

**Renewable Energy Utilization
(ME 4805)
Milwaukee School of Engineering
Fall 2018**

Instructor: Dr. Christopher Damm

Office phone: 414-277-7543

Emergency phone: 414-870-2424 (call or text)

E-mail: damm@msoe.edu **Website:** <https://faculty-web.msoe.edu/damm/>

Office hours: M 10-10:50, T 12-12:50, Th 11-11:50, and by appointment.

Office location: S-146

Required textbook: *Energy Systems Engineering; Evaluation and Implementation 3rd Edition, by Vanek, Albright, and Angenent*

Prerequisite: ME 2101 or ME-311 or ME-354 or AE-2121 or MT-3111 or equivalent

Course Description: This course focuses on the primary renewable energy technologies. Engineering design, thermodynamic performance, environmental impacts, and economic considerations are included in the analysis of renewable energy systems. System types include solar photovoltaic panels, solar thermal technology, biofuel technology, and wind energy. A comparative analysis of energy storage systems is also covered.

Related Program Student Learning Outcomes:

This course addresses student outcomes of MEv11.0 by producing graduates who have:

- an ability to apply knowledge of math, engineering, and science.
- an ability to identify, formulate, and solve mechanical engineering problems.
- an ability to communicate effectively.
- a broad education necessary to understand the impact of engineering solutions in a global and societal context.
- knowledge of contemporary issues.
- an ability to use techniques, skills, and tools in engineering practice.

Course Outcomes:

In this course the student will:

- appreciate the challenges facing world energy supply and use
- be able to predict the solar energy resource at any location on earth
- develop an understanding of the science of photovoltaic devices and solar thermal systems
- apply engineering design principles to solar power generation installations
- perform economic analysis of solar power systems
- analyze the energy potential of biofuels, the technology of biofuels production, and the economic advantages and disadvantages of energy from biomass
- develop an understanding of the science and engineering of wind energy systems
- appreciate the engineering necessity and comparable performance of storage systems for renewable energy

Methods of Assessing Student Outcomes: homework assignments/quizzes, in-class exam, and a final exam

Letter Grades (This is a rough guideline. Grade determination will be discussed further in class.)

<u>Letter Grade</u>	<u>% Equivalent</u>
A	93-100
AB	87-93
B	80-87
BC	75-80
C	70-75
CD	65-70
D	60-65
F	0-60

Grade Calculation	
Homework assignments and quizzes	35 %
In-class exam	30 %
Final exam	35 %

Homework:

Homework will be collected periodically during the Friday class meetings. Each student is required to find, read, summarize, and critique (in 1 or 2 pages, single spaced) an article in the scientific/technical literature or the popular press (when deemed appropriate) that relates to renewable energy technologies during weeks in which there is NOT another homework assignment due. **Students should submit a copy of the article with their synopsis.** On occasion, instead of a weekly homework assignment, I will give an announced quiz based on suggested problems/reading and lecture material from the previous lectures.

In-Class Exam:

The exam will be closed book/closed notes/closed laptop. You will be allowed one side of an 8.5"x11" sheet of paper for formulas and notes. Calculators are allowed.

A Note Regarding Exam Problems:

ALWAYS circle your answers and ALWAYS express them in the appropriate units! In general, be careful about units and always include them in the answer. Generous partial credit will be given whenever possible so attempt all problems.

Final Exam:

The final exam will be comprehensive. You will be allowed 2 sides of an 8.5"x11" sheet of paper for formulas and notes.

Attendance, Participation and Class Decorum:

Students are expected to attend lectures regularly and to participate fully in class discussions. Attendance in class is to your advantage. I will not take attendance & you will not be penalized for missing class. All information that will be on exams/quizzes will be covered during class. Your level of effort will be used to determine borderline grades. Attendance is a factor in gauging your level of effort. **I will not drop students from the class for not attending.** If you desire to drop the course, you must do so with the university registrar.

Regarding Collaboration and Academic Honesty:

You are expected to conform to the MSOE code for academic honesty. If a student is caught cheating on an exam or quiz, the student will receive an F for the course. (Students who are disciplined for cheating are not allowed to drop the course.) If a student cheats on a lab report, assignment, or project, the student will receive a zero on the assignment and may receive an F for the course because of the zero grade. Cheating students will be reported to the Department Head and the VP of Academics. If you cheat you risk expulsion from MSOE.

Examples of cheating:

- copying homework or lab reports
- copying from another student on an exam
- permitting another student to copy from you on an exam, homework assignment, or lab report
- copying homework or lab reports from previous terms
- copying homework from a solutions manual or from previously distributed solutions
- copying a homework solution from a student who is solving the problem for others in a group setting

Bottom line--Any time you represent the work of others as your own you are cheating.

Late Work, Missed Exams:

Homework is due at the beginning of class on the due date. Late homework will not be accepted for credit or graded. A student will receive a zero on exams and quizzes that are missed without a legitimate excuse (e.g. documented illness, family tragedy, etc.).

Tentative Course Overview (The order of topics is flexible.)

Introductory Material

- Energy use trends and implications
- Drivers of renewable energy development

Solar Energy

- Resource availability
- Daily energy
- Solar PV systems

Energy from Biomass

- Thermochemical platform
- Sugar platform
- 3rd generation technologies

Wind Energy

- Resource availability
- Components
- Estimating output

Energy Storage

- Necessity of storage for intermittent sources
- Comparison of round trip efficiencies

Optional topics (may be covered depending on student interest and available time)

- Geothermal energy

I will post a comment/suggestion envelope outside my office. Please let me know what you think about the course. I would particularly like to know how you feel about the pace of the course (too fast, too slow, or about right). *You can have a direct influence on this course while you are taking it!*

For students with documented disabilities, chronic medication conditions and mental health concerns; MSOE provides services to make reasonable accommodations available. If you are a student who requires or anticipates the need for accommodations, please contact Student Accessibility Services Office at 414-277-7281, by email at moureau@msoe.edu, or in person at K250 to discuss appropriate accommodations and eligibility requirements.