ENERGY IN THE EARTH SYSTEM (ERS 191)

Fall 2018, 3 credit online course
DRAFT SYLLABUS

Course Description: Explores the Earth Science concepts that underlie energy, energy sources, energy distribution and flow, and the role of energy in climate. We will consider the ways in which society interacts with and extracts energy from the Earth System, the energy balance of Earth and the climate implications of energy use, and gain an understanding of renewable and non-renewable energy sources. This course satisfies the General Education Applications of Scientific Knowledge and Quantitative Literacy requirements. Credits: 3.

Prerequisites: None.

Instructors: Professor Karl Kreutz (karl.kreutz@maine.edu), School of Earth and Climate Sciences & Climate Change Institute. Email is the best way to contact me with questions, concerns, help, etc. There will be an ERS191 Help Center available in Blackboard, which is another efficient way to get questions answered.

Electronic resources: This is an online class, and all course materials, discussion, and exams will be accessed via the internet. You will need a Blackboard account, which is available to you free as a UMaine student. For information and help with setting up your Blackboard account, go to the UMaine Information Technologies website (http://www.umaine.edu/it/). Course materials (slideshows, videos, discussion boards, and links to other online resources) that are in addition to the textbook reading will be available in Blackboard; as such, you will need to know how to login and navigate Blackboard confidently. A high-speed internet connection will be required to view video content. You will have full time access to the course, and thus can determine your own schedule each week for working through the assigned materials. This, however, means that you will need to practice effective time management to be prepared for each exam, and to submit your weekly discussion board posts on time (see below). You will need to have the latest version of MS Office, which available for free from UMaine IT (https://umaine.edu/it/).


ERS191 will take part in a new inclusive access program through the University of Maine Bookstore, to provide instant electronic access to the course textbook at the lowest price. You will have immediate access to a digital version of the textbook through your Blackboard account during the open add/drop period of your class—for free. Login to ERS191 on Blackboard and follow the instructions within the course to access the digital materials.

Upon registering for ERS191 your student account will be charged $62.55 for the inclusive access. If for some reason you decide you do not want to purchase these required materials from the Bookstore, you can opt out of the program by clicking “OPT OUT.” If you opt out by the add/drop deadline, your student account will be credited for the above amount. Due to the special pricing, no refunds can be processed after the add/drop period is over.
This program aims to offer all students accessibility and affordability. If you have any questions regarding the program, please email the bookstore at umbook@maine.edu or call them at 207-581-1742. For technical assistance, please email our program partner Red Shelf at help@redshelf.com.

While not required, I recommend the following books for additional information. Each discusses energy issues from different perspectives, and are written at a level appropriate for ERS191.


**Course Goals and Learning Outcomes**

*Course goals:* In ERS191: Energy in the Earth System, students will:

- Improve their Earth science, energy, and climate literacy
- Gain perspective on energy and climate issues by using a systems approach
- Become familiar with the range of energies in nature and society
- Appreciate the energy-based linkages among resource extraction, energy production and use, environmental change, Earth’s energy balance, and climate
- Practice fundamental habits of scientific thinking
- Apply critical thinking and quantitative skills to energy and climate issues in society

*Course learning outcomes:* Upon successful completion of ERS191: Energy in the Earth System, students will be able to:

1) Identify different forms of energy in the Earth system, and define using simple equations
2) Distinguish between concepts of energy and power, and convert between energy and power units across a range of Earth system sources and societal uses
3) Examine the magnitude of internal and external sources of energy in the Earth system using observational data, and compare energy reservoirs in the Earth system to historical, current, and future societal energy use
4) Identify interactions between surface and solid earth cycles related to energy flow and energy extraction
5) Evaluate the relative importance of natural processes and human activities that impact the distribution of energy
6) Calculate personal energy use, and compare to societal energy use and Earth system energy reservoirs
7) Explain the Earth system processes responsible for renewable and non-renewable energy resources;
8) Evaluate, using a simple quantitative (i.e., back of the envelope) approach, Earth science-related energy issues in society
9) Manipulate energy balance models of Earth, and use them to quantitatively assess the natural and enhanced greenhouse effect
10) Generate time-series graphs and spatial maps of Earth system data related to energy, energy use, and climate
These learning outcomes pertain to the overall course, as well as the General Education Applications of Scientific Knowledge and Quantitative Literacy requirements.

**Learning assessment:** Assessment of course learning outcomes will be based on the following items:

1. **Weekly Discussion (30% of final grade/300 points)**

Each week you will be required to contribute to a discussion of current events related to energy. To do so, please find and summarize a piece of energy-related media coverage published during that week. I define energy broadly (energy resources, energy policy, energy use, etc.). The criteria are that you: 1) discuss the energy-related aspect of the piece; 2) identify one (or more) quantitative aspects pertaining to energy in the Earth system or society; 3) identify one (or more) systems aspect in the piece (i.e., how one component, action, etc. affects something else); 4) provide a citation (i.e., where exactly did you find it – source, date, author), and 5) relate the content of the piece to the textbook reading for that section of the course. Each summary post should be a minimum of 200 words, and is due by 6 pm Sunday of that week. Additionally, I would like everyone to comment on at least one media piece posted by another student, to stimulate discussion. The posts for each individual week are worth 20 points (14 weeks x 20 points = 280 points total). Grading will be as follows: 10 points for energy discussion, quantitative, and systems information, 5 points for relating to textbook reading, and 5 points for commenting on another post. During the first week of class, I’d like everyone to introduce himself or herself with a post (20 points).

2. **Energy Assignments (40% of final grade/400 points)**

You will complete ten energy-related assignments pertaining to topics covered during each of the three course sections. The assignments will involve analyzing, interpreting, and discussing energy and/or climate data, energy and/or climate model output, or other data sources. Details for each assignment will be available in the relevant discussion forum. You can work on the assignments anytime during the week, and they are due by 6 pm Sunday of the week they are scheduled in. Each assignment will be worth 40 points.

3. **Exams (30% of the final grade/300 total points)**

There will be three exams in the course. All three exams will be taken online using Blackboard. Exam questions will come from the Chapter Review section at the end of each textbook chapter. I will provide a study guide for each exam, which will have a list of selected Questions and Exercises from each Chapter Review section. For the exam, I will simply select one Question and one Exercise from the study guide for each Chapter (although there are Chapters which do not have Exercises). Once started, you will have two hours to complete the exam and submit answers on Blackboard. Each exam needs to be taken by 6pm Sunday of that Week (e.g., Exam 1 in Week 1).

*Exam #1 (100 points): Exam 1 covers textbook chapters 1-4*
*Exam #2 (100 points): Exam 2 covers textbook chapters 5-11
*Exam #3 (100 points): Exam 3 covers textbook chapters 12-16

4. Extra Credit

Throughout the course, I may offer extra credit opportunities. These will involve data analysis, discussion of a particular energy-related topic or news item, reflection on energy or climate issues, etc. Details and points will be announced when opportunities are available in the Extra Credit discussion forum.

5. Determining your grade for the course

Exam #1 100 points
Exam #2 100 points
Exam #3 100 points
Weekly discussion 300 points
Energy assignments 400 points

TOTAL 1000 points (*plus any additional extra credit*)

A = 900 – 1000 (or more) points
B = 800 – 899 points
C = 700 – 799 points
D = 600 – 699 points
F = 599 points or less

ERS191 Policies: By turning assignments in on time, you are eligible for full credit. Late assignments forfeit the right to any credit; any partial credit for late assignments will be up to the instructor’s discretion.

University of Maine policy statements

UMaine has five required syllabus statements that can be accessed here: https://umaine.edu/citl/teaching-resources-2/required-syllabus-information/

- **Academic Honesty Statement**: Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

- **Students Accessibility Services Statement**: If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services, 121 East
Annex, 581.2319, as early as possible in the term. Students who have already been approved for accommodations by SAS and have a current accommodation letter should meet with Karl privately as soon as possible.

- **Course Schedule Disclaimer (Disruption Clause):** In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

- **Observance of Religious Holidays/Events:** The University of Maine recognizes that when students are observing significant religious holidays, some may be unable to attend classes or labs, study, take tests, or work on other assignments. If they provide adequate notice (at least one week and longer if at all possible), these students are allowed to make up course requirements as long as this effort does not create an unreasonable burden upon the instructor, department or University. At the discretion of the instructor, such coursework could be due before or after the examination or assignment. No adverse or prejudicial effects shall result to a student’s grade for the examination, study, or course requirement on the day of religious observance. The student shall not be marked absent from the class due to observing a significant religious holiday. In the case of an internship or clinical, students should refer to the applicable policy in place by the employer or site.

- **Sexual Discrimination Reporting:** The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or any form of gender discrimination involving members of the campus, **your teacher is required to report** this information to the campus Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity. **If you want to talk in confidence** to someone about an experience of sexual discrimination, please contact these resources: 1) For **confidential resources on campus:** Counseling Center: 207-581-1392 or Cutler Health Center: at 207-581-4000. 2) For **confidential resources off campus:** Rape Response Services: 1-800-310-0000 or **Partners for Peace:** 1-800-863-9909.

- **Other resources:** The resources listed below can offer support but may have to report the incident to others who can help:
  - For **support services on campus:** Office of Sexual Assault & Violence Prevention: 207-581-1406, Office of Community Standards: 207-581-1409, University of Maine Police: 207-581-4040 or 911. Or see the OSAVP website for a complete list of services at [http://www.umaine.edu/osavp/](http://www.umaine.edu/osavp/).