Renewable Energy Systems
Syllabus, ELEC 494, Spring 2012

Instructor: Peter Mark Jansson PhD PP PE
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Class Time: Monday, Wednesday and Friday 1.00-1.52 pm in DANA 116
Laboratory: Multiple Field Trips to be scheduled during the semester
Web Page: on MOODLE now
Office Hours: Tuesdays 1 pm-2.30 pm and Wednesdays 2.30 pm-4 pm
Prerequisites: Enrolled in Engineering
Textbook: Renewable and Efficient Electric Power Systems," Gilbert M. Masters, John Wiley & Sons © 2004, ISBN0-471-28060-7

Professional and Scientific Journals: IEEE Transactions on Sustainable Energy - EPRI Journal – Power Engineering Journal – Solar Engineering Journal – IEEE Power Engineering Review –IEEE Transactions on Power Delivery, on Power Systems, on Power Electronics, on Industrial Electronics, on Energy Conversion. You can find these journals in paper and/or electronic form at the library and/or library web-page. The content of these journals is usually a bit too advanced for the class, but if you are interested in the field beyond the level of the class then you may study them to learn more about current research in the area.

Key Course Topics: Introduction to Climate Change issues, Fundamentals of Electric Power, Electric Power Grid, Conventional Generation, Wind Power Systems, Wind/Grid Integration, Introduction to Power Flow, Distributed Generation Technologies, Economics of Distributed Resources, Energy Storage including Electric/Pluggable Hybrid Cars, The Solar Resource, Photovoltaic Materials and Systems, PV System design and Economics, Large Scale Inverter Technology, Smart Grid Integration Issues.

Course Grading*:

Homework	15%
Quizzes	10%
Midterm Exam I	15%
Midterm Exam II	15%
Class/Tour Participation/LCsy	10%
Final RES Project	15%
Final Exam	20%

*NOTE: Extra-credit may be offered for excellent, well-documented, course concept glossaries

Homework Policies:

· Most homework assignments are bi-weekly. Homework will tentatively be due on Fridays, but **due dates may vary!** Every homework will have its particular due date/time printed on top of the assignment. Be sure to check the due date!

· Note that some homework problems will not follow the standard textbook format. They will be testing you on *real world engineering skills.* As such, they may not have a unique and specific solution, they may be design oriented, they may have an economic component, they may not have all underlying assumptions clearly stated (i.e. you will need to fill in with reasonable assumptions of your own), and they are generally more difficult. Some problems may even be deliberately ill posed. Make sure to see me in office hours to discuss such problems **before** you submit your solutions.

· Students are encouraged to consult with each other on the principles involved in solving the homework problems as much as possible. However, they must apply these principles on their own and must hand in assignments that are based solely on their own individual work, their individual abilities, and their individual understanding.

· To be fair to all students, **no late homework** will be accepted. However, you will be able to drop your two lowest homework scores, which gives you some flexibility if you are out of town or sick. Exceptions to this policy will **not** be granted, unless in very extenuating circumstances. Exceptions require approval by Dean Marosi and will only be considered and/or discussed if more than three homework assignments were/will be missed.

· Homework solutions may be handwritten or typed, but may not be machine (e.g. photocopy copies) from other student's work. Make sure that you ***cite everything*** you use from the internet or other library sources!

· You are expected to present your homework solutions in a clear and legible fashion. Solutions with an unnecessarily convoluted structure may receive less or no credit. Remember: It is your job to convince me that you understand the material. If you make it easy for me then I will find it easier to give you full credit! In particular:

— Your name must be on the top of your solutions paper.
— Your paper must be stapled.
— Your solution must be ordered: problem 1 first, problem 2 second, and so forth. (Use a separate piece of paper for each problem, only if necessary).
— Clearly state all assumptions you are making.
— Put a box around your final answers.

Examination and Quiz Policies: · All exams will be *in-class* exams with closed book and closed notes. You will be allowed to bring:

1. One sheet of prepared equations (8-1/2" × 11") will be provided with each exam.
2. Pocket calculators may be permitted (watch out for announcement in class). Laptop computers and laptop-like pocket calculators are not permitted! Nor is any access to the internet allowed at any time during graded exams.

· All midterm exams will take the full class time (52 minutes).

· Make-up exams and missing class may be granted in cases of emergencies and for reasons such as job interviews, and so forth provided advanced notice is given to me. Make-up exams require the expressed approval of Dean Marosi.

· Requests for regrades of exams must be submitted **in writing within two weeks of the exam's return.** All questions may be regraded.
· You are expected to present your exam solutions in a clear and legible fashion. Solutions with an unnecessarily convoluted structure may receive less or no credit.
· Exam scores will be determined based on a scaling procedure that converts accumulated points into a corresponding percentage.

Field Trip Attire: For all laboratory exercises students are required to wear appropriate attire for the planned activity. If we are going on a Field Learning/Training Tour rugged shoes or sneakers are to be worn and shorts are prohibited. If we are meeting with utility and/or other professional groups the students should also be dressed appropriately for these meetings. We are currently planning to visit renewable energy sites in the Bucknell vicinity and in the greater Lewisburg area. Photographic technology is encouraged for each lab team on these trips to collect images to assist in the presentation of their lab report/findings/observations.

Attendance: · Attendance is generally expected for the classes and any scheduled field trips or labs. Excused absences are only approved when I am notified in advance. You will receive a zero for unexcused absences from labs (report) and lecture learning exercises if you have not made a reasonable attempt to notify the instructor in advance.

Other Policies: · I tend to read **email** regularly throughout the normal working day. I will try my best to reply to your emails within 24 hours. Please note, though, that I do not believe it beneficial to student learning to *teach-through-email* and, therefore, may choose to answer your email questions with: "I cannot answer your question over email. Please come and see me in person…". Also: always be sure to include ELEC494 in your subject line.
· I am generally available for consultation on Tuesdays 1-2.30 pm and Wednesdays 2.30-4pm and will endeavor to make myself available at other convenient times to meet your needs. I have other courses I am responsible for on MWF 10am-12 noon when I will not be available during the Spring 2012 semester. I spend significant time consulting on Thursdays, or may be out of town working with other colleagues or on my research. However, with advanced scheduling, I can surely set aside time for students whose schedules do not enable them to take advantage of my normal office hours.

Tentative Course Calendar (Spring 2012):

First Class:	Wednesday, 18 January
Midterm Exam I:	Wednesday, 15 February
Spring Break	10-18 March
Mid-Semester Grades:	Wednesday, 14 March
Final Project/Research Approval:	Wednesday, 21 March
Midterm Exam II:	Wednesday, 4 April
Last Class:	Monday, 30 April
Final Exam:	10 May (8-11AM)

Course Learning Outcomes:

At the end of the semester the students are expected to:

· demonstrate competence and understanding of how renewable energy systems function, what the technologies costs and how they can be constructed and designed.

· be able to understand fundamentals of electrical power, system efficiency, and electrical components associated with renewable energy systems and devices.

be able to determine solar and wind and other renewable resources in a location around the US and develop an estimate of economic performance for a system built there

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Tentative Course Outline

The material covered this semester will adhere closely to Chapters 1-9 in the course text book. However, some material may be omitted, and some material from topics outside the text may be added. Specific reading assignments will be posted on the course web page.

Week 1	Jan. 18, 20	Introduction; Basic electric circuits	(Chap. 1)
Week 2	Jan. 23, 25, 27	Fundamentals of Electric Power	(Chap. 2)
Week 3	Jan. 30, Feb. 1, 3	Electric Power Industry	(Chap. 3)
Week 4	Feb. 6, 8, 10	Distributed generation	(Chap. 4)
Week 5	Feb. 13, 15, 17	Distributed Resource Economics	(Chap. 5)
Week 6	Feb. 20, 22, 24	Wind Power Systems - Resources	(Chap 6)
Week 7	Feb. 27, 29, Mar. 2	Wind Power Systems - Technologies	(Chap 6)
Week 8	Mar. 5, 7, 9	Wind Power Design and Siting	(Chap. 6)
	Mar. 10-18 Spring Break		
Week 9	Mar. 19, 21, 23	The Solar Resource	(Chap. 7)
Week 10	Mar. 26, 28, 30	Photovoltaic Materials Characteristics	(Chap. 8
Week 11	Apr. 2, 4, 6	Photovoltaic System Design	(Chap. 9)
Week 12	Apr. 9, 11, 13	Photovoltaic System Design II	(Chap. 9)
Week 13	Apr. 16, 18, 20	Economics/Integration of Ren. Energy Systems	
Week 14	Apr. 23, 25, 27	Final Project Presentations	
Week 15	Apr. 30	Review for Final Exam	
Week 16	May.10	Final Exam (8.00-11.00 AM)	

Course Letter-Grade Distribution:

A-Range	above 90% of total course score
B-Range	below 90% but above 80% of total course score
C-Range	below 80% but above 70% of total course score
D-Range	below 70% but above 60% of total course score
F-Range	below 65% of total course score