

Minerals, Energy, and the Environment (Geology 323/523, Env. Studies 323)
Mon, Wed, Fri, 1:50–2:50pm, Harrington 217
Prerequisite: Geol 102, Geol 150, or Geol 110, Recommended: Chemistry 105

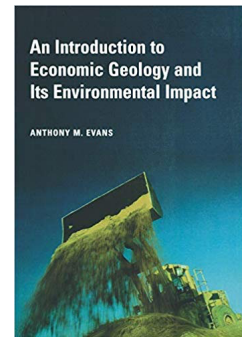
Instructor: Dr. Ben Hallett

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Office Hours: M 3–4pm, W 3–4pm, R 8:45–9:45am,
or by appointment



Text: Evans, *An Introduction to Economic Geology and Its Environmental Impact*, 1997, Blackwell Publishing. ISBN: 9780865428768

About this course

Minerals, Energy, and the Environment is a course in environmental geology with a focus on geologic principles as they relate to society's quest for raw earth materials for various applications. Through interactive lectures and a field trip we will review geologic processes that lead to mineral and energy resource deposit formation and redistribution. Students will learn scientific approaches to mineral and energy exploration, and review global and local economic and environmental factors that influence energy and metals markets driving these industries. Specific attention will be given to environmental topics by examining the impact in specific case studies of historic and modern mining and energy resource development and the specific long and short-term environmental impacts.

Course Objectives:

- 1) Learn the uses and applications of earth's mineral resources (metals and non-metals) to human society today and in the past.
- 2) Develop an understanding of the geologic processes that lead to ore formation, concentrating valuable materials that may be developed for consumption.
- 3) Learn the basic economic principles that drive minerals and geo-energy industries, and how these shape global economies and industries.
- 4) Understand the short term and long term environmental risks and impacts of mineral resource development, and why society struggles with these issues.
- 5) Critique societal perspectives on earth/energy resources and risks in the short term and long term, reconciling environmental and economic sustainability arguments.

Grades: Your course grade will be based on exams (45%), assignments including homework, quizzes, in-class exercises, group projects, papers, and presentations (35%), field trip participation/report (15%), and class participation (5%).

Graduate Credit: Students enrolled for graduate credit (51-523) must meet with me to plan and execute a research project that will be presented to the class.

Grade scale: 93% and up = A; 90–92 = A-; 87–89 = B+; 83–86 = B; 80–82 = B-; 77–79 = C+; 73–76 = C; 69–72 = C-; 66–68 = D+; 63–65 = D; 60–62 = D-; <60% = F
Graduate (523) grade scale: 93% and up = A; 90–92 = A-; 87–89 = B+; 83–86 = B; 80–82 = B-; 77–79 = C+; 73–76 = C; 69–72 = C-; <70% = F

Special Accommodations: Reasonable accommodations will be made for students with disabilities. Please contact the Accessibility Center (424-3100 (voice) or 424-1319 (TTY)) or visit their web site at <http://www.uwosh.edu/deanofstudents/Accessibility-Center> for the University's accommodation request form and documentation requirements. Information related to an individual's accommodation request will be kept confidential.

Disclosure Statement: Students are advised to see the following URL for disclosures about essential consumer protection items required by the Students Right to Know Act of 1990: <https://uwosh.edu/financialaid/consumer-information/>

Course Components:

Exams: Three exams will cover material from lectures and readings. The first two exams will be given in class, and the third (cumulative) exam will be a take-home. The exams test your ability to grasp concepts and solve problems rather than memorize formulas or vocabulary. However, if you fail to take good notes, participate in class, or gain a reasonable grasp of the material you will struggle with the exams.

Projects: A major group project will be to research a specific mineral district (large productive deposit or deposits). Groups will be assigned due to varying backgrounds. The district project will include both a written report and a presentation to be given in class.

Perception Paper: You will also individually research and write a paper based on your perception of the risks/rewards/impacts of a specific example of earth resource exploitation. In order to receive a grade you must meet deadlines regarding your topic, sources, and a draft for peer review.

Course Materials: In addition to the textbook, we will read some of the primary literature (scholarly journal articles and technical reports) relating to mineral deposits, energy, and the environment. Readings outside the required textbook will be posted in Canvas. Additional reading assignments will be announced in class.

Field Trip: A 3-day field trip is planned for October 15-17. We will travel to the Upper Peninsula of Michigan to the modern and historic mineral districts of Marquette–Ishpeming—and the Keweenaw Peninsula. Details will be announced in class. I will do all I can to keep costs associated with this trip to a minimum. A field trip report will be assigned following the trip. You will need your own detailed/specific notes from the field trip in order to complete this assignment. If you have a serious conflict you think prevents you from attending please contact me as soon as possible.

Tentative Course Schedule:

Week Beginning	Topic	Reading (Additional TBA)	Notes
Sep. 6	Introduction and context – thinking about earth resource exploitation and society, Chemistry review	NRC Report on Sustainability (Canvas) Evans Ch. 1–2.2.1	
Part 1: Ore Deposit Geology and Ore Formation			
Sep. 13	Review of classes of minerals, ore body characteristics, and host rock textures	MWE Ch. 2 (Canvas) Evans Ch. 4-5	HW1 Due 9/15
Sep. 20	Metallogenesis and ore formation; Igneous Systems and magmatic ore deposits	Evans Ch. 6.1-6.2.2; 11-13	
Sep. 27	Hydrothermal Ore Deposits	Evans Ch. 6.2.3-6.4, Ch.14-17	
Oct. 4	Sedimentary/Diagenetic/Placer ore formation and Supergene Processes	Evans Ch. 18-20	Exam 1 Ore deposits tentatively 10/4
Oct. 11	Industrial Minerals, Aggregates, Tools for studying mineral deposits	Evans Ch. 21, 7	Begin Mineral District Group Project
FIELD TRIP to Upper Michigan, October 15–17			
Part 2: Earth Resources and Economic Geology			
Oct. 18	Economic Geology of Steel and Base Metals	Evans Ch. 2	
Oct. 25	Economic Geology of Precious/Rare Metals; and Non-metallic Minerals (Diamonds)	Evans Ch. 9	
Nov. 1	Coal, fuel for industrial development, formation, history and impact	Evans Ch. 24	Group Presentations
Nov. 8	Hydrocarbons – formation and evolution of technology and society	Evans Ch. 25, G&S Ch. 1+ 3.7	
Part 3: Environmental Impacts and Risks of Earth Resource Exploitation			
Nov. 15	Environmental impact of petroleum industry; nuclear energy and uranium	Evans Ch. 25-27 WNA readings (Canvas)	Exam 2 Economic Geology and Energy
Nov. 22	Developing a mine and evaluating reserves	TBA	Case studies
Nov. 29	Mining and environmental concerns, surface/groundwater contamination issues	TBA	Case studies
Dec. 6	Public perception of mining and fossil fuels	TBA	Perception paper due
Dec. 13	Final week – Course themes and review	–	Take Home Exam 3

Important dates: 9/8/21 class begins; 9/14/21 last day to add without instructor's signature; 10/5/21 last day to add with instructor's signature; 10/6/21–10/12/21 Early Alert; 10/22/21 last day to drop without Late Drop Request Form or withdrawal; 11/24/21–11/28/21 Thanksgiving Break; 12/17/21 Classes end.