PHYS 302 Spring 2015

Sustainable Energy – Science and Application

Instructor:

Dr. Steve Lindaas http://web.mnstate.edu/lindaas
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Office Hours: see website

Official Course Description: This course provides an overview of the science involved in renewable energy and the application of that science. The student will gain an understanding of the science involved in energy production, energy storage, and energy conservation. They will complete a group project in developing their own design in one of the sustainable technologies.

Prerequisites: This course makes use of algebra, trigonometry and statistics to quantify concepts. It is expected that you have completed college algebra. For this course to count as an elective for the B.S. degree in physics students must have a calculus background. If you have questions about the mathematical rigor expected this semester, please see the instructor.

Required Texts:

- **The Renewable Energy Handbook, Revised Edition: The Updated Comprehensive Guide to Renewable Energy and Independent Living** 3rd Edition, by William H. Kemp, Aztext Press (2009) ISBN 098101321X
- **Sustainable Energy – without the hot air,** by David MacKay, UIT (2009) ISBN 9780954452933 [available on-line]

Supplemental Texts:

- **Renewable Energy Projects Workbook,** World Energy Council (April 2004)
- **Plan B 4.0: Mobilizing to Save Civilization**, By Lester R. Brown, Earth Policy Institute – W. W. Norton Co. (2009) ISBN: 978-0-393-33719-8 [available on-line]

Course Website: Course material is distributed online using both D2L and the course website (http://web.mnstate.edu/lindaas/phys302). See instructor if you anticipate having difficulty accessing the internet.

Evaluation: Each component of the course counts as follows –

Informal Writing and Homework	Analysis Reports (Papers)	Tests	Project(s)
20%	30%	20%	30%

Grades will be assigned on the absolute scale shown; plusses and minuses will be used for the top or bottom quarter of a bracket.

A	B	C	D	F
100-90%	89-80%	79-70%	69-60%	< 60%

Class Schedule:

Tuesday and Thursday	12:00 to 1:15 pm	Hagen 305
We may have field trips or evening films or activities that will be offered throughout the semester. We realize that your schedule might not allow your attendance at all of these activities but we expect attendance at a reasonable number.		

Learning Outcomes:

Students will be expected to

- Demonstrate an understanding of the wind energy technologies, solar technologies, heat pump technologies and the science behind them, and their application.
- Demonstrate an understanding of past, present and future energy trends.
- Demonstrate an understanding of conservation methods to reduce energy needs.
- Demonstrate an ability to complete a group research activity on their own design of a sustainable technology.

Outline of Major Content Areas:

1. Science and Design of Solar Energy Technologies
2. Peak oil theory
3. Electrical production (generators, alternators), consumption (heating and electric motors) and distribution (on and off grid)
4. Design Theory of Wind Energy Conversion Systems
5. Conservation of Energy Resources
6. Thermodynamics – 1st and 2nd laws
7. Heat Engines and Biomass Conversion

Course Components:

- **Informal Writing and Homework**: There will be a mixture of problems and reflection papers in response to readings. You are free (even encouraged) to collaborate on problems; however, work turned in should be your own. In the case of problems sets, all the problems may be graded or a subset will be graded and completeness checked. You will be assigned topics for response papers that might also be used for group discussions. More details will be given for each assignment. Late homework is generally not accepted.
- **Analysis Reports**: You will be providing written analysis of more complex problems. These reports are more in-depth then the homework and provide an opportunity for you to move beyond listing factoids and synthesize your knowledge.
- **Participation**: This course makes use of class discussions and group projects and hence your presence is expected. Please note that quality is more important than quantity of participation. Tours and films shown outside of class can contribute towards your participation.
- **Tests**: Exams may consist of a mixture of problems as well as questions based on class discussions. Partial credit will be given, but only if what you have written is logical and well organized. Make up exams will be given only in cases of documented emergencies.
- **Projects**: You will be working both individually and in teams on integrated projects. Each completed product will produce a product that will be shared with your peers.
- **Academic Honesty:** Your education is only as good as your integrity. If you have any questions as to what is acceptable behavior see the instructor or review the MSUM Student Academic Policy in the Student Handbook: http://www.mnstate.edu/sthandbook/ (Student Policy Info).
- **Universal Excuse Form (UEF)**: Life happens – use this form to propose a solution – preferably prior to anticipated problems.

Special Accommodations: Students with disabilities who believe they may need an accommodation in this class are encouraged to contact Greg Toutges, Director of Disability Services at 477-4318 (Voice) or 1-800-627-3529 (MRS/TTY), Flora Frick 154 as soon as possible to ensure that accommodations are implemented in a timely fashion. Information regarding Disability Services is available at http://web.mnstate.edu/disability/.