Sustainable Energy Strategies, Environmental Studies Department, San José State University
ENVS 133, Section 01, Spring 2019

Instructor: **Dr. Dustin Mulvaney, Associate Professor, Environmental Studies**
Office Location: **115A Washington Hall**
Email: **dustin.mulvaney@sjsu.edu**
Office hours: **Mondays 3–4 PM or by appointment**
Class Days/Time: **Monday & Wednesday 10:30–11:45 AM**
Classroom: **Clark Hall 238, Incubator Classroom**
Prerequisites: **ENVS 119 (preferred)**

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/Assignments
1/28	Green sheet, overview	Deep decarbonization strategies for California
1/30	How do we define sustainable energy transitions?	**Read Assignment 1 Prompt** Kallis, G., 2011. In defense of degrowth. *Ecological Economics*, 70(5), pp.873–880. Schwartzman, D., 2016. How Much and What Kind of Energy Does Humanity Need? *Socialism and Democracy*, 30(2), pp.97–120.
2/4	Critical Challenges for Energy Transitions	Smil, V., 2016. Examining energy transitions: A dozen insights based on performance. *Energy Research & Social Science*, 22, pp.194–197. Sovacool, B.K., 2016. How long will it take? Conceptualizing the temporal dynamics of energy transitions. *Energy Research & Social Science*, 13, pp.202–215.
2/6	Sustainable transportation: How can we decarbonize how we get around? Part 1, EVs	Sperling, D., & Eggert, A. (2014). California's climate and energy policy for transportation. *Energy Strategy Reviews*, *5*, pp.88-94. Sperling, D & Yeh, S. (2009). Low Carbon Fuel Standards Issues in Science and Technology. Winter.
2/11	Sustainable transportation, Part 2, What opportunities	Harvey, et al. 2018, Chapters 1–3

	do bioenergy pathways offer for sustainable biofuels?	Sheehan. 2009. Sustainable Biofuels. A commonsense perspective on California's approach to biofuels & global land use. Industrial Biotechnology. Scarlot & Dellemand. 2011. Recent developments of biofuels/bioenergy sustainability certification: A global overview *Energy Policy* 39: 1630–46.
2/13	Sustainable transportation, Part 3, Hydrogen	**Assignment 1 due, Read Assignment 2 Prompt** Hwang. 2013. Sustainability study of hydrogen pathways for fuel cell vehicle applications. *Renewable and Sustainable Energy Reviews* 19, pp.220–9.
2/18	Well-to-Wheel Analysis for sustainable transportation	Harvey, et al. 2018, Chapters 6–7 Zhu et al. 2014. Microalgal biofuels: Flexible bioenergies for sustainable development. *Renewable and Sustainable Energy Reviews* 30: 1035–46.
2/20	What is the promise of advanced and carbon negative biofuels?	Harvey, et al. 2018, Chapters 8–9 Mathews. 2008. Carbon-negative fuels. Energy Policy 36: 490–5. Lehmann. 2007. Bio-energy in the black. *Frontiers in Ecology and the Environment* 5(7) 381–7.
2/25	Should we Electrify Everything to meet decarbonization goals?	**Assignment 2 due, Read Assignment 3 Prompt** Harvey, et al. 2018, Chapters 4–5 Roberts, D. 2018. The key to tackling climate change: electrify everything. *Vox*. https://www.vox.com/2016/9/19/12938086/electrify-everything
2/27	"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. *Energy*, *73*(C), 875–889. http://doi.org/10.1016/j.energy.2014.06.099 OPTIONAL BACKGROUND READING Delucchi 2011. Wind, Water, and Solar Power for the World. http://spectrum.ieee.org/energy/renewables/wind-water-and-solar-power-for-the-world/0
3/4	Power density primer for various sources of electricity	Smil, 2010, Power Density Primer Parts 1–5, pages 1–18.
3/6	Solar PV Electricity, efficiency, PV module types, storage and	Zweibel Mason Fthenakis 2007. The Solar Grand Plan. Scientific American.

	transmission options	
3/11	Geothermal, wave, tidal, & hydropower, obstacles to deployment	**Assignment 3 due, Read Assignment 4 Prompt** Kane, M. 2005. California Small Hydropower and Ocean Wave Energy Resources. California Energy Commission. http://www.energy.ca.gov/2005publications/CEC-500-2005-074/CEC-500-2005-074.PDF
3/13	Where can we put wind turbines in California?	Dvorak, M. J., Archer, C. L., & Jacobson, M. Z. (2010). Renewable Energy. *Renewable Energy*, *35*(6), 1244–1254. http://doi.org/10.1016/j.renene.2009.11.022 Tabassum-Abbasi, Premalatha, M., Abbasi, T., & Abbasi, S. A. (2014). Renewable and Sustainable Energy Reviews. *Renewable and Sustainable Energy Reviews*, *31*(C), 270–288. http://doi.org/10.1016/j.rser.2013.11.019 Ocotillo Express in-class activity.
3/18	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. *Proceedings of the National Academy of Sciences*, 201517656–9. http://doi.org/10.1073/pnas.1517656112
3/20	How can we reduce energy use and GHGs in agriculture, water treatment, and industrial systems?	**Assignment 4 due, Read Assignment 5 Prompt** Harvey, et al. 2018, Chapters 11–12 California Energy Commission, www.energy.ca.gov/process
3/25	**Energy Policies for 2050**	Harvey, et al. 2018, Chapters 13–15
3/27	MIDTERM EXAM	Bring calculator, open notebook, writing tool
4/8	How can we reduce water footprint of energy system?	Fulton & Cooley. 2015. The water footprint of California's energy system 2002–2014. http://pacinst.org/wp-content/uploads/sites/21/2015/03/Fulton-and-Cooley-EST-Manuscript-Final2.pdf
4/10	Electricity storage & transmission	Jim Lazar, Teaching the Duck to Fly
4/15	Smart grid and distributed solutions	Adil, A.M. & Ko, Y., 2016. Socio-technical evolution of Decentralized Energy Systems_ A critical review and implications for urban planning and policy. *Renewable and Sustainable Energy Reviews*, 57(C), pp.1025–1037.
4/17	Is there a role for nuclear power and natural gas?	Keeping the balance: How flexible nuclear operation can help add more wind and solar to the grid http://news.mit.edu/2018/flexible-nuclear-operation-can-help-add-more-wind-and-solar-to-the-grid-0425

4/22	How can we reduce household energy demand?	Dietz, et al. 2009. Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *Proc. of the National Academy of Sciences* 106(44): 18452–6. http://dx.doi.org/10.1073/pnas.0908738106
4/24	How can we change energy use through changing behavior?	Dietz. 2010. Narrowing the US energy efficiency gap. *Proceedings of the National Academy of Sciences* 107(37): 16007–8. http://dx.doi.org/10.1073/pnas.1010651107
4/29	How much electricity and natural gas could be displaced with solar hot water heating?	**Assignment 5 due** Environment California. *Hot Water Heating* http://www.environmentcalifornia.org/sites/environment/files/reports/CAE%20Solar-Water-Heating.pdf
5/1	TEAM PRESENTATIONS	Transportation
5/6	TEAM PRESENTATIONS	Residential Energy Use
5/8	TEAM PRESENTATIONS	Industry and Commercial
5/13	TEAM PRESENTATIONS	Electricity
5/15	**FINAL EXAM 9:45am–12pm** **FINAL PAPER DUE**	

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

Environmental Studies Library Liaison: Peggy Cabrera, Peggy.Cabrera@sjsu.edu

https://libguides.sjsu.edu/environmental_studies

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 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 at http://www.sjsu.edu/provost/services/academic_calendars The Late Drop 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 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 at http://www.sjsu.edu/senate/docs/S12-3.pdf

Required Readings: These are posted or linked on canvas. There is a required text book and podcast subscription.

REQUIRED TEXT BOOK – Designing Climate Solutions: A Policy Guide for Low-Carbon Energy
Hal Harvey, Robbie Orvis, Jeffrey Rissman
Island Press, ISBN: 9781610919562 November 1, 2018
https://www.indiebound.org/book/9781610919562
https://www.amazon.com/Designing-Climate-Solutions-Policy-Low-Carbon/dp/1610919564/ref=sr_1_1?ie=UTF8&qid=1548666528&sr=8-1&keywords=Designing+Climate+Solutions

REQUIRED PODCAST SUBSRIPTION – Energy transition show hosted by Chris Nelder
https://xenetwork.org/ets/student-offer/
Having trouble? write support@xenetwork.org and they'll sort it out.

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. In this class you will be using social media and social media posts will count towards participation. You will be required to make six posts throughout the semester to Energy Twitter.

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

30% **Exams:** The midterms and final 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. The final exam is cumulative.

10% **Individual Research Project:** An individual research project on a sustainable energy strategy or source.

20% **Sustainable Energy Strategy Team Projects:** Students will develop a team projects related to the decarbonization of California's energy systems and economy. Students will be on four different teams throughout the semester. (1) Transportation, (2) Electricity, (3) Residential energy use, (4) Commercial and Industrial sectors.

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 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 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 at 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 (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 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 1st 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 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 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 at http://www.sjsu.edu/counseling.