Draft syllabus for
EK 1xx: WIND

Course Description:
Modern wind turbines have begun to play an important role in the production of electricity. This course provides an overview of wind turbine technology and energy concepts. It is designed for non-engineering majors. A brief history of windmills and their design will be given. The question of whether wind technology (or any other renewable source) can impact the energy crisis will be debated. The course gives an overview of fluid dynamic, thermodynamic, and rotor dynamic concepts as they apply to wind technologies. The fundamentals of energy measurement, energy availability, energy transmission, and energy consumption will be covered and used to strengthen the debate. The importance of function and form and the entangling of politics, human nature, and technology will be explored. Students will perform experiments, measure personal energy use, and visit wind turbine installations. 4cr.

Course faculty:
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General Course Information:

The class will meet twice a week for 2 hour sessions (as a regular engineering course).

The course will have a blackboard site. Grades will be loggged on the website and a discussion board will be used to discuss topics outside of class times.

Course text:
Wind Energy Explained, Theory, Design and Application*, J.F. Manwell, J. G. McGowan, A.J. Rogers*, Wiley.

Other reference material which will be used:
1. Feynman Lectures on Physics, Richard Feynman, Robert Leighton, and Matthew Sands, 1963, Addison Wellesley Pub. Co.
2. Review of Historical and Modern Utilization of Wind Power, Per Dannemand Andersen, 2007, Riso, National Lab for Sustainable Energy.
3. The Party's Over: Oil, War and the Fate of Industrial Societies, Richard Heinberg, 2005, New Society Publishers, BC Canada.
4. Information available on the International Energy Agency website and the US Energy Information Administration's website.
5. Various publications by Cutler Cleveland and Robert Kaufmann (BU)
6. Wind Power for Home & Business, Paul Gipe, Chelsea Green Publishing Co., 1993
7. Wind Power in View, Martin. Pasqualetti, Paul Gipe, Robert Righter,
8. Wind Energy comes of age, Paul Gipe, Wiley and Sons

If the reference is not an on-lilne reference, copies of relevant pages from these texts will be provided to the students. The full texts will be on reserve at the library.

Students are expected to attend lecture having read the relevant material. Students will be required to participate in one laboratory exercise outside of classtime and at least one field trip. The times for these activities will be coordinated with the students well in advance of the activity.

The tentative grading criteria is:
20% Attendance/discussion./participation/short quizes
5% Homework problems

10% Energy audit with write-up
15% Lab report (requires lab participation)
10% Aesthetics summary
15% Policy comparison paper
10% Presentation and debate of policy research findings
15% Final exam

Homework, which will be assigned in class and noted on the course web page is due at the beginning of the designated class period (unless otherwise noted.) All homework will be graded and returned. The top of the first page of the homework should have: your name and the course number. Every page should have the problem number on the top right corner. There should be no frayed edges and multiple pages must be stapled. You should briefly restate the problem (some even make a photo copy and tape the problem statement to the page). Give a sketch if helpful. List the basic assumptions. Give all necessary analysis. If asked to plot something, you must create a computer-generated graph with appropriate axis labels and legend. Place a box around the final answer. Correct units should accompany all numerical answers. **Any answer that is not of the correct order of magnitude, with no accompanying explanation, will be given no points, even if the method used to do the problem is correct.**

Honest policy: Adherence to the Student Academic Code of Conduct is expected. I encourage you to freely discuss the homework amongst one another as you formulate your solutions individually. *Your* written work should represent *your* understanding of the problem.

In practice this means that copying (in whole or in part) another student's homework, exam, computer program, or paper is not permitted. If you choose to discuss your work with a colleague, it should be a discussion in which one teaches another or both work to a mutual understanding. As a counter-example, it is not acceptable to give a friend your homework five minutes before class so that your friend can copy your work. I also consider it unacceptable to copy work from a student who was in the class a previous year. In your written reports, be careful to correctly use quotation marks for words that did not originate with you. Also, be sure to properly cite all sources you used. As is done in the scientific literature, you should *briefly* acknowledge in writing any significant discussion or interactions you had regarding the work you submit. As a general principle, I do not accept the justification that you were not sure of my intentions. If you feel you may be in an ethical gray area, then you should consult with me *before* acting.

Late policy: Papers and lab reports are due at the time assigned. Late papers or reports will be penalized 10 points for each day past the due date. However, homework due date/time will be more lenient.

Meeting	Topic/Reading	Lecture note	Assignment
1,2	History of wind energy Ref 2. on-line	Intro	
3,4	Global energy needs, current energy sources Refs. 3,4,5	How is energy measured? Potential guest speaker, Prof. C. Cleveland	Hmwk: Compare energy predictions – various websites
5	Resources on the horizon	Possible guest speaker from fuel cell group	
6,7	Museum of Science visit and discussion	Visit the 5 different wind turbines installed at MOS	Attend field trip
8,9	Personal energy audit, BU energy audit outcomes, Energy usage by country Ref. 4	Possible guest speaker – Prof. M. Gevelber	Perform energy audit, present results in form of a paper.
10,11	Political/societal challenges for renewable energy (part 1) Ref. 4,6,8; Text Chap.9,10;	Cape wind. NIMBY, BANANA. Intro to policy comparison due later in the semester	Choose country for comparison.
12,13	Basic fluid dynamics/aerodynamics Text Chap.3	Quick overview lift/drag etc	Hmwk: Some lift, drag problems
14	Aerodynamics laboratory Lab hand out.	Lab performed outside of lecture time for some, but we won't have lecture on one day to allow for the lab time.	Lab report
15,16	Wind turbine rotor dynamics, operation, efficiency Text Chap 4	Overview Betz theory etc. Revisit history of wind turbine as mechanical device vs. electricity generator	
17	Wind turbine sizes, output, applications Text Chap 8, Refs. 6,8	Recall MOS tour, how much energy can be generated etc.	Hmwk: mock wind turbine farm calculations
18,19	Thermodynamics, energy production, comparison of energy technologies Refs. 1, 3	Basic laws of thermo stated, explained. Mention energy density, energy storage. Wrap in transmission/transportation	Perhaps a demo of some sort for transmission
20,21	Where is the wind, grid issues/solutions Text Chap.1	Potential guest speaker – Stephen Connors, MIT: wind turbine siting. Potential guest speaker – Grid solutions Robert Kaufmann	
22	Wind energy economics Text Chap. 9	Potential guest speaker ? Guy from SMG?	
23,24,25	Political/societal challenges for renewable energy (part 2)		Presentations, debates
26	Aesthetics, noise, wind turbine siting Ref. 7, Text Chap. 10		Aesthetics essay summary