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GEO 3510 EARTH RESOURCES: Spring 2018

Tuesday-Thursday 11:00-12:15
Florida International University
Department of Earth and Environment

Teaching Faculty:

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Office hours:

Required texts:

Earth Resources and the Environment, 4th Edition, by Craig Vaughan and Skinner
(CVS in the course schedule)

Essentials of Geology, 13th Edition, by Lutgens, Tarbuck and Tasa (LUT in the course schedule)

Encounters with the Archdruid, by John McPhee

Common Reading for Global Learning:

The Case for Contamination, by Kome Anthony Appiah, New York Times, Jan. 1, 2006.

Recommended and extra credit texts:

Coal: A Human History, by Barbara Freese

Other study materials

Additional study materials, including the powerpoint files used in class, may be found in the content section of Blackboard. Blackboard is available to you for this course mainly for the distribution of these materials. I do not currently plan to have any of the course assessments done online—if that happens, it will be announced in class.

Course justification:

GEO 3510 Earth Resources is a Global Learning Foundations course and fulfills the Physical Sciences requirement for the University Core Curriculum when taken with the accompanying lab GEO 3510L.

Mineral and nonrenewable energy resources have been produced by geologic processes acting over much of Earth's history—consequently, they are erratically distributed over the Earth, and many resources are concentrated heavily in a small number of countries. Nevertheless, the demand and markets for these resources are global, and conflict over resources has often shaped the course of human events and will continue to do so. Discussion of each resource will include an overview of how the resources form geologically, what each resource is used for, which

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nations are the major resource holders and producers and which nations are most dependent on imports.

The use and impacts of earth resources are intrinsically global in scope and involve complex interrelationships among nations, government agencies, corporations, individuals and the local and global environment. Ownership, exploitation and scarcity of resources create tensions among nations, between the interests of corporations and individuals, and between the interests of development and conservation.

Understanding the use of earth resources and their impacts on society and the environment all requires an understanding of their interdisciplinary dimensions. The geology of the resource creates technical and engineering challenges in their extraction, processing and refining. Their global distribution creates political and economic challenges including the formation of cartels, the support of oppressive regimes by resource companies, and the prosecution of wars which have changed the course of history on the largest scales. The impact of resource extraction and use create political and scientific challenges as solutions to environmental problems are sought and political efforts are waged to implement those solutions. All of these scenarios play out in diverse ways in different countries with differing legal systems and cultural norms.

There are positive and negative aspects to the extraction and use of every resource, and a central emphasis of the course is to consider the uses of each resource together with the associated political, economic and environmental issues rather than treating each of those topics separately. Because everyone living in industrialized society is involved in the use of mineral and energy resources, the relationships between individuals and the pros and cons of resource are emphasized.

Global Learning Course Outcomes:

Global Awareness—Students will be able to demonstrate an understanding of the global sources of energy and mineral resources in their geologic, economic, political and environmental contexts.

Identify earth resources that are crucial to human society and their uses,

Demonstrate understanding of how these resources form geologically, which is the basis for the discovery of new resource deposits, the estimation of reserves and planning of resource use.

Demonstrate understanding of mining technologies, their various environmental impacts, and the economic and social factors that favor the use of one technology over another.

Analyze global impacts of earth resource extraction and use, particularly global warming, and evaluate means for reducing those impacts.

Global Perspective—Students will be able to analyze the extraction and use of resources from local, national and multinational perspectives, including the effects of cartels.

Demonstrate understanding of the effects of heterogeneous resource distribution, resource scarcity and resource replacement.

Analyze and describe how the global distributions of earth resources and competition for them have affected international relations past and present.

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Global Engagement—Students will collaborate in groups to devise solutions to problems involved in resource extraction and use.

Students will engage in an in-class debate of environmental/economic/social issues facing a large multinational mineral or energy resource company.

Students will reflect on the relationship between their own consumption of resources and consequent impacts.

Analyze the social and environmental impacts of extractive industries on local and national populations, including such examples as Nigeria, South Africa, and Andean South America.

Active Learning Exercises:

Students will participate in an in-class discussion session of the book “Encounter with the Archdruid.” Students will discuss resource and conservation issues raised in the book in small groups. Each group will make a brief oral presentation of its conclusions to the whole class and submit a written summary to me. Students will be evaluated on the basis of their participation in the discussions and presentation, which will depend on thoughtful consideration of the reading. There is no make up assignment for this activity.

Co-curricular Activities:

Students will be able to participate in the Tuesday Times roundtable discussions. Documented attendance of at least three of these activities and submission of a three-page summary of the activities (one full, single-spaced page per activity) will count as extra credit in the course as described in the section on grading policy.

Group learning exercise:

Students will participate in an in-class debate/role playing exercise in which they debate and devise solutions to major problems facing extractive industries, such as the recent Gulf of Mexico oil spill and Japan nuclear plant failures. Students will divide into groups representing different parties with distinct viewpoints on the problem, such as citizens groups, multinational corporations, government agencies and others as may be applicable.

Exam Attendance Policy:

You absolutely **MUST** attend the exams and the debate of the second text at the scheduled times. If you cannot attend, you must contact me **IN ADVANCE** to take the exam at a different time. **If you miss an exam without contacting me in advance, you will receive a zero for the exam no matter the circumstances.** To take an exam late, you **must** provide documentation that proves you could not be in attendance at the scheduled time, and arrangements will be made only in the case of serious emergencies, and only at my discretion. Attendance at athletic events, practices, family outings or trips, hangovers, sniffles, sick friends or family, car trouble, trips for other courses, forgetting the date of the exam, among many other excuses, are **NOT** acceptable and will **NOT** result in being allowed to take a make up exam. If you fail to attend an exam for any reason that does not in my opinion constitute an emergency, and if you do not contact me in advance, you will receive a zero for that exam. There will be no exceptions to this policy.

Grading Policy:

Grades will be based the following scores:

Two midterm exams	20% each
Final exam	25%

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In-class discussion of Encounters with the Archdruid	10%
In-class debate of challenges in resource use	10%
Discussion of the Common Reading	5%
Roll call attendance	10%

Assessment dates are indicated in **bold type** in the schedule below. Exams consist of a mixture of multiple choice (about 2/3 point total) and short essay type questions (about 1/3 of the point total). I will take roll call attendance at 5 random class meetings through the semester, and the attendance grade will make up the remaining 15% of your course grade. Attendance of 4 out of 5 = A, 3 out of 5 = B, 2 out of 5 = C, 1 out of 5 = D, 0 attendance = F. **There are no excused absences from roll call attendance—that is why you are allowed to have only one absence without it affecting your grade. Do not waste your time bringing me excuses for roll-call absences.** When I call roll, you are either in your seat or you are not—if you go out to the bathroom, to take a phone call, or if you walk in 2 minutes after I call roll, you are marked absent. If you get arrested, hit by a meteorite, married etc. more than once in the semester on days I call roll, you will be marked absent.

Extra Credit exercises:

There will be two available extra credit assignments. First, the university hosts a series of roundtable discussions called the Tuesday Times Roundtables each Tuesday from 12:30-1:30. Most of the roundtables are at the University Park campus but some are at Biscayne campus also. The schedule of discussions may be found at <https://global.fiu.edu/ttr/>. Documented attendance at three of these sessions, accompanied by a one page single spaced summary of the roundtable discussion, will earn you extra credit in the course. These writeups will be due on the last day of lecture (April 19). Second, a written quiz will be given on April 12, and students scoring a passing grade on that quiz (70 or better) will also receive extra credit. The quiz will cover the recommended text “Coal: A Human History.” In each case, extra credit consists of an increase to the overall semester grade by one fraction (e.g., from C- to C, B to B+).

Advice on Course Strategy

I have taught this class many times, and my advice on how to prepare yourself to succeed is as follows:

- 1) Print out outlines of the powerpoint files for each lecture, and use them as a template for your in-class note-taking. Notice, this implies that I expect you to take notes in class. Many things I expect you to know are not found in bullet lists in the powerpoints, and simply studying them alone will not result in a passing grade.
- 2) Print out and make many copies of the resource data sheet (available in Blackboard). Fill out one copy of the form for each resource we discuss after the introductory part of the semester (e.g., natural gas, copper, iron, diamonds, etc.) and use it to organize your information about each resource. These forms will be a crucial resource in preparing for the exams, especially the final exam.
- 3) Take advantage of the extra credit opportunities, especially the Tuesday Times Roundtable, early in the semester. Later in the semester the series will have ended and it will be too late to earn that extra credit. Asking for extra credit in the last week of the semester, like asking for an incomplete because your grade is too low, will not get you anywhere.

Course behavior:

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Students will arrive on time, ready to participate in the day's activities. Electronic devices may be used only for participation in class activities. Cell phones must be turned off or muted at all times. Any violations of the university honor code (available at <http://www2.fiu.edu/~daiglerr/code.htm>) will result in charges of academic misconduct. This includes any form of cheating such as use of unauthorized materials or communication during exams, plagiarism and so on. Students will behave in a respectful manner toward one another even during heated debates, regardless of how strongly you disagree.

Class Schedule (Subject to Modification)

Date	Topic	Reading
January 9	Course ground rules and introduction.	Syllabus
January 11	The Earth's internal structure and dynamics	LTT ch. 1,
January 16	Minerals and rocks	LTT ch. 2
January 18	Igneous rocks—how and where they form	LTT ch. 3
January 23	Surface processes: weathering and sedimentary rocks	LTT ch. 6, 7
January 25	Deformation of rocks	LTT ch 11
January 30	Class discussion	Encounters with the Archdruid
February 1	Weighing development and conservation Basic mineral economics, global cartels, National and multinational mineral companies and their political and social impacts	CVS ch. 2
February 6	Midterm 1	
February 8	Midterm results. Mining methods—technology, Environmental impacts, effect of social conditions, part 1—surface mining.	CVS ch. 4
February 13	Mining methods, part 2—underground mining	CVS, ch. 4
February 15	Energy resources—global overview of current use	CVS, ch. 5
February 20	Fossil fuels—formation of coal and petroleum, Overview of international reserve picture	CVS, ch. 5
February 22	Consequences of fossil fuel use—acid rain, geologic evidence on global climate change	CVS, ch. 4
February 27	Energy alternatives: Renewables	CVS, ch. 6
March 1	Energy alternatives: nuclear power—sources, technology and impacts	CVS, ch. 6
March 6	Midterm 2	
March 8	No class meeting (Field excursion in session)	

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March 13	Spring Break	
March 15	Spring Break	
March 19	Last day to drop with a DR grade	
March 20	The abundant metals: iron and aluminum Iron deposits and the evolution of the modern global Atmosphere	CVS, ch. 7
March 22	Abundant metals: manganese and titanium Seafloor deposits of manganese and other metals Discussion of the Common Reading and quiz	CVS, ch. 7 Common Reading
March 27	Platinum and the ferroalloy metals vanadium and Chromium: Extreme examples of heterogeneous global distribution.	CVS, ch. 8
March 29	Nickel, cobalt and other ferroalloys	CVS, ch. 8
April 3	Class group discussion of challenges in resource	
April 5	Copper and the base metals: their uses and roles In the rise of modern society	CVS, ch. 8
April 10	Gold and silver: Formation and uses, roles in imperialism and conquest.	CVS, ch. 8
April 12	Extra Credit Quiz, Coal: A Human History Formation of diamonds, DeBeers, international diamond cartel	CVS ch. 10
April 17	Industrial and chemical minerals	CVS ch. 10
April 19	Fertilizers: nitrogen, phosphorous and potassium Nitrates and the War of the Pacific	CVS ch. 9
April 26	Final exam, 8:45-11:45 in CP438	

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