

Spring 2025
Paul H. O'Neill School of Public and Environmental Affairs
Indiana University Bloomington
R674 Energy Economics and Policy

1. About the Course and the instructor

Instructor: Prof. Nikos Ziropiannis **Office:** SPEA 331; **Phone:** 812-856-8323; **E-mail:** nziropia@indiana.edu

Teaching Assistant: Lucas Giese; **E-mail:** lugiese@iu.edu

Dr. Z office Hours: Use this [Calendly link](#) to schedule a meeting with me

TA office Hours: Wednesdays 1 p.m. – 2 p.m. SPEA A206

Administrative Assistant: Taylor Turcotte; SPEA 410 tayturco@iu.edu Phone: (812) 855-5220

Class meeting days and times: MW 11:10-12:25 **Class location:** PV A335.

Course prerequisites and co-requisites: This course requires that you have taken and passed V517 Public Management Economics, or an equivalent (upon approval by the instructor). To succeed in R674 you will need a strong understanding of intermediate microeconomic principles, including an understanding of economic concepts and the intuition behind economic market dynamics, and the ability to interpret graphs. You must also have a firm grasp of algebra, the ability to calculate derivatives and integrals, and an understanding of discounting. If you feel you need to review material covered in V517 you can visit the web-page of professor Justin Ross's section of V517. Professor Ross has made a series of videos available to students covering topics such as principles of supply and demand, monopoly pricing, perfect competition, etc. You can access the course here: <https://iu.mediaspace.kaltura.com/channel/SPCN%2B517/165146301>

2. Readings and Materials

Required Text: There is no required text for this course. All readings can be accessed on Canvas unless otherwise noted. A few energy related resources that I highly recommend students familiarize themselves with are the Energy Institute at Haas Blog (<https://energyathaas.wordpress.com/>), the Resources Radio Podcast (<https://www.resources.org/resources-radio/>) run by Resources for the Future and the Volts Podcast (<https://www.volts.wtf/podcast>).

Canvas and other website information: All lecture notes, slides, assignment deadlines, readings and class grades will be posted on Canvas. Students are expected to check their Canvas web-site as well as their IU e-mail frequently and **stay up to date** with regards to the content that is posted there.

3. Course description

This course examines the economics of energy markets and policies, including analysis of energy supply and demand, various energy resources (e.g., coal, petroleum, natural gas, nuclear, renewables), energy efficiency, electricity markets and regulation, market failures, as well as the oil and transportation sector. Throughout the course of the semester, we will explore how the energy sector operates, and how and why these operations have historically been subject to government oversight and regulation. We will explore how government interventions—including taxes, subsidies, renewable energy mandates, rate regulations, as well as other policies—affect market conditions, and how these market conditions, in turn, affect operations in the energy sector. An important policy consideration in energy markets deals with the local pollution externalities they cause. This class will spend time analyzing those externalities and

students will be exposed to the use of Integrated Assessment Models that help monetize the damages from local pollution emitted through electricity generation and automobile use. Towards the end of the semester, we will discuss sources of uncertainty in energy policy and explore how they manifest themselves in the real world.

4. Learning Outcomes

After taking this course students will be able to:

- **Understand** the field of energy economics and policy, from a **domestic and international** perspective, and along the various **energy sectors** (electricity generation, transportation, industrial, residential).
- **Recognize** generalizable **economic principles** that hold true across many applications in energy policy.
- **Compare policy instruments** used in different sectors of energy policy.
- **Understand** the use of Integrated Assessment Models and learn to **apply** them to estimate damages derived from energy markets.
- **Critically assess** the interactions among **energy policy, instrument choice, and politics**.

5. Grading: Means of assessment

Class participation (15%): I expect that you come to class having completed and be ready to discuss the required readings assigned each week. In addition, I expect that you **engage and contribute** to class discussions and in-class group activities. Please note that attendance is not part of the grading schedule (i.e. no points simply for showing up for class). I allow **two absences** during the semester. You do not need to explain the reason of your absence unless it was due to a true emergency (in which case I would like to be informed about it). Other than those two absences, additional absences will have an impact on your participation grade. In the event of prolonged absences, I will allow students to request an adjustment to their participation grade weight. You will need to schedule a meeting with me by Friday April 25th at the latest, in order to discuss the specifics of that adjustment. The adjustment will include a reduction of the weight of your participation grade with a compensating increase in the weight of the final exam. This will ensure that your course grade is not negatively affected due to prolonged absences. In addition, in cases of prolonged absences due to health or family emergencies, I will consider your participation in the Canvas discussion forum (see relevant section below for details) as a substitute to your in-class participation. Any extraordinary circumstances will be handled on a case-by-case basis.

Please note that failure to observe the requirements listed in the class protocol section (please see below) will have a negative effect on your participation grade. In the middle of the semester, I will provide you with a preliminary participation grade (announced via Canvas) that will reflect an assessment of your in-class participation up to that point.

Weekly response papers (15%): You will have to submit **weekly response papers** based on each week's assigned readings. Response papers (RPs) will be due every Monday at 9am, and will be submitted via Canvas¹. Late submissions will be handled based on the late submission policy discussed below. For each RP you have to answer a list of questions that will prepare you to actively engage with the lectures each week. RPs will be graded on a pass/fail basis by the course TA and will all be weighted equally (each will

¹ The only exceptions will be RP#1 (week#1) that will be a trial (non-graded) assignment due on Wednesday 1/15 and RP#2 (week#2) that will be due on Wednesday 1/22 at 9am, since there is no class on Monday that week (Martin Luther King Jr. Day).

contribute just over 1% of your course grade). Since RPs are due before we cover the associated readings, I do not expect that your answers will be 100% correct. I do expect an honest effort towards addressing the RP questions, and a demonstration that you have thoroughly covered the assigned readings in your answers. So long as you accomplish that, you will receive full credit. Even though RPs receive a relatively low weight they are very important for your learning experience in this class. The questions I ask in the RPs will form the basis of our in-class discussions every week. Diligently working on your RP answers is a necessary condition for meaningfully contributing to class discussions and will help prepare you for the final exam. I will drop your lowest RP grade of the semester. Extraordinary circumstances will be handled on a case-by-case basis.

Problem sets (30%): Every other week you will have to complete a problem set based on the material we will cover in class. You may work together with your colleagues in completing each problem set and even submit your assignments as a team. There is a limit of two students per submission (if you choose to submit as a team). You can submit some problems sets on your own and others as part of a team. The only exception is problem set #1 (due on Friday Jan. 24th) that every student must submit independently (you can still work collaboratively with peers to complete PS#1, you just need to submit your own work). Other than PS#1, all other problem sets can be submitted as a team. You are welcome to switch teams over the semester as well as submit some problem sets on your own (eg. student A may submit PS#2 as a team with Student B, submit PS#3 individually, submit PS#4 as a team with student C, etc.). If you choose to submit as a team, only one team member must submit the team's answers on Canvas (listing the names of both teammates). The non-submitting team member must simply enter a note on Canvas indicating they are part of a team and list the name of their teammate. Teammates will receive the same grade for their submission. Each problem set will be weighed equally. The deadlines for each problem set are listed in the course outline (please see below for details). Late submissions will be handled based on the late submission policy discussed below. Unlike with weekly response papers, I will not drop any problem set grades.

Final Exam (40%): There will be a take home final exam (open book, open notes) at the end of the semester that will cover the material from the entire class. The exam will be distributed on Thursday May 1st at 9am and will be due at midnight on Wednesday May 7th. There will be no make-up final exam. Extraordinary circumstances will be handled on a case-by-case basis.

Late submission policy: Late assignments will receive grade deductions. Response papers and problem sets will receive a grade deduction of 1% for every hour past the deadline. For example, if a response paper is submitted at 1:30pm (instead of the 9am deadline), then the student will receive a grade deduction of 5%. Assignments submitted over 48 hours past the deadline will not be accepted and the student will receive a grade of zero for the assignment. Any extraordinary circumstances will be handled on a case-by-case basis. The final exam will have a unique set of late submission guidelines.

Deadline extension token: During the first week of class, I will ask you to upload a video, introducing yourself to your colleagues. This will be an optional submission. The students that upload a video will receive a deadline extension token (DET). The DET can be exchanged for one no-questions-asked 48 hour extension of any assignment during the semester. Simply e-mail the course TA (Lucas Giese), stating that you will use your DET for, say, response paper #8 and you will not receive any late penalties for submitting that assignment up-to 48 hours past the deadline. The token **cannot** be used for an extension of the final exam deadline. **If you want to use your DET for an extension to a problem set that you are working on with another classmate, both students need to apply their DETs towards the extension.**

Grade summary

| | |
|---|------|
| Weekly response papers (equally weighted) | 15% |
| Class participation | 15%* |
| Problem sets (equally weighted) | 30% |
| Final exam (cumulative) | 40%* |

*Students have the right to request an adjustment of their participation grade in the event of extraordinary circumstances (see class participation section above for details).

Your letter grade for this course will be calculated based on the following IU default scale:

| Letter grade | A+ | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | F |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Minimum Percentage | 97% | 93% | 90% | 87% | 83% | 80% | 77% | 73% | 70% | 67% | 63% | 60% | 0% |

6. Class Policies

Communication: I make every effort to respond to e-mails sent during business hours as soon as possible (usually within a few hours if not immediately). E-mails sent from students after 5pm will not be answered until the following business day. I do not respond to e-mails during the weekend. I will have the same expectations from you in terms of responding to my e-mails or to announcements posted on Canvas. Students are expected to use professional language when communicating with their instructor and teaching assistant and refrain from using informal salutations. Before asking a question about course assignments, deadlines or class policies, students are expected to carefully consult the course syllabus.

Availability/Office hours: The thing I enjoy most about teaching is interacting with students, learning from and about them. I am always happy to meet with students and discuss any issues regarding the course and the material we cover. Please use this link to set up an appointment with me: <https://calendly.com/nzirotia>. The course TA (Lucas Giese) will hold office hours on Wednesdays from 1- 2 p.m. in SPEA A206.

Class protocol: We have 75 minutes per lecture and I intend to use all of them. Please be on time and refrain from visiting with your classmates during the lecture. On my end, I will make sure never to keep you longer than 12:25pm. I do not appreciate students who arrive late for class, or those that start packing up their belongings 5 minutes before class is over. If you have any conflicting appointments before or after class please do let me know.

If you have a positive COVID-19 test, have COVID-like symptoms, or have been instructed to quarantine you should not attend class. While in-class participation is part of your grade for this course, I will make sure that prolonged absences will not affect your participation grade. This will be done using the following flexibility mechanisms:

1. I will consider adjusting your participation grade with an equivalent adjustment of your final exam grade.
2. I will allow students to contribute to the on-line Canvas discussion forum (see below for details) and use those contributions as evidence of in-class participation.

Lectures will be recorded and posted on Canvas a few hours after every class. This is an additional flexibility mechanism so that students don't miss out on important class material in the event of extended COVID related absences. That said, recorded lectures should not be considered a substitute for in-class participation. I do **not allow** students to attend class remotely or join lectures "live" via zoom.

I observe a very strict laptop policy. I reluctantly allow the use of laptops in class, although students should be aware that research has demonstrated negative learning impacts from laptop use in the classroom^{2,3,4}. You can use your laptop to take notes but for absolutely no other reason. Do not let the use of your laptop be a distraction for me or for your classmates. No texting or cell phone use of any kind is allowed during class. Please see me for any extraordinary circumstances.

Canvas Discussion forum: In order to facilitate out-of-class learning and engagement, I will make the “Discussion” feature of Canvas available to students. Students should feel free to post questions about the material, comment on the readings as well as respond to questions that have been asked by their peers. I will be monitoring the Canvas Discussion forum and will occasionally address questions that have been asked. Participation in the Canvas Discussion forum is optional. In the event of prolonged absences due to health-related issues, I will consider contributions to the Canvas discussion forum as evidence of in-class participation.

Use of Artificial Intelligence (A.I.) in this class: Using A.I. (such as ChatGPT) to assist you in completing assignments will be allowed in this class and will be treated like any other outside source. Just like with any outside source, students must use quotation marks and cite ChatGPT (if content is taken directly from ChatGPT) or cite ChatGPT without quotation marks (if the student uses ChatGPT’s “ideas”). If students use A.I. in an unauthorized manner, they will be committing plagiarism and will be subject to penalties in this class and sanctions by Indiana University as described in the IU student code cited above. Examples of how to cite A.I. tools can be found [here](#).

Accessible Educational Services (AES): Every attempt will be made to accommodate qualified students with disabilities (e.g. mental health, learning, chronic health, physical, hearing, vision neurological, etc.) You must have established your eligibility for support services through the appropriate office that services students with disabilities. Note that services are confidential, may take time to put into place and are not retroactive; 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 (web-page: <https://studentlife.indiana.edu/care-advocacy/iub-aes/index.html>). The office is located on the basement floor of Eigenmann Hall, #001. You can also locate a variety of campus resources for students and visitors that need assistance at: <https://accessibility.iu.edu/index.html>.*

Academic Integrity: Students are expected to be familiar with their rights, responsibilities and relevant procedures as described in the IU student code (<https://studentcode.iu.edu/index.html>). IU students are expected to: “*Respect the rights and dignity of other members of the university community*” (IU Student Code, 2023). Instances of academic misconduct (including but not limited to, cheating on an exam, plagiarizing in an assignment, etc.) will be handled pursuant to university policy as outlined in the IU student code: <http://studentcode.iu.edu/procedures/bloomington/discipline/academic-misconduct/index.html>

Note Selling: Several commercial services have approached students regarding selling class notes/study guides to their classmates. Selling the instructor’s notes/study guides in this course is not permitted. Violations of this policy will be reported to the Dean of Students as academic misconduct (violation of

² Sana, F., Weston, T., & Cepeda, N. J. (2013). Laptop multitasking hinders classroom learning for both users and nearby peers. *Computers & Education*, 62, 24-3.

³ Glass, A. L., & Kang, M. (2018). Dividing attention in the classroom reduces exam performance. *Educational Psychology*, 1-14.

⁴ <https://www.insidehighered.com/news/2018/07/27/class-cellphone-and-laptop-use-lowers-exam-scores-new-study-shows>

course rules). Sanctions for academic misconduct may include a failing grade on the assignment for which the notes/study guides are being sold, a reduction in your final course grade, or a failing grade in the course, among other possibilities. Additionally, you should know that selling a faculty member's notes/study guides individually or on behalf of one of these services using IU email, or via Canvas may also constitute a violation of IU information technology and IU intellectual property policies; additional consequences may result.

Online Course Materials: As the instructor of this course, I hold the exclusive right to distribute, modify, post, and reproduce course materials, including all written materials, study guides, lectures, assignments, exercises, and exams. While you are permitted to take notes on the online materials and lectures posted for this course for your personal use, you are not permitted to re-post in another forum, distribute, or reproduce content from this course without the express written permission of the faculty member. Any violation of this course rule will be reported to the appropriate university offices and officials, including to the Dean of Students as academic misconduct.

Equity Diversity and Inclusion: As the premier school of public and environmental affairs in the world, the O'Neill School recognizes that identifying solutions to complex and intersectional issues requires the inclusion of diverse voices. We aim to respect and elevate the voices of all community members, whose diverse perspectives span the dimensions of race and ethnicity, national origin, culture, and language; gender, gender identity, sexual orientation, and marital status; religion and political perspective; age; disability status; veteran status; and socioeconomic status. The O'Neill School values the engagement of all faculty, students, staff, alumni, and community members in these endeavors. The O'Neill Office of Equity, Diversity and Inclusion has numerous resources available on its web-site related to School and University wide policies <https://oneill.indiana.edu/about/diversity/>. One resource that I particularly recommend, is the "[First Steps Handbook](#)" on how to elevate voices, challenge perspectives and transform cultures.

Writing Tutorial Services (WTS): For free help at any phase of the writing process—from brainstorming to revising the final draft—visit the Writing Tutorial Services' (WTS, pronounced "wits") website: <https://wts.indiana.edu/>.

Library support services: IU Libraries provide one-on-one research help to all students. Chat: Ask a Librarian at <https://libraries.indiana.edu/help> | Email: libref@indiana.edu | Send a Text: 812.671.0275 | Call: 812.855.0100 | Zoom or in-person appointment: <https://libraries.indiana.edu/research-consultations> | Citations: libcite@indiana.edu

Free, individual digital subscriptions for all Bloomington students, staff and faculty are provided by the Libraries for the following publications: [The Wall Street Journal](#), the [New York Times](#) and the [Chronicle of Higher Education](#). You must use your IU identification to activate the accounts you wish to subscribe to through the Libraries' website.

7. Course Outline

This is a tentative reading list. I might add (or remove) readings along the way but will give you at least one weeks' notice if I do so. The outline is subject to limited change in the event of extenuating circumstances. All reading materials can be accessed on the "Readings materials" folder on Canvas unless otherwise noted.

Week #1 (1/13-1/15): Introduction, course logistics. History of the US electric grid

Stokes, L. (2020). *Short Circuiting Policy: Interest Groups and the Battle over Clean Energy and Climate Policy in the American States*. Oxford University Press

- Chapter 3: An Institutional History of Electricity Politics and Climate Inaction (pages 68-107)
- Borenstein, S. (2021). Can Net Metering Reform Fix the Rooftop Solar Cost Shift? Energy Institute at Haas Blog. Available on-line at: <https://energyathaas.wordpress.com/2021/01/25/can-net-metering-reform-fix-the-rooftop-solar-cost-shift/>

Week #2 (1/22: No class on 1/20-MLK Day): Fundamentals of Wholesale Electricity Markets. The Economics of Deregulation.

- Griffin, J.M., and Puller, S.L. (2009) A Primer on Electricity and the Economics of Deregulation (p. 1-23). From: Electricity Deregulation: Choices and Challenges, Griffin, J.M., and Puller, D.L. (eds.), The University of Chicago Press. Available as an e-book from the IU library here: <https://ebookcentral.proquest.com/lib/iub-ebooks/reader.action?docID=471817>
- FERC (2020). Energy Primer: A Handbook of Energy Market Basics.
- Chapter 3: Wholesale Electricity Markets (pages 35-69). *Note:* Pages 70-105 go over the various ISOs and RTOs. I will not cover them in detail in class.

Problem set #1 due on Friday Jan. 24th.

Week #3 (1/27-1/29): Electricity Pricing in the Wholesale and Retail Markets (Part I)

- Borenstein, S. (2000). Understanding Competitive Pricing and Market Power in Wholesale Electricity Markets. *The Electricity Journal*, 13(6), 49–57.
- Joskow, P. L. (2012). Creating a smarter U.S. Electricity grid. *Journal of Economic Perspectives*, 26(1), 29–48.
- Nock, D., & Baker, E. (2017). Unintended consequences of Northern Ireland’s renewable obligation policy. *The Electricity Journal*, 30, 47–54.
- Wilson, M. (2021). Fight Over “Peaker” Plants Poses Grid Climate Test. EnergyWire, Available at: <https://www.eenews.net/articles/fight-over-peaker-plants-poses-grid-climate-test/>

Week #4 (2/3-2/5): Electricity Pricing in the Wholesale and Retail Markets (Part II)

- Harding, M., & Sexton, S. (2017). Household Response to Time-Varying Electricity Prices. *Annual Review of Resource Economics*, 9, 337–359.
- Lyubich, E. (2020). The Race Gap in Residential Energy Expenditures. Working paper available at: https://evalyubich.com/files/race_energyGap.pdf
- Doremus, J. M., Jacqz, I., & Johnston, S. (2022). Sweating the energy bill: Extreme weather, poor households, and the energy spending gap. *Journal of Environmental Economics and Management*, 112, 102609.
- Davis, L. (2020). Four Facts about Covid and US Electricity Consumption. Energy Institute at Haas Blog. Available at: <https://energyathaas.wordpress.com/2020/11/09/four-facts-about-covid-and-u-s-electricity-consumption/>
- Borenstein, S. (2016). Is Electricity Pricing Different from “Real Markets”? Should it Be? Energy Institute at Haas Blog. Available at: <https://energyathaas.wordpress.com/2016/06/13/is-electricity-pricing-different-from-real-markets-should-it-be/>

Problem set #2 due on Friday Feb. 7th.

Week #5 (2/10-2/12): Electricity Pricing in the Wholesale and Retail Markets (Part III)

- Borenstein, S., & Bushnell, J. B. (2022). Do Two Electricity Pricing Wrongs Make a Right? Cost Recovery, Externalities, and Efficiency. *American Economic Journal: Economic Policy*, 14(4), 80–110.
- Cicala, S. (2022). Imperfect Markets versus Imperfect Regulation in US Electricity Generation. *American Economic Review*, 112(2), 409–411. <https://doi.org/10.1257/AER.20172034>

Week #6 (2/17-2/19): Energy Transition (Part I)

- Borenstein, S. (2012). The private and public economics of renewable electricity generation. *Journal of Economic Perspectives*, 26(1), 67–92.
- Butters, A. R., Dorsey, J., and Gowrisankaran, G. (2021). Soaking up the Sun: Battery Investment, Renewable Energy, and Market Equilibrium. National Bureau of Economic Research, Working Paper Series.
- Tomich, J. (2021). Grid Operators: Leading or Stalling the Energy Transition? Energywire (12/13/21). Available at: <https://www.eenews.net/articles/grid-operators-leading-or-stalling-the-energy-transition/>

Week #7 (2/24-2/26): Energy Transition (Part II)

- Davis, L. W., Hausman, C., & Rose, N. L. (2023). Transmission Impossible? Prospects for Decarbonizing the US Grid. *Journal of Economic Perspectives*, 37(4), 155–180.
- Rand et al. (2023). Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection as of the End of 2022. Lawrence Berkeley National Laboratory publications.

Problem set #3 due on Friday Feb. 28th.

Week #8 (3/3-3/5): Integrated Assessment Models: A Primer

- Banzhaf, H. S. (2022). The Value of Statistical Life: A Meta-Analysis of Meta-Analyses. *Journal of Benefit Cost Analysis*, 13(2), 182–197.
- Muller, N. Z., and Mendelsohn, R. (2012). Using Marginal Damages in Environmental Policy: A Study of Air Pollution in the US. The AEI Press, Washington D.C. Available as an e-book through the IU library here: <https://iucat.iu.edu/catalog/13506279>
- Chapters 2-4 (pages 27-66)

Week #9 (3/10-3/12): Mid-semester review

“Mock” exam question. No new material assigned this week.

Spring Break (3/17-3/19): No class**Week #10 (3/24-3/26): Integrated Assessment Models: Applications to Electricity Generation**

- Holland, S. P., Mansur, E. T., Muller, N. Z., & Yates, A. J. (2020). Decompositions and policy consequences of an extraordinary decline in air pollution from electricity generation. *American Economic Journal: Economic Policy*, 12(4), 244–74.
- Thind, M. P. S., Tessum, C. W., Azevedo, I. L., & Marshall, J. D. (2019). Fine Particulate Air Pollution from Electricity Generation in the US: Health Impacts by Race, Income, and Geography. *Environmental Science and Technology*, 53(23), 14010–14019

3/26: Guest lecture by [Cody Smith](#), Director of Climate Initiatives at the Iowa Environmental Council.

Problem set #4 due on Friday March 28th.

Week #11 (3/31-4/2): Benefit-Cost Analysis and Instrument Choice in Energy Markets

- Keohane and Olmstead (2016) Markets and the Environment. Available through the IU-Library at this link: <https://ebookcentral.proquest.com/lib/iub-ebooks/detail.action?docID=4787531>
- Chapter 2: Economic Efficiency and Environmental Protection (p. 11-34)
 - Chapter 3: The Benefits and Costs of Environmental Protection (p. 35-68).
- Perman, R., et al. (2011). Natural Resource and Environmental Economics, 4th edition. Pearson publishing
- Chapter 6: Pollution Control: Instruments (pages 177-228)

Week #12 (4/7-4/9): Uncertainty in Energy and Environmental Policy

Perman, R., et al. (2011). *Natural Resource and Environmental Economics*, 4th edition. Pearson publishing

- Chapter 7: Pollution policy with imperfect information (pages 229-250)

Shapiro, J. S., & Walker, R. (2020). Is Air Pollution Regulation Too Stringent. In *NBER Working Paper Series*.

Problem set #5 due on Friday April 11th.

Week #13 (4/14; 4/16): Oil markets and the Transportation sector

Baumeister, C., & Kilian, L. (2016). Forty years of oil price fluctuations: Why the price of oil may still surprise us. *Journal of Economic Perspectives*, 30(1), 139-60.

Burlig, F., Bushnell, J., Rapson, D., & Wolfram, C. (2021). Low Energy: Estimating Electric Vehicle Electricity Use. *AEA Papers and Proceedings*, 111, 430–435.

Lee, M., Anchondo, C., & Richards, H. (2020). Uncharted territory: Oil prices go negative for 1st time.

EnergyWire (E&E News). Available at: <https://www.eenews.net/stories/1062929285>

National Research Council (2015). *Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles*. Washington, DC: The National Academies Press.

- Chapter 9: Consumer Impacts and Acceptance Issues (p. 307-333)

Week #14 (4/21-4/23): Revenue Recycling and Carbon Pricing

Carl, J., & Fedor, D. (2016). Tracking global carbon revenues: A survey of carbon taxes versus cap-and-trade in the real world. *Energy Policy*, 96, 50–77.

Goulder, L. H., Hafstead, M. A. C., Kim, G., & Long, X. (2019). Impacts of a carbon tax across US household income groups: What are the equity-efficiency trade-offs? *Journal of Public Economics*, 175, 44–64.

Problem set #6 due on Friday April 25th.

Week #15 (4/28-4/30): Review for final exam

Review sessions on Monday 4/28 and Wednesday 4/30. The final exam will be made available on Canvas at 9am on Thursday May 1st and will be due on Wednesday May 7th at 11:59pm.

Week #16: Final exam

Final exam due on Wednesday May 7th at 11:59pm.

8. Additional Readings

The list below is an optional supplementary readings list. Students who are interested in digging deeper into a particular topic might find those readings useful. I might occasionally include materials from those additional readings in lecture slides and presentations, but I do not expect students to read those papers in advance. Readings listed below will not be made available on Canvas. Students can access them through the on-line journal link of the IU library (<https://one.iu.edu/task/iub/full-text-online-journals>). In case you are having trouble accessing any of the articles please consult an IU librarian at [this link](#) (e-mail, text, phone and on-line chat options available).

Weeks #1-#2: The history of the US electricity grid. Fundamentals of Wholesale Electricity Markets.

Griffin, J. M., & Puller, S. L. (2009). Introduction: A Primer on Electricity and the Economics of Deregulation.

In *Electricity Deregulation: Choices and Challenges* (pp. 1–27). Available as an e-book through the IU library at: <https://iucat.iu.edu/catalog/14617996>

Healy, P. M., & Palepu, K. G. (2003). The fall of Enron. *Journal of Economic Perspectives*, 17(2), 3–26.

<https://doi.org/10.1257/089533003765888403>

NYISO Interactive Learning Modules: <https://www.nyiso.com/online-learning>

NYISO Slideshows: <https://www.nyiso.com/course-materials> (Market Overview MT-101 has an overview of all the markets with slides 41-48 showing examples of the difference between day-ahead and real-time markets and slides 68-100 showing how congestion and losses factor into energy prices. NYMOC ALL MT-201 dives into each market in more detail)

CAISO: <http://www.caiso.com/participate/Pages/LearningCenter/default.aspx>

Virtual Fieldtrip to the IU Central Heating Plant. Hosted by Mark Menefee, Assistant Director of Utility Services at IU (available on Canvas).

Tabb, M., DelViscio, J., and Gawrylewski, A. (2021). What is a Smart Grid, and How Might One Protect Our Energy Future? *Scientific American*. Available at: <https://www.scientificamerican.com/video/what-is-a-smart-grid-and-how-might-one-protect-our-energy-future/>

Weeks #3-#5: Electricity Pricing in the Wholesale and Retail Markets

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Weeks #13: Oil Markets and the Transportation Sector

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Week #14: Revenue Recycling and Carbon Pricing

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9. Additional Information for Students

1. *TimelyCare*. IU students have free, 24/7 access to virtual mental health care services with TimelyCare. Students do not need insurance to access TimelyCare services.
<https://www.iu.edu/mental-health/find-resources/timely-care.html#0>
2. *Incompletes*. The grade of Incomplete used on the final grade reports indicates that the work is satisfactory as of the end of the semester but has not been completed. The grade of Incomplete may be given only when the completed portion of a student's work in the course is of passing quality. Instructors may award the grade of Incomplete upon a showing of such hardship to a student as would render it unjust to hold the student to the time limits previously fixed for the completion of his/her work. More information on incompletes is available here:
<https://policies.iu.edu/policies/aca-66-grades-and-grading/index.html>
3. *Late Withdrawal*. The auto-W deadline is NO LONGER THE LAST DAY OF CLASS (as it was during and post-Covid). After the auto-W deadline, withdrawal will be significantly limited and you will need permission to withdraw and must meet requirements established by the O'Neill School.
4. *Counseling and Psychological Services (CAPS)*: For information about services offered to students by CAPS: <http://healthcenter.indiana.edu/counseling/index.shtml>
5. *Bias Reporting*: Bias-based incident reports can be made by students, faculty and staff. Any act of discrimination or harassment based on race, ethnicity, religious affiliation, gender, gender identity, sexual orientation or disability can be reported through any of the options: *fill out an online report at* <https://reportincident.iu.edu/>, *2) call the Dean of Students Office at (812) 855-8187.*
6. *Sexual Misconduct and Title IX*: As your instructor, one of my responsibilities is to help create a safe learning environment on our campus. Title IX and our own Sexual Misconduct policy prohibit sexual misconduct. If you have experienced sexual misconduct, or know someone who has, the University can help.

If you are seeking help and would like to talk to someone confidentially, you can make an appointment with:

- i. The Sexual Assault Crisis Service (SACS) at 812-855-8900
- ii. Counseling and Psychological Services (CAPS) at 812-855-5711
- iii. Confidential Victim Advocates (CVA) at 812-856-2469
- iv. IU Health Center at 812-855-4011

For more information about available resources: <http://stopsexualviolence.iu.edu/help/index.html>. It is also important to know that federal regulations and University policy require me to promptly convey any information about potential sexual misconduct known to me to our campus' Deputy Title IX Coordinator or IU's Title IX Coordinator. In that event, they will work with a small number of others on campus to ensure that appropriate measures are taken and resources are made available to the student who may have been harmed. Protecting a student's privacy is of utmost concern, and all involved will only share information with those that need to know to ensure the University can respond and assist. I encourage you to visit <http://stopsexualviolence.iu.edu/help/index.html> to learn more.

7. Commitment to Diversity and Support: Find your home and community at IU

IU is home to a number of centers that foster community among students with specific ethnic backgrounds, gender identities, and sexual orientations. If you haven't already, find your campus community in one of the centers listed below:

| | |
|---|---|
| Asian Culture Center 807 East Tenth Street, Bloomington, IN 47408 Phone: 812-856-5361 Email: acc@indiana.edu https://asianresource.indiana.edu/index.html | First Nations Educational & Cultural Center 712 E 8th St., Bloomington, IN 47408 Phone: 812-855-4814 Email: fnecc@indiana.edu https://firstnations.indiana.edu/contact/index.html |
| LGBTQ+ Culture Center 705 E 7th St., Bloomington, Indiana 47408 Phone: 812-855-4252 Email: glbtserv@indiana.edu https://lgbtq.indiana.edu/contact/index.html | La Casa Latino Culture Center 715 E 7th St., Bloomington IN, 47408 Phone: 812-855-0174 Email: lacasa@indiana.edu Website: https://lacasa.indiana.edu/ |
| Neal Marshall Black Culture Center 275 N Jordan Ave Bloomington, Indiana 47405 Phone: 812-855-9271 Email: nmgrad@indiana.edu Website: https://blackculture.indiana.edu/index.html | Jewish Culture Center Address: 730 E 3rd St., Bloomington, Indiana 47401 Phone: 812-336-3824 Website: https://iuhillel.org/iu-jewish-culture-center |

8. Students in Financial Crisis: The Student Advocates Office can help students work through personal and academic problems as well as financial difficulties and concerns in order to help students progress towards earning a degree. In addition to advising student on appeal and financial issues such as financial aid or tuition, they also have emergency funds for IU students experiencing emergency financial crisis. <https://studentlife.indiana.edu/care-advocacy/advocates/help/financial-issues/index.html>

9. Emergency Food Relief

If you find you are in need of food and do not have the resources to purchase it, please consider utilizing the emergency food relief system on campus and in the community. The following units/agencies are here to assist with food relief:

- *Crimson Cupboard*: <https://studentaffairs.indiana.edu/student-support/crimson-cupboard/index.html>
- *Mother Hubbard's Cupboard Food Pantry*: <https://www.mhcfoodpantry.org/>
- *Other pantries*: <https://www.foodpantries.org/ci/in-bloomington>

10. Disclosure of Student Records: The 1974 Family Educational Rights & Privacy Act (known as "FERPA") protects the privacy of students' educational records and generally prohibits the release or disclosure of student records by school officials to any third party without the student's prior written consent. As your instructor I will ensure that, prior to communicating with parents or any third party about a student's educational records (including grades, papers, performance, etc.), and assuming that the student wants me to convey that information, I will have obtained the necessary prior written consent from the student. If the student fails to provide me with such written consent, then I will not be able to provide information on the student's educational records to their parents

or to any third party (please note that this is especially relevant in the event a student wants me to be listed as a reference in a job application, or wishes to obtain a recommendation letter from me).

11. Academic Integrity-Online Course Materials: The instructor holds the exclusive right to distribute, modify, post, and reproduce course materials, including all written materials, study guides, lectures, assignments, exercises, and exams. While you are permitted to take notes on the online materials and lectures posted for this course for your personal use, you are not permitted to re-post in another forum, distribute, or reproduce content from this course without the express written permission of the instructor. Any violation of this course rule will be reported to the appropriate university offices and officials, including to the Dean of Students as academic misconduct.
12. Religious Observances: In accordance with the Office of the Dean of Faculties, any student who wishes to receive an excused absence from class must submit a request form available from the Dean of Faculties for each day to be absent. This form must be presented to the course instructor by the end of the second week of this semester. A separate form must be submitted for each day. The instructor will fill in the bottom section of the form and then return the original to the student. Information about the policy on religious observation can be found at the following website: <https://policies.iu.edu/policies/aca-59-accommodation-religious-observances/index.html>