Department of

Community Sustainability

**CSUS 259**

**Sustainable Energy & Society**

Spring 2021

Synchronous Meeting:

Thursday, 5pm – 6:20pm

Via Zoom

Instructor: Doug Bessette, PhD

Office Location: 327 Natural Resources Building

Office Hours: Thursdays 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 multiple textbooks and additional readings will be provided by the instructor via D2L*. Only* *the Randolph & Masters textbook is* *required.\**

1. **Randolph & Masters, 2018. Energy for Sustainability: Foundations for Technology, Planning, and Policy, Second Edition. Island Press, Washington.**
2. Everett, Boyle et al., 2012. Energy Systems and Sustainability: **Power for a Sustainable Future, Second Edition. Oxford University Press, London.**
3. Peake, Stephen, 2018. Renewable Energy: Power for a Sustainable Future, Fourth Edition. Oxford University Press, London.
4. Jacobson, Mark, 2021. 100% Clean, Renewable Energy and Storage for Everything. Cambridge University Press. (eBook)

\*Students with financial constraints should contact the instructor.

**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 & Participation **20 points.** (8%)

2. 8 Weekly Assignments (5 pts each) **40 points.** (16%)

3. Energy News Assignment **10 points.** (4%)

4. 3 Problem Sets (10 pts each) **30 points.** (12%)

5. Midterm Exam **50 points.** (20%)

6. Semester Project **50 points.** (20%)

7. Final Exam **50 points.** (20%)

**Total 250 points. (100%)**

**Grading Scale:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Points** | **> 235** | **217-235** | **200-217** | **187-200** | **175-187** | **160-175** | **150-160** | **< 150** |
| Grade | 4.0 | 3.50 | 3.00 | 2.50 | 2.00 | 1.50 | 1.00 | 0 |

**Assignments:**

1. **Attendance & Participation.** **(20 pts; 8%)** Students are expected to attend every synchronous class and actively and constructively participate in class, by both asking and answering questions, engaging in surveys, using the chat window, and showing evidence that they have engaged the readings, videos and lectures. 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! If you cannot attend class(es), please let me know beforehand. Continued absences will decrease your Attendance & Participation grade. **If I don’t know your name by the end of the course, it is unlikely you will earn the full 20 points! All class sessions will be recorded and posted in D2L.**

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

1. **Weekly Assignments (40 pts; 16%).** Students will be assigned a short assignment 8 times during the semester. These assignments will include surveys, online quizzes, short responses, social media activities, etc. Instructions will be provided accordingly.

Each assignment will be due the night before class, i.e., Wednesday before Midnight.

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

1. **Energy News Assignment.** **(10 pts; 4%)** Students must *once during the semester* begin the class reporting on a current event in energy news. Students must submit one Powerpoint slide before class and clearly demonstrate understanding of the event by presenting the news story in *LESS THAN SIXTY SECONDS*. To receive full points, the student’s slide must be neatly constructed and free of grammatical errors (5 pts). The student must briefly summarize the event (5 pts), link it to course material (5 pts), and discuss why it’s important (5 pts). The student must note the source and reporter (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

1. **Problem Sets (30 pts; 12%).** Students will be assigned three problem sets worth 10 points each over the course of the semester. These sets require slightly more work, attention and energy than do the weekly assignments. Some math may be required.

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

1. **Midterm Exam** **(50 pts; 20%): Due by 10pm on Thursday, March 25th**. Students will take one open-book, time-limited (2 hour) mid-term examination immediately following the second section of the course. Students will be allowed to use online materials, but may not work together or request the help of others. This mid-term is intended to ensure that students gain a basic—and broad—understanding of course material.

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

1. **Semester Project** (**50 pts; 20%**) Students will be tasked with examining a current topic of energy sustainability as either an individual or as members of a group. The focus of each project is up to the student(s) involved; however, the instructor must approve each project focus before they proceed. Groups **can be up to FIVE** students. The result of this project must be either a professional report, live presentation, online video, or audio recording (i.e., Podcast); examples will be provided. *Students are encouraged to be creative.* Student composition and project topics must be locked in by **Thursday, March 25th, 2021**.

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

1. **Final Exam (50 pts; 20%): Due by 10pm on Tuesday, April 27th**. Students will take one open-book, time-limited (2 hour) final examination due by 10pm on Tuesday April 27th. Students will be allowed to use online materials, but may not work together or request the help of others. This final exam is cumulative and is intended to ensure that students gain a basic—and broad—understanding of course material.

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

**Course Schedule**

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| --- | --- | --- | --- |
| **Week** | **Class** | **Topic** | **Assignments** |
| **Section I. The Energy Landscape** | | | |
| **Week 1** | Tues Jan 19 | Introduction | No Assignments Due |
| Thurs Jan 21 | Defining “Energy Sustainability”  Energy Not-So-Basics |  |
| **Week 2** | Thurs Jan 28 | History and Current Trends.  Production, Consumption & Waste | *WA #1 Due Wed 27th by Midnight* |
| **Week 3** | Thurs Feb 4 | Coal, CCS, Oil & Natural gas | *WA #2 Due Wed 3rd by Midnight* |
| **Week 4** | Thurs Feb 11 | Emissions & Climate Change | **Problem Set #1 Due Before Class** |
| **Section II. Clean Energy Sources & the Grid** | | | |
| **Week 5** | Thurs Feb 18 | The Grid  Micro-grids | *WA #3 Due Wed 17th by Midnight* |
| **Week 6** | Thurs Feb 25 | Solar, PV & Concentrated | *WA #4 Due Wed 24th by Midnight* |
| **Week 7** | Thurs Mar 4 | Wind, Onshore & Onshore | **Problem Set #2 Due Before Class** |
| **Week 8** | Thurs Mar 11 | Electric Vehicles & Battery Storage  Nuclear Power | *WA #5 Due Wed 10th by Midnight* |
| **Week 9** | Thurs Mar 18 | Hydroelectric, Storage, Tidal & Wave Power  Biofuels, Algae, Ethanol | **Problem Set #3 Due Before Class** |
| **Week 10** | Thurs Mar 25 | **Midterm (Exam due by 10pm on March 25th)** | |
| **Section III. Energy & People** | | | |
| **Week 11** | Thurs Apr 1 | Federal & State Energy Policy  Carbon Policy | *WA #6 Due Wed 31st by Midnight* |
| **Week 12** | Thurs Apr 8 | Energy Justice, Poverty & Sovereignty | *WA #7 Due Wed 7th by Midnight* |
| **Week 13** | Thurs Apr 15 | Energy, Food & Water  Natural/Human Disasters | *WA #8 Due Wed 14th by Midnight* |
| **Week 14** | **TUES** Apr 20 | Sem. Project Presentations (*No class Thursday*) | *Project Due Wed 21st by Midnight* |
| **Finals** | Tues Apr 27 | **Final (Exam due by 10pm on April 27th)** | |

**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 may be dropped from the course.

### E-Learning Policies:

Information technologies such as D2L, Zoom, 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 regularly.
* 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.

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.
* Raises an inappropriate subject.

### Academic Honesty:

[Article 2.III.B.2](http://splife.studentlife.msu.edu/academic-freedom-for-students-at-michigan-state-university/article-2-academic-rights-and-responsibilities) 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*](http://splife.studentlife.msu.edu/regulations/general-student-regulations); the all-University Policy on [*Integrity of Scholarship and Grades*](http://www.reg.msu.edu/AcademicPrograms/Print.asp?Section=534); and [Ordinance 17.00](http://splife.studentlife.msu.edu/regulations/student-group-regulations-administrative-rulings-all-university-policies-and-selected-ordinances/examinations-ordinance-17-00), Examinations. (See [Spartan Life: Student Handbook and Resource Guide](http://splife.studentlife.msu.edu/) and/or the MSU Web site: [www.msu.edu](http://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](http://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)](http://splife.studentlife.msu.edu/academic-freedom-for-students-at-michigan-state-university) 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](http://splife.studentlife.msu.edu/academic-freedom-for-students-at-michigan-state-university) 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](http://splife.studentlife.msu.edu/regulations/general-student-regulations) 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. Students may **not** record online sessions, lectures, or any other classroom activities, nor post 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](http://www.reg.msu.edu/) 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 9/28/20. 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](https://www.rcpd.msu.edu/) (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](https://www.rcpd.msu.edu/) (<http://www.rcpd.msu.edu>).

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# **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.