PHYC 151 Energy: Technology and Society

Course Description

An investigation of the sources, generation, transmission, storage, and uses of energy based on physical laws and processes, and an overview of the implications and consequences for society. (3 credit hours)

Prerequisite: None

Course Objectives

- gain knowledge of the terminology and underlying physical science of various energy sources and energy generation;
- identify and use basic physical laws in text and mathematical forms and relate them to the technology related to energy;
- read, interpret, and analyze graphs, tables, and charts to extract data that will be used as the basis for formulating reasoned opinions;
- use data from reliable sources to develop an understanding of the advantages and disadvantages of using various energy sources;
- develop an understanding of how the choice of energy sources has consequences for economic development and the environment;
- gain an appreciation of how the use of energy choices can lead to future solutions or problems; and
- make reasoned and intelligent personal choices using energy in their own lives based on the risks, rewards, costs, and benefits.

Course Rationale

Energy is an important part of today's modern society. An improved standard of living for individuals and national economic development depend on a reliable and plentiful supply of energy. It is used to produce manufactured goods from natural resources and provide many essential and useful services for our daily lives. The use of fossil fuels has become an integral part of transportation, source of electricity, supply of heat, and resource for plastics and other goods. Political events associated with this resource have made people more aware of the crucial role that energy plays in their lives and the need to increase the use of alternative energy sources. There are also many concerns of how our continued use of energy resources can affect the environment, such as in global warming, mining techniques, deposition of acid rain, and radioactive waste disposal. The use and availability of energy has become a global issue that has many consequences not only for us and for our nation, but for the world.

A course that describes the technological aspects of energy, as well as the economic, environmental, and global consequences, should be an essential component of a well-informed and contemporary student's education. Students taking this course will gain knowledge of the basic terminology and the underlying science associated with various energy sources, its generation, and use. Basic physical principles linked with energy will be studied, such as mechanics, electricity and magnetism, thermodynamics, and atomic and nuclear physics. The best way to understand the choice of present and future energy alternatives, and the environmental, social, and economic consequences accompanying them, is to understand the scientific principles involved. Students will gain an appreciation of the complexity of the issues involved and develop an informed position on this important topic.

Students will gain knowledge in the discipline through readings in the text, lecture, journal articles, and class discussion. Additional necessary skills will be obtained through solving problems related to the topic, such as quantitative problem-solving methodology, the ability to read and interpret graphs, and construct logical arguments to support a position. There are many issues to which students can apply the scientific knowledge gained to social contexts. For example, the cost effectiveness of using coal to generate electricity at the expense of the environment may be explored, or the tradeoff of using alternate sources, such as wind energy, versus fossil fuels to effectively produce sufficient energy to meet the needs of a modern city.

Course Content, Format, and Bibliography

The instructional format for PHYC 151 includes: lectures coupled with multimedia material presented using classroom technology, lecture demonstrations of physical phenomena, small-group discussion and role-play positions on various topics, and student presentations. The multimedia material may include computer-based simulations, information from the Internet, video clips and presentations, and audio clips. Electronic audience response devices, or "clickers," may be used to poll class responses and opinions. Small group discussions may also be used to cover different aspects of a topic, and role-playing of positions with differing viewpoints may also be used to gain an appreciation of the complexity of issues. The class will meet for three fifty-minute periods per week. An example of an appropriate textbook for this course is: *Energy, Its Use and the Environment, 4th Edition*, by R. Hinrichs and M. Kleinbach, Thomson/Brooks Cole Publishers. Readings may also be taken from journal articles such as the *Annual Review of Energy*. A student research paper or oral presentations on selected topics on energy may also be used in the class to develop research and communication skills.

A sample course schedule may look like the following:

Week	Topic
1	Introduction to Energy
2	Energy Conservation and Mechanics
3	Heat, Work, and Thermodynamics
4	Home Energy Conservation
5	Electromagnetism and Generation of Electricity

6	Electricity: Circuits and Superconductivity
7	Energy from Fossil Fuels
8	Energy Use and Air Pollution, Waste Heat, and Global Warming
9	Solar Energy: Characteristics and Heating
10	Electricity from Solar, Wind, and Hydro
11	Building Blocks of Matter: Atoms and Nuclei
12	Nuclear Power: Fission
13	Effects and Use of Radiation
14	Energy Alternatives: Geothermal and Biomass
15	Future Energy Sources: Fusion