EESC UN1600 Earth Resources and Sustainable Development

Prerequisites

There are no prerequisites. Familiarity with the names of the chemical elements, their abbreviations on the periodic table, and the notation used for chemical compounds (for example, H2O) is recommended but not required.

Course Objectives

This course is intended to provide an overview for non-majors and first year grad students interested in sustainable development and economic policy, and to provide a starting point for potential majors in Earth and Environmental Sciences, providing motivation to pursue further knowledge of topics including mineralogy, plate tectonics, and the carbon cycle. The course will provide a survey of the origin and extent of mineral resources, fossil fuels, industrial materials, fertilizer, soil and fresh water, many of which are nonrenewable, finite resources on a human time scale. We will also review the environmental consequences of resource extraction and use. We use the textbook Earth Resources and the Environment, by James Craig, David Vaughan and Brian Skinner. This course will provide an overview, but will include focus on topics of current societal relevance, including estimated reserves and extraction costs for fossil fuels, geological storage of CO2, sources and disposal methods for nuclear energy fuels, sources and future for luxury goods such as gold and diamonds, and materials used in consumer electronics and in newly emerging technologies such as lightweight magnets and rechargeable batteries (e.g., heavy rare earth elements, mostly from China). Guest lectures will provide "real world" input when possible.

Method of Instruction

Attendance at two lectures per week is required for 1600 and 4600 students. Participation in an informal discussion group each week is required for all W4600 students, and optional for interested students in V1600 (see method of evaluation, below).

4600 students, and 1600 students who elect to attend a discussion group, are required to attend one discussion group meeting per week.

Instructor information

Prof. Peter Kelemen is Arthur D. Storke Professor in the Dept. of Earth & Environmental Sciences. Prof. Kelemen studies feedback mechanisms in reactive transport of fluids and deformation in the earth, ranging from genesis of oceanic and continental crust, to volcanic plumbing systems, to earthquakes, to weathering. A current focus is capture and storage of CO2 via accelerated formation of solid carbonate minerals during weathering. Prof. Kelemen was a founding partner of Dihedral Exploration, "extreme terrain" mineral exploration
consultants, and in this capacity he worked in NW Canada, Alaska and Greenland each summer from 1980-1992. Kelemen's chair at Columbia is named for Arthur D. Storke, who was president of Climax Molybdenum Corp., served as Britain’s Minerals Advisor during WWII, and was about to become president of the giant Kennecott Copper Corp. at the time of his death in a plane crash in 1948.

**Office Hours**

Prof. Kelemen's office hours will be 2:45 pm to 4:00pm on Tuesday and Thursday in 556 Schermerhorn, or by appointment.

**Method of Evaluation**

V1600: Class participation (very short, easy quizzes, mainly on the reading assignments) 15%, Midterm 10%, final exam 15%, and EITHER (1) two term papers 30% each, OR one term paper, due at the end of the semester, and participation in a discussion group including one presentation.

W4600: Class participation (very short, easy quizzes, mainly on the reading assignments) 15%, Midterm 10%, final exam 15%, two term papers 20% each, discussion section participation including one presentation, 20%.

For both V1600 and W4600: Two percentage points subtracted for each day a term paper is late, including weekends (e.g., 1 day late: maximum possible 28 of 30%; 1 week late: maximum 16 out of 30%).