**The Institute on Energy, Economics, and the Environment:**

**A STEM Course**

**Summer 2022 June 12th-July 8th**

**Course Syllabus**

**Instructor Information**

Dr. Lori A. Dickes, Associate Chair, Graduate Programs Director, Department of Political Science, Clemson University. Director Masters in Public Administration program and Research Associate South Carolina Water Resources Center

**This course is supported by a generous grant from the Electric Cooperatives of South Carolina**

**Academic Credit**

Three graduate hours from the University of South Carolina will be awarded based on your successful completion of this course. Due to the shortened nature of this course, attendance in synchronous Zoom sessions along with participation in asynchronous sessions is mandatory.

**Textbooks:**

There are no textbooks for this course. All materials will be provided electronically and uploaded in a shared folder for students to access.

Other materials will be assigned and provided throughout the course. **Course readings are identified on page 6; all materials will be loaded in the class shared drive before the start of class.**

**Please see the detailed course calendar on pages 7-9.**

**Course Description:**

Integration of economics, energy  and environmental concepts across the middle level and high school science and math curriculum is the primary focus of this course.

Energy and Environmental issues have become increasingly salient as nations and communities reel from the effects of extreme weather and climate events like drought, flooding, record heat years, hurricanes, and others. As well, questions about how best to invest, use, allocate, and manage our nations and the globe's natural resources are increasingly prevalent. Legislators at every level of government, local government officials and many other organizations find themselves absorbed in diverse energy and environmental issues from solar and wind power to flooding to our changing demand for electric vehicles, amongst many others. In this rapidly changing environment, understanding the intersection of economics, energy and environmental decision making is increasingly critical for our youth.

This course will show science, math, and other enrichment teachers in the middle and high school grades how to integrate economic fundamentals across energy and environmental curriculum. Economics is a critical part of understanding the use, value, and management of any natural resource, and energy is no exception. Incorporating economics into energy and environmental topics broadens students' understanding of the science of energy by incorporating critical economic variables like reliability, affordability, sustainability, and others. The choices any society makes about how and which energy sources to invest in creates short-run and long-run economic consequences for individuals, firms, and nations that will last generations.

Specifically, this course will help teachers use economic concepts to provide their students with a more complete understanding of energy and related environmental issues. Specific economic concepts will be applied in classroom activities that demonstrate the role of economics across the field of energy and the environment more broadly. Printed materials, videos, podcasts and other on-line sources will be used to show teachers the many options available to them as they organize their own lessons integrating economics and energy into their courses. Lectures, hands-on class activities, discussions, guest speakers and other “project-based” complementary approaches to achieving these outcomes will be used.

This course will take place both in person and asynchronously online over 4 weeks (see detailed calendar below). **Teachers will be required to complete several asynchronous learning assignments in weeks 3 and 4. This will involve listening and reflecting on several podcasts, completion of a personal energy audit, and finally, developing their own curriculum unit with a minimum of 3-5 lessons due one week after our final class period.**

**Learning Outcomes:**

At the end of this course students will be able to do the following:

1. Identify and describe the different energy sources available and utilized across South Carolina and the world.
2. Understand trends and changing patterns in energy consumption and use in South Carolina and the world.
3. Classify and compare the costs and benefits of different energy sources related to their reliability, affordability and environmental stewardship.
4. Apply economic decision-making concepts, like scarcity, costs/benefits, supply and demand, and others to the field of energy and related environmental issues.
5. Develop project-based lessons that support both STEM and Common Core Standards integrating economics, energy and environmental issues.

**Grading Scale Undergrad:**

A 90 - 100

B 80 – 89.9

C 70 – 79.9

D 60-  69.9

F 0 - 59.9

**Grading Scale Graduate:**

A 90 - 100

B 80 – 89.9

C 70 – 79.9

F 0 - 69.9

**Grading Rubric:**

***This course is a graduate course and all students are expected to perform at a graduate level. Graduate level coursework requires more rigor and higher standards of evaluation. If you have any questions about this, please let me know.***

Both Undergraduates and Graduate students will complete the following assignments:

1. In-Class Participation: 25%
2. 2 Written Assignments: 20%
3. Energy Audit: 10%
4. Two blog posts based on classroom readings: 20%

**Graduate students will also be required to complete:**

1. Individual Curriculum Units (3-5 lesson plants): 25% (Total with above 100%)

**In place of the curriculum units, Undergraduate students will complete:**

1. Lesson Plan on Energy and Economics: 30% (Total with above 100%)

**Attendance Policy**

This is an intense summer course, and it is important to have all students’ full participation. Being present is critical to your success. **Class will meet for 6 full days in person** **which means 1 class is equivalent to 2.5 weeks.**

Given the condensed schedule, the following penalties apply to missed class time:

* Half a day- half a letter grade penalty
* Whole day- entire letter grade penalty

**If you have an emergency or an “excused” absence that we discuss and you clear with me, we can determine a way for you to make up some of the missed work and realize less of a penalty. I do understand that things happen:)**

**Description of Assignments**

1. ***Individual Curriculum Units***

The individual curriculum units will be composed of a minimum of 3 and no more than 5 lesson plans. The objective is to develop grade appropriate Science, Math or Social Studies lessons and activities into a coherent curriculum unit. It is strongly encouraged that you think about STEM related activities and instruction as you develop your lesson.

If your school district uses a template for lesson plans and units, you may use this. We are not specifying a specific template. Each lesson should approximate a class period or a little more. You must include all videos, handouts, PPTS etc. that another teacher might use to use this unit.

You will do these largely outside of class, though I am available by appointment anytime virtually. Your unit plans are due no later than **Thursday, July 7th, 2022, by midnight in our classroom Google Drive folder**.

The following are requirements of the curriculum units:

* The units should have an overriding theme that is clearly identified and summarized in the beginning of the unit. For example: Renewable Energy, Solar Energy, Conservation and Energy Efficiency, Transportation and Technology etc.
* At least one lesson must clearly integrate **economic** issues and/or decision-making tools into the unit.
* All activities must be included in the final unit. Presentations, links to videos, student handouts etc.
* The unit should include multi-media resources and appropriate links. Please make sure all links work.
* All source material must be appropriately documented with a references section.
* Please use 11 or 12 font and double or single spaced depending upon the organization of the document.
* You may use whichever citation style you feel most comfortable (MLA, APA, Chicago etc.), just please use one.
* All curriculum units will be uploaded to the SC Electric Cooperatives website.

***Undergraduate Lesson Plans***

This is the “final” assignment for undergraduate students that are taking the course. The requirements are as follows:

* Must be math or science focused.
* The unit should include at least 1 multi-media resource and appropriate links. Please make sure all links work.
* All source material must be appropriately documented with a references section.
* Must incorporate 1 or more SC Science, Math or Social Studies Standards.
* Please use 11 or 12 font and double or single spaced depending upon the organization of the document.
* You may use whichever citation style you feel most comfortable (MLA, APA, Chicago etc.), just please use one.

1. ***In Class Activities and Participation:***

Printed materials, videos, and online sources will be used to show teachers the many options available to them as they organize their own lessons integrating economics and energy into their courses. Lectures, hands-on class activities, discussions, and guest speakers are complementary approaches to achieving these outcomes.

 In class participation is a critical part of the course. There will be daily activities that require each student’s full attention. These will include, but are not limited to, group projects, presentations, debates and generally active engagement. All in-class activities will be graded for participation, but you must complete them and turn them in to receive a participation grade.

1. ***Written Assignments***

In addition to the curriculum unit, each teacher will complete a total of 4 written assignments and an individual energy audit. These assignments will be focused on guest speakers and assigned course readings and podcasts on topics of your choosing. These assignments will be broken up as follows:

* **Two written assignments covering the material presented by 2 of our guest lecturers during our in-person class time together.**

Your write-ups from two guest presentations should be no more than 2 pages each, size 12 font, double-spaced.  The idea of each assignment is to provide a summary of the speaker’s presentation, followed by 3-4 highlighted talking points. I define a talking point as something new you learned, a posed question, idea for future research, etc. that you have taken from the presentation. These talking points should not be presented as brief bullets, rather in the form of a few sentences describing the idea of your specific point. Please feel free to integrate examples or relevant personal experience.

**Your speaker assignments are due in our classroom Google Drive folder no later than Monday, June 20th at 5:00 pm.**

* **Two writing assignments from Week 2 and 3 reading and podcast list**

On page 9 of the syllabus there articles and podcasts identified from a wide range of sources related to course topics. You may choose 2 articles based on your interests. **After reading these, you will write 2 separate blog posts about each article.** Each blog post should be no more than 500 words, single spaced and may contain pictures, video links etc.

A blog tends to be written in more of a journal or diary style. A blog can include personal reflections and respectful and accurate commentary on issues or events. Think of this blog as a tool to share information, foster dialogue, and enhance critical thinking and ideas.

**Blog posts are due Friday, June 31st at midnight in our classroom Google Drive folder.**

* **Energy Audit Assignment**

A separate assignment sheet for this assignment will be shared in Week 2. This assignment will have several parts:

1. Read the following article - Peter Miller, “It Starts at home,” *National Geographic Magazine*, March 2009.
2. Watch the following video: ***The Great Energy Gamble:*** https://www.schooltube.com/video/683a0cde1bf54d4a8c84/PBS%20NOVA:%20The%20Big%20 Energy%20Gamble
3. Keep an Energy Diary from **Sunday, June 19th– Saturday, July 25th**. This Diary should include the following for each day in a well-organized table or spreadsheet.
	1. Did you drive? How far did you drive?
	2. What electric or gas-powered appliances did you use each day and approximately for how long?
	3. Did you use any public transportation, carpooling, or make any efforts to conserve?
	4. Did you buy gas this week? How many gallons?
4. At the end of the week, please develop a 2-3-page reflection on your own energy usage and what you have learned from this project?

Focus on ways you think you could reduce your energy consumption or develop energy efficiency measures in your home.

1. Complete the home energy audit worksheet as a part of the final part of this assignment

**Your home energy audit, reflection paper and home energy worksheet are due Tuesday, June 28th by 5:00 pm.**

**Course Calendar**

**Week 1: June 12th-17th, 2022**

**We will spend Sunday, June 12th-Friday, June 17th on The University of South Carolina Campus. All housing and food costs are covered.**

**Information and directions to field trips will be handed out/discussed the first morning of class.**

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| **Readings Before Class** | 1. The Power of Incentives by Dwight Lee-Why are incentives important?
2. Defining the Value of the Cooperative Business Model, Anne Reynolds, Assistant Director of the Center for Cooperatives University of Wisconsin.  http://www.uwcc.wisc.edu/pdf/Reynolds\_WhitePaper\_values.pdf
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|  | **Sunday, June 12th** |
| 12:00 pm- 1:30 pm | Check in at USC dorms  |
| 2:00-2:30 | Welcome, Introductions and Syllabus Review |
| 2:30-3:45 | Introduction to Economics, Key Principles |
| 3:45:4:00 | Break |
| 4:00-5:00 | Discussion of Readings and Thinking like and Economist |
| **Readings For Monday** | 1. *The Regional Economist, The Federal Reserve Bank of St. Louis.*  “Rockets and Feathers, Why Don’t Gasoline Prices Always Move in Sync with Oil Prices?” by Michael Owyang and E. Katarina Vermann. October 2014, pgs. 4-9.
2. The Economist Magazine. December 2014 edition:

“Sheikhs vs. Shale,” pg. 17 |
|  | **Monday, June 13th** |
| 8:30-9:30 am | The Energy Quiz The PACED MODEL: Candy Bars as a source of Energy |
| 9:30-10:00 am | Readings Discussion and Beginning to Discuss Supply and Demand |
| 10:00-10:15 am | Break |  |
| 10:15- 11:30 am | Group Activity- Supply and Demand Redux, Graphing and Energy Examples |  |
| 11:30-12:45 | Lunch |  |
| 1:00-2:00 pm | Solar Smores☺  |  |
| 2:00-3:00 pm | **Speaker: Jochen Lauterbach: US vs German Electricity Generation: Emissions and Emissions Reduction Technologies** |  |
| 3:00-3:15 pm | Break |  |
| 3:15-4:30 pm  | How we use energy, sources, geography, and such. The Energy Information Administration and other sources |  |
| 4:30-5:15 | Discussion of readings and review of the day. Assignments for Wednesday |  |
| ***Readings for Tuesday*** | 1. The Economist Magazine. January 17-23, 2015, edition:

“Seize the Day,” pg. 91. The Economist Magazine. November 26, 2016, edition:

“Breaking the Habit,” pgs. 3-5 |  |
|  | **Tuesday, June 14th** |  |
| 8:30-9:30  | Group work on energy sources |  |
| 10:00- 11:00 | **Speaker #2** |  |
| 11:15- 12:15 | What is a public good? Can you rank your favorite public goods? |  |
| **FIELD TRIP****1:00-4:00 pm** | Location TBA-  |  |
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| **Readings for Wednesday** | 1. The Economist Magazine. January 17-23rd 2015 edition: “We make our own.” pgs. 6-8 - Special Report Section.
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|  | **Wednesday, June 15th** |  |
| 8:30-10:00 am | Group Presentations on Energy Sources |  |
| 10:00-10:15 am | Break |  |
| 10:15-11:00 pm | Externalities, the Environment and Energy? What are they and how do we deal with them? |  |
| 11:00-12:00 | **Speaker #3** |  |
| 12:15-1:15 | Lunch |  |
| 1:30-2:30 | Hands on Fun with Gina Varat and Suzanne Nagy- Enlighten SC and all things Energy                                                                                                       |  |
| 2:30-2:45 | Break |  |
| 2:45-4:15 | Common resources and markets, is there an equilibrium; activity on externalities, public goods, and common resources. |  |
| 4:30-5:15 | Debrief on the day and readings |  |
| **Readings for Thursday** | 1. The Economist Magazine. “The dream that failed.” March 10, 2012.
2. The Economist Magazine. “From oiloholics to e-totalers.” November 26, 2016. Pgs. 8-9.
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|  | **Thursday, June 16th** |  |
| 8:30-9:30 am | Peak Oil-What is it? What is Next for Energy? |  |
| 9:30-10:30 am | **Speaker #4** |  |
| 10:30-10:45 am | Break |  |
| 10:45-12:00 pm | Markets rock but what about monopolies and oligopolies?           Is the energy market perfectly competitive? OPEC, Nuclear?? |  |
| 12:00-12:45 pm | Boxed Lunches |  |
| 1:00- 4:00-pm | Field Trip |  |
| **Readings for Friday** | The Economist Magazine. January 17-23rd 2015 edition: “A Brightening Continent,” pgs. 8-9 - Special Report Section.The Economist Magazine. “Into the Twilight Zone.” November 26, 2016. Pgs. 11- |  |
|  | **Friday, June 17th** |  |
| 8:30-9:30  | **Speaker #5** |  |
| 9:30-10:30  | Let’s talk transportation, energy, and markets |  |
| 10:30-10:45 | Break |  |
| 10:45-11:45  | Trash and energy? Let’s play Dumptown |  |
| 11:45-1:00 | Lunch |  |
| 1:00-2:00  | Electric Vehicles- market disruptions- solar car fun |  |
| 2:00-3:00 | **Speaker #6** |  |
| 3:00-3:15 | Break |  |
| 3:15-4:30  | Brief presentations on ways to reduce driving, trash production, home and/or business energy usage? |  |
| 4:30-5:30  | Course evaluations, wrap up of other activities that we have not concluded |  |

**Week 2: June 19th- 25th**

Week 2 involves independent readings, home audit, development of individual blog posts and research for your final curriculum unit. Virtual advising on any class assignment is available.

**Week 3: June 26th- July 2nd**

Week 3 involves turning in individual blog posts and your home audit. Final work on curriculum units will occur this week. Virtual advising on any class assignment is available.

**Week 4: July 3rd- July 9th**

Your primary assignment is to complete your individual curriculum units. Each curriculum unit must have a minimum of 3-5 lessons included with appropriate activities and attachments. Dr. Dickes will be available for consultation online as needed.

**Assignment Due Dates-** ALL Final Drafts assignments are due on the day and time listed below. Please upload all assignments to our classroom Google Drive folder by the assigned time and date.

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| --- | --- |
| **Monday, June 20th 5:00 pm** | **Speaker reflection papers due** |
| **Tuesday, June 28th 5:00 pm** | **Home audit and reflection paper due** |
| **Friday, June 31st midnight** | **Blog posts on readings due** |
| **Thursday, July 7th- midnight** | **Final curriculum units due** |

**Additional Resources**

1. Energy audit activity video [http://www.pbs.org/wgbh/nova/education/video/ht/w-3519-energy-01- 220.html](http://www.pbs.org/wgbh/nova/education/video/ht/w-3519-energy-01-220.html)
2. Energy Quest <http://www.energyquest.ca.gov/teachers_resources/lesson_plans.html>
3. Florida Solar Energy Center <http://www.fsec.ucf.edu/en/education/k-12/curricula/index.htm>
4. Miami Museum of Science: <http://www.miamisci.org/af/sln/>The Atoms Family
5. National Center for Case Study Teaching in Science. <http://sciencecases.lib.buffalo.edu/cs/>
6. NOVA. [www.pbs.org.](http://www.pbs.org/)
7. US Department of Energy. Database of State Incentives for Renewable Energy. <http://www.dsireusa.org/>
8. US Energy Information Administration <http://www.eia.doe.gov/kids/energy.cfm?page=1>

**Readings and Podcasts for Class:**

**All readings will be loaded into our classroom shared drive-in advance of the start of class.**

**Week One**

1. The Power of Incentives by Dwight Lee-Why are incentive important?
2. Defining the Value of the Cooperative Business Model, Anne Reynolds, Assistant Director of the Center for Cooperatives University of Wisconsin. <http://www.uwcc.wisc.edu/pdf/Reynolds_WhitePaper_values.pdf>
3. White Paper on Carbon Economy- Day 1 and 2

4.. Miller Center of Public Affairs. “America’s Energy Future: Balancing Renewable Power and Carbon Fuel.” Jonathan Z. Cannon and Michael R. Bucy. <http://teacherweb.com/NY/marlborohighschool/MrVentriglia/AmericasEnergyFuture.pdf>

1. *The Regional Economist, The Federal Reserve Bank of St. Louis.* “Rockets and Feathers, Why Don’t Gasoline Prices Always Movie in Sync with Oil Prices?” by Michael Owyang and E. Katarina Vermann. October 2014, pgs. 4-9.

**Weeks Two – Four Readings**

* The Economist Magazine. January 17-23rd 2015 edition: “Seize the day,” pg. 9
* The Economist Magazine. January 17-23rd 2015 edition: “Let there be light,” pg. 3
* The Economist Magazine. January 17-23rd 2015 edition: “We make our own.” pgs. 6-8 - Special Report Section.
* The Economist Magazine. January 17-23rd 2015 edition: “A Brightening Continent.” pgs. 8-9 - Special Report Section.
* The Economist Magazine. January 17-23rd 2015 edition: “Invisible Fuel.” pgs. 11-12 - Special Report Section.
* The Economist Magazine. “From oiloholics to e-totalers.” November 26, 2016. Pgs. 8-9.
* The Economist Magazine. “Breaking the Habit.” November 26, 2016. Pgs. 3-5
* The Economist Magazine. “Into the Twilight Zone.” November 26, 2016. Pgs. 11-12
* The Economist Magazine. “The Dream That Failed.” March 10, 2012. Pgs. 1-3
* The Economist Magazine. “Blow Ups Happen.” March 10, 2012. Pgs. 1-6
* The Economist Magazine. “Charging Ahead, The Future of Cars.” April 20, 2019. Pgs. 57-59

**Academic Integrity:** All students must review the policies on Academic Integrity. This information can be found at [https://www.sa.sc.edu/academicintegrity/](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.sa.sc.edu_academicintegrity_&d=DwMFAg&c=Ngd-ta5yRYsqeUsEDgxhcqsYYY1Xs5ogLxWPA_2Wlc4&r=kUyyUVN5GOvsCqdtbYhqpJevk5lswEyp5E_5pBLNuss&m=Iz05FwJox0emnJa-eLtOC9p0EVhsAif4x82WK4KgCkw&s=tBmeYfgZl9xZwOxh3ct0XaQzeZFYGF47z9ah8Z5CnXs&e) . It should be noted that submitting someone else’s work is cheating and against the Carolina Code. Cheating, or any other Academic Integrity violations, may result in failure of the course for all involved parties. All parties will also be referred to the Office of Academic Integrity for additional retribution.

As a member of the professional development community, participants are expected to evidence a high standard of personal conduct, respect, and honorable professional characteristics in the presentation of their course assignments and interaction with class peers.

**Disability Statement:** Any student with a documented disability should contact the Office of Student Disability Services at 803-777-6142 to make arrangements for appropriate accommodations. The instructor will work to make all accommodations necessary for student success.