

19201 (FA 19) - GEOS230A ENVIRONMENTAL GEOLOGY

[Home](#) / [My courses](#) / [Fall 2019](#) / [19201-GEOS230A](#)

GENERAL INFORMATION



[Link to Dr. J's Calendar & Office Hours](#)



[Announcements](#)

COURSE INFORMATION

This course uses Moodle as an on-line platform to display course policies (e.g. grading, classroom expectations) and the schedule (e.g. assignments, exam dates). That means that the information posted on Moodle **is** your syllabus - everything you need to know is here. Please read all the material in this section ("Course Information") carefully and also review the course topics and schedule that are described in the sections below.



[Course Description, Goals, and Texts](#)

An overview of the course material



[Course Policies](#)

Contains information about class expectations.



[Course Structure](#)

Contains information about assignments and grading

INTRO TO ENVIRONMENTAL GEOLOGY

(August 21 - Aug 28)

During the first week of class, you will learn about the underlying principles that define the sub-discipline of environmental geology as well as ways that professionals in this field approach their work.



[Reading Assignments for this section](#)

Please read the assigned material prior to the start of class on the date indicated. "Optional reading" is listed as helpful background material whereas "required reading" contains information that you will be expected to know for homework, quizzes, and tests. I will also post links or citations for additional information if you are curious or want to learn more about a particular topic.

Out of Class Work



[First portfolio reflection](#)



[Kehew chapter 1](#)



[Anthropocene](#)



[definition of Environmental Geology](#)

UNIT I: NATURAL RESOURCES

(August 30 - September 20)

Natural resources are any naturally-occurring products (geological or biological) that can be used to support human activities. Most geological natural resources are considered non-renewable because they take 100s - 1,000,000s of years to form. Historically, most professional geologists worked in what are called "extractive industries," meaning that they located deposits of natural resources, removed them through drilling or mining, and separated the valuable materials to become raw materials for manufactured products. Today, extractive industries like hydraulic fracturing and metal mining are still major employers of geologists, but so too are consulting firms, governmental agencies, and NGOs. The knowledge and skills of environmental geologists are particularly valuable because they not only understand foundational geologic knowledge but are also considered with the sustainability of the resources and the consequence that development can have on ecosystems of human societies.

In this first major unit, you will learn about two specific natural resources (soils and economic minerals) because they critical to the well-being of society but face serious environmental problems. Detailed information on how these resources form, distinct features of different resources, and the ways that they are used is essential to making sound management choices now and in the future.

Unit Exam I - Friday, September 20

Focus Topic: Soils

 [Soils Quiz: Sept 10 @ 9 am - Sept 13 @ 3pm](#)

 [Reading Assignments for this Section](#)

Focus Topic: Economic Mineralogy & Mining

 [Minerals Quiz: Sept 13 @ 2 pm - Sept 18 @ 3pm](#)

 [Reading Assignments for this Section](#)

SPECIAL FEATURE: ENVIRONMENTAL JUSTICE

(September 23 - 27; please attend DePauw Dialogue on Sept 25)

In honor of DePauw Dialogue, you will learn about historic and contemporary environmental racism and discuss how environmental geologists can work towards environmental justice.

UNIT II: WASTE AND POLLUTION

(September 30 - October 18)

One of the problematic downsides of natural resource development for a consumeristic society is the creation of pollution (solids, liquids, and vapors). In recent years, new professional opportunities have opened up for environmentally-trained geologists to help clean up (aka remediate) polluted sites as well as find alternative methods or materials that reduce the amount of waste generated in the first place.

During this second major unit, you will learn the types and sources of different environmental pollutants, the ways in which these pollutants are regulated, and the ways that they are treated or managed to reduce harm to people and the environment. Our focus areas for this unit will be "garbage" (municipal solid waste) and water quality.

Unit Exam II - Friday, October 18

Focus Topic: Solid & Hazardous Wastes

 [Reading Assignments for this Section](#)

 [Sustainable Materials Management - EPA](#)

 [Recycling Benefits - EPA](#)

 [Hazardous Wastes - EPA](#)

Focus Topic: Water Pollution

 [Reading Assignments for this Section](#)

 [Hydrologic Cycle Interactive Diagram - USGS](#) [EPA Drinking Water Standards](#)

UNIT III: NATURAL HAZARDS

(October 28 - November 25)

Living on earth is dangerous! Plate tectonics, the sun, and our atmosphere conspire to create all kinds of destructive processes that are not only very costly (an estimated \$306 billion was spent in 2017 in the US alone), they are also deadly. Geologists and other scientists serve an important role in helping to mitigate these disasters by studying the natural processes that give rise to these natural phenomena and informing the public about them. Additionally, environmental geologists study how human activities (mining, urbanization, fossil fuel consumptions) can increase the risk factors, including frequency, consequence, for many kinds of natural hazards.

In our last major unit, you will learn when and how flooding and mass movements occur, how risk factors change over time, and what can be done to protect life and prevent property damage.

Unit Exam III - Monday, November 18

Focus Topic: Streams & Floods

 [Reading Assignments for this Section](#) [USGS Factsheet: Significant Floods of the 20th Century](#) [Flood Data](#)

Focus Topic: Slope Processes & Mass Movements

 [Reading Assignments for this Section](#)

SPECIAL FEATURE: GEOLOGY & SUSTAINABILITY

(December 2 - Dec 6)

Sustainability Science - which is described by the Proceedings of the National Academy of Science website as "...an emerging field of research dealing with the interactions between natural and social systems...." is the application of combined knowledge and skills from multiple disciplines, including geology and other science, social sciences (history and sociology, political science), and the humanities (philosophy and ethics, literature, the arts) to address emerging environmental dilemmas. Though nearly everything you learned in this course fits under this wide umbrella, during the final week of the course, you will learn specific ways that geologic knowledge can be used to address a problem of your choosing.

ENVIRONMENTAL GEOLOGY RESEARCH PAPER
























 [Guidelines, deadlines, and expectations](#) [Research Paper Submission](#)

ENVIRONMENTAL GEOLOGY COURSE PORTFOLIO

As a cumulative final project, you will create a portfolio that demonstrates what you have learned throughout the semester and how your understanding of environmental geology has developed and deepened. This portfolio is part "evidence" (specific content, assignments or exams) and part "reflection" (your commentary about the specific content and evidence). In addition to anything else you might want to add, your portfolio **must** include reflective essays that will be due throughout the semester.

 [Why are you here?](#)

REFERENCES AND RESOURCES

-  [Finney and Edwards \(2016\)](#)
-  [Lewis and Maslin \(2015\)](#)
-  [This American Life - Nauru](#)
-  [Diamond on Easter Island](#)
-  ["Mountaintop Removal Consequences"](#)
-  [USGS Hazards Factsheet](#)
-  ["The Rising Costs of Natural Hazards" \(2005\) from NASA](#)
-  ["Human Domination of Earth's Ecosystems"](#)
-  [Soils Overview](#)
-  [Univ. of Idaho - 12 Soil Orders](#)
-  [Soil horizon development animation](#)
-  [Pimentel et al 1995 soil erosion](#)
-  [USGS Landslide Hazards Website](#)
-  ["Some Facts about Asbestos" from USGS](#)
-  ["Silicosis" \(2000\) from WHO](#)
-  [Mineral Science and Technology](#)
-  [USGS Circular 1139](#)
-  [Linking Ecosystem Services, Rehabilitation, and River Hydrogeomorphology by Thorp et al \(2010\)](#)
-  [USGS Hazards Webpage](#)
-  [National Resource Conservation Survey - Homepage](#)
-  [USGS flood](#)
-  [USGS Flood Reports by State](#)
-  [UNEP IPCC](#)

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[Home](#)

[Data retention summary](#)

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19201 (FA 19) - GEOS230A ENVIRONMENTAL GEOLOGY

[Home](#) / [My courses](#) / [Fall 2019](#) / [19201-GEOS230A](#) / [Course Information](#) / [Course Description, Goals, and Texts](#)

COURSE DESCRIPTION, GOALS, AND TEXTS

Environmental Geology is the study of what environmental scientists have dubbed the *critical zone*, which is the land area between groundwater aquifers and the tops of the vegetative canopy, because this is the zone that supports and contains terrestrial life, but is rapidly degrading. Throughout the semester, you will build upon your existing geologic knowledge to examine the processes that influence the physical and chemical nature of the Earth and also consider the influence of human actions on the lithosphere, hydrosphere, and atmosphere. Real-world examples will emphasize the importance of these topics for solving environmental problems.

Course goals: In this class, you will:

- Develop your conceptual understanding of the geologic processes that affect – and are affected by – human activities;
- Examine, describe, and predict the short (<1 – 10 years) and long term (>50 years) consequences of resource extraction and development upon the lithosphere, hydrosphere, and society;
- Investigate and evaluate how the principles of sustainability can be used to address waste and pollution and improve human and ecosystem health;
- Apply quantitative methods to natural disaster problems to gain insight in how scientists help reduce property damage and loss of life; and
- Gain confidence as a self-directed learner who is able to figure out the necessary approach to solve different kinds of qualitative and quantitative geologic problems within the critical zone.

Course texts:

- *Geology for Engineers & Environmental Scientists* by Alan Kehew (this will be your primary text)
- Selections from: *Dirt; The Ecstatic Skin of the Earth* by William Bryant Logan; *Garbage Land* by Elizabeth Royte; *Control of Nature* by John McPhee;
- Additional scientific articles and opinion pieces provided on Moodle

Last modified: Tuesday, 20 August 2019, 8:05 PM

[◀ Announcements](#)

Jump to...

[Course Policies ▶](#)

[Data retention summary](#)
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19201 (FA 19) - GEOS230A ENVIRONMENTAL GEOLOGY

[Home](#) / [My courses](#) / [Fall 2019](#) / [19201-GEOS230A](#) / [Course Information](#) / [Course Policies](#)

COURSE POLICIES

Your attendance and active participation in class are essential for you to learn this material and therefore **attendance is required**. If you need to miss a class because of sickness, personal emergency, university-sponsored activity, or religious requirement (see [student handbook](#)), please try to let me know ahead of time so we can arrange a time for you to make up the material. If I do not hear from you within 24 hours of a missed class or lab, your absence will be considered unexcused and you will not have a chance to make up missed material.

Laptops and cell phones are useful tools for learning, but they can also be a terrible distraction for you, me, and your peers. Therefore, unless we are actively using one in class, **all internet-enabled devices must be closed or put away**. Violation of this policy will negatively impact your overall grade.

For each section of the course, I will provide handouts with important concepts, definitions, and images in order to keep you organized and to minimize errors associated with copying from the board or screen. However, these notes are deliberately skeletal, and you will need to flesh them out with your own annotations, sketches, explanations, etc. I have also included locations where you will practice problems or respond to questions, so please make sure that you have your notes with you every day. There will be a \$15 charge to cover the printing cost of these notes that will be charged to your student account after the first week of class.

It is the policy and practice of DePauw University to provide reasonable accommodations for students with properly documented disabilities. Written notification from Student Disability Services is required. If you are eligible to receive an accommodation and would like to request it for this course, please contact Student Disability Services. Allow one week advance notice to ensure enough time for reasonable accommodations to be made. Otherwise, it is not guaranteed that the accommodation can be provided on a timely basis. Accommodations are not retroactive. Students who have questions about Student Disability Services or who have, or think they may have, a disability (psychiatric, attentional, learning, vision, hearing, physical, medical, etc.) are invited to contact Student Disability Services for a confidential discussion in Union Building Suite 200 or by phone at 658-6267.

****Academic Integrity**** Any activity which gives one student an unfair advantage over other students will be handled in accordance with established University procedures as described in the Student Handbook.

Last modified: Tuesday, 20 August 2019, 8:10 PM

[◀ Course Description, Goals, and Texts](#)

Jump to...

[Course Structure ▶](#)

Data retention summary
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19201 (FA 19) - GEOS230A ENVIRONMENTAL GEOLOGY

[Home](#) / [My courses](#) / [Fall 2019](#) / [19201-GEOS230A](#) / [Course Information](#) / [Course Structure](#)

COURSE STRUCTURE

Contains information about assignments and grading

Overall Structure: there are three major units in this course (resources, pollution, hazards), each of which contains two focus topics. Additionally, there are two, one-week interludes that will allow us to consider special topics. Moodle displays the overall schedule and a description of each of these course elements.

Evaluation (aka "how you will earn your grade): your understanding of environmental geology will be evaluated in a number of different ways.

- **Tests and quizzes:** Each major unit will have an in-class exam worth 15% of the final grade (45% total). Additionally, each focus topic will have an out-of-class quiz worth 5% of your final grade; only the five best quiz scores (25% total) will be considered in the final calculations.
- **Active engagement:** Success in this course requires your disciplined attention to the material both in and outside of class. You will regularly engage in in class activities, including problem solving and applied discussion of class topics, that will help you learn. During each class, I will assess your engagement and award 2, 1, or 0 points if you were present and focused, present but unfocused or distracted, or absent, respectively. (Note, you can make up participation points for an excused absence by completing an out of class assignment that simulates what we did that day). Out of class work (aka homework) is your opportunity to develop your conceptual understanding of the course material and practice applying it to different scenarios. As such, your grade will be based on the effort and logic that you demonstrate, not on the accuracy of your answers. Each out-of-class assignment is worth 10 points; incomplete or problematically short answers will receive 2 - 7 points depending on the level of effort demonstrated. **Except under very unusual circumstances, late homework will not be accepted.** Your active engagement score, which is worth 10% of your final grade, will result from the accumulation of all of these points during the semester.
- **Course portfolio:** Throughout the semester, I will ask you to reflect on the importance of the material in this class to your personal and professional goals through a series of short (~350 – 500 word) essays. At the end of the semester, you will compile these and other relevant course materials into a (physical) course portfolio that demonstrates your learning and growth. The portfolio, which is worth 15% of your final grade, serves as the final for this course and is therefore due on Monday, December 9 at 11:30am.
- **Research paper:** Because this course cannot cover all topics of interest, you will have the opportunity to do independent research on a subject of your choosing. Details about this assignment, which is worth 5% of your final grade, will be explained in class and posted to Moodle in September.
- **Bonus points:** Periodically, I will award bonus points for excellent work or effort. For example, attending a talk from a campus speaker and writing a short response paper can earn bonus points. These points can be used to increase your participation grade by up to 10% percentage points - this means that the maximum participation grade could be 110% !

Grading: your work will contain both quantitative/factual information and qualitative/subjective information; both kinds of answers will be carefully reviewed for accuracy and quality. The amount of credit awarded to incorrect quantitative/factual answers will be based on the nature of the math error or the amount of detail shared. Good qualitative answers that adequately address the question asked will generally receive a B-range score. A-range scores require answers of excellent quality. C-range answers indicate one or more missing elements; lower scores indicate problematic misconceptions.

I understand grades are important, and that uncertainty about one's grade can cause undue stress. **I will be happy to discuss your current grade at any point throughout the semester.** Additionally, I will be happy to discuss ways in which you might be able to improve your grade, should that be a goal.

Last modified: Tuesday, 20 August 2019, 8:17 PM

[◀ Course Policies](#)

Jump to...

[Reading Assignments for this section ▶](#)

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