

ENPR 256 - Sustainable Systems, Energy

Syllabus (DRAFT)

Summer/Fall, 2006

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<http://cs.earlham.edu/~charliep/courses/enpr256/syllabus.pdf>

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1 Description

Students will research, design, and install a modest grid-tied solar/wind/other energy system at Miller Farm. The course will include a combination of analytical/quantitative work and light construction. 4 credits. Prerequisites: consent of the instructor.

While not a requirement, preference will be given to students living at Miller Farm during the summer and/or the following fall semester.

The basic outline of the course is as follows:

- Perform an energy audit of Miller Farm. Design and install monitoring equipment for on-going measurement and reporting of energy usage.
- Research and implement an energy conservation plan for Miller Farm.
- Research, design, and construct/install a solar based electrical generation system at Miller Farm.
- Research wind based electrical generation systems for potential use at Miller Farm.
- Research, and working with Richmond Power & Light install, a grid inter-connect for the energy system(s) at Miller Farm.
- Organize the results of the work for this class in the form of a poster and then present that poster at two colloquiums, one on-campus at Earlham and one at the Cope Environmental Center. The bulk of this item will be done during the fall.
- Organize the results of the work for this class in the form of an interactive display suitable for inclusion in the Green Zone. For more information about the Green Zone see <http://cs.earlham.edu/~charliep/green-science/overview.html>. The bulk of this item will be done during the fall.

This list is likely to change, with notice, as the course progresses. This is the first time the course is being offered. How much we actually accomplish by the end of the course is difficult for me to judge now, in this syllabus I've made the first estimate. As I make more detailed plans, and the course unfolds, we'll revise our goals as necessary.

A wide variety of tools and techniques will be employed during this class, some examples:

- spreadsheet

- circular saw
- library and on-line research
- hammer
- text processing software
- shovel
- wiki
- wheel barrow
- web browser
- Watts Up? meter
- email
- ladder
- Internet publishing and content organization tools
- volt/Ohm/amp meter
- presentation and prose development
- digital camera
- knife, fork, and spoon

While students are not expected to be facile in any or all of them as a pre-requisite for the class, I will expect that with instruction and support you will be willing to embrace all of them at some level.

A note of caution. I have *never* taught a course in sustainable energy systems before. It has been a long time since a formal class has been taught in the context of Miller Farm. I have taught computer science and fire/EMS at various levels to a variety of audiences for about 15 years. My carpentry and electrical skills are pretty decent and I've lived on a farm for about 20 years. My interest in sustainable systems dates back to my youth and I have some experience working with both solar and wind based power generation. There will probably be some rough spots along the way as we figure-out the best way to approach all this but I hope that in the end the view will be pretty reasonable.

2 Organization

Most of the work for this class will be accomplished during the summer, class will meet for two three hour sessions on Tuesday afternoons and Saturday mornings for 9 weeks between June 13th and August 12th. Regular attendance will be important, it will be hard to catch-up or make-up work due to the nature of the material. We can adjust the daily session times as necessary to accommodate people's work schedules. This is a detail we'll handle at the start of the summer.

During the fall we will have about 8 meetings of 1 hour each, at times to be mutually determined. Most of our time in the fall will be spent working on the presentations and the display for the Green Zone.

For both the summer and the fall students are expected to commit to the requisite out-of-class work normally associated with that many contact hours. I suspect this will be a time consuming course, not necessarily harder than most but certainly one that will require more focus and personal energy than is typical since we will have a lot going on at any given time.

Much of the work in this class will be done as a group or sub-groups. The breadth of skills that we will need to accomplish our goals is such that it's unlikely that any one of us will be able to "go it alone". Many of us will bring valuable experiences and knowledge to this class. It is expected that students will approach this enterprise with both a desire to learn new material and a willingness to teach their fellow students.

Colin Copeland will be working with us as the teaching assistant for this course. He has experience with some of the gear we'll be using and has worked on sustainable energy projects in the context of the Hardware Interfacing Project and the Green Science group.

There are a couple of times during the summer when I'm committed to teaching workshops for the National Computational Science Institute in various places far from Richmond. While I'm away Colin will be leading the class, I'll also be pretty available via email when away.

3 Textbooks

To be determined. I'm considering two or three more focused books rather than a single volume. The course will make extensive use of Internet based resources.

4 Assignments

The work for this class will be built with the following types of assignments:

1. Exercises will be organized around researching various aspects of design and construction, the energy audit, data analysis, and related tasks. There will be about 12 of these. Exercises will usually be turned-in on paper.
2. Labs are where we will design, build, install, and test the monitoring, solar, and wind gear. Labs will usually be physical things we'll inspect together. Deficiencies in labs must be corrected since we'll be leaving the artifacts of this course for Miller Farmer's to operate and maintain over the long-term.
3. Developing a poster and presentation and the delivering it at Earlham and the Cope Environmental Center in the fall. Developing a display for the Green Zone.
4. Your weekly journal entries will describe what you are doing and how you are going about it. Often I'll give you particular questions to consider as well. There will be about 20 of these.
5. Class participation is showing-up, doing the work, and actively engaging your fellow students and myself in the enterprise of learning.

See below for a breakdown of the weights assigned to each of these components.

5 Grading

1. Exercises	30%
2. Labs	30%
3. Posters, Presentations, and the Display	15%
4. Journal	15%
5. Class participation	10%

It is possible to register for this course as ENPR 356, that is for upper-level credit. In order to do this students will need to perform one of the following independent projects *in addition* to the basic requirements for the course:

- Model the Miller Farm energy system using an open source analog for Stella or the equivalent. At least one display option must visualize information representing the total system. Thoroughly document the model, the equations, and the validation and verification procedures performed.
- Develop a content structure for the Environmental Responsibility Committee's web presence. The goal of the ERC site is to be a one-stop location with either content or pointers to a broad range of environmental, energy, and sustainability materials and information about Earlham. Organize the ERC's materials into that structure and publish the content on the Internet. Provide documentation and tools to support the on-going maintenance of the site.
- Organize and document a "green" tour of Earlham, including Miller Farm, the Green Zone in Dennis Hall, and anything else that springs-up in the next 6 months. Develop and publish a self-guided tour brochure, this should be available both as a prose/pictures webpage and as a downloadable podcast *ala* museum audio tour gear. Provide documentation and tools to support the on-going maintenance of the content.
- Your idea here, subject to my approval.

Students interested in this option should consult with me *before* registering for the course.

6 Disabilities

Please let me know as early in the semester as possible if there are any adaptations or accommodations you require, if there is any emergency medical information I should know about, or if you might need special arrangements in the case the building needs to be evacuated. The Earlham policy is:

Any student with a documented disability (e.g., physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact Academic Support Services and the instructor at the beginning of each semester. Accommodation arrangements must be made during the first-two weeks of the semester.

It is important to follow this procedure.