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# NRGY 101.01: Introduction to Sustainable Energy Systems I

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# Introduction to Energy Systems I

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<b>Course Number:</b>	NRG101
<b>Credits:</b>	3
<b>Meeting times:</b>	T R 12:40-2:00 pm in HB17
<b>Instructor:</b>	Bradley Layton 406-243-7865 <a href="mailto:bradley.layton@umontana.edu">bradley.layton@umontana.edu</a>
<b>Office Hours:</b>	TR 9:30-11:00 in Griz House 8 or by appt.
<b>Pre-/Co-requisites:</b>	M090 or equivalent

## Course Description

NRG101 Introduction to Energy Systems I is a survey of traditional energy systems and technologies. The course introduces conventional primary energy sources—coal, oil, gas, nuclear—and examines the technologies used to capture, convert, distribute, store, and utilize these energy sources. Consideration is given to the physical and engineering aspects, as well as economic, social, environmental, and political factors that affect the sustainability of these sources.

## Course Overview

Introduction to Energy Systems I is the first of a two-part course. It provides students with a comprehensive look at the history and nature of energy production and consumption. Consideration is given to the primary sources of the earth's energy supplies and their ability to sustain the increasing rate of consumption with current and emergent technologies. The various forms of conventional energy sources and the services derived from their use are discussed in considerable detail.

This course also addresses the invention and improvement of devices and machines that convert free energy into heat, light, and motive power. Of special interest are the inventions that enable the generation, distribution, and use of electricity. Costs, benefits, and sustainability of each type of conventional primary energy source and its associated technologies are evaluated.

Introduction to Energy Systems I provides students with a working quantitative mathematical knowledge of fundamental energy laws and principles and their associated technologies. It prepares students for the study of inexhaustible energy systems such as those that harvest solar, wind, geothermal, microhydro, tidal and wave power. Students also examine systems that rely on renewable energy sources such as biofuels and related technologies which are examined in more depth in Introduction to Energy Systems II. Both courses address physical and technical aspects as well as issues of sustainability, environment, economics (including feasibility studies) and society.

## Course Objectives

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

- Understand the importance of energy in our current technological society;
- Understand the physical and technical aspects of energy and energy supply/demand systems;
- Identify the technologies, their key elements and basic principles, that we use to capture, convert, store, and distribute energy;

Bradley Layton

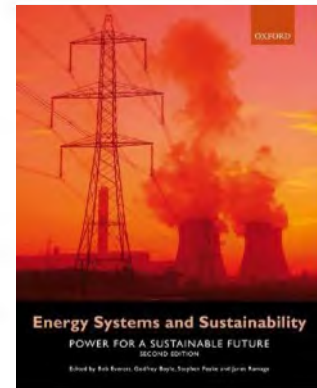
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- Identify factors that contribute to the economic viability of energy generation, and evaluate the efficacy of conservation and efficiency measures;
- Discuss the problem of sustainability in the context of energy and identify technical and social barriers and solutions to energy use;
- Assess the costs and benefits associated with different energy sources and technologies;
- Perform basic energy-related calculations;
- Undertake first-order economic analyses of an energy project, taking into account the effect of such factors as discount rates and project lifetimes;
- Develop a strong practical and theoretical knowledge of the full suite of conventional energy systems and apply that knowledge to real world situations.

### Required Texts

Boyle, Godfrey, B. Everett, and J. Ramage, eds. *Energy Systems and Sustainability: Power for a Sustainable Future*. Oxford University Press in association with The Open University, 2012. ISBN: **978-0199593743**

Note: The textbook comes bundled with Boyle, Godfrey, ed. *Renewable Energy: Power for a Sustainable Future*. Oxford University Press in association with The Open University, 2004. ISBN: 0199261784. This book will be used in Introduction to Energy Systems II. The “bundled” set can be purchased for a substantial discount; ISBN: 9780195370744.



### Recommended equipment

A **Kill-A-Watt** meter. This little meter can be bought at a few stores around Missoula (Solar Plexus, Sunelco), as well as online. It is an invaluable education device and will give you some insight into how much energy some of your appliances are using. We will have a few exercises throughout the semester that require you to collect that kind of data and report on it. We will compare the actual data to estimates made early in the course.

### Assessment/Grading Policies

Grades are based upon successful completion of the following:

Exams (7)	70%
Summaries (5)	15%
Participation/Attendance/Summary responses	15%

Grade scale

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

## Exams

There will be seven exams and they will, appear at the end of the learning units on the course website. These, you will note, comprise the majority of your grade. The dates of the exams are posted at the end of the syllabus. Please note:

**Exam and quiz policy: *There are no 'make-up exams' without prior notice of absence. If you will miss an exam, you must notify me in advance.***

## Attendance and participation

Attendance and participation are mandatory, and implemented via in-class participation and the various Forums within the Moodle shell. Participation is based upon your presence in class and your contribution to discussions and Q & A.

## Summaries

There will be five summaries, which comprise a significant portion of your grade. Instructions for completing these can be found in the online course supplement. *Submit your work to **both** the Forum **and** the Upload for Grade links.* Responding to your classmates' summaries is also required and forms a portion of your participation grade. Respond to at least three for full credit.

## Lectures

Lectures are recorded once per week on Thursdays in Missoula. Students living in town are encouraged to attend. For out-of-town students, and students with commuting challenges, the lectures are also available for viewing via iTunesU. A link to iTunesU is available under [OneStop](#). If you would like to log in during lecture, you may do so using the Amvonet link near the top of the middle column on the course website.

## 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

may be obtained via [courseware-support@umontana.edu](mailto: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](#).

## Schedule of Classes

For a schedule of classes, please see the [Provost's website](#).

Week 1: Intro, LU1 Chapters 1 & 2

Week 2: Chapters 1 & 2 **Exam I**

Week 3: LU2 Chapters 3 & 4 **Summary I**

Week 4: Chapters 3 & 4 **Exam II**

Week 5: LU3 Chapters 5 & 6 **Summary 2**

Week 6: Chapters 5 & 6 **Exam III**

Week 7: Chapters 7 & 8 **Summary 3**

Week 8: Chapters 7 & 8 **Exam IV**

Week 9: LU5 Chapter 9

Week 10: Chapter 9 **Exam V**

Week 11: Chapters 10 & 11 **Summary 4**

Week 12: Chapters 10 & 11 **Exam VI**

Week 13: LU7 Chapters 12, 13, 14

Week 14: Chapters 12, 13, 14 **Summary 5**

Week 15: Chapters 12, 13, 14 **Exam VII**

Week 16: Final Exam Week – Bonus Final