Energy Systems in Transition
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Our class will be held in PV 275 on Monday and Wednesday at 11:30am – 12:45pm

This is a graduate level overview course that introduces the basic elements of energy and energy systems. We will learn about energy sources, how they work, and how the nature of sources shapes their roles within the energy system.

Students will acquire the ability to think and write critically about energy systems and energy transitions. Students will gain a level of familiarity with the complex problems associated with energy use to understand how to begin solving the challenges related to decarbonization. Given the wide-ranging issues, we will be reading, summarizing, presenting, writing, and doing some calculations in this course.

Textbooks: There are two books for this course that are available for free through our library and on canvas: Sustainable Energy Transitions by Dustin Mulvaney (shortened to Transitions in the syllabus) and Introduction to Energy Analysis (3rd edition) by Kornelis Blok and Evert Nieuwlaar, (shortened to Analysis in the syllabus). We will also read other articles and reports as they come up. Please have a look at Canvas to see if there are additional readings for the week.

Office hours: For questions, stay after class ends. My general office hours will be held after class in my office located at 347 in O'Neill. There is no TA for this course.

Special needs: Please let me know by the first week of classes if you have any special needs and what accommodations you need.

Course requirements

1. Attend class. Class participation is an important part of the course. Ask good questions and be part of the discussion. Effective participation also means **making space for people who do not feel comfortable participating in a class discussion to participate.** Avoid phones or computers in class, as it breaks deeper discussions and understanding. (If you need to miss class because of physical or mental health needs, please do so. You do not need to email me in advance.)

2. Do the readings. Some readings will take time to digest, and you will benefit from discussion with other students prior to class and during class. Work with other students and bring your questions to class. I have also created a list of resources (news, journals) for you to start off learning about our field more broadly. Please add to the list as you go.

3. Paired research paper There is one paired research paper assignment for this course. You will work with one partner and pick a country of your choosing (making sure no one else in class has picked this country via canvas). You will investigate what their current energy system is, what a low carbon energy future will look like for them and identify policy pathways to achieving this future. Papers will need to be submitted online through Canvas *and* in paper copy the day that they are due. They will be shared with the rest of the class. Please work *cooperatively* with each other.

4. Paired presentation: Each student will do *one paired in-class presentation* over the semester to present their research paper. Presentations should be no longer than 20 minutes (not including questions from the class). This assignment is designed to ensure you can understand, digest, critically examine, and report on the research you have done. Please work *cooperatively* with each other.

5. Quizzes: On most Wednesdays, I will give you a paper-and-pen only closed-book quiz on the materials for that week. This will be a one-page short assignment designed to assess your understanding and learning. Your two lowest quiz grades will be dropped. Frequent quizzes are designed to facilitate learning and help you master the material.

There are no extra credit assignments for this class.

Grading: The grading scale for this class will be the following: min of 97 A+, min of 93 A, min of 90 A-, min of 87 B+, min of 83 B, min of 80 B-, min of 77 C+, min of 73 C, min of 70 C-, min of 67 D+, min of 63 D, min of 60 D-, and less than 60 F. I reserve the right to adjust this scale (i.e., lower it) to account for variability in testing results. There are no exams in this course.

Research Paper	40%	Nov 11
Quizzes	50%	Most Wednesdays
Presentation	10%	Rolling Dec 2-Dec 9

On health: Please take care of your physical and mental health first. If you have a positive COVID-19 test, have COVID-like symptoms, or have been instructed to quarantine, you should not attend class. If you need a mental health day, please take one. For mental health resources, please see the bottom of the syllabus and contact CAPS and Timelycare. **Be kind to yourself and those around you.**

Schedule

Date	#	Topic	Readings	Due
Aug 26	1	Energy: introduction and challenges	No readings	
Aug 28	2	Energy and society	Transition: Ch 1 Energy transitions Analysis: Ch 1 Energy and society Enroad: https://www.climateinteractive.org/en-roads/	
Sep 4	3	Energy Units and Trends	Transition: Ch 2 fundamentals of energy science Analysis: Ch 2 what is energy Smil, V. (2006). *Energy: Beginners guide*: Oneworld. (Introduction and Ch 5: Energy in everyday life). Podcast: https://xenetwork.org/ets/episodes/episode-119-energy-basics-parts-1-3/	Quiz 1

Sep 9	4	Calculating energy use	Transition: Ch 3 energy and the social sciences	
Sep 11	5	Net zero emissions and climate change	Transition: Ch 10 sustainability and just energy strategies Analysis: Ch 16 climate-neutral energy systems Outlook: Part B, pg 119- 175	Quiz 2
Sep 16	6	Efficiency	Analysis: Ch 10 energy efficiency and Ch 13 volume, structure, and energy efficiency	
Sep 18	7	Demand side management	IPCC (2022) Demand, services and social aspects of mitigation.	Quiz 3
Sep 23	8	Oil	Transition: Ch 4 fossil fuels Analysis: Ch 5 energy extraction and conversion Outlook: Ch 7 – Liquid fuels (browse)	
Sep 25	9	Coal	Transition: Ch 4 fossil fuels Analysis: Ch 5 energy extraction and conversion	Quiz 4
Sep 30	10	Natural gas	Transition: Ch 4 fossil fuels - continued Analysis: Ch 5 energy extraction and conversion Outlook: Ch 8 – Gaseous fuels (browse)	
Oct 2	11	Nuclear	Analysis: Ch 5 energy extraction and conversion Transition: Ch 5 nuclear and renewables	Quiz 5
Oct 7	12	Hydropower	https://www.eia.gov/energyexplained/hydropower/ https://www.energy.gov/eere/water/types-hydropower-plants https://www.energy.gov/eere/water/hydropower-basics https://www.ucsusa.org/resources/environmental-impacts-hydroelectric-power	
Oct 9	13	Solar	https://www.energy.gov/eere/solar/how-does-solar-work https://www.nrel.gov/research/re-solar.html	Quiz 6
Oct 14	14	Wind	https://www.energy.gov/eere/wind/wind-energy-basics	
Oct 16	15	Case study of Puerto Rico	https://www.nrel.gov/docs/fy24osti/88615.pdf	Quiz 7
Oct 21	16	No class	Work on presentations and research paper	
Oct 23	17	No class	Work on presentations and research paper	
Oct 28	18	Grids and storage	Transition: Ch 7 low carbon electricity systems https://www.nytimes.com/interactive/2023/06/12/climate/us-electric-grid-energy-transition.html	

			https://www.cfr.org/backgrounder/how-does-us-power-grid-work https://www.nrel.gov/research/power-grid.html https://www.nrel.gov/research/eds-hydrogen.html	
Oct 30	19	Markets	Analysis: Ch 6 energy markets	Quiz 8
Nov 4	20	Policies	Analysis: Ch 14 energy policies and evaluation	
Nov 6	21	Transportation	Transition: Ch 8 low carbon mobility	Quiz 9
Nov 11	22	New administration and energy policies	**Guest lecture:** Steve Nadel Executive Director of American Council for an Energy-Efficient Economy (ACEEE) https://www.aceee.org/about/aceee-staff/steven-nadel	Research paper
Nov 13	23	Indicators and LCA	Transition: Ch 6 energy indicators Analysis: Ch 11 Economic analysis	Quiz 10
Nov 18	24	Energy and the built environment	Transition: Ch 9 industries and the build environment Analysis: Ch 4 energy use in industry, analysis and management of energy use https://www.nrel.gov/research/re-net-zero-buildings.html	
Nov 20	25	Justice	Transition: Ch 10 Sustainable and Just Energy Strategies	Quiz 11
Dec 2	26	Presentations	Groups 1, 2, 3	Presentations
Dec 4	27	Presentations	Groups 4, 5, 6	
Dec 9	28	Presentations	Groups 7, 8, 9	
Dec 11	29	Final discussion and next steps		

Energy Resources

The Energy Transition show by Chris Nelder
David Roberts: https://www.volts.wtf/p/welcome-to-volts
Rewiring America: https://www.rewiringamerica.org/
Energy wire: https://www.eenews.net/publication/energywire/
Climate wire: https://www.eenews.net/publication/climatewire/
IEA news: https://www.iea.org/news
IEA energy systems: https://www.iea.org/energy-system
The Conversation: https://theconversation.com/us/environment
EERE: https://www.energy.gov/eere/office-energy-efficiency-renewable-energy

Student Resources

Students Needing Additional Financial or Other Assistance: The Student Advocates Office (SAO) can help students work through personal and academic problems as well as financial difficulties and concerns. SAO also assists students working through grade appeals and withdrawals from all classes. SAO also has emergency funds for IU

students experiencing emergency financial crisis
https://studentaffairs.indiana.edu/studentadvocates

Sexual misconduct: As your instructor, one of my responsibilities is to create a positive learning environment for all students. IU policy prohibits sexual misconduct in any form, including sexual harassment, sexual assault, stalking, sexual exploitation, and dating and domestic violence. If you have experienced sexual misconduct, or know someone who has, the University can help. If you are seeking help and would like to speak to someone confidentially, you can make an appointment with the IU Sexual Assault Crisis Services at 812-855-5711, or contact a Confidential Victim Advocate at 812-856-2469 or cva@indiana.edu

Counseling and Psychological Services (CAPS): Students can contact CAPS 24/7 to speak to a crisis counselor. Call 812-855-5711, option 1 or contact your local hospital emergency department. You may also contact the National Suicide Prevention Lifeline at 1-800-273-8255. If you need to talk to a trained professional staff for confidential support, please visit:
http://healthcenter.indiana.edu/counseling/index.shtml

Another new resource available to students is Timely Care:
https://app.timelycare.com/auth/login

Accessible Educational Services for Students (AES): Every attempt will be made to provide accessibility measures (accommodations) to students with qualifying medical conditions (e.g. mental health, learning, chronic health, physical, hearing, vision, neurological, etc.), under the Americans with Disabilities Act. You must have established your eligibility for support services through Accessible Educational Services for qualifying medical conditions. Note that services are confidential, may take time to put in place, and are forward moving. Captions and alternate media for print materials may take three or more weeks to get produced. Please contact Accessible Educational Services (AES) at 812-855-7578 as soon as possible if accessibility measures are needed. The office is located on the basement floor of Eigenmann Hall, #001.