EK 131/132 module: Introduction to Wind Energy
MW 3-5

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. 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 importance of function and form and the entangling of politics, human nature, and technology will be explored. Students will measure personal energy use and analyze wind turbine data from the Museum of Science's wind turbine lab. 2cr.

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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.
- The material in this course will mainly be covered through guided personal discovery. The course projects will provide additional frameworks for the course topics. Regularly, assignments on a new topic will be completed by the students before class so that the class meeting will be spent on broader discussion and debate related to the topic.

Reference material:
1. Wind Energy Explained, Theory, Design and Application*, J.F. Manwell, J. G. McGowan, A.J. Rogers*, Wiley. (On hold in the Engineering Library)
2. Review of Historical and Modern Utilization of Wind Power, Per Dannemand Andersen, 2007, Riso, National Lab for Sustainable Energy. (Available online)
3. Information available on the International Energy Agency website and the US Energy Information Administration's website. (Available online)
4. Wind Energy comes of age, Paul Gipe, Wiley and Sons (On hold in the library)

Module Goals:
- To introduce the basic science and engineering behind wind turbines.
- To explore how an understanding of the fundamentals behind a technology can truly inform a debate concerning that technology.
- To appreciate the impact of non-technical elements such as politics and public perception on renewable energy source development and propagation.

Module Outcomes:
As an outcome of completing this course, students will:

1. gain an understanding of fundamental energy principles
2. learn how wind turbines work
3. complete a "personal" energy audit in order to better understand their own energy usage
4. understand the assessment of wind energy from technical, political, socio-economic, and public perception points of view.
5. gain experience working with and analyzing wind data and wind turbine data
6. improve their technical research skills

Major assignments:

1. Energy audit (of the home of a family member or friend).
2. Analysis of wind turbine data (provided by the Museum of Science)
3. Creation and testing of wind turbine blades for desktop scale turbine.
4. Blog posting regarding discussion of health impact of wind turbines.

The tentative grading criteria is:

30% Attendance/ participation/problem sets
15% Energy audit with write-up
20% Blade creation, testing, and report
15% MOS data analysis project and write-up
20% Blog entry – health impact of wind turbines

Meeting	Topic/Reading	Lecture note	Assignment
1	History of wind energy Ref 2. on-line	Intro, where renewables fit, overall energy overview	
2	Read handout.	Where's the wind, avail power, Betz limit, tip ratios	Basic turbine power problems. Think about shape of blades you will design.
3	Energy audit final synopsis	Compare power out of turbine vs. needed power. Discuss outcomes of energy audit.	Completed energy audit write-up.
4,5,7,8,9	MOS turbine background	MOS turbines, data assignment discussion	MOS turbine data analysis
6,7,8,9	Blade design, cut, test	Turbine blade aerodynamics, testing method	Lab testing of blades
9, 10	Online comments about health impact of turbines or policy impact	Discussion on health impacts, ethics, comparison with other energy soucres. Examples of how policy can affect adoption of wind energy	Blog entry
11		Analysis of project results	
12		Wrap-up	