

Syllabus

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Office Hours: T 12:30-2:30, W 2-4, F 12-2, and by email appt.



Environmental Geology is the application of geologic principles to interactions between humanity and the physical Earth. This course places emphasis in those areas of geology with most immediate societal relevance including: hazards (earthquakes, volcanoes, floods, coastal erosion), resources (minerals, hydrocarbons, water, soils), land use (waste disposal, water supplies), environmental health (water quality, air quality, natural and human causes of pollution), and global change (emphasizing the geologic record of climate).

The learning goals for you in this course are:

- As a natural science lab course: develop skills to collect, interpret, present, and evaluate scientific data
- As an introductory geology course:
 - Demonstrate fundamental knowledge of the physical and chemical properties of the lithosphere and hydrosphere (minerals, rocks, soils, and water), geologic time and earth history, whole earth structure, and the origins of rock systems in the context of plate tectonics.
 - Demonstrate skills in mineral, rock, and soil identification, interpretation of topographic and geologic maps, and interpreting and evaluating geological data, hypotheses, and ideas.

General Information

Textbook: Environmental Geology, Edward A. Keller. Bring your book to each class and lab.

Readings: Readings from the textbook and other sources will be used for lab projects, class discussions, and on exam questions. Your learning will be optimal if readings are completed before and during the time that a topic will be covered in class.

Exams: Exams will include lecture, lab, and reading materials and will typically include short-answer and essay type questions that require you to apply what you learned (beyond simple memorization).

Labs: Labs are an important part of this course where you will apply fundamental concepts in environmental geology. All lab assignments will be evaluated as part of the course grade.

Written Projects: All written projects are expected to be of respectable quality. Formats are: typewritten with 1" margins, 1.5 line spacing, and 11 or 12 point font (also double sided if possible). Material submitted with excessive spelling errors, careless writing style, etc. will be returned ungraded. Carefully follow the guidelines provided for each project. An honor code pledge needs to be signed on every assignment.

Team Projects: Several lab and research projects will be completed by teams. The work on these projects is expected to be distributed among the team members. In cases where a team member does not participate in the work, that team member will not receive credit for the assignment. Clearly only one person can sit down to type a team report but the content of that report needs to be prepared by the entire team and each team member is responsible for proof-reading and approving the final version of the team report.

Late Assignments: Unless prior arrangements are made or unexpected emergencies occur, assignments that are late will not be graded and no credit will be received.

Allegheny College Year of Health Course Collaboration – Environmental Health and Water

This course is part of Allegheny College's 2008-09 Year of Health, a campus-wide curricular initiative that focuses on all aspects of health, from personal wellness and community health to environmental and global health. One key goal of this initiative is to understand the fundamental connections between our professional and personal actions and human health outcomes. As part of the Year of Health, this course is part of a four-course Demmler Collaboration examining water and health from a wide range of perspectives and involving students from:

GEO 108: Environmental Geology

POLSC 236: Health Policy

FSENV201: Environmental Problem Solving

COMRT 360: Rhetoric and Civic Engagement

Your role in this collaboration will be to work with students from each of these courses to address a current topic on water and health. This project will provide the opportunity for you to participate on an interdisciplinary task force which is a typical approach used throughout industry, academics, and government. This collaboration will involve:

- a required field trip on Saturday Sept. 13 from 9 AM to 1:30 PM
- attending ~3-4 guest lectures both during class and outside of class
- a team project that explores an issue related to water and health (teams include students from each course)
- a required evening symposium and presentation of team projects (Tues. Dec. 8 from ~5PM to 8PM).

Course Grade

Final grades will be calculated based upon lab projects, exams, water and health project, and participation:

		Points	Total Points	Total Percent of Grade
3 exams		50 each	150	~40%
10 labs		10 each	100	~25%
Water and Health Project	Report	70	100	~25%
	Product	20		
	Poster	10		
Participation*		25	25	~10%
Total Points:			375	

Participation includes:

- Attendance in class and lab
- Attendance on Water and Health field trip
- Attendance at Water and Health guest lectures
- Completion of responsible work during labs
- Completing assignments on time
- Contributing to questions and discussions during class and lab (this does not mean monopolizing a discussion or talking for its own sake).

Letter grades for the course will be based on a total of 375 possible points:

A range: ≥ 338 ; B range: 300-337; C range: 262-299; D range: 225-261; F: < 225 ($< 60\%$)

(Curves are not normally applied but will be considered if the class average is below the mid C range)

Outline of Topics

Date	Topic	Reading*
Hydrosphere -- Water On Our Planet		
M 9/1 to W 9/3	<i>Concepts of Environmental Geology</i> Human links to earth systems: hazards, resources, health, global change <i>Hydrologic Cycle, Groundwater Resources</i> Aquifers, groundwater flow, groundwater-surface water connections Lab 1 (9/1): Groundwater processes. Due Sept. 3.	Ch. 1 Ch. 12 (emphasis on 12.1, 12.3, 12.4 – 1 st page) R8
M 9/8	<i>Meet in Quigley 101</i> – joint session with the other courses of the Demmler Environmental Health/Year of Health collaboration. Video on Water Quality Lab 2: Aqueous geochemistry and acid mine drainage. Due Sept. 10.	Ch. 13
W 9/10	<i>Water quality and pollution</i> – case studies of public health issues	Ch. 13, R9
Sat. 9/13	<i>Required field trip: 9 AM-1:30 PM, Demmler Environmental Health joint session. Meet on North Main St. at top of Brooks Walk.</i>	
M 9/15 to W 9/17	<i>Rivers & Floods</i> Drainage basins, types of rivers, sedimentary environments and deposits of river systems, flood processes, hydrographs Lab 3 (9/15): Field trip - Meadville flood control. Due Sept. 17.	Ch. 8 Appendix E R10
M 9/22 to W 9/24	<i>Coastal Processes</i> Coastal erosion and coastal management, ocean systems Lab 4 (9/22): Field trip – coastal processes of Lake Erie. Due Sept. 24. Leave at 11 AM, return before 5:00 PM 9/22: Topics for “water and health” project are due.	Ch. 10 R11
Earth Surface Processes -- Slopes and Soils		
9/29	<i>Slope stability</i> - landslides, slumps, land subsidence (sinkholes) Lab 5: Field trip – Meadville area slope processes, introduction to topographic maps. Due at end of lab.	Ch. 9, 12.4 R6
10/1	Exam 1 – material of 9/1 through 9/24	
M 10/6	<i>Soil Resources</i> Weathering processes and soil formation; soil types and links to climate; soil erosion. Lab 6: Soil profiles; topographic maps & landscape. Due Oct. 8.	Ch. 16
W 10/8	<i>Meet in Quigley 101</i> – joint session with the other courses of the Demmler Environmental Health collaboration. Time for team meetings.	
M 10/13	FALL BREAK	
Earth's Lithosphere – Mineral and Rock Resources		
W 10/15	<i>Earth Structure</i> – plate tectonics, rock cycle (overview of igneous, metamorphic, and sedimentary rocks)	Ch. 2; Ch. 3.1-3.7 R1, R3 Appendix A, B
W 10/15	<i>Required evening lecture 7-8 PM, Water Quality and Human Health</i>	
M 10/20	<i>Rock cycle (continued), Mineral Systems</i> Lab 7A: Minerals and rocks; economic resources. Due Oct. 27.	Ch. 3.1-3.7 Appendix A, B

*Ch = text chapter; R = reading set

W 10/22	<i>Economic Minerals and Ores</i>	Ch. 14; App. A
M 10/27	<i>Mining Practices</i> - Environmental impacts; sustainable mining Lab 7B: Minerals and rocks; economic resources. Due end of lab.	Ch. 14, R5
W 10/29	<i>Meet in Quigley 101</i> – joint session with the other courses of the Demmler Environmental Health collaboration. Guest lecture on water quality of Lake Erie.	
Internal Earth Processes – Earthquakes, Volcanoes		
M 11/3	<i>Tectonic Stress and Rock Deformation</i> Faults and folds, global seismicity Lab 8: Geologic maps – applications for predicting landslides and resources. Due at end of lab.	Ch. 3.8-3.9
W 11/5	Exam 2 – material of 9/29 to 10/29	
M 11/10 W 11/12	<i>Earthquakes</i> Seismic waves and ground shaking, earthquake hazards (building design; rock slide potential; liquefaction; tsunami); predicting earthquakes; case studies of recent earthquakes. No new lab – use time for water and health project.	Ch. 6 R2
M 11/17 W 11/19 M 11/24	<i>Volcanoes</i> Types of volcanoes, origin of magmas, eruption processes, volcanic hazards (eruption products; lahars), predicting eruptions, living with volcanoes – case studies. Lab 9 (11/17): Volcanic hazards of Dante’s Peak. Due Nov. 19. No new lab on 11/24 – use time for water and health project.	Ch. 7 R4
W 11/26	<i>Thanksgiving Break</i>	
M 12/1	<i>Geologic Time – age of Earth, radiometric dating, human evolution, mass extinctions</i> No new lab – use time for water and health project.	Appendix D
T 12/2	<i>Water and Health Project Symposium – team presentations of projects</i> 5-6 PM set up; 6-8 PM presentations. Joint session with the other courses of the Demmler Environmental Health/Year of Health collaboration.	
Global Change		
W 12/3	<i>Glaciers</i> How they form and move, how they shape the land, glacial deposits.	R7
M 12/8	<i>Global Climate</i> – global records of climate change, ice ages Lab 10: Glacial geology of northwestern Pennsylvania, application for land use planning. Due on Dec. 10.	
W 12/10 <i>Last Class</i>	<i>Discussion on global change</i> – impacts, actions?	
W 12/17	Exam 3 (Final) – cumulative with emphasis on material from 11/3 to 12/10.	

Reading Sets

R1 Plate Tectonics

This Dynamic Earth – The Story of Plate Tectonics, U.S. Geological Survey

<http://pubs.usgs.gov/gip/dynamic/dynamic.html> (web site version)

<http://pubs.usgs.gov/gip/dynamic/dynamic.pdf> (pdf version)

What On Earth Is Plate Tectonics? US Geological Survey Resources For National Park Geology

<http://www2.nature.nps.gov/geology/usgsnps/pltec/ptnut.pdf>

R2 Earthquakes

Earthquake Hazard in the Heart of the Homeland, U.S. Geological Survey Fact Sheet 131-02

<http://pubs.usgs.gov/fs/fs-131-02/fs-131-02.pdf>

Saving Lives Through Better Design Standards, U.S. Geological Survey Fact Sheet 176-95

<http://pubs.usgs.gov/fs/1995/fs176-95/fs176-95.pdf>

R3 Earth Materials – Minerals and Rocks (Overview)

Barnes, J. H., 2004, Rocks and minerals of Pennsylvania (4th ed.): Pennsylvania Geological Survey, 4th ser., Educational Series 1, 30 p.

<http://www.dcnr.state.pa.us/topogeo/education/rocksminerals/es1.pdf>

R4 Volcanoes

Feldman, J., and Tilling, R.I., 2007, Danger Lurks Deep: The Human Impact of Volcanoes, Geotimes, v. 52, no. 11, November 2007, p. 30-35.

What are volcano hazards? U.S. Geological Survey Fact Sheet 002-97 (revised July 2004)

<http://pubs.usgs.gov/fs/fs002-97/>

Mount Baker—Living with an Active Volcano, U.S. Geological Survey Fact Sheet 059-00

<http://pubs.usgs.gov/fs/2000/fs059-00/fs059-00.pdf>

Living on Active Volcanoes—The Island of Hawai'i, U.S. Geological Survey Fact Sheet 074-97

<http://pubs.usgs.gov/fs/fs074-97/fs074-97.pdf>

R5 Mineral Resources and Mining

Barnes, J. H., and Smith, R. C., II, 2001, The nonfuel mineral resources of Pennsylvania: Pennsylvania Geological Survey, 4th ser., Educational Series 12, 38 p.

<http://www.dcnr.state.pa.us/topogeo/education/es12.pdf>

Manheim, John, 2006, A new look at mining and the environment: finding common ground: Geotimes, v. 51, no. 4, p. 18-22.

Placer Gold Mining in Alaska — Cooperative Studies on the Effect of Suction Dredge Operations on the Fortymile River, <http://pubs.usgs.gov/fs/fs-0155-97/fs-0155-97.pdf>

R6 Landslides

Landslide Hazards, U.S. Geological Survey Fact Sheet 0071-00.

<http://pubs.usgs.gov/fs/fs-0071-00/fs-0071-00.pdf>

Delano, H. L., and Wilshusen, J. P., 2001, Landslides in Pennsylvania: Pennsylvania Geological Survey, 4th ser., Educational Series 9, 34 p.

<http://www.dcnr.state.pa.us/topogeo/hazards/es9.pdf>

R7 Glaciers and Climate Change

Sevon, W. D., Fleeger, G. M., and Shepps, V. C., 1999, Pennsylvania and the Ice Age (2nd ed.): Pennsylvania Geological Survey, 4th ser., Educational Series 6, 30 p.

<http://www.dcnr.state.pa.us/topogeo/education/es6/es6.pdf>

R8 Water Resources

Fleeger, G. M., 1999, The geology of Pennsylvania's groundwater (3rd ed.): Pennsylvania Geological Survey, 4th ser., Educational Series 3, 34 p.

<http://www.dcnr.state.pa.us/topogeo/education/es3.pdf>

Estimated Use of Water in the United States in 2000, U.S. Geological Survey Fact Sheet 2005-3051.

<http://pubs.usgs.gov/fs/2005/3051/>

Water-Level Changes in the High Plains Aquifer, Predevelopment to 2003 and 2002 to 2003

<http://pubs.usgs.gov/fs/2004/3097/pdf/fs-2004-3097.pdf>

R9 Water Quality and Environmental Health

Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams

<http://toxics.usgs.gov/pubs/FS-027-02/pdf/FS-027-02.pdf>

Assessing the Vulnerability of Public-Supply Wells to Contamination from Urban, Agricultural, and Natural Sources, U.S. Geological Survey Fact Sheet 2005-3022.

<http://pubs.usgs.gov/fs/2005/3022/>

R10 Rivers and Flood Hazards

Significant Floods in the United States During the 20th Century— USGS Measures a Century of Floods, U.S. Geological Survey Fact Sheet 076-00.

<http://pubs.usgs.gov/fs/fs76-00/fs076-00.pdf>

Large floods in the United States: Where they happen and why, by J.E. O'Connor and J.E. Costa, U.S. Geological Survey Circular 1245, 2003, 12 p.

<http://pubs.usgs.gov/circ/2003/circ1245/pdf/circ1245.pdf>

The World's Largest Floods, Past and Present: Their Causes and Magnitudes, By Jim E. O'Connor and John E. Costa, U.S. Geological Survey Circular 1254, 2004, 19 p.

<http://pubs.usgs.gov/circ/2003/circ1245/pdf/circ1245.pdf>

R11 Coastal Systems

National Assessment of Coastal Vulnerability to Future Sea-Level Rise, U.S. Geological Survey Fact Sheet 076-00. <http://pubs.usgs.gov/fs/fs76-00/fs076-00.pdf>

Tsunami Hazards—A National Threat, U.S. Geological Survey Fact Sheet 2006-3023.

<http://pubs.usgs.gov/fs/2006/3023/2006-3023.pdf>