

Statement on how ES 155 meets the general principles, and specific General Learning Objectives of the Natural Science category of the General Education Curriculum

General Principles: *The General Education Committee (GEC) expects GEC courses in the natural sciences to foster an understanding of the principles, theories, and methods of modern science, relationships between science and technology, and the effects of science and technology on the environment.*

General Learning Objectives: *The GEC has specified that students fulfill the following General Learning Objectives (GLOs) in the Natural Science category of the GEC:*

- 1. Understand the basic facts, principles, theories, and methods of modern science;*
- 2. Learn key events in the history of science;*
- 3. Provide examples of the inter-dependence of scientific and technological developments; and*
- 4. Discuss social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.*

Earth Sciences 155 Energy and Environment is uniquely designed to meet the General Principles and specific General Learning Objectives of the Natural Science category of the General Education Curriculum. The course was developed because of the recognized need for a basic course that teaches the fundamentals of energy supplies (renewable and non-renewable sources) in a synergistic manner with environmental issues that relate to energy efficiency, conservation, and consumption.

As required in GLO 1 and GLO 2, Energy and Environment will devolve the basic facts, principles, theories, and methods associated with energy. Existing energy supply technologies from non-renewable sources (e.g., hydrocarbons, and nuclear) and renewable sources (e.g., wind, biomass, hydroelectric, geothermal, and solar) will be presented in the context of a portfolio of possible energy sources, along with an analysis of the historical economic costs and benefits of energy technologies. The potential environmental impact of each energy source will be discussed in a historical context of past energy production, and future energy use. Students will be challenged to develop a personal understanding of how future decisions about energy sources will be linked to scientific and technological developments in the past.

The course will develop an introduction to recent scientific techniques and technological developments required to assess, analyze, compile, and present information in an accurate and defensible format. The interdependence between technological improvements and scientific advances will be demonstrated clearly, thereby meeting GLO 3. For example, scientific advances in the laboratory were necessary to the production of gasoline from raw crude oil, while increased dependence and demand on gasoline led to new technologies for locating and producing oil and gas from the Earth's subsurface. The push-pull nature of science and technology is present throughout the history of energy development, including today's most fundamental scientific question concerning the future impact of global warming and the resulting present-day emphasis on the development of renewable energy sources.

Perhaps few courses address the essence of GLO 4 as directly as does ES 155 Energy and Environment. The thread that binds the course together is the fundamental issue of energy consumption

impacting our standard of living, and the adverse impact of energy consumption on the environment of the Planet. Science and technology have led to the development of massive supplies and consumption of non-renewable energy, resulting in robust economic growth. The side-effects of consuming non-renewable energy supplies are a decrease in the supply and large scale environmental pollution. Scientific and technological advances will, undoubtedly, be necessary to develop new renewable sources of energy that simultaneously address problems of the environment that were originally caused by the massive consumption of fossil fuels that was facilitated by scientific and technological advances. The current controversies and economic implications of energy options for the future will be presented and discussed. At a minimum, students enrolled in this course will develop the knowledge necessary to understand the basic technologies and scientific facts associated with current discussions and controversies related to energy and the environment.