

FORT LEWIS COLLEGE  
Department of Physics and Engineering

COURSE: ENGR 410 – Alternative Energy Systems, 12:20 – 1:15 MWF, Theatre 105

TERM: Spring 2015

INSTRUCTOR: Dr. Laurie Williams

Office: 632 BH; Office Hours: 11:15 – 12:10, MWF; 1:25 – 3:25 T; 2:30 – 3:25 F

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**COURSE OBJECTIVE:** This course is a first-order introduction to the plethora of many of the alternate energy technologies now considered as viable or promising. The course covers basic principles, the amount of renewable resource available, quantitative aspects, difficulties and limitations, and economic considerations of alternate energy technologies.

An underlying goal of the course is to provide students with an overview of energy usage in the contemporary world. In addition to the technical contents of the course, the energy consumption, end-point energy usages, and energy availability in the United States are previewed.

**COURSE OUTCOMES** (with corresponding ABET Outcomes):

1. Quantitative attributes of different energy systems (Outcome a, e, h, and j).
2. Availability of different energy sources (Outcome a, e, h, and j).
3. Physical principles of different energy systems (Outcome a, e, h).
4. Design/selection/economic/environmental issues and energy sources (Outcome a, c, e, h, j and k).
5. Compare different energy technologies and choose the most appropriate based on local conditions (Outcome a, c, e, f, h, and k).
6. Sources of information on alternative energy systems.

**ABET OUTCOMES:**

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- (e) An ability to identify, formulate and solve engineering problems.
- (f) An understanding of professional and ethical responsibility.
- (h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- (j) A knowledge of contemporary issues.
- (k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

**PREREQUISITES and EXPECTATIONS:** Prerequisite course - Engr 270 (thermodynamics). I expect each student to attend all classes and complete all homework assignments. Be at class on time and turn in your homework on time.

**Note: Familiarity with basic concepts of fluid mechanics, thermodynamics, and heat transfer is presumed in the development of topics in the textbook, but maturity in these subjects is not needed in order to understand the developments**

TEXTBOOK: B.K.Hodge, 2010, *Alternative Energy Systems and Applications*, John Wiley and Sons.

CLASS PARTICIPATION: Learning engineering subjects can be a difficult task; it can only be done by working problems on your own. Your learning in this course will be a combination of textbook material, lecture material in-class discussion, and problem solving. Your active participation in class exercises and discussion is essential to your learning of the subject matter. Your own work in problem solving is a key to your mastery of the subject matter.

HOMEWORK: Weekly homework assignments will be assigned. These problem sets are due at the beginning of class on Monday of each week. The solutions to the assigned “exercises” will be posted on the course Canvas site by the end of the day Thursday – prior to the assignment due date. The underlying assumption here is that each of you is a mature and responsible learner who wishes to understand the material and obtain a good grade. Homework is intended to be a learning tool rather than an assessment instrument.

HOMEWORK GRADING: Homework sets will be **evaluated** on a quality rating from 0 to 5 as shown below.

Rating	Comments
5	All problems assigned were completed, worked in detail, and followed engineering format.
4	At least 75% of the assignment was completed, worked in detail and followed engineering format.
3	Incomplete solutions 50% of the time, some copying
2	Vague and incomplete solutions more than 75% of the time, possible copying.
1	Submitted only a few problems with large probability of copying
0	No homework submitted.

GRADING: Your grade in this course will be based on homework, two exams, random quizzes, a presentation, and a final exam. Weighting is as follows in computing the final grade:

Assignments	10%
Presentation	15%
Quizzes	20%
Exams	30%
Final	25%

GRADES:

Grades will be no worse than:

- >90 - A
- >80 - B
- >75 - C
- >60 - D
- <60 – F

NO MAKE-UP EXAMS: There are no make-up exams. Students who miss the exams will receive a grade based on their performance on their completed course work.

WITHDRAWALS:

- 1) Withdrawals from the course may be made until January 27<sup>th</sup> without a record.
- 2) After January 28<sup>th</sup> no withdrawals (leaving the course with a “W”) from the course are allowed.

DEPARTMENT POLICIES: For policies on grading, syllabus changes, disputes with instructor, academic dishonesty, and other important issues see: Syllabus Policies (link on Moodle and faculty webpage, [http://faculty.fortlewis.edu/Williams\\_1/](http://faculty.fortlewis.edu/Williams_1/)).

SPECIAL NEEDS: Students with disabilities who require reasonable accommodations to fully participate in course activities or meet course requirements must register with Disability Services, 280 Noble Hall, 247-7459. If you qualify for services, bring your letter of accommodations to me as soon as possible.

CHANGES: Students are responsible for all changes to this outline announced in class.

Readings should be completed prior to the lecture.

### Engr 410 - Alternative Energy Systems, Spring 2015 Tentative Schedule

Week	Dates	Subject	Reading	Homework Problems
1	1/12 – 1/16	Course Introduction Energy Resource Assessment and Usage, Efficiency	Chap 1,	In class assignment
2	1/19 – 1/23	Fundamentals of Turbomachinery	Chap 2	Review prob 3, 7 Exercise 1, 3a, 3e
3	1/26 – 1/30	Hydropower	Chap 3	Review prob 6 Exercise 1, 4, 9
4	2/2 – 2/6	Wind Energy	Chap 4	Review prob 3, Exercise 1, 5, 10
5	2/9 – 2/13	<b>Exam 1</b> , Solar Radiation Introduction and Background	Chap 6	Review prob 7. Sun Path program, exercise 8
6	2/16 – 2/20	Solar Thermal Applications	Chap 7	Review prob 5, 12 Exercise 1, 6
7	2/23 – 2/27	Passive Solar Energy	Chap 8	Review prob 4 Exercise 2, 6
8	3/2 – 3/6	Photovoltaic Systems	Chap 9	Review prob 1, 9 Handout
9	3/9 - 3/13	<b>Exam 2</b> , Biomass	Chap 12	Review prob 7, 14 Exercise 1, 3
10	3/16 – 3/20	Combustion Turbines	Chap 5	Review prob 2, 8 Exercise 1, 4, 6
	3/23 - 3/27	Spring Break		
11	3/30 – 4/3	CHP Systems, Geothermal Energy	Chap 11, 13	Chap 13 - Review prob 4, Ex 1, 3
12	4/6 – 4/10	Ocean/Tidal Energy	Chap 14	Review prob 2 Exercise 1, 3, 4
13	4/13 – 4/17	Nuclear Energy	Chap 15	Chap 15 - Review prob 7, 12, Ex 1, 3, 5
14	4/20 – 4/24	<b>Catch up and Review</b>		
<b>Final Exam, Monday, 4/27, 9:45-11:45 am</b>				