LSC Use Only Proposal No:	UWUCC Use Only Proposal No: 11-123d.
LSC Action-Date: AP-3/22/12	UWUCC Action-Date: AP-4/3/12 Senate Action Date: App-9/11/12

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) Michael A. Poage	Email Address mpoage@iup.edu
Proposing Department/Unit Geoscience	Phone 7-5627

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

New Course	Course Prefix Change	Course Deletion
X Course Revision	Course Number and/or Title Change	Catalog Description Change

Current course prefix, number and full title: GEOS 152 Physical Resources of the Earth

Proposed course prefix, number and full title, if changing:

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

☐ Learning Skills ☑ Knowledge Area ☐ Global and Multicultural Awareness ☐ Writing Across the Curriculum (W Course)

☐ Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)

☐ Global Citizenship ☐ Information Literacy ☐ Oral Communication

☐ Quantitative Reasoning ☐ Scientific Literacy ☐ Technological Literacy

3. Other Designations, as appropriate

☐ Honors College Course ☐ Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

☐ Catalog Description Change ☐ Program Revision ☐ Program Title Change ☐ New Track

☐ New Degree Program ☐ New Minor Program ☐ Liberal Studies Requirement Changes ☐ Other

Current program name:

Proposed program name, if changing:

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)		3/6/12
Department Chairperson(s)		3/6/12
College Curriculum Committee Chair		3/7/12
College Dean		3/12/12
Director of Liberal Studies (as needed)		3/28/12
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	Gail S Sechrist	4/5/12

Received APR 5 2012 Liberal Studies

Received MAR 28 2012 Liberal Studies

Received MAR 12 2012 Liberal Studies

1. SYLLABUS OF RECORD

I. Catalog Description

GEOS 152 Physical Resources of the Earth 3c-0l-3cr

Prerequisite: No GEOS majors/minors

An introduction to mineral, energy, and water resources of the earth; genesis of ore depositions; exploration, exploitation, and utilization of resources; impact of exploitation of resources on the environment and on humankind. (Offered as GEOS 221 prior to 2009-2010 and GEOS 252 prior to 2010-2011)

II. Course Outcomes

At the conclusion of this course, students should be able to:

Objective 1:

Understand the geological processes responsible for formation of mineral, energy and water resources of the Earth. Relate the different kinds of physical resources to their plate tectonic setting and their geological evolution. Given the large-scale geologic setting, identify possible areas worthy of exploration for mineral, energy, or water resources. Evaluate among different models of ore genesis.

Expected Student Learning Outcome 1 and 2:

Informed and Empowered Learners

Rationale:

Assignments and course content will require students to achieve a level of knowledge that will enable them to understand the geological processes responsible for the Earth's major physical resources and draw connections between physical resources and their tectonic and geochemical origins. In addition students will develop a knowledge base sufficient to identify plausible regions for exploration for a variety of physical resources.

Objective 2:

Describe the history of some important ore deposits as resources and make some predictions regarding their future.

Expected Student Learning Outcome 1 and 2:

Informed and Empowered Learners

Rationale:

Students will be required to attain a knowledge base enabling them to understand the nature of specific globally important ore deposits. Students will critically analyze data regarding example deposits and be able to analyze their future potential using a variety of resource calculation methodologies as well as predictions of future global consumption.

Objective 3:

Understand the role of technology in the exploration and exploitation of physical resources. Identify the role of the geologist during the exploration, development and production stages of a mine or well.

Expected Student Learning Outcome 1:

Informed Learners

Rationale:

Assignments such as a paper or exams will require students to achieve a level of knowledge that will enable them to understand the use of modern technology in the development of physical resources and recognize the importance of understanding geology and the role of the geologist in all stages of physical resource development.

Objective 4:
Evaluate both the negative and positive consequences of resource exploitation on the physical environment and on the living world.
Expected Student Learning Outcome 3:
Responsible Learners
Rationale:
Assignments such as a paper or exams will require students to evaluate the consequences of living in a modern resource-dependent society and the social responsibilities of each citizen to understand these consequences. Students will assess the benefits and drawbacks of resource development and consider ways that modern society may eventually reduce its dependence on extractive and environmentally destructive industries.

Objective 5:
Evaluate the global distribution of mineral resources and interpret international flow of resources in economic, political and social contexts.
Expected Student Learning Outcome 2 and 3:
Empowered and Responsible Learners
Rationale:
Assignments such as a paper or exams will require students to evaluate the global distribution of natural resources toward an assessment and understanding of the importance of economic policies and international politics in providing nations with essential mineral, energy and water resources. Students will analyze the potential effects of supply disruptions on national economies and the political stability of nations.

Objective 6:
Comprehend the difficult choices between development policies and resource exploitation and preservation of the environment.
Expected Student Learning Outcome 3:
Responsible Learners
Rationale:
Assignments such as a paper or exams will require students to evaluate the consequences of current development policies and resource exploitation with regard to the environmental preservation and sustainability. Students will be required to evaluate relevant information (resource data, national and global supply and demand, environmental issues) and generate their own viewpoint with regard to real cases of mine and energy resource development.

III. Course Outline

Part A: Introduction to Physical Resources **6 academic hours**

1. Natural Resources as the Foundation of Modern Society
2. Historical Use of Natural Resources
3. Environmental Impacts of Resource Use
4. Earth Processes and the Origins of Natural Resources
5. Basic Geochemistry

Part B: Metallic Mineral Resources **10 academic hours**

1. Geochemically Abundant Metals
2. Base Metals
3. Geochemically Scarce Metals
4. Precious Metals
5. Rare Earth Elements

Exam 1

Part C: Energy Resources — **1 academic hour**

1. Conventional Carbon-Based Fuels: Oil, Natural Gas, Coal — **12 academic hours**
2. Unconventional Carbon Based Fuels: Tar Sands, Oil Shales, Methane Hydrates
3. Nuclear Energy
4. Renewable Energy Sources: Geothermal, Wind, Solar, Hydroelectric

Exam 2

Part D: Water Quality — **1 academic hour**

Part E: Industrial Resources — **6 academic hours**

1. Building Materials — **6 academic hours**
2. Fertilizers
3. Industrial Chemicals

Cumulative final exam during final exam period. — **2 academic hours**

IV. Evaluation Methods

Each component of the course will contribute to final grade according to:

Exam 1	20%
Exam 2	20%
Final Exam	25%
Problem Sets	20%
In-Class Exercises	15%
Total	100%

V. Example Grading Scale

The final grade for this course will be determined using the following schedule:
A=90-100%; B=80-89%, C=70-79%, D=60-69%, F=<60%

VI. Attendance Policy

The attendance policy will conform to IUP's undergraduate course attendance policy.

VII. Required textbooks, supplemental books and readings

Required textbook: Craig, J.R., Vaughan, D.J., and Skinner, B.J. *Earth Resources and the Environment*: Prentice Hall, 2010, 528p.

Supplemental book: Schneiderman, J.S. *The Earth Around Us: Maintaining a Livable Planet*: W.H. Freeman and Co., 2000, 455p.

VIII. Special resource requirements

There are no special resource requirements for this course.

IX. Bibliography

In addition to the required textbooks and supplemental readings from science journals, the following will be used to develop the course curriculum:

Chiras, D.D. and Reganold, J.P. (2009) *Natural Resource Conservation: Management for a Sustainable Future (10th Edition)*: Addison Wesley, 672p.

Deffeyes, K.S. (2008) *Hubbert's Peak: The Impending World Oil Shortage*: Princeton University Press, New Jersey, 232p.

Marshak, S. (2005) *Earth: Portrait of a Planet, 2nd ed.*: Norton Publishing, London, 748p.

Skinner, B.J., Porter, S.C. and Park, J. (2004) *Dynamic Earth: An Introduction to Physical Geology*: John Wiley and Sons, New York, 584p.
Smith, G.A. and Pun, A. (2006) *How Does Earth Work? Physical Geology and the Process of Science:* Pearson Prentice Hall, Upper Saddle River, N.J., 641p.
Yergin, D. (2008) *The Prize: The Epic Quest for Oil, Money & Power*: Free Press, 928p.

2. SUMMARY OF PROPOSED REVISIONS

1. Objectives – the course objectives were revised slightly from the original syllabus of record and aligned with the Expected Undergraduate Student Learning Outcomes (EUSLO) and Common Learning Objectives found in the criteria for a non-laboratory Natural Science course.
2. Common Learning Objectives for a non-laboratory Natural Science course are met in the content portion of the course. These objectives are:
    - examine a body of knowledge of natural science that will contribute to an understanding of the natural world and an appreciation of the impacts that natural sciences have on the lives of individuals and the world in which they live
    - understand the differences between science as a knowledge base and science as a process that generates knowledge
    - develop an inquiring attitude consistent with the tenets of natural science
    - understand the empirical nature of science
    - understand the concept of bias and the efforts to which scientists go to avoid it
3. Updated textbook and non-textbook reading to a more current book.
4. Updated the bibliography.

3. JUSTIFICATION/RATIONALE FOR REVISIONS

The course is a currently approved Liberal Studies Non-Laboratory Natural Science course and is being revised to meet the new curriculum criteria for this category as outlined in the undergraduate catalog.

4. OLD SYLLABUS OF RECORD

See attached sheets.

Liberal Studies Course Approval General Information

1. This course will be taught in one section by one instructor.

2. Readings taken from Vassar College Professor Jill S. Schneiderman's collection of essays entitled "The Earth Around Us: Maintaining a Livable Planet" [W.H. Freeman and Company: New York, 2000, 455p.; ISBN 0-7167-3397-8] will highlight the important contributions that this and other female scientists have made to conveying modern science to a broad audience (see "C" below). Other authors of essays in this collection include Marcia Bjornerud (Lawrence University), Allison McFarlane (George Mason University), Cathryn Manduca (Carleton College), Kirsten Menking (Vassar College), Naomi Oreskes (University of California at San Diego), and Jill Singer (Buffalo State University).

3. In addition to the textbook "Earth: An Introduction to Physical Geology", a number of non-textbook readings will incorporated into the course from the above-mentioned collection of essays, "The Earth Around Us: Maintaining a Livable Planet". Essays in this collection address the interactions of humans and planet Earth in a discussion of modern environmental issues. Essay titles include:

"From the Catskills to Canal St.: New York City's Water Supply"
"Ruling the Range: Managing the Public's Resources"
"Are Soils Endangered?"
"An Earth Scientist in City Hall: Geology and Community"
"Lessons from the Past for Future Climate"

4. This course will draw on elements of the geosciences pertinent to understanding the interactions between various Earth systems en route to forming the natural resources on which society depends. As such, this course will focus on the fundamental systems that constitute our planet as well as the internal process that shape our planet. This emphasis on Earth systems and processes is designed to provide a working knowledge of the Earth Sciences but is different from that provided for beginning majors in that it is directed toward the formation of natural resources rather than the broader realm of the geosciences. As such, this course does not cover the detail and depth that beginning majors would encounter in introductory courses such as GEOS 201 Foundations of Geology.

Example Exercise and Grading Rubric

See following pages for example exercise.

Grading Rubric

Part 1

Question 1:	2 points
Question 2:	2 points
Question 3:	2 points
Question 4:	4 points
Question 5:	2 points
Question 6:	2 points
Question 7:	4 points
Question 8:	4 points
Question 9:	4 points
Question 10:	4 points

Part 2

Question 1:	10 points
Question 2:	10 points
Question 3:	10 points
Question 4:	10 points
Question 5:	10 points
Question 6:	10 points
Question 7:	10 points

TOTAL 100 points

GEOS 152: Coal and Coal Mining in the United States

Part 1: Coal: Its Nature, Use, and Environmental Impact

The United States has vast deposits of coal which are much more extensive than its petroleum and natural gas resources. When compared to petroleum and natural gas, using heat energy content as the basis for comparison, over 90% of the total estimated U.S. recoverable fossil fuel reserves are found in coal. Using this comparison, petroleum accounts for about 3% and natural gas about 4% of our fossil fuel energy reserves.

The United States has about 1.7 trillion tons of identified coal resources of which 495 billion tons are of sufficient thickness, quality, and are close enough to the surface to be classified as reserves; that is, with present-day technology and prices it is profitable to mine these deposits. Depending on the depth of coal and thickness of the deposit, coal is mined using either underground or surface mining techniques. Generally about 50% of the coal is recovered when room and pillar methods are used and 85% of coal is recovered using longwall methods. Surface mining is more efficient than either of these other two techniques and can recover more than 90% of the coal present.

Although in the U.S. the amount of coal being mined using underground techniques has remained fairly constant over the past 50 years, the percentage has decreased significantly at the expense of great increases in surface mined coal. In 1950, over 75% of coal mined used underground mining methods, whereas by 1995, nearly 65% was mined using surface mining techniques.

Coal quality varies greatly depending mainly on the relative amounts of carbon, volatile matter, moisture, sulfur and ash that it contains. Coal is classified into several different ranks (lignite, subbituminous, bituminous and anthracite) which are determined by the degree of metamorphism to which the original plant matter has been exposed. This is mainly a matter of time and pressure driving off moisture and volatile matter therby increasing the percentage of carbon in the remaining coal. *Table 1* shows the classification, including heat value, for the different ranks of coal.

Table 1: Classification of coal rank.

Rank	Carbon, %	Volatile Matter, %	Moisture, %	Btu/lb
Lignite	25-35	20-25	35-50	6,000-8,000
Subbituminous	35-45	30-35	20-35	8,000-11,000
Bituminous	45-85	15-35	5-20	10,000-15,500
Anthracite	85-95	5-10	3-5	14,500-15,000

The United States is second in the world in coal production (behind China) with coal being produced in over 20 states. Wyoming is thee leading coal producer followed by Kentucky, West Virginia, Pennsylvania, Texas and Illinois. By 1995, 47% of the total US coal production was

from west of the Mississippi River, up from 5.2% in 1965. The growth in western coal production is due largely fromt he increased demand for low-sulfur coal which is generally more abundant in the west. *Figure 1* shows the distribution of coal fields in the U.S.

A number of environmental problems are associated with the mining and utilization of coal. Land subsidence may take place in areas of underground mining. Surface mining, especially contour stripping, can result in severe erosion problems and subsequent siltation of streams. Federal and state reclamation laws require surface-mined lands to be restored to before-mining topography with return of original topsoil. Enforcement is sometimes a problem and as a result not all land is adequately reclaimed. Acid-mine drainage from abandoned underground mines and surface waste piles can make streams highly acidic an uninhabitable by aquatic life.

Utilization of coal as an energy source has changed dramatically over the last half century. Prior to 1950 coal was a major source of energy for residential and commercial heating, the steel industry (coke) and transportation (railroads) with less than 20% being consumed by electric utilities. By 1995, 88% of all coal used in the U.S. was by electric companies.

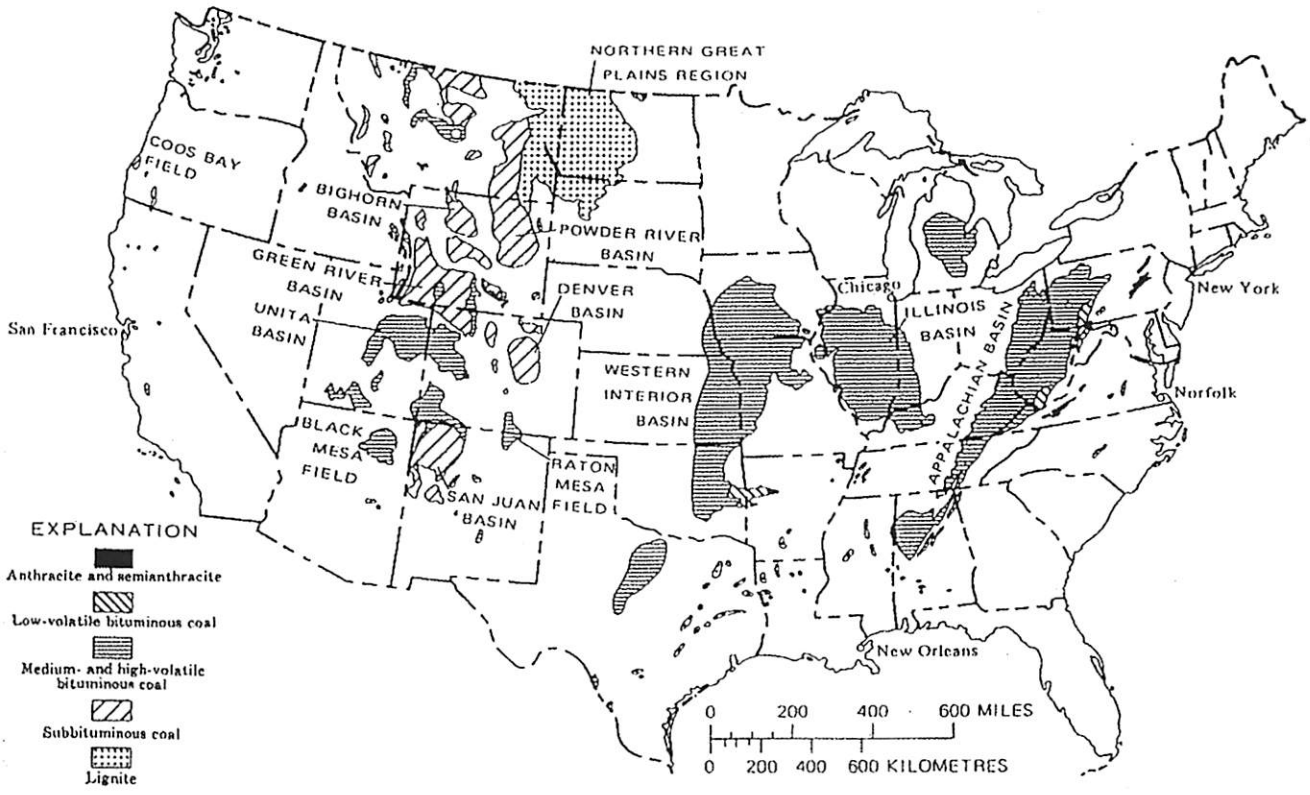
The burning of coal produces gases and particulate matter that, unless controlled, are released into the atmosphere. At most coal-burning electric power plants, electrostatic precipitators, which remove 99% of the particulate matter, are installed. The major gases released are sulfur and nitrogen compounds as well as carbon-dioxide. Sulfur emissions are generally credited with the major responsibility for acid rain. Some bituminous coals from the Appalachian Basin and the Illinois Basins can contain up to 6% sulfur. Some of the sulfur, especially if it is in the form of pyrite (FeS_2) can be removed before combustion by washing the coal as can much of any other mineral matter. Most of the remaining sulfur can be controlled during combustion using scrubbers, but there are still many plants that do not have adequate pollution control technology. Carbon-dioxide produced in the burning of any fossil fuel is an important factor in global climate change. Heavy metals such as mercury can also be a problem.

Table 2: U.S. coal production, 1980-1995 in millions of short tons.

Year	Bituminous Coal	Subbituminous Coal	Lignite	Anthracite	Total[1]
1980	628.8	147.7	47.2	6.1	829.7
1981	608.0	159.7	50.7	5.4	823.8
1982	620.2	160.9	52.4	4.6	838.1
1983	568.6	151.0	58.3	4.1	782.1
1984	649.5	179.2	63.1	4.2	895.9
1985	613.9	192.7	72.4	4.7	883.6
1986	620.1	189.6	76.4	4.3	890.3
1987	636.6	200.2	78.4	3.6	918.8
1988	638.1	223.5	85.1	3.6	950.3
1989	659.8	231.2	86.4	3.3	980.7
1990	693.2	244.3	88.1	3.5	1029.1
1991	650.7	255.3	86.5	3.4	996.0
1992	651.9	252.1	90.1	3.5	997.5
1993	576.7	274.9	89.5	4.3	945.4
1994	640.3	300.5	88.1	4.6	1033.5
1995[2]	611.1	328.4	86.1	4.1	1029.7

(1) Preliminary data. (2)May not equal sum of parts due to rounding.

Figure 1: Distribution and type of U.S. coal fields.



Questions: Use Tables 1-2 and Figure 1 to answer questions 1-7:

1) Of what rank is most of the coal that occurs in Wyoming?

2) What is the rank of most Appalachian coal?

3) Anthracite, which is mined in eastern Pennsylvania and is known for its clean burning qualities and high heat value, accounts for a diminishing share of total coal production. In 1950 it accounted for about 8% of the total coal produced in the U.S. What percent did it account for in 1995?

4) What percentage of coal produced in the United States in 1980 was bituminous? Subbituminous? Lignite? Anthracite? What were the percentages for each in 1995?

5) Which ranks of coal have seen the greatest increase in production in the past fifteen years?

6) How does the heat value in Btu/lb of Wyoming subbituminous coal compare to anthracite coal of eastern Pennsylvania (assume average values from Table 1)?

7) Approximately how much Wyoming coal would have to be burned to obtain the heat produced by burning 1 ton of average anthracite coal?

8) Some 12,500-Btu/lb Appalachian Basin bituminous coals have as much as 6% sulfur in mineral and organic matter, while some 7,500-Btu/lb western subbituminous and lignite coals have 1% sulfur. In comparing 1% sulfur coal with 6% sulfur coal, how much more heat is produced for the same amount of SO_2 production by burning the 1% sulfur coal versus the 6% sulfur coal?

9) What are some of the kinds of damage caused by acid rain?

10) Explain why CO_2 emissions from coal-fired electric plants could be a factor in global climate change.

Part 2: Evaluation of a Potential Coal Mine

In the hills and mountains of the Appalachians where coal beds are close enough to the surface, coal may be mined using contour stripping methods. The operation consists of removing the material on top of the coal (overburden) using modern high-capacity equipment. The coal is then dug out with a power shovel , loaded on trucks and hauled to facilities where it is screened, washed and shipped to users.

For this exercise, we have set up a hypothetical coal company, Ole King Coal, with a realistic mining opportunity at Rusty Gulch. A 5-ft. thick seam of coal occurs on a four sqaure mile property in an Appalachian coal field (see below). The botom of the seam occurs at an elevation of 860 ft. The high-capacity equipment to be used for this operation allows for profitable mining where 100 feet or less of overburden must be removed to reach the coal. Other pertinent information is as follows:

a. There are 640 acres in a square mile; one short ton equals 2000 pounds.
b. One acre-foot of bituminous coal (that is a foot thick seam of coal that covers an acre) weighs approximately 1800 sort tons.
c. Ole King Coal expects to recover 85% of the mineable coal from this seam.
d. The coal will be sold to a coal-burning power plant for $21.50 per short ton.
e. The capacity of the mining and washing equipment is 3,500,000 tons of saleale coal per year.
f. Gross operational costs are expected t average $19.25 per ton of saleable coal over the life of the mining operation. These costs include the cost of mine development, royalties labor, taxes, employee benefits, depreciation, and $6300 per acre for reclamation.

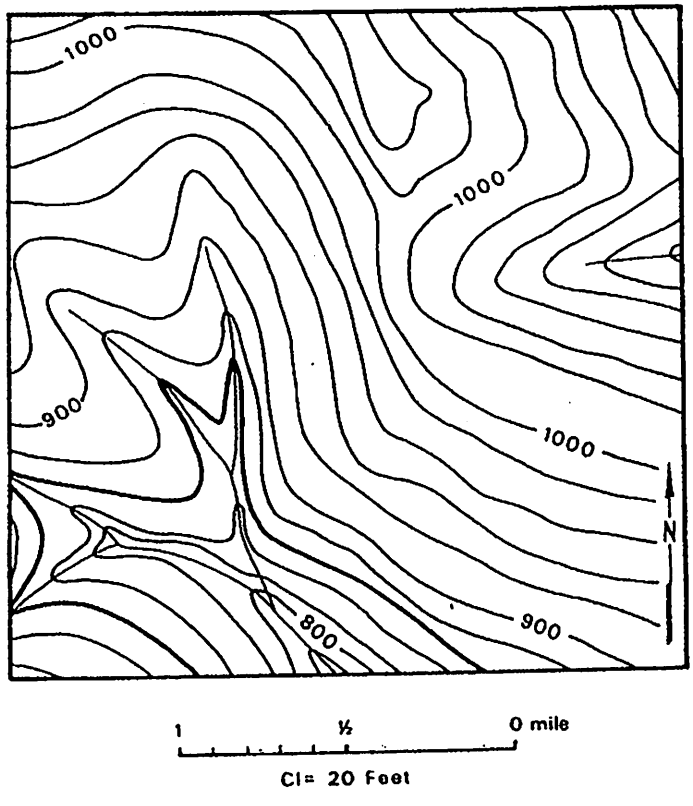


Figure 2: Topographic map of the Rusty Gulch mine property.

Questions:

1) On the topographic map, each contour line represents a specific elevation. Using different colors show the following regions:

a. the area below 860 ft. where no coal is present
b. the area where coal will be profitable mined
c. the area where overburden is too thick to mine the coal

2) Calculate the area from which coal can be profitably mined. Draw a grid system on the map and estimate the area in square miles. Then convert this area to acres (640 acres in a square mile).

3) What is the total amount of mineable coal in tons (use information above)? Remember that the coal seam is five feet thick.

4) What is the tonnage that should be recoverable (Ole King Coal can only recover 85% of the total coal)?

5) What is the total gross income expected for the Rusty Gulch property?

6) What are the total estimated expenses for the mining property?

7) What is the expected life of the operation if mined at the full capacity of the equipment?

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

LSC Use Only	UWUCC Use Only
Number _____	Number 9
Action _____	Action _____
Date _____	Date _____

I. TITLE/AUTHOR OF CHANGE
COURSE/PROGRAM TITLE GS 221 Physical Resources of the Earth
DEPARTMENT Geoscience
CONTACT PERSON Dr. Darlene S. Richardson

II. THIS COURSE IS BEING PROPOSED FOR:
___ Course Approval Only
_✓_ Course Approval and Liberal Studies Approval
___ Liberal Studies Approval only (course previously has been approved by the University Senate)

III. APPROVALS
Connie J. Sutton
Department Curriculum Committee
Department Chairperson
College Curriculum Committee
College Dean*
Director of Liberal Studies (where applicable)
Provost (where applicable)

*College Dean must consult with Provost before approving curriculum changes. Approval by College Dean indicates that the proposed change is consistent with long range planning documents, that all requests for resources made as part of the proposal can be met, and that the proposal has the support of the university administration.

IV. TIMETABLE

Date Submitted to LSC _____
to UWUCC _____
Semester/Year to be implemented _____
Date to be published in Catalog _____

Revised 5/88

[Attach remaining parts of proposal to this form.]

PART IV. DESCRIPTION OF CURRICULUM CHANGE

1. Catalog description

GS 221 Physical resources of the Earth — 3 credits
3 lecture hours
0 lab hours
(3c-0l-3sh)

Prerequisite: GS121 General Geology I or GS101 Earth Science Geology/Oceanography

Introduction to mineral, energy, and water resources of the Earth, genesis of ore deposits; exploration, exploitation, and utilization of resources; impact of exploitation of resources on the environment and on humankind. Field trips which may occur on weekends.

Includes

2 Course Syllabus

I CATALOG DESCRIPTION

GS 221 Physical Resources of the Earth 3c-0l-3sh
Prerequisite: GS 121 ~~General Geology I or GS 101 Earth Science~~ Geology/Oceanography

Introduction to mineral, energy, and water resources of the Earth: genesis of ore deposits; exploration, exploitation, and utilization of resources; impact of exploitation of resources on the environment and on humankind. Field trips which may occur on weekends.

II. COURSE OBJECTIVES

1. Understand the geological processes responsible for formation of mineral, energy, and water resources of the Earth. Relate the different kinds of physical resources to their plate tectonic setting and their geological evolution. Given the large scale geologic setting, identify possible areas worthy of exploration for mineral, energy, or water resources. Evaluate among the different models of ore genesis.

2. Describe the history of some important ore deposits as resources and make some predictions regarding their future.

3. Understand the role of technology in the exploration and exploitation of physical resources. Identify the role of the geologist during the exploration, development and production stages of a mine or well.

4. Appreciate both the negative and positive consequences of resource exploitation on the physical environment and on the living world.

5. Evaluate the global distribution of mineral resources and superficially interpret international flow of resources in economic, political, and social contexts.

6. Comprehend the difficult choices between development policies and resource exploitation and preservation of the environment.

7. Theme of the course: "We shall not cease from exploration./And the end of all our exploring/ Will be to arrive where we started/ And know the place for the first time." T.S. Eliot

III. COURSE OUTLINE

Introduction to physical resources of the Earth: minerals and rocks, energy sources, water, concepts of resource, reserve, and ore (1 week)

Uses of physical resources from a historical perspective (1 week)

Earth resources (geological processes of formation, relationships with plate tectonics, important localities, case histories dealing with exploitation of these resources and impacts of that exploitation on humankind) (8 weeks)

Energy resources. "fossil fuels", nuclear power, alternatives for future energy supplies
Ores that are abundant: Metals such as iron, manganese, aluminum, titanium, copper, and so on
Ores that are rare: Metals such as precious metals (gold, silver, and so on), base metals (lead, zinc, and so on), precious stones (diamond, ruby, and so on)
Agricultural minerals: nitrogen, phosphorus, and so on
Construction materials: sand, gravel, cement, and so on
Water resources
Soil resources

Exploitation of physical resources and impact on the environment (1 week)

Exploitation of physical resources and impact on humankind (1 week)

Two guest lecturers:
Dr. Miriam Chaiken, Sociology-Anthropology, IUP: a case history of the US government and exploitation of mineral resources on a Native American Reservation in Arizona (1/3 week)

Ms. Eileen Cooper, History, IUP: a history of coal mining in Pennsylvania. Ms. Cooper was instrumental in establishing the Coal Heritage Center in the Johnstown Flood Museum. (1/3 week)

(1/3 week, i.e. one class period will be the midterm exam)

Two field trips which may occur on weekends:

1. Coal strip mine in western Pennsylvania
2. Coal mining town and the environmental impact on local streams of bony piles and acid mine drainage

IV. EVALUATION METHODS

The final grade for the course will be determined as follows:

60% Two tests: one midterm and one final consisting of short-answer type (multiple choice, completion, matching) and short essay type questions (100 points each test).

15% Unannounced quizzes on lecture and reading material and short essays (done in 10-15 minutes of class time) on the assigned readings.

25% Short paper (about 5 pages) or a class oral presentation on a topic approved by the professor. The research paper or presentation will deal with some aspect of the impact of the exploitation of physical resources on the environment or on humankind. The topic is to be selected from a list of topics generated by the professor by quarter term, an outline is to be submitted at mid-term, a rough draft at three-quarter term and the polished paper will be due two weeks before the final examination

period The research paper will be graded on selection of the appropriate amount and kind of factual material, critical evaluation of those data, ability to synthesize that information to make a point, proper citation of references and a clear, concise writing syle.

Required reading:

Craig, J.R., Vaughan, D.J., Skinner, B.J., 1988, Resources of the Earth: Prentice-Hall, 395 pp.

McPhee, J. 1980. Basin and Range

McPhee, J., 1982, Annals of the Former World: Suspect Terranes· 3 part series in the New Yorker, September 13, 20, 27, 1982.

Cooper, Eileen, 1982, Rochester and Pittsburgh Coal Company. The First Hundred Years, pamphlet.

Other readings in journals or newspapers will be assigned in lecture

Required viewing (videocassettes): (viewed in class or as homework assignments

Broken Rainbow
Matewan
The Molly Maguires
Planet Earth Series: The Living Machine, Gifts of the Earth, Fate of the Earth
The Witwatersrand Basin

Resource materials used to prepare for and teach this course:

Berner, E.K. and Berner, R.A., 1987, The Global Water Cycle: Prentice-Hall, 397 pp

Broecker, W.S., 1985, How to Built a Habitable Planet: Eldigio Press, 291 pp.

Flawn, P T., 1966, Mineral Resources: John Wiley and Sons, 406 pp.

Griggs, G.B. and Gilchrist, J.A., 1983, Geologic Hazards, Resources, and Environmental Planning: Wadsworth, 502 pp.

Kuzvart, M. and Bohmer, M., 1978, Prospecting and Exploration of Mineral Deposits: Elsevier, 431 pp.

Moran, J.M., Morgan, M.D., and Wiersma, J.H., 1986, Introduction to Environmental Science: W.H. Freeman, 709 pp.

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3 Course analysis questionnaire

Section A: Details of the Course

A1 This course is designed for the Liberal Studies Program in the category of Natural Science: Non-Laboratory. Thus, the course is designed for those students who select the option of taking one semester of science with lab and two semesters of science without lab. This course is not intended for majors in the Department

A2. This course does not require changes in the content of existing courses.

A3. The organization of this course follows the traditional type of offering by the Department, but it is somewhat different from the other courses in the Department in the increased emphasis on the interrelationships among geological events and impacts on the environment and humankind.

A4. This course has not been offered as a special topics course.

A5. This course is not a dual-level course.

A6. This course is not to be taken for variable credit.

A7. I surveyed universities near IUP and found that mineral resource courses are taught at most of them, but as a majors type of course. In Appendix I I have included excerpts from the appropriate catalogs which deal with these courses.

A8. The content of this proposed course is not recommended or required by any professional society, accrediting authority, law, or any other external agency.

Section B: Interdisciplinary Implications

B1. This course will be taught by one instructor with occasional guest lecturers.

B2. No additional or corollary course are needed with the course.

B3. The Department offers a majors level course, GS 335 Economic Geology, which deals with the location and origin of fossil fuels and ores with emphasis on ore genesis. The Geography courses GE 231 Economic Geography, GE 333 Trade and Transportation and GE 335 Geography of Energy (not taught in 88-89) all relate to spatial patterns of trade (see catalog descriptions of these courses) whereas this course will deal mainly with the geological processes of formation of

physical resources. In addition to dealing with mineral resources. this course is easily separable from the geography courses in that this course will also discuss water as a physical resource and alternate energy sources. This course does overlap somewhat with GE 440/540 Conservation: Environmental Analysis. but differs in approach. scope (this geography course includes living resources). and audience. The Geography Department supports the approval of this course (Appendix II).

B4. Students in the School of Continuing Education are welcome to attend this course.

Section C: Implementation

C1. Resources

a. No new faculty is needed to teach this course.

b. Current space allocations are adequate to offer this course.

c. Current equipment is adequate to offer this course.

d. The Department budget is sufficient to purchase supplies for this course.

e. Library holdings are barely adequate: new books on the geology of mineral resources have been ordered.

f. The Departmental vans will be used to transport students on field trips.

C2. No grant funds are associated with this course.

C3. The Department expects to offer this course every one or two years in the Spring semester. The frequency of course offering will depend on student demand for the natural science: non-lab option of the Liberal Studies program.

C4. I anticipate offering one section per semester.

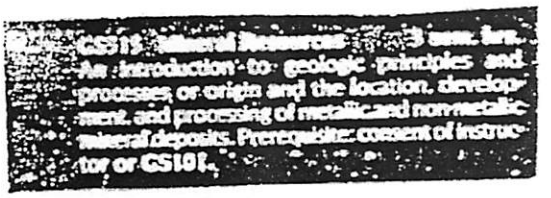
C5. Twenty-five to fifty students can be accommodated in a section of this course. Space is limited on field trips. but students will have a choice of which field trip they wish to attend.

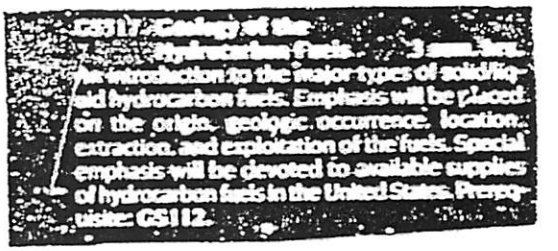
C6. I do not know of any professional society recommendations which will limit enrollments in this lecture course.

C7. This course will be one of the natural science: non-lab courses which a student may take to fulfill his/her natural science requirement in the Liberal Studies program.

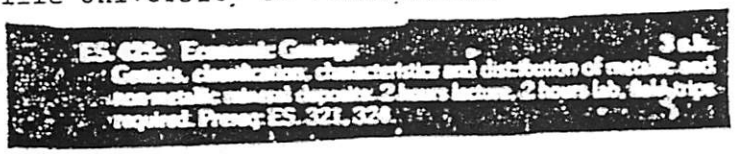
APPENDIX I: COURSE DESCRIPTIONS OF SIMILAR COURSES

Edinboro University of Pennsylvania



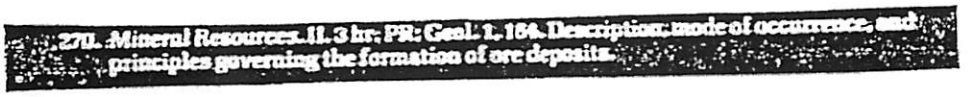


Millersville University of Pennsylvania



Pennsylvania University of Pennsylvania

West Virginia University



IUP
Indiana, Pennsylvania 15705

Date: March 8, 1989

Subject: GS 221 Physical Resources of The Earth

To: Dr. Darlene Richardson
Geoscience Department

From: Bob Begg/Chairperson
Department of Geography & Regional Planning

While considerable overlap exists in the content of GS 221 and several of our courses your approach to the topics differs substantially. The greatest overlap is with GE 440/540 Conservation: Environmental Analysis. In that course the use of natural resources, energy, soil and water resources are considered from the perspective of human interaction. While there may be a great deal of commonality in these topics you seem to approach them from a physical science perspective.

Courses of similar topic content offered by different departments or colleges will inevitably overlap. However, I believe that one of the strengths of liberal education is that different scholars may present different perspectives on the same topic.

cc: Rickie Sanders