SYLLABUS

College of the Arts and Sciences

School of Earth Sciences

Course Number/Title: 155 Energy and Environment

Instructor/Lectures: Dr. Jeffrey Daniels (SES) and Dr. Stacey Fineran (SENR)

Graduate Teaching Associate: TBD

Required Text/Reading List: Oil and the Future of Energy: Climate Repair * Hydrogen * Nuclear Fuel * Renewable and Green Sources * Energy Efficiency (Editors of Scientific American); Readings from: Beyond Oil (Kenneth Deffeyes), Nontechnical Guide to Petroleum Exploration, Drilling, and Production (Norman Hyne), The Grid (Phillip Schewe), 2005 IPCC Report, Renewable Energy (Godfrey Boyle), Dire Predictions (new book to be published soon by Prentiss Hall), and others.

Credit: 5 Credit Hours

Prerequisite: None

GEC Category: Meets Category 3 Natural Sciences BA, Section 2 Physical Science Sequence and Section 4 Physical Science course

Course Structure: Five, 1-hour lectures or 2 2.5-hour lectures.

Description: This course is designed to cover the fundamentals of energy sources, energy use, energy efficiency, and resulting environmental implications of the various energy supplies.

Content: This course will provide students with a scientific context to evaluate energy options for the future. In addition, the course will introduce new concepts that have been proposed to ensure energy sustainability (e.g., the wedge concept), and the environmental costs and trade-offs of various energy options, including the use of different sources and the potential impact of energy efficiencies. Students taking this course will be able to make informed choices on energy related issues in the future and open

their minds to considering new concepts of energy sources in the context of energy efficiency and Earth sustainability.

Learning Objectives: The overall objective of this course is to present an overview of energy sources that will allow potential students to evaluate energy options for the future in a context of energy efficiency and Earth sustainability. Additionally, to meet the proposed GEC status in the Natural Science category and its stated general principles and the four specified GLO's, the following learning objectives will be accomplished by students successfully completing the course:

- Learn the sources, occurrence, and availability of traditional, alternative, and natural energy supplies;
- Learn the basic concepts of renewable and non-renewable energy sources and associated issues in the context of energy efficiency and Earth sustainability;
- Develop an understanding of production technology, including the basic working principles and components of energy production devices;
- Develop an overall framework for energy cost that includes all the factors that make up the price of transportation and power generation usage of energy;
- Understand that studies in energy issues are inherently interdisciplinary;
- Understand the potential technical and scientific impact of global-scale legislative proposals;
- Develop an appreciation of the true cost and sustainability of energy supplies over time, including the technological, economic, and sociological challenges; and
- Enhance ability to critically assess future energy options from a personal and global perspective.

Course Grades: The course will be graded according to results from examinations, attendance, and in-class participation as follows:

Two midterm exams	20% and 30%
Final Exam	35%
Attendance and Participation	15%

The grading scale for this course will be developed as results of assignments and exams become available. The instructors will describe this grading scale in class and via Carman by the second week of the quarter.

Policies on Attendance and Absences: Attendance is encouraged at all lecture sessions. The instructor should be notified as soon as possible in emergency situations where students must miss class. The deadline for make-up work for missed assignments, quizzes or examinations is one (1) week from the original date of administration. Each student must meet individually with the instructor regarding make-up work for missed assignments.

Disability Services: Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue (telephone 292-3307, TDD 292-0901, (http://www.ods.ohio-state.edu/).

Academic Misconduct: The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students will complete all academic and scholarly assignments with fairness and honesty. Failure to follow the rules and guidelines established in the University's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct".

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process". Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. All suspected cases of academic misconduct will be reported to the University Committee on Academic Misconduct. If academic misconduct has been committed, possible sanctions could include a failing grade in this course and suspension or dismissal from the University.

Topical Outline: The following is a tentative, chronological outline of course lecture topics and scheduled examinations:

Week 1: Overview of Sustainable energy sources and environmental considerations

a. Sustainable energy defined
b. Energy reserves (world, national, local) and globalization
c. Energy production and projections (world, national, and local)
d. Transportation, storage, and distribution of energy
e. Environmental effects of energy
f. The energy and environment equation

Week 2: Non-renewable sources -- Fossil Fuels

a. Petroleum resources and use
b. Petroleum development (exploration and production cycle)
c. Coal resources and use
d. Coal development (exploration and production)
e. Sustainability of oil and gas

Week 3: Non-renewable sources – Fossil Fuels

a. Oil and gas and globalization
b. Economic dependence on oil and gas
c. Conversion and combustion of fossil fuels
d. Fossil fuels as a source of pollution
e. Carbon management

Week 4: Non-renewable sources – Nuclear

a. Nuclear power
b. Occurrence and distribution of nuclear material (mining, milling, enrichment, and fuel processing)
c. Nuclear power plants (operation and design, present and future)
d. Nuclear safety
e. Nuclear waste and environmental impact

MIDTERM EXAMINATION 1

Week 5: Renewable energy

a. Definition of renewable energy and comparison to fossil fuels
b. Energy potential of renewable sources
c. Technological, economic, and sociological impediments to renewable development
d. Renewable energy resources
e. Development challenges of renewable energy

Week 6: Renewable sources – wind, tides, and water waves

a. Sources of wind and generating systems
b. Wind economics and prospects
c. Water waves and tides as sources of energy
d. Environmental considerations of wind and water as energy sources

Week 7: Renewable sources – solar

a. Energy potential from solar
b. Thermal electric systems
c. Photovoltaic systems
d. Sustainability and environmental costs of solar

Week 8: Renewable sources – geothermal and Hydroelectric

a. Geothermal energy sources
b. Conversion of thermal energy to electricity
c. Hydroelectric resources
d. Environmental impact of hydroelectric

MIDTERM EXAMINATION 2

Week 9: Renewable sources – Biomass and hydrogen

a. History of the use of biomass
b. Sources of biomass
c. Biomass conversion to fuel
d. Biomass conversion to electricity
e. Environmental impact of biomass utilization

Week 10: Energy Efficiency and wrap up

a. Buildings and industrial efficiency
b. Transportation, storage, and distribution of energy
c. Complex balancing factors for sustainable energy and environment
d. The societal challenge of energy and the environment

FINAL EXAMINATION