NRG 242 SOLAR THERMAL AND WIND SYSTEMS

**Course Number:** NRG 242  
**Course Title:** Solar Thermal and Wind Systems  
**Meeting Times:** TR 8:10-9:30  
**Instructor:** Bradley Layton  
**Contact:** bradley.layton@umontana.edu  
**Credits:** 3

**COURSE DESCRIPTION**
NRG 242 Solar and Wind Systems is an introduction to the fundamentals of solar thermal and wind energy for the design and installation of solar thermal and wind systems. The material covered will prepare students for a career in renewable energy or for installing a renewable energy system on their own home.

**COURSE OBJECTIVES**
Upon completion of this course, the student will be able to:

1. Develop a working knowledge of the solar constant (1000 W/m²)
2. Apply the laws of thermodynamics to solar thermal and/or wind systems
3. Describe factors that affect solar and wind output
4. Evaluate solar resources on a site-specific basis
5. Evaluate wind resources on a site-specific basis
6. Perform a thermal load analysis
7. Perform an electrical load analysis
8. Describe, specify, and site equipment appropriately
9. Estimate energy output and cost
10. Use the tools of the plumbing and electrical trades using safe working practices
11. Identify at least six local installers of solar thermal or wind systems
12. Participate in a Passivhaus build, OR
13. Design, build, and test a solar thermal system, OR
14. Design, build, and test a wind system  
   a. Design includes drawing both a plan view and a detailed mechanical view of the system  
   b. Build includes acquiring materials, and constructing system, examples include 3D printing of a microturbine, generator, and energy storage system.  
   c. Test includes data collection of system for at least one week
15. Present data from project

**PREREQUISITES**
NRG 101, M121, M122 (co-req) Students must be able to download and open Word and PDF files and do online research. A prior knowledge of the basics of electricity is recommended but not mandatory.

**AUDITING**
This course may be audited for no credit.
REQUIRED TOOLS
A digital multi meter for measuring AC or DC voltage, continuity, resistance, and 10 amps of AC or DC current. Inexpensive meters ($25.00) are available from Radio Shack, auto parts stores, or online.

REQUIRED TEXTS
ISBN 978-1-84407-760-1

Wind Power Workshop: Building Your Own Wind Turbine Piggott

OPTIONAL TEXT

RECOMMENDED TEXTS
Home Power Magazine digital subscription $9.95 highly recommended. A hard copy is available in the Missoula College library.

ADDITIONAL RESOURCES
3D Printer manual.
DIY generator kit
ASSESSMENT:

assignments/participation  30%
Exams and quizzes 40%
Class project 30%

GRADE SCALE:

A = 90-100
B = 80-89
C = 70-79
D = 60-69
F = 59 and below

ASSIGNMENTS AND PARTICIPATION:
Students are required to login at least twice per week to check announcements and to update assignments. Generally, assignments require researching a topic from the textbook or the Internet, posting information to the discussion board, and participating in discussions on multiple topics. Participation in the weekly forums is required and includes responding to at least one fellow student posting to receive full credit. Late work is typically not accepted.

ONLINE LECTURE MATERIAL, QUIZZES AND EXAMS:
Each week students will be required to read the lecture material and supplemental online reading and take the corresponding quiz or exam prior to the following class meeting. Expect 3-4 hours for reading lecture material and completing quiz or exam each week plus 3-4 hours for doing research and completing assignments each week. Late work is typically not accepted.

CLASS PROJECT:
The class projects this year will be building intensive and will require each student to design and build either a solar thermal or a wind turbine system followed by a report. Example projects include (1) participating on a solar thermal or a wind turbine build of an existing passive house, (2) designing, building, and testing a solar thermal system (3) designing, building, and testing a wind turbine.

DROP/ADD POLICY
The Drop/Add Policy may be found at the in the Provost’s website.

ACADEMIC HONESTY POLICY
All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students must be familiar with the Student Conduct Code.

ACCOMMODATIONS
To request an accommodation, please contact the Course Instructor. For more information, visit accommodation website or call 406.243.2243 (Voice/Text).
COMMUNICATION
Communication is vital to your success in this course. Contact information is provided in this Syllabus. As the Course Instructor, I try to answer all calls and e-mails promptly. Communicating with the Course Instructor is the Student’s responsibility especially with regard to meeting deadlines. In general, late assignments are not accepted and exams cannot be made up. If an unforeseen event happens, please contact the Course Instructor immediately, and PRIOR to a deadline, to make alternative arrangements for meeting your class responsibilities.

ONLINE SUPPORT
Online support may be obtained via courseware-support@umontana.edu or x4999

EMAIL POLICY AT UM
According to University email policy, an “employee must use only UMM assigned student email accounts for all email exchanges with students, since such communication typically involves private student information.” For more information on setting up and using your GrizMail account, visit the UMONTANA INFORMATION TECHNOLOGY WEBSITE.

OUTLINE:
Week 1 Project planning, Solar Resource/Wind Resource
Week 2 Theory Part I
Week 3 Design Review
Week 4 Theory Part II
Week 5 Preliminary Building
Week 6 Theory Part III
Week 7 Continue Building
Week 8 Theory Part IV
Week 9 Continue Building
Week 10 Theory Part V
Week 11 Review of Local Economy
Week 12 Review of Local and Regional Subsidies
Week 13 Projects Complete / Thanksgiving Holiday
Week 14 Theory Part VI
Week 15 In-class design reports

Topics in Detail:
Week 1 Solar Resource/Wind resource
   Project selection

Week 2 Theory Part I
   Wind
   Propose system

Week 3 Design Review
   Begin sourcing materials
   NABCEP
   National Electrical Code
   ANSI-IREC discussion
Week 4 Theory Part II
   Wind
   Storage options for projects

Week 5 Preliminary building
   Tools
   Safety
   Share build plans
   Revise theoretical output predictions

Week 6 Theory Part III
   Wind

Week 7 Continue Building
   Preliminary Data?

Week 8 Theory Part IV
   Wind

Week 9 Continue Building
   Midterm on theory

Week 10 Theory Part V
   Wind

Week 11 Review of local Economy
   Economics of your project and larger projects

Week 12 Review of local and regional subsidies

Week 13 Projects complete / Thanksgiving Holiday
   Data acquisition review

Week 14 Theory Part VI
   In class discussion of theory vs. data presented

Week 15 Reports due/final exam review