

**Sustainable Energy Strategies, Environmental Studies Department, San José State University  
ENVS 133, Section 01, Spring 2016**

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 Office hours: Tuesday 12–1:45 PM or by appointment  
 Class Days/Time: Tuesday, Thursday 9–10:15 AM  
 Classroom: Clark Hall 238, Incubator Classroom  
 Prerequisites: ENVS 119 (no exceptions)

**Course Description:** This course will provide students with a comprehensive overview of energy efficiency, energy conservation, and energy generation opportunities for transitioning to a sustainable energy economy. Students will learn about metrics and assessment tools to evaluate alternative modes of transportation, transportation fuels, electricity infrastructure, designs in the build environment and other green infrastructures and their impacts on greenhouse gas emissions, land use, ecological systems, air pollutants, and environmental justice. Students will learn about the biophysical constraints and opportunities for sustainable energy based on Earth’s resources. The class will also explore how concepts from environmental sociology, political ecology, and science & technology studies help us understand, explain, and advocate for energy transitions. Topics include solar, wind, geothermal, bioenergy, storage (fuel cells, batteries), and electricity transmission/integration. Existing energy options are unsustainable, so pursuing sustainable energy options will be critical to the long-term survival and prosperity of human civilization.

**Class & Reading Schedule** (subject to change with fair notice)

Date	Lecture topic	Readings, keywords & concepts
1/28	Green sheet overview, Deep decarbonization strategies for California	Green sheet overview  Keywords & concepts: decarbonization
2/2	How do we define sustainable energy in the age of the Anthropocene?	Fiksel, J. 2006. Sustainability and resilience: toward a systems approach. <i>Sustainability: Science, Practice, &amp; Policy</i> 2(2) <a href="http://sspp.proquest.com/static_content/vol2iss2/0608-028.fiksel-print.html">http://sspp.proquest.com/static_content/vol2iss2/0608-028.fiksel-print.html</a>  Keywords & concepts: Anthropocene, Earth stewardship, resilience, systems thinking, life cycle assessment, biocomplexity
2/4	Sustainable transportation: How can we change the way we move around?	Mwasilu, F., Justo, J. J., Kim, E. K., Do, T. D., & Jung, J. W. (2014). Electric vehicles and smart grid interaction: A review on vehicle to grid and renewable energy sources integration. <i>Renewable and Sustainable Energy Reviews</i> , 34, 501-516.  Keywords & concepts: EVs, ICEs, BEVs, HEVs, V2G, smart grid
2/9	Will hydrogen fuel cells be an important prime mover?	Hwang. 2013. Sustainability study of hydrogen pathways for fuel cell vehicle applications. <i>Renewable and Sustainable Energy Reviews</i> 19: 220–9.  Keywords & concepts: Sources of H2, how electrolysis works
2/11	What opportunities do bioenergy pathways	Sheehan. 2009. Biofuels and the conundrum of sustainability. <i>Current Opinion in Biotechnology</i> 20: 318–24.

	offer? What are the characteristics of sustainable biofuels?	Keywords & concepts: Sustainability metrics and indicators, land use, water, carbon debt, indirect impacts
2/16	What are the land use implications of biofuels?	Delucchi, M. 2010. Impacts of biofuels on climate change, water use, and land use <i>Annals of the New York Academy of Sciences</i> . 1195: 28–45.  Sheehan. 2009. Sustainable Biofuels. A commonsense perspective on California’s approach to biofuels & global land use. <i>Industrial Biotechnology</i> .  Keywords & concepts: indirect and direct land use, water impacts, sustainability certifications
2/18 <b>A1 due</b>	What policies can we use to encourage low carbon transportation fuels and ensure their sustainability?	Sperling & Yeh. 2009. Low Carbon Fuel Standards. <i>Issues in Science and Technology</i> . Winter.  Scarlot & Dellemand. 2011. Recent developments of biofuels/bioenergy sustainability certification: A global overview <i>Energy Policy</i> 39: 1630–46.  Keywords & concepts: LCFS, RSF2, CAFÉ, sustainability certifications
2/23	What is the promise of advanced and carbon negative biofuels?	Mathews. 2008. Carbon-negative fuels. <i>Energy Policy</i> 36: 490–5. Lehmann. 2007. Bio-energy in the black. <i>Frontiers in Ecology and the Environment</i> 5(7) 381–7. Zhu et al. 2014. Microalgal biofuels: Flexible bioenergies for sustainable development. <i>Renewable and Sustainable Energy Reviews</i> 30: 1035–46.  OPTIONAL: NREL Scientists Find Key Function for Ferredoxins in Algae Hydrogen Production <a href="http://www.nrel.gov/news/press/2014/8301.html">http://www.nrel.gov/news/press/2014/8301.html</a>
2/25	What does Well-to-Wheel Analysis tell us about sustainable transportation options?	
3/1 <b>A2 due</b>	The promise of “Wind, Water, & Sunlight” strategies.	Jacobson, M. Z., Delucchi, M. A., Ingraffea, A. R., Howarth, R. W., Bazouin, G., Bridgeland, B., et al. (2014). A roadmap for repowering California for all purposes with wind, water, and sunlight. <i>Energy</i> , 73(C), 875–889. <a href="http://doi.org/10.1016/j.energy.2014.06.099">http://doi.org/10.1016/j.energy.2014.06.099</a>  Keywords & concepts: wind, water sunlight strategies, dispersed interconnection, flexible loads, spinning reserves, V2G, onsite storage, weather forecasting, demand-response, annualized costs.  OPTIONAL BACKGROUND READING Delucchi 2011. <i>Wind, Water, and Solar Power for the World</i> .

		<a href="http://spectrum.ieee.org/energy/renewables/wind-water-and-solar-power-for-the-world/0">http://spectrum.ieee.org/energy/renewables/wind-water-and-solar-power-for-the-world/0</a> Assignment 7 readings: <a href="#">Jacobson Delucchi 2011 WWS part 1.pdf</a> <a href="#">Delucchi Jacobson 2011 Energy Policy Part 2.pdf</a>
3/3	Considering the power density renewable electricity	Smil, 2010, Power Density Primer Parts 1–5, pages 1–18.  Keywords & concepts: energy and power density
3/8	Solar PV Electricity, efficiency, power density, PV module types, storage and transmission options	Zweibel Mason Fthenakis 2007. The Solar Grand Plan. Scientific American.
3/10 <b>A3 due</b>	Wave, tidal, & hydropower, obstacles to deployment	Kane, M. 2005. California Small Hydropower and Ocean Wave Energy Resources. California Energy Commission. <a href="http://www.energy.ca.gov/2005publications/CEC-500-2005-074/CEC-500-2005-074.PDF">http://www.energy.ca.gov/2005publications/CEC-500-2005-074/CEC-500-2005-074.PDF</a>
3/15	Where can we put wind turbines in California? How can we mitigate or minimize wildlife impacts?	Dvorak, M. J., Archer, C. L., & Jacobson, M. Z. (2010). Renewable Energy. <i>Renewable Energy</i> , 35(6), 1244–1254. <a href="http://doi.org/10.1016/j.renene.2009.11.022">http://doi.org/10.1016/j.renene.2009.11.022</a>  Tabassum-Abbasi, Premalatha, M., Abbasi, T., & Abbasi, S. A. (2014). Renewable and Sustainable Energy Reviews. <i>Renewable and Sustainable Energy Reviews</i> , 31(C), 270–288. <a href="http://doi.org/10.1016/j.rser.2013.11.019">http://doi.org/10.1016/j.rser.2013.11.019</a>
3/17	Where can we put utility-scale solar without impacts to land cover change or protected areas?	Hernandez, R. R., Hoffacker, M. K., Murphy-Mariscal, M. L., Wu, G. C., & Allen, M. F. (2015). Solar energy development impacts on land cover change and protected areas. <i>Proceedings of the National Academy of Sciences</i> , 201517656–9. <a href="http://doi.org/10.1073/pnas.1517656112">http://doi.org/10.1073/pnas.1517656112</a>
3/22 <b>A4 due</b>	Geothermal energy	Dickson and Fanelli, 2004 <b>Keywords &amp; concepts:</b> flash, dry, binary geothermal plants
3/24		Research day
4/5	How can we mitigate or minimize wildlife impacts?	Readings on assignment sheet. Ocotillo Express in-class activity.
4/7	How can we reduce water footprint of energy system?	Fulton & Cooley. 2015. The water footprint of California’s energy system 2002–2014. <a href="http://pacinst.org/wp-content/uploads/sites/21/2015/03/Fulton-and-Cooley-EST-Manuscript-Final2.pdf">http://pacinst.org/wp-content/uploads/sites/21/2015/03/Fulton-and-Cooley-EST-Manuscript-Final2.pdf</a>
4/12	Electricity storage & transmission	Talbot. 2008. Lifeline for Renewable Power. <a href="http://www.technologyreview.com/featuredstory/411423/lifeline-for-renewable-power/page/1/">http://www.technologyreview.com/featuredstory/411423/lifeline-for-renewable-power/page/1/</a>  <b>Keywords &amp; concepts:</b> smart grid, demand response, CAISO, V2G, duck curve
4/14	Is there a role for	TBD

	nuclear power and natural gas?	
4/19	<b>EXAM</b>	Bring calculator, open notebook, writing tool
4/21	Can we “green” the sources of energy for buildings?	Hosanky. 2011. Green Building Materials. In Mulvaney. <i>Green Energy: An A-to-Z Guide</i> Sage. <a href="http://knowledge.sagepub.com/view/greentechnology/n58.xml">http://knowledge.sagepub.com/view/greentechnology/n58.xml</a>  Keywords & concepts:
4/26	How can we reduce household energy demand?	Goodier. 2011. Home Energy Rating System. In Mulvaney. <i>Green Energy: An A-to-Z Guide</i> Sage. <a href="http://knowledge.sagepub.com/view/greenenergy/n71.xml">http://knowledge.sagepub.com/view/greenenergy/n71.xml</a>  Keywords & concepts: Home Energy Rating Systems, Heating, cooling, lighting, electricity use
4/28	How can we change energy use through changing behavior?	(1) Dietz, et al. 2009. Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. <i>Proc. of the National Academy of Sciences</i> 106(44): 18452–6. <a href="http://dx.doi.org/10.1073/pnas.0908738106">http://dx.doi.org/10.1073/pnas.0908738106</a> (2) Dietz. 2010. Narrowing the US energy efficiency gap. <i>Proceedings of the National Academy of Sciences</i> 107(37): 16007–8. <a href="http://dx.doi.org/10.1073/pnas.1010651107">http://dx.doi.org/10.1073/pnas.1010651107</a>  Keywords & concepts: energy efficiency gap, household actions
5/3	How much electricity and natural gas could be displaced with solar hot water heating?	Environment California. <i>Hot Water Heating</i> <a href="http://www.environmentcalifornia.org/sites/environment/files/reports/CAE%20Solar-Water-Heating.pdf">http://www.environmentcalifornia.org/sites/environment/files/reports/CAE%20Solar-Water-Heating.pdf</a>  <b>Keywords &amp; concepts:</b> Maximum collector temperature, simple economic payback time, solar energy factor, annual operating costs
5/5 <b>A5 Due</b>	How can we reduce energy use and GHGs in agriculture, water treatment, and industrial systems?	California Energy Commission. <a href="http://www.energy.ca.gov/process">http://www.energy.ca.gov/process</a>
5/10	What are the natural resource considerations for California’s energy transition?	Hurd et al. 2012 Energy Critical Elements for Sustainable Development. <i>MRS Bulletin</i> 37: 405–10.
5/12 <b>FINAL PAPER due</b>	Final Paper Due	Roundtable discussion of individual final research papers
5/18	Group Presentations 7:15–9:30am, same room, 15 minute presentations	

**Canvas & MYSJSU Messaging:** You are responsible for regularly checking the canvas emails and messaging system through <http://my.sjsu.edu> and <https://sjsu.instructure.com>

### **Course Goals and Student Learning Outcomes**

At the end of this course, students should be able to:

- Understand the opportunities for renewable and alternative energy deployment.
- Understand and assess the renewable energy resource base on Earth.
- Describe basic principles to improve efficiency and design of energy delivery, recognize opportunities to reduce energy consumption, and promote sustainability.
- Assess basic economic, government policy, and social equity dimensions of alternative energy options

**Required Readings:** These are linked on canvas.

**Environmental Studies Library Liaison** Peggy Cabrera, [peggy.cabrera@sjsu.edu](mailto:peggy.cabrera@sjsu.edu)

**Classroom Protocol:** You are expected to come to every class on time. Coming into class late is a disturbance to others. Classroom participation is 20% of your grade, and classroom disturbance will be reflected in participation scores. **No cell phone, emailing, or text messaging during class.** If you need to make a phone call or send an email, please excuse yourself from class.

### **University Policies**

#### **General Expectations, Rights and Responsibilities of the Student**

As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with SJSU's policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arises. To learn important campus information, view [University Policy S90-5](http://www.sjsu.edu/senate/docs/S90-5.pdf) at <http://www.sjsu.edu/senate/docs/S90-5.pdf> and SJSU current semester's, at <http://info.sjsu.edu/static/catalog/policies.html> In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not address the issue, it is recommended that the student contact the Department Chair as the next step.

**Dropping and Adding:** Students are responsible for understanding the policies and procedures about add/drop, grade forgiveness, etc. Add/drop deadlines can be found on the current academic year calendars document on the [Academic Calendars webpage](http://www.sjsu.edu/provost/services/academic_calendars) at [http://www.sjsu.edu/provost/services/academic\\_calendars](http://www.sjsu.edu/provost/services/academic_calendars) The [Late Drop Policy](http://www.sjsu.edu/aars/policies/latedrops/policy) is available at <http://www.sjsu.edu/aars/policies/latedrops/policy> Students should be aware of the current deadlines and penalties for dropping classes. Information about the latest changes and news is available at the [Advising Hub](http://www.sjsu.edu/advising) at <http://www.sjsu.edu/advising>

**Course Requirements & Assignments:** SJSU classes are designed such that in order to be successful, it is expected that students will spend a minimum of forty-five hours for each unit of credit (normally three hours per unit per week), including preparing for class, participating in course activities, completing assignments, and so on. More details about student workload can be found in [University Policy S12-3](http://www.sjsu.edu/senate/docs/S12-3.pdf) at <http://www.sjsu.edu/senate/docs/S12-3.pdf>

**How do I turn in papers?** This will depend on the assignment. In general, *type-written* papers will be submitted via canvas while *handwritten & mathematical* work will be submitted on paper.

**GRADING** is based on.

**20% Participation.** Share your thoughts about the readings, ask thoughtful questions, answer discussion prompts. Keeping good notes about the main points or views taken by authors is a good means a facilitating a sustained discussion. You will also be asked to work in small groups now and then in class, and you will be

expected to be a contributing member to your group.

**20% Assignments:** There will six assignments that must be completed.

1. A1 – Assignment 1 – Biofuels, Sustainability, & Social Justice
2. A2 – Assignment 2 – Well-to-Wheel Analysis
3. A3 – Assignment 3 – Renewable electricity footprints
4. A4 – Assignment 4 – Ocotillo Express Wind Controversy
5. A5 – Assignment 5 – Energy for Solar Hot Water

**20% Exam:** The midterm exam will be open notebook. The tests will include short answer, multiple choice, problem sets, and essay questions. However, you will not have access to any electronic devices (other than a calculator) and you will not have access to the Canvas site. You must bring a calculator to the examinations. To study for the tests, you should review the readings, course lecture notes, homework, and learning objectives well in advance of the test date. The midterm will include material covered during the first portion of the class. We will include both multiple choice and problems related to the scientific principles of energy, heat, and work. You are encouraged to review the problems sets before the midterm.

**20% Individual Research Project:** An individual research project on a sustainable energy strategy or source.

**20% Group Research Project:** Students will develop a research project related to renewable or conventional energy technologies. More details on this assignment will be available on the course website.

### Course Grading

The course grade will be determined based on a total 100 possible points. Accumulated points that fall within the grade scale below determine your semester grade.

A+ 97-100	A 92-96	A- 89-91	B+ 86-88	B 81-85	B- 79-80	C+ 76-78
C 72-76	C- 69-71	D+ 67-68	D 64-66	D- 60-64	F < 60	

### University policy on academic integrity

Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy S07-2](http://www.sjsu.edu/senate/docs/S07-2.pdf) at <http://www.sjsu.edu/senate/docs/S07-2.pdf> requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The [Student Conduct and Ethical Development website](http://www.sjsu.edu/studentconduct) is available at <http://www.sjsu.edu/studentconduct>

**Instances of academic dishonesty will not be tolerated.** Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person’s ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU’s Academic Policy S07-2 requires approval of instructors.

### Campus policy in compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. [Presidential Directive 97-03](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) at [http://www.sjsu.edu/president/docs/directives/PD\\_1997-03.pdf](http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf) requires that students with disabilities

requesting accommodations must register with the [Accessible Education Center](http://www.sjsu.edu/aec) (AEC) at <http://www.sjsu.edu/aec> to establish a record of their disability.

## Other Campus Resources

- Computer labs for student use are available in the [Academic Success Center](http://www.sjsu.edu/at/asc/) at <http://www.sjsu.edu/at/asc/> located on the 1st floor of Clark Hall and in the Associated Students Lab on the 2nd floor of the Student Union. Additional computer labs may be available in your department/college. Computers are also available in the Martin Luther King Library. A wide variety of audio-visual equipment is available for student checkout from Media Services located in IRC 112. These items include DV and HD digital camcorders; digital still cameras; video, slide and overhead projectors; DVD, CD, and audiotape players; sound systems, wireless microphones, projection screens and monitors.
- **Peer Connections** <http://peerconnections.sjsu.edu> is located on the 1<sup>st</sup> floor of Clark Hall in the Academic Success Center as well as in Room 600 in the Student Services Center. Peer Connections' free tutoring and mentoring is designed to assist students in the development of their full academic potential and to inspire them to become independent learners. Peer Connections tutors are trained to provide content-based tutoring in many lower division courses (some upper division) as well as writing and study skills assistance. Small group and individual tutoring are available. Peer Connections mentors are trained to provide support and resources in navigating the college experience. This support includes assistance in learning strategies and techniques on how to be a successful student. Peer Connections has a learning commons, desktop computers, and success workshops on a wide variety of topics. For more information on services, hours, locations, or a list of current workshops, please visit [Peer Connections website](http://peerconnections.sjsu.edu) at <http://peerconnections.sjsu.edu> for more information.
- The **SJSU Writing Center** is located in Clark Hall, Suite 126. All Writing Specialists have gone through a rigorous hiring process, and they are well trained to assist all students at all levels within all disciplines to become better writers. In addition to one-on-one tutoring services, the Writing Center also offers workshops every semester on a variety of writing topics. To make an appointment or to refer to the numerous online resources offered through the Writing Center, visit the [Writing Center website](http://www.sjsu.edu/writingcenter) at <http://www.sjsu.edu/writingcenter>. For additional resources and updated information, follow the Writing Center on Twitter and become a fan of the SJSU Writing Center on Facebook.



- **SJSU Counseling and Psychological Services** The SJSU Counseling and Psychological Services is located on the corner of 7th Street and San Carlos in the new Student Wellness Center, Room 300B. Professional psychologists, social workers, and counselors are available to provide confidential consultations on issues of student mental health, campus climate or psychological and academic issues on an individual, couple, or group basis. To schedule an appointment or learn more information, visit [Counseling and Psychological Services website](http://www.sjsu.edu/counseling) at <http://www.sjsu.edu/counseling>.