**The Institute on Energy, Economics, and the Environment: A STEM Course Summer 2023 June 11th-July 16th**

**Course Syllabus**

**Instructor Information**

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**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 pages 5-6; 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 globes 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

for many 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 -5, with final lesson and unit plans due in week 5. 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 plans.**

**Learning Outcomes:**

At the end of this course students will be able:

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: 15%
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): 30% (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 5.5 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- whole 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 really do understand that things happen.

**Description of Assignments**

### 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 even though I am available by appointment anytime virtually. Your unit plans are due no later than **Sunday, July 9th, 2023, 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 resources 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 Standard
  + 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.

### 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 the following: short team presentations, lesson scavenger hunts, experiments, class debates and others.**

Your active engagement in critical. All in-class activities will be graded for participation; you must complete them and turn them in to receive a participation grade**.**

### Written Assignments

In addition to the curriculum unit, each teacher will complete a total of 2 short written assignments and an individual, home 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:

## One written assignment covering the material presented by 1 of our guest lecturers during our in-person class time together.

Your write-ups from one guest presentation should be no more than 2 pages, 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 but 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 Wednesday,

**June 21st at midnight.**

* **1 blog writing assignments from Week 2 and 3 reading and podcast list.**

Throughout the syllabus are listed articles and podcasts identified from a wide range of sources related to course topics. **You may choose 1 article or podcast based on your interests.**

* 1. Based on the thing you read or listened to about each article, you will write a separate blog post. Each blog post should be no more than 500 words, single spaced and may contain pictures, video links etc.
  2. I will post all of the blogs on a shared Google document and each student should respond with a 200–300-word response to at least one other student’s original blog post.

A blog tends to be written in more of a journal or diary style. A blog can include personal reflections, 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.

## Primary Blog Post due – Friday, June 23rd- midnight

## Secondary Blog Post due- Monday, July 3rd- midnight

* **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 25th – Saturday, July 1st**. 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?
  5. Focus on ways you think you could reduce your energy consumption or develop energy efficiency measures in your home. What is hard about reducing energy consumption? What is easy?

## Your home energy audit and reflection paper are due no later than Friday, July 7th by 5:00 pm. Please note, I know this is the week of July 4th. You are welcome to turn this assignment in early and/or complete your audit over the week prior to this week. BUT Please turn in your audit no later than July 7th.

**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 date and time. If you need a bit more time on any of these just please let me know.

|  |  |
| --- | --- |
| **Wednesday, June 21st, midnight** | **Speaker reflection papers due** |
| **Friday, July 7th - 5:00 pm.** | **Home audit and reflection paper due** |
| Primary Post due – Friday, June 23rd- midnightSecondary Post due- Monday, July 3rd- midnight | **Blog posts on readings due** |
| **Sunday, July 9th- midnight** | **Final curriculum units due** |

**Course Calendar**

**Week 1: June 11th-16th, 2023**

**We will spend Sunday, June 11th-Friday, June 16th on The University of South Carolina Campus. All on-campus housing and food costs are covered. Information and directions to field trips will be handed out/discussed during the first-class period.**

|  |  |
| --- | --- |
| **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> |
|  | **Sunday, June 11th** |
| 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.   *Reading Question? What are the major drivers of gas prices?* |
|  | **Monday, June 12th** |
| 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- Team work on energy sources. 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. 9 2. The Economist Magazine. November 26, 2016, edition: “Breaking the Habit,” pgs. 3-5 |
|  | **Tuesday, June 13th** |
| 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** | Location TBA- |
| **1:00-4:00**  **pm** | Richland County Landfill |
| **Readings for Wednesday** | 1. The Economist Magazine. January 17-23rd 2015 edition: “We make our own.” pgs. 6-8 - Special Report Section. |
|  | **Wednesday, June 14th** |
| 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 |
| 1:30-2:45 | Some hands-on Fun – oil spill experiment. Why do we have fewer oil spills? |
| 2:45-3:00 | Break |
| 3:00-4:45 | Enlighten SC Website and Scavenger Hunt – Teacher Teams  Shared conversation on Lesson Plans and Resources |
| 4:45-5:15 | 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. |
|  | **Thursday, June 15th** |
| 8:30-9:30 am | Peak Oil-What is it? What is Next for Energy? |
| 9:45-11:15  am | Hands on Fun with Gina Varat and Suzanne Nagy- Enlighten SC and all things Energy |
| 11:15-11:30 | Break |
| 11:30 -12:00  pm | Begin discussion on markets rock but what about monopolies and oligopolies?  Is the energy market perfectly competitive? OPEC, Nuclear?? |
| 12:15-12:45  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 16th** |
| 8:30-9:30 | **Speaker #4** |
| 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 #5** |
| 3:00-3:15 | Break |
| 3:15-4:30 | 3 Minute thesis on ways to reduce energy usage at home, school and work. |
| 4:30-5:30 | Course evaluations, wrap up of other activities that we have not concluded |

# WEEKS 2-5 OVERVIEW

# Week 2: June 18th- 24th

Week 2 involves independent readings, speaker reflection papers, work on your 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 25th- July 1st

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

# Week 4: July 2nd- July 8th

Your primary assignment is to complete your individual curriculum units to turn in early the next week. 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.

**Week 5: July 9th- July 14th:**

Your curriculum units are due Sunday, July 9th. This is your last week of class so please turn in any assignments that you may have missed.

**Additional Resources**

1. Energy audit activity video [http://www.pbs.org/wgbh/nova/education/video/ht/w-3519-energy-01-](http://www.pbs.org/wgbh/nova/education/video/ht/w-3519-energy-01-220.html) [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>

*5. 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
  + he 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 polices on Academic Integrity. This information can be found at may 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.