.
- Determine optimum sizes and configurations for active solar heating systems (particularly collectors for hot water).
- Understand how passive solar heating systems work.
• Determine optimum sizes and configurations of passive solar heating systems and the interplay with house thermal characteristics.

• Calculate expected electrical energy output from photovoltaic systems, for system design purposes.

• Quantify the suitability of one wind energy site relative to another.

• Determine wind energy availability at a site for a given wind turbine.

• Optimize wind turbine tower height and turbine selection.

• Design battery storage and wiring systems for home electric systems.

• Design plumbing (penstock) requirements for microhydropower energy systems.

• Determine electricity output expected from microhydropower systems.

• Understand some practical aspects of house construction and electrical system installation.

• BE SENSITIVE TO THE IMPORTANCE OF ENERGY CONSERVATION.
Appendix to General Information
Homework Format

Professional quality report writing is very important in the “real world”. This is not a major focus of BEE 401 but you are likely to get better grades if you consider completing your homework exercises as a communication process. It is claimed that, after graduation, your work as a professional will require approximately 80% of your communications be in written form.

Written communications can be required for many reasons. Perhaps it is a report to a client. Perhaps a report to “The Boss”. Perhaps instructions for others. In BEE 401, we will assume, because of the kinds of work we will do, the first reason - your work is to provide information to someone who is paying you to do it. Your grade is your pay.

Below is a suggested format. The aim is to showcase and organize your work, not to create extra work. Organizing your work as a formal report prevents inadvertently leaving out important (read ... worth lots of points) parts.

1. Most professional reports begin with an Executive Summary of no more than three pages, which is much too long for our homework exercises, but a one-paragraph summary of your work would be good. What was the overall problem (one sentence, perhaps), how did you solve the problem, and (briefly, but this is the most important part) what did you learn and how much will it cost (if appropriate)?

2. The next step is typically a more detailed description of the problem you are trying to solve. This, too, can be as short as a paragraph in BEE 401 and is generally an abstraction of the homework assignment as given. As part of this, it is useful to list a one-sentence objective – which provides a good focus to your work and results. For BEE 401, the objective can be as simple as: “Determine the economically optimum size of an active solar collector system to provide hot water for a single family house and family of five in Ithaca, NY.” This, too, usually comes almost directly from the written homework assignment.

3. As a “Materials and Methods” section, a very brief summary of the equations that apply should suffice as a start. A few words to describe what the symbols mean could help the presentation. After the equations, a set of sample calculations should be included. Many of the equations will be a real pain to type so hand written is fine. In fact, the entire report can be hand written as long as it is neat and readable.

4. Results can be next. This does not mean your computer output (that is included as an Appendix). Graphs, tables, and a verbal description of results should be included here. Next...one paragraph of interpretation can suffice for the “Discussion” part of the report. More is fine, but don’t spend pages on this part unless it really interests you from a subject matter/research standpoint.

5. Finally, as an appendix, include the actual spreadsheet/computer program and the output. I know...the program is most of your effort but, to the outside world, the problem you are solving is the most important part and the computer is just a tool to solve the problem.

A fancy binder is not needed for the homework exercises, nor does your work need to be typed! However, please be sure the sheets are stapled together, and in order, so pieces will not be lost on the journey between you and the grader and then back to you.

AND........................................Be sure your names are on your work.