

## ***Energy Choices for the 21<sup>st</sup> Century***



*Are you confused by all the talk about fracking, tar sands, the Keystone Pipeline, the proposed Blue Castle nuclear power plant in Green River, or climate change? Do you wonder why we haven't done more to develop our abundant renewable resources? Can we achieve sustainability?*

*Come and explore Geography 3368 – Energy **Choices for the 21<sup>st</sup> Century** – and learn the truth about Energy – the single factor that may have the greatest impact on your lives and those of your children!*

## SYLLABUS

### **Geography 3368/5368** **Energy Choices for the 21<sup>st</sup> Century** **Fall Semester 2016** **Syllabus**

#### **Course Title and Numbers:**

**Energy Choices for the 21<sup>st</sup> Century**

#### **Also taught as:**

Geology 3368/5368

Environmental and Sustainability Studies 3368

**Prerequisites:** A basic knowledge of algebra is a prerequisite; calculus is not required.

**On-line Class:** This class will utilize the Canvas system for class materials, videos, discussions, and quizzes.

#### **Credit Hours:**

Three (3) credit hours.

**Fulfills the Gen Ed requirement for Physical/Life Science Exploration.**

Fulfills the requirement for Climate Change emphasis.

Is a required choice for the Urban Systems, Location & Resilience emphasis.

It is on the related course list for the Integrated Certificate in Sustainability.

#### **Meeting Times and Locations:**

This class is taught online, utilizing the University of Utah Canvas system. Mid-term and Final exams will also be taken on-line. Professors will be available for, and encourage, one-on-one and/or group meetings with students.

#### **Faculty Office Number, Location and Hours:**

**Instructor:** Dr. Jack Hamilton holds degrees in geology, geochemistry, and environmental management. He was the first Director of the Energy Commercialization Center at the University of Utah and is Adjunct Associate Professor in Geography. Dr. Hamilton worked for the first 15 years of his career as a petroleum geologist for Texaco and The Dow Chemical Company. Subsequently, he managed regional offices for several national environmental consulting firms before coming to the University in 1998. He taught the Energy Resources class in the Department of Metallurgical Engineering for nine years and has been a frequent guest lecturer on the topic of energy.

**Office Hours:** Dr. Hamilton's office is located in Room 180B of Orson Spenser Hall (OSH). Meetings with students will be by appointment. The preferred phone number is 801-403-7952 (cell), and email is [jack.hamilton@utah.edu](mailto:jack.hamilton@utah.edu).

**Co-instructor:** Dr. Ola Opara. Dr. Opara holds degrees in environmental protection and management, and environmental engineering, earned through the interdisciplinary Environmental Engineering

Graduate Program at the Department of Metallurgical Engineering.

**Office Hours:** Dr. Opara's office is located in Room 180B of Orson Spenser Hall (OSH). Meetings with students will be by appointment. The preferred phone number is 801-230-6096 (cell), and email is [opara.ola@gmail.com](mailto:opara.ola@gmail.com).

**Course Description:**

This class is designed to give students an introduction to the critical energy issues facing our planet, with a focus on controversial topics and issues in Utah. These will include: hydraulic fracturing (fracking), offshore oil and gas development, oil shale and tar sand development, nuclear energy (with particular regard to the proposed Blue Castle nuclear plant in Green River and storage of radioactive waste in Utah), wind, solar and geothermal energy (again, with emphasis on Utah), other renewable technologies, the Smartgrid, difficulties in commercializing new energy technologies, air pollution, transportation choices, energy policy development, and global issues including population dynamics, climate change, carbon management, water resources, the Law of Unintended Consequences, and tipping points. A number of outstanding guest lecturers will provide expertise in their respective fields through videos.

A basic knowledge of algebra is a prerequisite; calculus is not required.

The class will be taught in five learning modules, as shown:

1. Energy Basics, Heat, Engines and Electricity
2. Fossil Fuels: Oil, Gas and Coal; Unconventional Fossil Fuels: Unconventional Natural Gas, Fracking, Oil Shale, Oil (Tar) Sands, Transportation, Air Pollution and Conservation
3. Nuclear Energy & Nuclear Issues in Utah
4. Renewables: Wind, Geothermal and Biomass, Solar and Hydro
5. Sustainability and Global Climate Change & Carbon Management

This table outlines the principal work elements for Energy Choices for the 21<sup>st</sup> Century. The book we will be using is Energy & the Environment – Choices and Challenges in a Changing World, by Reza Toossi, 2<sup>nd</sup> Edition, and reading page numbers are given for that edition. If a section ends in the middle of a page, you can decide where the section logically ends. You are expected to read the intro and the summary for each section. You are not required to read or do the math problems unless specifically instructed to do so; of course, you may do them, if you like. The required math (there is not much) will be discussed and made clear in the videos and supplemental information.

Not all the material in the book is essential to the class, but you may, of course, read any additional material that interests you. It is permissible for students to use other, similar text books, however, it will be up to the student to make sure that the same material is covered. The Toossi book is available as an on line book at approximately half the price of the hard copy.

In addition to the book, you will have PowerPoint videos to watch on all the topics. Some of these videos are broken into several pieces to make them more digestible, however, the required video consists of all the pieces under the same name. The PowerPoint videos that are required are shown in red on this chart. The primary content focus of the class and the exams is based on the videos, therefore, you are strongly encouraged to watch the videos first, and then read the book so you will know and can concentrate on the material that is deemed most important.

You will also have two movies to watch – one on Kentucky Coal and one on Wind – and an online game to play. There will be on line discussions where you will be expected to work with other students. Students are encouraged to share their opinions and experiences and will critique other students in a constructive, collaborative manner. There will be a field trip to visit the nuclear reactor on the University campus. It will be scheduled in the afternoon so as many students as possible can participate.

The class will be taught as an on-line class, with online videos of the lectures and online class discussions.

There will be an online homework quiz at the conclusion of each learning module that the students will complete. Answers and comments will be posted on Canvas and feedback will be given so the students will use the quiz as a learning mechanism.

There will be online discussions during each learning module where students will interact with each other and the instructors to discuss and address questions and current events related to that subject matter. The professor will audit and help guide the discussion, pose questions and make comments as appropriate. Students will be required to participate in the discussion groups and will be graded on their responses. Students will be expected to track energy-related news through various media and be prepared to analyze and discuss the issues in the context of the course curriculum. The specific Learning Modules are listed above. Group projects within the discussion group will be encouraged. Feedback will be provided on individual and group discussions. Professors are always available for and encourage face-to-face meetings with students.

**Texts:**

Energy and the Environment, Second Edition, Choices and Challenges in a Changing World, Reza Toosi, Verve Publishers. Also available on line at 50% the cost of the hard copy at <http://www.vervepublishers.com/toosi/ee2011> .

**Evaluation Methods and Criteria:**

All test questions will be covered in the lecture materials and reviewed prior to exams. Lecture videos and PowerPoints will be posted on University of Utah Canvas system. A typical exam will have two to three problems to solve, two to three short essay questions, and several multiple choice, fill-in-the-blank, or true/false question groups. The Mid-term exam will cover only the material covered in that section of the class; approximately half of the Final Exam will cover material covered in the second half of the class. The other half of the questions will cover the entire semester.

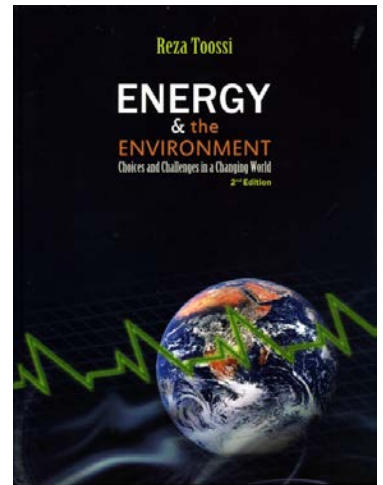
Independent and creative thinking is a primary criterion in online discussion group grading. Accuracy, depth and quality of research are the second most important criteria, and grammar, organization and presentation is third. A confidential survey is presented at the end of the final exam to assist the professors in improving the online process, although student input is appreciated at any time.

Final grades will be scaled on a curve.

**Grading:**

Module Quizzes

15%



Online Discussion Groups	25%
Midterm Exam	30%
Final Exam	30%

Students taking the course at the 5000 level will be held to a higher standard of performance, will be expected to take a leadership role in student discussions and projects, and may be asked to assist in mentoring other students.

**Course Objectives:**

At the end of the course, students will be able to:

1. Apply a working knowledge of energy: what it is, units of energy and how to convert from one form to another, different forms of energy (mechanical, chemical, heat, etc.), the First and Second Law of Thermodynamics and will be able to differentiate the energy use sectors (e.g., transportation vs. electricity production vs. residential heating and cooling) and how different energy resources are better suited for different purposes.
2. Compare and evaluate energy resources (fossil fuels, nuclear, renewables – wind, solar, geothermal and hydro) particularly with respect to Utah, how much energy each can realistically provide and identify the advantages and disadvantages of each resource. Applying the principle of "unintended consequences" and the fact that there are always unintended and unanticipated consequences that may overwhelm the intended consequence. They will discover that there are no "good" and "bad" energy resources and that a sustainable future will require diversified energy production with proper environmental regulations.
3. Evaluate the global distribution and geopolitics of energy resources and be able to critique and analyze energy policy, how and why it's made, and how we can develop energy policies that will sustain us and our children through the next century. They will analyze how scientific facts and controversies are presented in the public forum, and how to interpret and judge critically important issues like global climate change, the Keystone XL Pipeline, carbon management, hydraulic fracturing, wilderness preservation and renewable energy.
4. Solve everyday issues in their lives with practical knowledge about things like conservation, selecting the right automobile, knowing what an energy efficient home is and how to make a home more energy-efficient through design, insulation and other methods.
5. Collaborate with other students through the online experience to enhance learning through teamwork, leadership and group discussion, and will demonstrate their knowledge through homework, exams, and particularly in the online discussion groups where collaboration will be encouraged: Communicate; assist each other; organize response.
6. Integrate all of the above into a functional knowledge and appreciation of energy, why we need it and how we can pursue it in a way that considers all the facets of sustainability: the ecological footprint, a skyrocketing global population, what sustainability really means and how we can change to achieve it in a context that will help the student chart a life-path that will incorporate the principles of environmental justice and sustainability.

Student will acquire skills and knowledge that they can use in their everyday lives. They will be able to read and interpret energy news in the context of a global community where energy demand may soon



exceed supply. They will also be able to realistically evaluate alternative energy resources and plan conservation measures and lifestyle changes that can help create a sustainable future. They will gain immediately applicable skills like knowing how to calculate the R-value of insulation, choose an energy-efficient home, select an automobile or reduce air pollution.

### **Teaching and Learning Methods:**

The primary teaching methods are: 1) online lecture videos, 2) online homework assignments with feedback, and 3) online class discussions using the University Canvas system. All exam questions will be covered in the lecture materials. Copies of all lecture PowerPoint presentations, other related materials, and homework will be available on-line on University of Utah Canvas. The Canvas system will be utilized as much as possible to foster student collaboration and to provide feedback to individual students and the group.

### **Key to Success in this Class:**

The University expects regular “attendance at all class meeting” – in this case, that means participation in all online activities in accordance with the class schedule. Students are responsible for acquainting themselves with, and satisfying, the entire range of academic objectives and requirements as defined by the instructor.

Your best strategy for success is to watch all video presentations, make sure you understand the homework assignments and ask questions if you don’t, and to participate actively in the group discussions! All test questions will have been covered in the videos and class discussions. A comprehensive review will be given prior to exams. Both professors are available to provide individual assistance to students.

### **ADA Statement:**

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to the Center for Disability Services. \

### **Student Support:**

1. If you are a **student veteran**, the U of Utah has a Veterans Support Center on campus. They are located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: <http://veteranscenter.utah.edu/>. Please also let me know if you need any additional support in this class for any reason.
2. If you are a member of the **LGBTQ community**, I want you to know that my classroom is a safe zone. Additionally, please know that the U of Utah has an LGBT Resource Center on campus. They are located in Room 409 in the Oplin Union Building. Hours: M-F 8-5pm. You can visit their website to find more information about the support they can offer, a list of events through the center and links to additional resources: <http://lgbt.utah.edu/>. Please also let me know if there is any additional support you need in this class.
3. If **English is your second language**, please be aware of several resources on campus that will support you with your language development and writing. These resources include: the

Department of Linguistics ESL Program (<http://linguistics.utah.edu/esl-program/>); the Writing Center (<http://writingcenter.utah.edu/>); the Writing Program (<http://writing-program.utah.edu/>); the English Language Institute (<http://continue.utah.edu/eli/>). Please let me know if there is any additional support you would like to discuss for this class.

**Faculty and Student Responsibilities:**

All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, beginning with verbal warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee. Faculty must strive in the classroom to maintain a climate conducive to thinking and learning and students have a right to support and assistance from the University in maintaining a climate conducive to thinking and learning.

**Content Accommodations:**

“Content accommodations” will not be made. This course might expose you to things you find discomforting or dissonant with your beliefs. Accommodations in course content, requirements, or expectations will not be made. Students who find the content of this course objectionable or in violation of their beliefs should drop the class. The U policy: [www.admin.utah.edu/facdev/index.html](http://www.admin.utah.edu/facdev/index.html)