Environment, Energy, and Society

Spring 2018

BIOSC 2040, Section 002

Three (3,0) credit hours

Time	Where	Date Range
2:00 pm – 3:15 pm (T, Th)	Jordan Hall G33	Jan 10, 2018 - May 02, 2019

Note: The last day of class is 25 April. The final exam for this course is on Thursday, 2 May 2019, at 0800-1030

Course Instructor: Dr. John J. Hains

jhains@g.clemson.edu (this is the best way to communicate)

Office: 143 Long Hall

Phone: Clemson University does not provide me with a phone. Use email.

Office Hours:

I am cheerfully available to students at any and all times that I do not have other responsibilities.

Course Description: This course examines the role of energy on this planet, its role in driving ecosystems and society, the modern processes of power and energy production by man, the resultant interactions with the environment, and the overall relationship between these technologies and the development and structure of society. The course introduces historical and contemporary sources of energy and power as well as the economic, social, and political forces important for types and patterns of development. It introduces relationships between these forces and the resultant impacts to ecosystems and the environment.

General Education Competencies:

This course has the ability to satisfy or contribute to the satisfaction of several General Education competencies. Students are encouraged to consult the Undergraduate Catalog for a complete discussion of general education. This course is designed to satisfy or contribute to the following competencies:

1. Natural Science - Satisfies
2. Science, Technology, and Society- Satisfies
3. Critical Thinking Skills – Contributes or Satisfies
4. Ethical Judgment – Contributes

The following student learning outcomes are designated according to their respective competencies.

NOTE: With respect to Critical Thinking and Ethical Judgment, there is no exclusion of these competencies from the others. There are elements of critical thinking which are part of - and apply to - every other competency in the general education list and elements of ethical judgment which apply to nearly every topic in this course. Critical thinking is central to the mastery of many of these topics and ethical judgment is central to the fairness of their application.

Clemson Thinks2: What is Critical Thinking?

This course is designed to be part of the Clemson Thinks2 program. “Critical thinking is reasoned and reflective judgment applied to solving problems or making decisions about what to believe or what to do. Critical thinking gives reasoned consideration to defining and analyzing problems, identifying and evaluating options, inferring likely outcomes and probable consequences, and explaining the reasons, evidence, methods and standards used in making those analyses, inferences and evaluations. Critical thinking is skeptical without being cynical, evaluative without being judgmental, and purposefully focused on following reasons and evidence wherever they may lead.”

http://www.insightassessment.com/FAQ/FAQs-General-Critical-Thinking/What-is-Critical-Thinking

Learning Outcomes and Course Objectives:

To provide students an appreciation of the relationships between the technologies of power and energy, the resultant impacts to the environment, and the structure of every aspect of society. These objectives and outcomes are further explained in the following discussion of Clemson's General Education requirements and competencies.

Science, Technology, and Society Objective: This entire course is designed to integrate a broad range of topics which depend on – and relate to – science, technology, and society (STS). Its objective is to engage the student in these topics in a manner that allows them to understand the interrelationships between science, technology, and society and to be able to analyze these relationships as well as to critically examine both the relationships as well as the consequences to all levels of society.

Natural Science Objective: Students will learn how all of the primary sources of energy are acquired and used as well as the basic principles which govern interactions with environment and society. For this objective there will be a specific assignment which will require demonstration of an understanding of the structure of a complex system of energy processes as well as the quantification of those processes and the importance of the results to our planet.

Ethical Judgment Objective: Students will identify ethical conflicts related to energy, environment, and society. Each content topic will involve issues in which people can be adversely affected and in some cases documentaries will be presented which provide detailed, graphical examples of these ethical conflicts. Students wishing to use this course in support of this General Education competency will have an opportunity, on personal request, to complete an optional writing assignment in which Ethical Judgment is an objective with regard to several carefully-chosen energy-related topics. (See General Education Competencies discussion)

Critical Thinking Skills Objectives:

CT^2 Objective 1: Students will be able to interpret and analyze diagrams and graphical representations of the global processes of energy exchange with respect to large-scale climate patterns. Natural science is quantitative and this requires the ability to present results in quantitative ways. The ability to interpret such representations is important for analysis of the ideas, their assumptions, and their results. This outcome will also enable students to better assess derivative aspects of the content that occurs later in the course.

CT^2 Objective 2: Students will be able to apply their interpretations and extend them to identify the social and environmental impacts of energy use. The premise of this course is that an understanding of energy can be employed to understand the structure of both ecosystems and social systems. Students will be able to apply their interpretations of data and natural systems to further analyze the interactions between technological development, energy development and use, and growth and evolution of human societies.

CT^2 Objective 3: Students will be able to interrogate the relationships of energy processes to cultural and social structures and institutions and to identify sources of conflict as well as the potential ways to resolve those conflicts.

CT^2 Objective 4: Students will understand the complexity of the above relationships and be able to identify and the economic and political connections and influences. Students will also be able to identify ways to test these relationships to determine their strength or validity.

General Education Competencies:
Please refer to the further discussion of the Gen Ed competencies in the Undergraduate Catalog. We will cover this in the first class meetings as well.

1. Natural Science – You will demonstrate scientific literacy by explaining the process of scientific reasoning and applying scientific principles to complex interactions between social and ecological processes. These are related also to Critical Thinking and STS general education competencies.
How will you do this? Students will complete a required exercise in which fundamental natural science facts and principles are employed in order to calculate and predict the outcome of a complex system of natural processes. This assignment will also be employed to better understand later topics in the course.

2. Science, Technology, and Society – This entire course is designed to address these topics and the interactions between them. It is listed as one of the STS courses. Completion of the course will satisfy this requirement for graduation.
How will you do this? Throughout this entire course students will acquire greater understanding of the relationships between science, its interactions with technology, and finally the effects and interactions of both science and technology on society. This goal will be completed incrementally throughout the course and assessed with conventional testing and assessment tools.

3. Critical Thinking – Demonstrate the ability to assemble information relevant to a significant, complex issue, evaluate the quality and utility of the information, and use the outcome of the analysis to reach a logical conclusion about the issue.
How will you do this? In each section of the course students will be identify the essential elements of conflict between alternate ideas and to challenge themselves to arrive at rational personal views. This will involve exploration of the historical development of select topics which continue to be challenged by conflicting interests and which also contain vital ethical questions. And it will involve application of critical thinking skills that can be used elsewhere in coursework or personal life.

CT2 assessments:
You will be assessed by the CT2 program through the application of a mandatory 'pre-course' survey or test which will assess your initial critical thinking status and a 'post-course' follow-up survey or test to measure the difference. These assessments are mandatory.

4. Ethical Judgment – You will demonstrate an ability to identify, comprehend, and deal with ethical problems and their ramifications in a systematic, thorough, and responsible way. Every topic in this course contains important ramifications for ethical judgment, ranging from personal decisions to the entirety of society. **How will you do this?** Students who request to complete a major writing assignment for ethical judgment will be able to use that as an artifact to demonstrate their proficiency in this general education competency.

Attendance Policy
Students are required to attend all lectures in accordance with stated policy – Refer to next page.

"Regular and punctual attendance at all class and laboratory sessions is a student obligation, and each student is responsible for all the work, including tests and written work, in all class and laboratory sessions."
More to the point, **it is possible that missing a single lecture could cost you a letter grade on an exam**. Absences for legitimate reasons are allowed and prior notification is requested. Otherwise, *Post facto* excuses are required. Class role will be taken as necessary to conform to administration requirements.
The REAL Story: You'll notice later in the syllabus that although there is a reference book for this course, the book doesn't cover all the topics. You really, **really** need to attend all the lectures. Get the hint? I will present much content in the lectures and you will be responsible for that content even though it isn't available in any other format.

Class Dismissal
Unless announced in advance, failure of the lecturer to arrive for 15 minutes after the scheduled beginning constitutes postponement of that lecture. (this has never happened for me, ever)

Class Decorum:
As you will soon discover, decorum is rather informal in my lectures. You are encouraged to question, challenge, or discuss any aspect of the topic at hand. You can be sure that your thoughts, in turn, will receive similar scrutiny. All I ask is for you to try to control your emotions.
Cell phones must be silenced and out of view for all lectures.

Disability Access
Students with disabilities requesting accommodations should make an appointment with the Director of Disability Services (656-6848) to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Accessibility Services when they meet with instructors. Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

Academic Integrity
"As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form."
In this course students may not re-use any material from any other class, previous or current. All assignments must be an expression of the student's own original ideas and newly composed this semester, unrelated to any other course assignments.

Title IX Statement
Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at http://www.clemson.edu/campus-life/campus-services/access/anti-harassment-policy.html

Any questions about this course, the syllabus, or its compliance with the undergraduate regulation letter must first be addressed to the instructor.

Copyright Statement

Nearly all of the material in this course is copyrighted. It is intended for use only by students registered and enrolled in this course and only for instructional activities associated with and for the duration of the course. These materials may not be retained in another medium or disseminated further. They are provided in compliance with the provisions of the Teach Act. Students are reminded to refer to the Use of Copyrighted Materials and "Fair Use Guidelines" policy on the Clemson University website for additional information: http://clemson.libguides.com/copyright

Textbook – Hinrichs, R, and M. Kleinbach. 2006. Energy: Its Use and the Environment. Thomson Brooks/Cole. Belmont, CA. 595 pp. and appendices. ISBN: 0-495-0185-5
Be sure to get the 4th Edition – it's much less expensive.

There are a few copies of this book for loan to students in my course. They are on reserve in the library and are free unless you fail to return them. I purchased these for this course but the enrollment is greater than the number I purchased so they are available on a first-come, first-served basis.
There is a newer edition but we do not need the updated version as I will give you updated information in my lectures. So don't bother with the new edition. The used ones are much less expensive and can be ordered online.

You ARE encouraged to construct and maintain a personal notebook (either printed or electronic) in which you archive your notes, my handouts, and all relevant materials that are needed for the course topics. Some suggestions on how to do this can be found on Blackboard or Canvas.

Course Topic List (will be modified to reflect current events or class interests) [Gen Ed notations follow]
Topic 1: Introduction – Current Events, so many of them.
What are Science, Technology, and Society? How are they related? STS
History of technology and energy production. What are the ways that energy influences both natural and social systems? STS, Natural Science
Physical basics of energy and power, limitations of production and use. How do these limitations affect society? Natural Science
The nature of illusion and self-deception. Ethical Judgment, CT2
Introduction to critical thinking skills. CT2
The self-correcting nature of science as a way to avoid deception. Natural Science, CT2, Ethical Judgment, STS
Topic 2: The interactions of energy in the environment. The role of energy in natural ecosystems. The effect of energy subsidies. Cybernetics and thermodynamics. STS, Natural Science
Topic 3: Survey of human energy sources and their current relative importance. Future outlook. Historical development of energy, the industrial revolution, the growth of the urban social system. Contemporary sources of energy and long term outlook. STS, Natural Science
Topic 4: The relationship between energy technology and economic growth. Historical changes in transportation, changes in manufacturing, changes in health, changes in food production, housing, education, recreation. STS, CT2, Ethical Judgment, Natural Science

Topic 5: Direct and indirect environmental effects. Complete cycle components, transmission, transformation, efficiency, use, entropy. System-level interactions with emphasis on global effects. Global climate change. Net energy analysis of power production – how much energy is required to have a baby? STS, CT2, Ethical Judgment, Natural Science
How do we decide the sources of energy and materials? What is a carbon footprint and what is 'cap and trade' economics? Methods to minimize impacts. Conservation measures. Natural Science, STS, CT2, Ethical Judgment
Topic 6: Major energy technology specifics: Fossil fuels – origin, history, outlook. Effects of acquisition, conversion, generation, transmission, depletion. Socio-economic factors affecting siting, operation, and waste disposal. STS, Natural Science, CT2, Ethical Judgment
Topic 7: Major energy technology specifics: Hydroelectric – diversity, history, limitations, outlook. How do societies decide to create lakes? What are the costs versus the benefits? How can political forces bias the process? STS, Natural Science, CT2, Ethical Judgment
Topic 8: Major energy technology specifics: Nuclear – history, technologies, current status, outlook, real and potential impacts, waste management. The political factors: Price-Anderson Act, imminent domain, waste disposal. Is there such a thing as waste disposal for nuclear waste? Long term effects and our ability to predict them. STS, Natural Science, CT2, Ethical Judgment
Topic 9: Alternative energy technology specifics: Solar, wind, geothermal, other sources – status, potential, limitations, outlook. Political and economic forces influencing their development and market growth. Are they really the answer? STS, Natural Science, CT2, Ethical Judgment
Topic 10: Life in an energy-dependent society: Structures, housing, economy, transportation, communication, structure of society and social institutions (health, nutrition, governance). STS, CT2, Ethical Judgment
Topic 11: Case studies; past, current, consequences – these will be interspersed throughout other topics and employed to illustrate other principles and relationships. STS, Natural Science, CT2, Ethical Judgment

Special Notes:
This course will challenge you to assemble and synthesize your own view or mental model of complex systems and interactions between complex systems. Lectures are designed to assist you with this task but the 'heavy lifting' of completing the synthesis in a way that is unique to your own needs and abilities is YOUR task. For this reason, **attendance and attention to the lectures is mandatory. The reference book simply does not cover all of this material, nor does it convey the central message of the course. The book is a reference book that helps with some topics. Other topics are completely outside the scope of the text and lecture attendance is the only way to acquire this content.**

CT2 assessments: As mentioned in the course objectives, there will also be a pre- and post-course assessment with respect to your critical thinking skills. This assessment is done online. The CT2 assessment is entirely voluntary by the student.

Exams
There will be two (2) major tests during the semester, each associated with a course topic area. Additional short quizzes may be added as needed. There will also be a comprehensive final exam that will be worth more points than one of the major tests.
Exam #1 (tentatively scheduled for 21 February)
Exam #2 (tentatively 28 March)
Final Exam: Thursday, 2 May 2019 at 0800-1030am in the regular lecture classroom.

Course Grade: This is determined by dividing the total number of earned points by the total number of possible points. Extra credit, if any, will be added to the numerator but not the denominator. The grade is based on a standard scale: 89.5-100% = A, 79.5-89.5% = B, 69.5-79.5% = C, 59.5-69.5% = D, less than 59.5% = F.

Important Additional Notes on Class Assignments

Assigned homework will be due as announced. All of it will be accepted **only** using the Turnitin feature in Blackboard or Canvas. Late homework will be downgraded 10% per day unless a reasonable excuse is accepted by the instructor.

Assignments that are turned in 10 or more days late will receive a zero. Homework will be checked for completeness and content mastery, creativity, and technical accuracy. Turnitin will check for originality and other aspects of original expression. Work must be original or properly referenced.

Grading Criteria: The following criteria will be used for grading all work in this class:

1. Content mastery - students show ability to understand facts, concepts, and theories.
2. Synthesis and Integration - students show connections between this and other disciplines.
3. Creativity - students use course material to generate their own insights and applications.
4. Communication: Communications must be clear, concise and technically correct.