



Department of
Community Sustainability

MICHIGAN STATE
UNIVERSITY

CSUS 259
Sustainable Energy & Society
Spring 2019
Tuesday and Thursday, 5pm – 6:20pm
306 NRB

Instructor: Doug Bessette, PhD

Office Location: 327 Natural Resources Building

Office Hours: Wed 1pm – 3pm; Immediately after class or by appointment

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Catalog Course Description: Examines sustainable fuels and technologies, energy systems, energy transitions, and personal and societal roadblocks to achieving sustainable energy. Also engages energy poverty, energy justice and real-world energy decision-making.

Course Materials:

We will draw from each of the three textbooks below, and additional readings will be provided by the instructor via D2L. Purchasing Randolph & Masters (2018) is highly recommended, but not required.

1. Everett, Boyle et al., 2012. Energy Systems and Sustainability: Power for a Sustainable Future, Second Edition. Oxford University Press, London.
2. Randolph & Masters, 2018. Energy for Sustainability: Foundations for Technology, Planning, and Policy, Second Edition. Island Press, Washington.
3. Peake, Stephen, 2018. Renewable Energy: Power for a Sustainable Future, Fourth Edition. Oxford University Press, London.

Course Outcomes:

In this course, students will:

1. Develop a basic understanding of fundamental energy concepts including thermodynamics, entropy, mass balance and energy efficiency;
2. Examine how different types of energy are generated, distributed and used;
3. Evaluate and compare renewable and sustainable energy sources and technologies;
4. Examine energy, food, water and climate systems, and system shocks;
5. Identify and address energy decisions, behavior and biases;
6. Gain an appreciation for how unequal access to and distribution of energy contributes to poverty and injustice.

Upon completion of this course, students will be able to:

1. Distinguish sustainable forms of energy from *renewable, low-carbon, and fossil-fuel* derived forms of energy.
2. Identify *laws of thermodynamics* and explain their role in organizing our energy system.
3. Explain how *energy has been historically, is currently, and may in the future* be produced, distributed and used.
4. Identify the *attributes* of different types of energy and *analyze tradeoffs* between energy portfolios.
5. Define the concept of and calculate their own *energy footprint*.
6. Identify specific problems of and populations suffering from *energy poverty and injustice*, both domestic and internationally.
7. Explain relationships between *energy and water, food and climate change* using a systems approach.
8. Identify and suggest means for overcoming *ideological, political, economic and personal obstacles* to sustainable energy.
9. Evaluate the *risk and resilience* of different energy systems.
10. Research and calculate fuel and technology costs and outputs using *Life-Cycle Analysis*.

Course Learning Outcomes:

These course outcomes support the Department of Community Sustainability undergraduate program competencies of *Critical Thinking, Systems Thinking, Economic Literacy, Equity, Civic Engagement, Leadership, Initiative and Practical Skills, and Ethics*. In addition, this course supports Michigan State University's Undergraduate Learning Goals of *Analytical Thinking, Effective Citizenship, Effective Communication and Integrated Reasoning*. Students can learn more about the Department of Community Sustainability undergraduate competencies at http://www.canr.msu.edu/csus/undergraduate/sustainability_core . More information about MSU's Undergraduate Learning Goals is available at <http://undergrad.msu.edu/msu-goals>.

Assignments & Grading:

Grade Distribution

1. Attendance:	50 points	(10%)
2. Class Participation:	50 points	(10%)
3. News Assignment (2)	25 points	(5%)
4. Quizzes/Take-Home Assignments	50 points	(10%)
5. Midterm Exam	100 points	(20%)
6. Group Project Report/Presentation	100 points	(20%)
7. Final Exam	125 points	(25%)

Total	500 points	(100%)
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Grading Scale:

Points	> 465	435-464	400-434	385-399	365-384	335-364	300-334	< 300
Grade	4.0	3.50	3.00	2.50	2.00	1.50	1.00	0

Assignments:

1. Attendance. (50 pts) A sign-in sheet will be distributed during each class. Students must sign next to their name each class period to receive credit for attending.

Grading: Students are allowed ONE unexcused absence per semester. For each subsequent absence, students will lose three points: 2 unexcused absences = 47 pts; 3 unexcused absences = 44 pts; 4 = 41 pts; 5 = 38 pts. Upon the sixth unexcused absence, the student will automatically receive an attendance grade of zero. Students who miss a quiz or a take-home assignment due to an *unexcused* absence will receive a zero.

Learning Outcomes: Initiative and practical skills

Absences will be excused for the following reasons: (a) required field trips for other classes with a note; (b) participation in university athletics with a note; and (c) illnesses for which you have a doctor's note (if you are seriously ill for an extended period, it may not be possible to continue with the class). If students must miss a class for one of these reasons, they should try to inform the instructor in advance. Students are responsible for making up all the work missed and the instructor will not respond to emails requesting information about missed classes.

2. Class Participation. (50 pts) Students are expected to actively and constructively participate in class, by both asking and answering questions, and showing evidence that they have engaged the readings. If students feel uncomfortable speaking during class, they can attend office hours or schedule times outside of class to speak about the course content one-on-one with the instructor. Emailing the instructor does not count as participation. Students' contribution to the group project will also be incorporated into their participation grade.

Grading: Students who participate *consistently* throughout the semester, i.e., every day, will earn 50 pts. Those who participate often, i.e., ~ every other class, will earn 45 pts; occasionally = 42 pts; rarely = 40 pts; and not at all = 25 pts (since half of participating is showing up). **NOTE:** if I don't know your name by the end of the course, it is unlikely you will earn more than 40 points.

Learning Outcomes: Critical thinking; systems thinking; leadership; initiative and practical skills; analytical thinking; effective communication; integrated reasoning

3. Energy News Assignment. (25 pts) Students will, **twice during the semester**, begin the class reporting on a current event in energy news. This news must be real, i.e., not fake, and come from a reputable journalistic source of information. The news item must be about an event or a timely editorial, and not simply a new data point, or summary of consumption or production, etc. Visual aids are ***not allowed*** for this assignment; however, the student must be able to present the story in a straightforward, understandable, and most importantly interesting way. These assignments are principally intended to spark discussion and encourage students to pay attention to energy developments.

Grading: Each report is worth up to 25 points, and your final grade will be an average of the two reports. To receive full points, the student must demonstrate a genuine understanding of

the event, item or report (10 pts), as well as be able to clearly communicate (5 pts) it to the class, explaining why it's important in general (5 pts) and why it's relevant to the class (5 pts). The student should be ready to answer questions about the event from both the class and instructor.

Learning Outcomes: Critical thinking; systems thinking; initiative and practical skills; analytical thinking; effective communication; integrated reasoning

4. Quizzes & Take-Home Assignments (*no more than 50 pts*). Over the course of the semester, students will be assigned one or two short take-home assignments that will be due at the beginning of the next course period. These assignments will focus on practicing relevant skills such as calculating an energy footprint, conducting a life-cycle analysis or calculating an EROI (*energy return on investment*). Additionally, *at least two* previously unannounced quizzes will be given over the course of the period to ensure students are engaging the assigned readings.

5. Mid-term Exam (100 pts). Students will take ONE closed-book, in-class, mid-term examination immediately following the second section of the course. Students will be allowed one sheet of paper *with handwritten notes*. This mid-term is intended to ensure that students gain a basic—and broad—understanding of the course material. This exam will be entirely multiple-choice, and sample exam questions will be provided throughout the course.

Grading: Both the midterm and final exam will be graded according to MSU's grade scale:
4.0 = 93-100%; 3.5 = 87-93%; 3.0 = 80-87%; 2.5 = 77%-80% 2.0 = 73-77%;
1.5 = 67-73%; 1.0 = 60-67%; 0 = < 60%

A curve will be used to ensure the median grade on each exam is at least a 3.5.

Learning Outcomes: Critical thinking; systems thinking; economic literacy; initiative and practical skills; analytical thinking; effective communication; integrated reasoning

6. Group Project Report or Presentation (100 pts) Students will be tasked with examining a current topic, problem, or proposed solution of energy sustainability as members of a group. The focus of each group's project is up to the students involved; however, the instructor must approve each group's project focus before they proceed. Groups **must** be between 3 to 5 students. The result of this project must be either a professional report or a presentation delivered via whichever medium the group chooses, i.e., a Powerpoint or Keynote presentation, a YouTube video, a website, etc. *Students are encouraged to be creative!*

Additionally, students will be asked to grade each member's contribution to the group project; this grade which will be incorporated into that student's participation grade.

Learning Outcomes: Critical thinking; systems thinking; initiative and practical skills; analytical thinking; effective communication; effective citizenship; integrated reasoning

7. Final Exam (125 pts) Students will take a closed-book final exam during the allotted exam period. This exam is cumulative in that it will assess students' understanding of the material spanning the entire course, not just that material which follows the mid-term. Again, sample exam questions will be provided throughout the course, and students will be allowed one sheet of paper *with handwritten notes*. This exam may have short-answer questions, fill-in-the-blanks

and matching questions. A curve will be used to ensure the median grade on each exam is at least a 3.5.

Learning Outcomes: Critical thinking; systems thinking; economic literacy; equity; ethics initiative and practical skills; analytical thinking; effective communication; integrated reasoning

Course Schedule

Week	Class	Topic	Readings
Section I. The Energy Landscape			
Week 1	1: Tu Jan 8	Course Introduction	<i>None</i>
	2: Th Jan 10	Defining Energy Sustainability	<i>Randolph & Masters (pg. 3-5); Everett et al. (pg. 10-30); Peake (pg. 13-16); Roberts, 2018</i>
Week 2	3: Tu Jan 15	Energy "Not-So-Basics" I	<i>Peake (pg. 2-7); Randolph & Masters (Ch. 4; pg. 95-131)</i>
	4: Th Jan 17	Energy "Not-So-Basics" II:	<i>Conca, 2015; Hirsch, 2015; Everett et al. (pg. 559-561); Randolph & Masters (pg. 50-53; Ch. 5: 133-169)</i>
Week 3	5: Tu Jan 22	History of Coal, Oil & Natural Gas	<i>Randolph & Masters (pg. 5-13); Freese, 2003, Coal (pg. 1-7; 233-236); NYTimes, 1947; McGraw, 2011 (pg. 29-36; 36-40)</i>
	6: Th Jan 24	Current Trends: Production, Consumption & Waste	<i>Everett et al. (pg. 77-91); Roberts, 2018; DOE, 2015 (pg. 6, 24-30)</i>
Week 4	7: Tu Jan 29	Coal; Clean Coal, CCS	<i>Everett et al. (pg. 146-177); UCS, 2017; Grossman, 2017; Freese, 2003 (pg. 236-239); Helm, 2017 (pg. 1-11)</i>
	8: Th Jan 31	Oil, Natural gas & Fracking	<i>Krauss, 2018; Raimi, 2017 (Ch. 2; pg. 11-30); Sisk, 2017; Everett et al. (pg. 213-275)</i>
Week 5	9: Tu Feb 5	Emissions & Climate Change	<i>Randolph & Masters (pg. 37-43); NCA4 (pg. 175-189); Richter, 2014 (Ch. 8 pg. 103-116); Everett et al., (pg. 584-587); Helm, 2015 (pg. 1-11)</i>
	10: Th Feb 7	Section Review & Discussion	
Section II. Renewable Energy Sources & the Grid			
Week 6	11: Tu Feb 12	The Grid	<i>Bakke, 2016 (pg. xi - xxx); DOE, 2015 (pg. 11-23)</i>
	12: Th Feb 14	Micro-Grids	<i>Roberts, 2018; Roberts, 2018; EPA</i>
Week 7	13: Tu Feb 19	Solar Photovoltaics; Concentrating Solar; Future of Solar	<i>Peake (pg. 115-125; 146-150) or Randolph & Masters (pg. 341-351); DOE, 2017; Winkelstern, 2018</i>
	14: Th Feb 21	Onshore and Offshore Wind	<i>Randolph & Masters (pg. 372-382); Peake (pg. 354-358); Irfan & Zarracina, 2018</i>
Week 8	15: Tu Feb 26	Distributed Energy: Electric Vehicles & Battery Storage	<i>Randolph & Masters (pg. 324-333; pg. 406-420)</i>
	16: Th Feb 28	Nuclear Energy	<i>Siegel, 2016; Morgan et al., 2018; Zoellner, 2010 (pg. viii - xii); Randolph & Masters (pg. 47-50)</i>
<i>Spring Break- NO CLASS on March 5th or March 7th!</i>			

Week 9	17: Tu Mar 12	Biofuels, Algae, Ethanol	<i>Randolph & Masters (Ch. 14; pg. 429-459)</i>
	18: Th Mar 14	Hydroelectric, Pumped Storage, Tidal, & Wave Power	<i>Moran et al., 2018; Peake (pg. 243-253; 257-260; 270-278); Cho, 2017</i>
Week 10	19: Tu Mar 19	Section Review & Discussion	
	20: Th Mar 21	Midterm (20% of grade)	
Section III. Energy & People			
Week 11	21: Tu Mar 26	Federal & State Energy Policy	<i>Randolph & Masters (Ch. 17; pg. 519-527; 542-545; 560-562; 566-571; 574-575; 602-605); Stanton, 2018</i>
	22: Th Mar 28	Lobbyists and Carbon Policy	<i>Rabe, 2018 (Ch. 1; pg. 1-12); Kaufman, 2018; Worland, 2018</i>
Week 12	23: Tu Apr 2	Energy Justice	<i>Sovacool, 2014 (Ch.1, pg. 1 -18); Portteus, 2018; Fleming, 2018; Hernandez, 2015</i>
	24: Th Apr 4	Energy Poverty	<i>Wirth, 2018; Lynch, 2018; Nathwani, 2018; Min, 2015</i>
Week 13	25: Tu Apr 9	Energy & Food	<i>Pollan, 2008; Garza, 2014; Farand, 2017</i>
	26: Th Apr 11	Energy & Water	<i>Webber, 2016 (Ch. 1; pg. 1-18; Ch. 4; 70-96)</i>
Week 14	27: Tu Apr 16	Energy Shocks: Natural & Human Disasters	<i>Michanowicz, 2018; Brugnone, 2018; Dengler, 2017; Tyrrell, 2018; Gearino, 2018</i>
	28: Th Apr 18	Energy Employment: Getting a Job in Energy	<i>None</i>
Week 15	29: Tu Apr 23	Team Presentations	
	30: Th Apr 25		
Finals	Tu Apr 30	Final Exam (25% of grade)	

Course Policies

Attendance:

Students whose names do not appear on the official class list for this course may not attend this class. Students who fail to attend at least one of the first two class sessions or class by the fifth day of the semester, whichever occurs first, may be dropped from the course.

E-Learning Policies:

Information technologies such as D2L and email are widely used in this class. As a result, there are some additional policies that need to be understood.

- Students should visit the course's D2L site on a regular basis.
- Students should check their email frequently (all class email is sent to the student's official MSU email account).
- All assignments submitted electronically, either on disk or via email, should be free of any viruses and/or worms. Any infected file or disk that is submitted will receive a zero (0) for that assignment.
- This course recognizes the students' right to privacy and adheres to the Family Educational Rights and Privacy Act (FERPA).
- Students need to review the university policy "Acceptable Use of Computing Systems, Software, and the University Digital Network" at <http://lct.msu.edu/guidelines-policies/aup/>.

- The Web site tech.msu.edu provides a number of information technology resources for students.
- You are responsible for the operation of any personally owned computers you use on or off campus. **A malfunctioning computer system is NOT a valid excuse for submitting late work.**
- Students are expected to have a high degree of self-motivation and self-direction in this class and develop the needed technology skills to excel in this class and in life.

Excessive emails make an unreasonable time demands on both sender and recipient. Please ensure you have a legitimate need before you write. The instructor will answer emails about:

- Questions arising from difficulty in understanding course content.
- Requests for feedback about graded assignments.
- Private issues appropriate for discussion within the teacher-student relationship.

The instructor will NOT answer emails which:

- Pose questions answered in the course information sections of the course D2L site.
- Pose questions answered in the course syllabus.
- Lack a subject line clearly stating the purpose of the email and the course number (CSUS259).
- Raises an inappropriate subject.

Academic Honesty:

[Article 2.III.B.2](#) of the Academic Freedom Report states: “The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards.” In addition, the Department of Sustainability adheres to the policies on academic honesty specified in General Student Regulation 1.0, [Protection of Scholarship and Grades](#); the all-University Policy on [Integrity of Scholarship and Grades](#); and [Ordinance 17.00](#), Examinations. (See Spartan Life: Student Handbook and Resource Guide and/or the MSU Web site: www.msu.edu).

Therefore, unless authorized by your instructor, you are expected to complete all course assignments, including homework, lab work, quizzes, tests and exams, without assistance from any source. You are expected to develop original work for this course; therefore, you may not submit course work you completed for another course to satisfy the requirements for this course. Also, you are not authorized to use the www.allmsu.com Web site to complete any course work in this course. Students who violate MSU regulations on Protection of Scholarship and Grades will receive a failing grade in the course or on the assignment.

****Faculty are required to report all instances in which a penalty grade is given for academic dishonesty. Students reported for academic dishonesty are required to take an online course about the integrity of scholarship and grades. A hold will be placed on the student's account until such time as the student completes the course. This course is overseen by the Associate Provost for Undergraduate Education.****

(See also <https://www.msu.edu/~ombud/academic-integrity/index.html>). **There will be no warnings** – the maximum sanction allowed under University policy will occur on the first offense.

Bereavement:

Students seeking a grief absence should be directed to the Grief Absence Request Form found on the RO home page (<https://reg.msu.edu/>) under ‘Student Services – Grief Absence Request Form’ OR to StuInfo (<https://stuinfo.msu.edu/>) under ‘Academics - Enrollment Information and Services – Grief Absence Request Form.’

Disruptive Behavior:

Article 2.III.B.4 of the [Student Rights and Responsibilities \(SRR\)](#) for students at Michigan State University states: "The student's behavior in the classroom shall be conducive to the teaching and learning process for all concerned." Article 2.III.B.10 of the [SRR](#) states that "The student and the faculty share the responsibility for maintaining professional relationships based on mutual trust and civility." [General Student Regulation 5.02](#) states: "No student shall . . . interfere with the functions and services of the University (for example, but not limited to, classes . . .) such that the function or service is obstructed or disrupted. Students whose conduct adversely affects the learning environment in this classroom may be subject to disciplinary action through the Student Judicial Affairs office.

Social Media

As members of a learning community, students are expected to respect the intellectual property of course instructors. All course materials presented to students are the copyrighted property of the course instructor and are subject to the following conditions of use:

1. Students may record lectures or any other classroom activities and use the recordings **only** for their own course-related purposes.
2. Students may share the recordings with other students enrolled in the class. Sharing is limited to using the recordings **only** for their own course-related purposes.
3. Students **may not** post the recordings or other course materials online or distribute them to anyone not enrolled in the class without the advance written permission of the course instructor and, if applicable, any students whose voice or image is included in the recordings.

Any student violating the conditions described above may face academic disciplinary sanctions.

Commercialized Lecture Notes:

Commercialization of lecture notes and university-provided course materials is not permitted in this course.

Understand When You May Drop This Course:

It is the student's responsibility to understand when they need to consider un-enrolling from a course. Refer to the [Michigan State University Office of the Registrar](#) for important dates and deadlines.

Drops and Adds:

The last day to add this course is the end of the first week of classes. The last day to drop this course with a 100 percent refund and no grade reported is **2/1/2019**. The last day to drop this course with no refund and no grade reported is **2/27/2019**. You should immediately make a copy of your amended schedule to verify you have added or dropped this course.

Inform Your Instructor of Any Accommodations Needed

Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. If you have a documented disability and verification from the [Resource Center for Persons with Disabilities](#) (RCPD), and wish to discuss academic accommodations, please contact your instructor as soon as possible. It is the student's responsibility to provide documentation of disability to RCPD and meet with an RCPD specialist to request special accommodation before classes start.

Once your eligibility for an accommodation has been determined, you will be issued a verified individual services accommodation ("VISA") form. Please present this form to the instructor at the start of the term and/or two weeks prior to the accommodation date (test, project, etc).

Requests received after this date will be honored whenever possible.

RCPD is located in 120 Bessey Hall, near the center of the Michigan State University campus, on the southwest corner of Farm Lane and Auditorium Road. RCPD may be contacted by phone at (517) 884-7273 (884-RCPD), or [via their website](http://www.rcpd.msu.edu) (<http://www.rcpd.msu.edu>).

Handling Emergency Situations

In the event of an emergency arising within the classroom, the Professor will notify you of what actions that may be required to ensure your safety. It is the responsibility of each student to understand the evacuation, "shelter-in-place," and "secure-in-place" guidelines posted in each facility and to act in a safe manner. You are allowed to maintain cellular devices in a silent mode during this course, in order to receive emergency SMS text, phone or email messages distributed by the university. When anyone receives such a notification or observes an emergency situation, they should immediately bring it to the attention of the Professor in a way that causes the least disruption. If an evacuation is ordered, please ensure that you do it in a safe manner and facilitate those around you that may not otherwise be able to safely leave. When these orders are given, you do have the right as a member of this community to follow that order. Also, if a shelter-in-place or secure-in-place is ordered, please seek areas of refuge that are safe depending on the emergency encountered and provide assistance if it is advisable to do so.

Syllabus Disclaimer

All syllabi are subject to minor changes to meet the needs of the instructor, school, or class. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. The instructor reserves the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes through the course site announcements. Please remember to check your MSU email and the course site announcements often.