

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

LSC Use Only	
Number	_____
Action	_____
Date	_____

UWUCC Use Only	
Number	_____ 9 _____
Action	_____
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

Conni Lutton
Department Curriculum Committee

Debra Ross
College Curriculum Committee

J. Wald
Department Chairperson

[Signature]
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 _____

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.

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Includes

2 Course Syllabus

I CATALOG DESCRIPTION

GS 221 Physical Resources of the Earth

3c-01-3sh

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:

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| 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 style.

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.E. 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: Eisevier, 431 pp.

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

National Academy of Sciences, 1975, Mineral Resources and the Environment: a report prepared by the Committee on Mineral Resources and the Environment

Ochola, S.A., 1975, Minerals in African Underdevelopment: a study in the continuing exploitation of African resources: Bougle L'Ouverture Press, 148 pp.

The Open University, 1976, Crustal and Mantle Processes: Porphyry Copper Case Study:

The Open University Press. 80 pp

Peters, W.C., 1978. Exploration and Mining Geology. John Wiley and Sons. 696 pp

Rickard, T.A., 1974. Man and Metals. Arno Press. 1068 pp.

Simon, J.L. and Kahn, H., eds., 1984. The Resourceful Earth. Blackwell. 592 pp

Warren, E., 1973. Mineral Resources. John Wiley. 272 pp

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

Duquesne University of Pennsylvania

GS115 Mineral Resources 3 sem. hrs.
 An introduction to geologic principles and processes of origin and the location, development, and processing of metallic and non-metallic mineral deposits. Prerequisite: consent of instructor or GS101.

GS117 Geology of the Hydrocarbon Fuels 3 sem. hrs.
 An introduction to the major types of solid/liquid hydrocarbon fuels. Emphasis will be placed on the origin, geologic occurrence, location, extraction, and exploitation of the fuels. Special emphasis will be devoted to available supplies of hydrocarbon fuels in the United States. Prerequisite: GS112.

Millersville University of Pennsylvania

ES 635 Economic Geology 3 s.h.
 Covers classification, characteristics and distribution of metallic and non-metallic mineral deposits. 2 hours lecture, 2 hours lab, field trips required. Prereq: ES 321, 326.

Pennsylvania University of Pennsylvania

431 Economic Geology (3-2-2) Introduction to the study of mineral deposits. Prerequisite: GEOSC 084 or 076.
Gold and Rose

West Virginia University

270. Mineral Resources. II. 3 hr. PR: Geol. 1. 184. Description: mode of occurrence, and principles governing the formation of ore deposits.

Date: March 8, 1989

Subject: GS 221 Physical Resources of The Earth

To: Dr. Darlene Richardson
Geoscience Department

From: Bob Begg^{er}/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