

Fall 9-1-2018

## ENST 391.80: ST: Energy and Climate Honors

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### Recommended Citation

McDonough, Peter, "ENST 391.80: ST: Energy and Climate Honors" (2018). *Syllabi*. 8135.  
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## Energy and Climate Course Syllabus - Fall 2018 ENST 391

**Instructor:** Peter McDonough                      peter.mcdonough@umontana.edu  
**Class:** Tues/Thurs 12:30 - 1:50 pm              DHC 119  
**Office Hours:** M/W/F 11:00 am – 1:00 pm, and by appointment

### Course Summary

The world of energy and its corresponding environmental issues is rife with controversy. The decline of the coal industry, fracking, offshore wind, solar net metering, nuclear risk - the list is long and varied, and proposed solutions are met with fierce resistance from one “side” or another. Through these issues and the disparate perspectives that define them, students will develop a vocabulary around and understanding of how the energy world operates, particularly with respect to its role in driving, mitigating, or adapting to climate change.

The class will begin by exploring energy as we experience it in our daily lives, and then trace it back through the grid to its generation sources, touching on the basic science and technology, environmental factors, financial and economic considerations, and politics of each step along the way. Students from both technical and theoretical backgrounds will collaborate to explore these issues in depth through debate, hands-on exercises, field trips, and simulations, as well as a final class portfolio.

### Expectations

This is an experimental course in the truest sense: not only is it relatively new to UM, but the methods we will employ do not fall into any one academic box. Within this class you will do everything from writing personal opinion essays to bidding for power purchase agreements, and from testing laws of electromagnetism to negotiating world climate agreements. Given the breadth of our topic, nothing is off the table. Therefore there will be days when you, personally, are completely comfortable with the material, and days when you are anything but. You are not alone. The class will always begin with the most fundamental concepts and build from there; your job is to be prepared for each class and to persist when there are unanswered questions. If you have a question then chances are, especially in a class this broad, others do too.

This is also a diverse class, including students from a range of backgrounds and interests, as well as various guest speakers and guides. One of the difficulties in the contentious energy and climate world is working with hard-liners, and so this class will strive to remain objective and inclusive of diverse opinions. I expect you to avoid digging trenches (unless an assignment calls for it), but instead to listen, and to respond with a better question.

### Course Reading

All texts will be available electronically on Moodle, and will be assigned individually. This is not a reading-heavy class, though you are expected to find your own sources in preparation for other class activities and assignments.

## **Course Assignments and Activities**

### Energy Resource Short Exercises

These will be assigned throughout the portion of the class focusing on energy generation types in order to give you practice with some of the math and science behind generation. The questions are deliberately brief and varied in order to give you some freedom to decide/discover how to approach the problem. Each assignment is on Moodle. If you are out of practice approaching mathematical problem solving, office hours may be worth your time.

### Progressive Issue Essays and Presentation

These are 5-part, iterative essays that will allow you to explore popular controversial issues that will not be discussed in depth during class time. From a list of controversies you will eventually write about five, building on the work of four of your classmates. Half of the class will present on the topic of their final essays.

### Home Energy Challenge

After the first week of class you will perform a basic energy audit of your home, painting a picture of how much electricity you consume and when, as well as your associated emissions. For the next three weeks (weeks 2-4) you will add one new energy reduction measure to your repertoire each class day, and share what you've done in class. At the end you will see how much you have managed to save. All instructions are on Moodle and will be explained in class.

### IPP Game

For three weeks outside of class you will play the role of an independent power producer (IPP), building a portfolio of generating plants and competing against your classmates to sell power to the utility. Auction bids, agreements, portfolio changes, etc. will be done via email. Rules and procedures will be given and explained in class.

### World Energy Game

We will dedicate two class periods to simulating global energy policy negotiations. This will be explained further in class and all materials will be provided.

### Final Class Portfolio

There are two parts to the portfolio, each designed to test different skills in the class. The first is a public campaign that you and a group will design or join to address a particular energy or climate issue on campus (main campus or Missoula College) or the city of Missoula. The second is a device that you will design and build to capture wasted energy and convert it to useful electricity. Instructions for both will be explained in class and are available on Moodle. I recommend that you begin planning for these early. There is no homework for the final two weeks, so you will have time to finish and fine-tune them. The final exam period is dedicated to presentations about campaigns; everyone will display their devices that day, exhibition-style around the classroom.

### Presentations

Each student will give one presentation this semester. You may present either on the Issue Essays in Week 7, or on your campaign experience during the final exam period. If you

present on the former, remember that at least one member of your final portfolio group will need to present in the final period.

### Energy in the News

Two students each day will briefly regale the class with the latest energy news. This will count towards your participation.

### Take-Home Final

This will be a slightly longer version of one of the short exercises in which you will be free to explore a scenario, make appropriate assumptions, and provide a reasonable solution.

### **Final Exam**

Students will present their final portfolios during the final exam period. There will be a short take-home final due that day, but no in-class exam.

### **Technical Support**

If you are experiencing technical difficulties and need immediate assistance, here are important resources:

- Email: [umonline-help@umontana.edu](mailto:umonline-help@umontana.edu)
- Phone: 406.243.4999 or 866.225.1641 (toll-free)
- Web: [UM Online Technical Support](#)

### Note: .

Firefox is the preferred internet browser for Moodle

### **Disability Student Services**

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or 406.243.2243. I will work with you and Disability Services to provide an appropriate modification. [Disability Services can be found here.](#)

### **Plagiarism Warning**

Plagiarism is the representing of another's work as one's own. It is a particularly intolerable offense in the academic community and is strictly forbidden. Students who plagiarize may fail the course and may be remanded to Academic Court for possible suspension or expulsion. (See Student Conduct Code section of the catalog.) Students must always be very careful to acknowledge any kind of borrowing that is included in their work. This means not only borrowed wording but also ideas. Acknowledgment of whatever is not one's own original work is the proper and honest use of sources.

### **The UM Writing Center**

Located in Lommasson 271, the Writing Center is a great resource for all writers, from first-year students to tenured professors. Visit their website for helpful handouts on writing effective thesis statements or introductions, and to schedule one-on-one appointments with writing tutors throughout the semester: [UM Writing Center](#).

Assignment	Points (out of 235)	Time Frame
Short assignments	5 pts each (x8)	Weeks 8 - 12
Letters	5 pts each (x2)	Week 1, 14
Home Energy Audit	10 pts	Week 1
Home Energy Challenge	20 pts	Weeks 2 - 4
Issue Essays (+ Presentation)	10 pts each (x6)	Weeks 2 - 7
IPP Game	20 pts	Weeks 6 - 8
World Energy Game	10 pts	Week 13
Final Portfolio	30 pts	All Semester
Take-Home Final	10 pts	Week 14 - 15
Participation	25 pts	All Semester

### Assignments and Class Schedule (Subject to change)

Date	Topic	Due
8/28	Class Intro	-
8/30	Energy Basics	Letter Graphic (Reading)
9/4	Energy Consumption <i>Choose Issue Essay #1 topic</i>	Home Audit results
9/6	Energy to waste, Climate science	Personal footprint Causes (Reading)
9/11	Energy Service	Issue Essay #1 Maps (Reading)
9/13	Utilities	Power to the People (Reading)
9/18	Load Duration and Energy Mixes	Issue Essay #2
9/20	Smart Grid, DSM	-
9/25	Policies and Net Metering	Issue Essay #3 HEC Results
9/27	Northwestern Energy guest speakers	-

10/2	Climate Change and Response (IPP Active)	Issue Essay #4 Moodle 1 (Reading)
10/4	Carbon Market Policies (IPP Active)	-
10/9	Integration of Renewables (IPP Active)	Issue Essay #5
10/11	Presentations (IPP Active)	Issue Presentations Final Portfolio proposal
10/16	Electromagnetism (IPP Active)	Presentation Responses
10/18	Fossil Fuels (IPP Active)	EM exercise
10/23	Solar PV	Fracking Fluid exercise
10/25	Solar Thermal	Solar exercise
10/30	Wind	Solar Consumption exercise
11/1	Hydro	Wind exercise
11/6	<i>Election Day - Go Vote!</i>	-
11/8	Nuclear	Hydro exercise
11/13	Biofuels	Fission exercise
11/15	Fuel Cells and Hydrogen	
11/20	Transportation	Ethanol exercise (Receive World Energy materials)
11/22	<i>Thanksgiving - Go Away!</i>	-
11/27	World Energy Game	-
11/29	World Energy Game	-
12/4	Global Energy Development	Letter (part 2)
12/6	Geopolitics of Energy	Geopolitics of Energy (Reading)
12/10 Final	Final presentations, Exhibition 10:10 am - 12:10 pm	Device, Take-home final (Portfolio Report due by 12/14)