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Drew Howing is Environmental Program Coordinator at Iowa Lakes Community College.

Updated in 2017, this course covers an introduction to energy, sustainability and the environment offered in credit programs in a face-to-face format.

Course Syllabus

Energy, Sustainability, and the Environment

SER-101

MWF 11:00-11:55

Fall 2017

Iowa Lakes Community College
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Estherville, IA 51334

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Catalog Description: Energy, Sustainability, and the Environment is designed to provide the student with a basic understanding of energy, the types and availability of energy resources, the trends in energy consumption and demand, and the environmental problems associated with energy usage. Topics covered

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will include the basic energy physics, the categories of energy resources, energy patterns and trends, and the environmental aspects of energy consumption.

Prerequisites: None

Credits: Lecture (SER-101) – 3 credits

Text & Additional Materials: Introduction to Energy, Environment, and Sustainability by Paul Gannon, 2nd Edition

Course Objectives: The objectives of this course are to provide the student with knowledge of energy and its production and consumption by humans. The student will become familiar with the basic energy physics, the types and availability of perpetual, renewable, and non-renewable energy resources, the patterns of human energy usage and demand, and the environmental problems that arise from energy consumption by humans.

Course Competencies: Upon completion of this course the student will be able to:

1. Define energy and describe why the availability of energy is important to human society.
2. List the various forms of energy and describe the types of energy conversions which can take place when going from one form to another.
3. List and define the commonly used energy units and mathematically convert them using energy equivalencies.
4. Define both descriptively and mathematically the following terms; speed, velocity, acceleration, and force.
5. State Newton's First, Second, and Third Laws of Motion and describe their implications with regard to energy usage.
6. Define both descriptively and mathematically the following terms; work, momentum, potential energy, mass, inertia, weight, kinetic energy, and power.
7. State the First and Second Laws of Thermodynamics and describe their implications with regard to energy usage.
8. Describe the two ways that energy can be transferred in a system.
9. Define the following terms; heat, temperature, specific heat, latent heat of fusion, and latent heat of vaporization.
10. State the Law of Conservation of Energy and describe its implications with regard to energy usage.
11. Define both descriptively and mathematically the following terms; efficiency, mechanical equivalent of heat, energy conversion, and Carnot engine.

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12. List the methods of energy conservation and list the advantages and disadvantages of implementing these methods.
13. State Coulomb's Law, Joule's Law, and Ohm's Law and describe their implications with regard to electrical systems.
14. Compare and contrast the types of electric currents and describe the applications of each type of current.
15. Describe how an electric current is generated.
16. Describe the factors involved in commercial electricity generation.
17. Outline the steam-electric generating plant cycle.
18. List and describe the types of natural resources.
19. Define the following terms as they relate to natural resources; recycling, reuse, resource depletion, environmental degradation, sustainable yield, resource conservation, multiple-use, scarcity, and resource crisis.
20. Describe the "tragedy of the commons" and how it applies to resource management.
21. State the advantages and disadvantages of fossil fuel usage.
22. List the types of fossil fuels and describe their applications as energy sources.
23. Describe the global distribution and abundance of fossil fuels.
24. Describe the advantages and disadvantages of the following non-fossil fuel energy resources; nuclear fission, radiant solar, wind, biomass, hydropower, and geothermal.
25. Describe the global distribution and abundance of the following energy resources; nuclear fission, radiant solar, wind, biomass, hydropower, and geothermal.
26. Outline the nuclear fuel cycle.
27. Describe the energy potential of the following sustainable energy resources; radiant solar, wind, biomass, hydropower, and geothermal.
28. Describe the factors that affect the availability of radiant solar energy.
29. Explain why wind, hydropower, and biomass are actually types of solar energy.
30. Describe the advantages and disadvantages of the following potential energy resources; alternative fossil fuels, hydrogen, and nuclear fusion.
31. State the reasons for the "energy dilemma" and list the key components contributing to this dilemma.
32. Describe the possible negative outcomes associated with the "energy dilemma" and what can be done to avoid them.
33. Define the following terms; sustainability, sustainable energy, life cycle costs, energy intensity, average energy per capita, primary energy, and end-use energy.
34. List the factors standing in the way of sustainable change.
35. Outline the historical events that have affected global energy consumption.
36. Describe the relationship between energy consumption, population growth, and the growth of the global economy.

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37. Describe the energy usage trends in the United States and these trends related to the “energy dilemma” in the United States.
38. Define peak oil and describe how it relates to the problems associated with usage of fossil fuels.
39. Define the following terms; reserves, cumulative production, static reserve index (SRI), and externalities.
40. Describe the theory of global warming and discuss how it relates to energy consumption.
41. Describe the options available to humans to deal with the impacts of climate change.
42. Describe the limits on the following non-fossil fuel energy resources; nuclear power, hydropower, geothermal, wind, photovoltaic electric systems, thermal solar systems, and biofuels.
43. Define the following terms; energy intensity, energy conversion efficiency, energy functional efficiency, and energy conservation.
44. Describe the potential of the following renewable energy sources; direct solar thermal energy, photovoltaic electricity, wind electrical generation, hydropower electricity, biomass energy in gaseous, liquid, and solid forms, geothermal heating and electricity, and tidal and wave electricity.
45. Describe the steps that must be taken to achieve a sustainable energy future and discuss the challenges that must be overcome to make this happen.
46. Define the following terms; depletion, degradation, pollution, and pollutant.
47. List the factors that determine the effects of a pollutant.
48. Outline the history of environmentalism in the United States.
49. List the conditions that must exist for an air pollution problem to occur.
50. Define the following terms; attrition, vaporization, combustion, primary air pollutant, secondary air pollutant, point source air pollutant, multiple source air pollutant and smog.
51. List the major categories of air pollutants and describe their effects on human health.
52. List and describe the primary air pollutants associated with energy consumption.
53. Define the following terms; surface water resources, groundwater resources, point source water pollution, and non-point water pollution.
54. Describe the types of water pollution associated with the following; municipal water pollution, industrial water pollution, and agricultural water pollution.
55. List and describe the major categories of water pollutants associated with energy consumption.
56. Describe the environmental aspects of nuclear, electromagnetic, and thermal pollution.
57. Define the following terms; radioactivity, radioisotope, ionizing radiation, Roentgen, Roentgen equivalent man (rem), radiation absorbed dose (rad), and Currie.
58. Describe the environmental aspects of hazardous materials and wastes associated with energy consumption.
59. Describe environmental impact and list the factors that contribute to creating an environmental impact.

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60. Describe how development of sustainable energy resources contribute to reducing environmental impact.

Units of Instruction: During the semester the following units will be covered:

1. Basic energy physics.
2. Categories of energy resources
3. Energy patterns and trends
4. Environmental aspects of energy consumption

Methods of Instruction: There are three hours of lecture, demonstrations, discussions, and Internet research assignments each week. Guest speakers and field trips will also be included as part of the course instruction.


Attendance Policies: Students are expected to attend class. Attendance will be taken and used in the determination of the final course grade. Each student will begin the semester with three sick leave/personal days which may be used as needed by the student for any illnesses or personal matters which may arise during the semester. Once these three days have been missed, two points will be taken for every additional missed class period. Course work or exams missed on those days may be made up if done so within **five** class days after the absence. If more than five days are missed during the semester, make-up of course work or exams missed on those days will not be allowed. In the case of an extended illness or personal emergency, the above policies may be modified if the circumstances warrant special consideration. Days missed as a result of a school related activities (i.e. participation in course field trips, athletic events, etc.) will be considered as an excused absence only if a memo from the faculty member sponsoring the event is received by the instructor prior to the absence. If such a memo is not received, the absence will be considered as a missed class period.

Grading Policies: Grading is determined by a percentage of total points for the semester.

Scale: A = 90 to 100%
B = 80 to 89%
C = 70 to 79%
D = 60 to 69%
F = Less than 60%

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Four 1-hour tests of 100 points each will be given during the semester. These tests will include multiple choice and essay questions. Four quizzes of 10 points each will also be given during the semester. These quizzes will consist of 10 multiple choice questions. Class reports and projects will be assigned during the semester and will be graded on accuracy, completeness, proper format, neatness, and scientific knowledge. A 100-point research paper is also required for this course.

Tests = 400 points
Quizzes = 40 points
Class Reports = 200 points
Research Paper = 100 points
Participation = 60 points
TOTAL POINTS = 800 points

Other Expectations: Students are expected to arrive on time and have the necessary course materials and supplies required for the day's activities. The usage of cell phones by students during class is prohibited. Failure to abide with this policy may result in the ejection of the student from the classroom. Students ejected from the classroom will also forfeit one of their sick leave/personal days as a result of violation of this policy.

Important: NO food or drinks in the lab.

Students must abide by all policies as stated in the Iowa Lakes Community College Student Handbook.

Students should be aware that classes might be audio or video recorded by one or more students. The college's policies governing the audio or video recording of class are included in the Student Handbook. Students who have any questions or concerns about class recordings should address their questions or concerns with the instructor at the *beginning of the semester*.

STUDENT ACADEMIC HONESTY POLICY

Iowa Lakes Community College believes that personal integrity and academic honesty are fundamental to scholarship. Iowa Lakes strives to create an environment where the dignity of each person is recognized and an atmosphere of mutual trust exists between instructors and students. The faculty has confidence in the integrity of the students and encourages students to exercise good judgment in fulfilling this responsibility.

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Actions contrary to academic integrity will not be tolerated. Activities that have the effect or intention of interfering with learning or fair evaluation of a student's work or performance are considered a breach of academic integrity. Examples of such unacceptable activities include, but are not limited to:

- **Cheating** (intentionally using or attempting to use unauthorized material, assistance or study aids in my academic work). For example, using a cheat sheet for a test, looking at another student's paper during an exam, stealing or buying all or parts of an exam or paper, altering and resubmitting work for a better grade without prior approval to do so, etc.
- **Plagiarism** (representing another's ideas, words, expressions or data in writing or presentation without giving proper credit, failing to cite a reference or failing to use proper documentation, using works of another gained over the Internet and submitted as one's own work).
- **Falsification and/or misrepresentation of data** (submitting contrived or made-up information in any academic exercise). For example, making up data, citing non-existent sources, etc.
- **Facilitating Academic Dishonesty** (knowingly helping or attempting to help another violate any provision of the academic honesty policy). For example, working together on a take-home exam or other assignment when the option has not been made available, giving a paper/assignment to another student for his/her use, etc.
- **Multiple Submissions** (submitting, without prior approval from the instructor involved, any work submitted to fulfill academic requirements in another class). For example, submitting the same paper for two different classes, etc.
- **Unfair Advantage** (trying to gain unauthorized advantage over fellow students). For example, gaining or facilitating unauthorized access to exam materials (past or present); interfering with another student's efforts in an academic exercise; lying about the need for an extension on a paper or assignment; destroying, hiding, removing or keeping library materials, etc.

Disciplinary Action

Any violation of this policy will be treated as a serious matter. The instructor has primary responsibility over classroom behavior and maintaining academic integrity. Students who earn an "F" based on any violation of the Student Academic Honesty Policy may not withdraw from the class (and receive a grade of W). Depending on the nature and severity of the offense, Iowa Lakes Community College reserves the right to exercise disciplinary action as outlined in the Disciplinary Action Section of the Student Handbook.

Americans with Disabilities Act – Policy of Nondiscrimination

It is Iowa Lakes Community College policy to not discriminate against qualified individuals with disabilities and to provide reasonable accommodation(s), as required by law, to otherwise qualified applicants for admission or to students with disabilities in all education programs, activities, services and practices, including application procedures, admissions, course selection, the awarding of degrees, discipline and dismissal. Educational opportunities will not be denied to an otherwise qualified application or student because of the need to make reasonable accommodation(s) or modification(s) for the physical and mental impairment(s) of any such individual.

Iowa Lakes Community College students needing reasonable accommodation(s) and/or modification(s) should contact Jody Condon by phone at (712) 852-5219 or via email at jcondon@iowalakes.edu. To assure that accommodation(s) and/or modification(s) will be ready when classes start, students must make the request as soon as possible, before a semester begins.

It is the policy of Iowa Lakes Community College not to discriminate on the basis of sex, race, national origin, creed, age, marital status or disability in its education programs, activities, or employment policies, as required by Titles VI and VII of the 1964 Civil Rights Act, Title IX of the 1972 Educational Amendments, Section 504 of the Federal Rehabilitation Act of 1973 and Title II of the Americans with Disabilities Act (ADA) of 1990.

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Inquiries regarding compliance with Title IX, Title VI, Title VII, or Section 504 may be directed to Kathy Muller, Human Resources, Iowa Lakes Community College, 19 S. Seventh Street, Estherville, IA 51334, telephone (712) 362-0433; to the Director of the Iowa Civil Rights Commission, Des Moines; or to the Director of the Region VII Office of Civil Rights, Department of Education, Kansas City, Missouri.

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