Geosciences 102: The Dynamic Earth with Laboratory
Fall 2018 Syllabus

Lecture Instructor: Hilary Palevsky, hpalevsky@wellesley.edu, Office: Science Center S391

Lecture meetings: 9:50-11:00 am Tuesdays and Fridays, Science Center 268

Course websites: Lecture: https://sites.google.com/wellesley.edu/geos-102-02-fa-18
Lab: https://sites.google.com/a/wellesley.edu/geos-102-lab-fa18/

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Course description:
The Earth is a dynamic planet where change is driven by processes that operate within its interior and on its surface. In this course we study these processes as well as interactions between the solid earth, the hydrosphere, the atmosphere, and the biosphere that together produce the environment we live in and influence our daily lives. Topics covered include the origin and history of the Earth, plate tectonics, deep time, the materials that make up the solid earth, the distribution of earthquakes and volcanoes, hydrology, landscape evolution, and global climate. Laboratory exercises, project work, and local field trips provide hands-on opportunities to develop key concepts and hone observational and analytical skills.

Learning outcomes:
By the end of this course, you should be able to:

1. Describe the physical nature of the earth, the processes that shape our planet, and the complex interaction of earth system processes with each other and with human activities.
2. Understand the scientific method by which information is communicated, critiqued, and revised over time by many practitioners, and how this has led to consensus on plate tectonics and climate change as overarching themes in our modern understanding of earth systems.
3. Apply the scientific method to develop an understanding of earth system processes by making observations, by interpreting those observations, and by independently testing those interpretations.
4. Reason about the range of time scales (seconds to billions of years) and spatial scales (atomic to planetary) over which earth system processes operate.
5. Interpret geospatial information by visualizing three-dimensional landscapes and sub-surface structures via maps and cross-sections.
6. Construct geologic narratives about the history of a region and about past environments and environmental processes by observing the composition and structure of earth materials (rocks and minerals), and spatial relationships among rock units.
7. Evaluate the scientific and societal merit of proposed human interventions to address and adapt to natural and climate change-driven hazards that affect people.

Transferable skills and goals:

Science is a team activity

Scientific research is not conducted by individuals working alone, but by collaborative teams. In this class, you will collaborate with your peers to learn new material and tackle challenging tasks. We will emphasize and practice group work in class, in lab, and in assessments of your learning. Research on learning shows that this will both improve how much you learn as an individual as well as help you develop transferable skills for working as a member of a team.

No fear of math!

Quantitative analysis of information is important both for scientists and scientifically-literate global citizens. In this class, you will develop your ability to quantitatively interpret and explain scientific data from graphical, numerical, and algebraic sources. Specifically, by the end of the semester you will have the ability to make back of the envelope estimates and determine if you answer "makes sense", you will be able to make simple calculations involving unit conversions and dimensional analysis, and you will gain experience with the construction of graphs to evaluate the relationships between variables.

Real-world awesome women geoscientists

Geoscientists come from a diverse array of backgrounds. Throughout this class, you will learn about the careers, experiences, and scientific accomplishments of real-world women geoscientists who have made and are currently making important contributions to our knowledge about our planet. The goal of highlighting these women geoscientists is to expose you to the excitement of scientific discovery, counter the stereotype that the main accomplishments in this field have been made by dead white men, and encourage you to identify with the range of backgrounds and paths that lead to careers in geoscience today.

Learning Goals for all 100-level Geosciences courses:

- Develop scientific literacy
- Explore earth systems in the classroom, the lab, and in the field
- Understand our local landscape, sustainability, and planetary limits
- Collect, curate, and model data to create geological narratives

Place in the Wellesley Curriculum:

GEOS 102 serves both as an overview of Physical Geology and the Earth System for the non-Geosciences major (it fulfills the Distribution Requirement for the Nature of Scientific Inquiry in the Physical Sciences) and as an introduction to more advanced study for prospective Geosciences majors.

Assignments:

Readings:

A set of readings -- including videos and online articles as well as textbook selections -- will be posted on the website for each course topic, along with key questions/goals to guide your reading. These materials will be posted at least one week in advance. I will expect you to read and review these materials prior to beginning each topic in class. This will allow us to use our in-class time together for activities, discussion, and exercises that will help deepen your knowledge of complex subjects and practice problem solving skills, rather than my lecturing on the "vocabulary" of the geosciences.

Debates:

We will hold two in-class debates organized around proposed solutions to geoscience issues that affect people's lives (earthquake preparedness and geoengineering global climate). Each debate will have an associated writing assignment and set of additional readings that you will complete prior to the in-class debate.

The goal of these debates to provide you with a chance to apply the knowledge you have gained in class to evaluate the scientific and societal merit of human interventions in the earth system, and to practice communicating that knowledge in both written and oral formats.

Exams:

This course will have a midterm and a final exam. The exams in this course are designed to be both a learning experience and an assessment tool. All exams (including the final) will have a group component to the work with open notes and will then transition into traditional closed-book style. The goal of the exam is to apply the kinds of applied problem-solving skills that you will practice regularly through in-class activities and take-home assignments. There will never be questions that merely require you to regurgitate factual content from the course.

Note: This format requires that the final exam be a scheduled final exam.

Women in Geosciences reflections:

Throughout the course, you will complete weekly short weekly assignments about the scientific work and career paths of women geoscientists from a diverse array of backgrounds, experiences, fields, and jobs in the geosciences. For each week, you will learn about a different scientist and her work and experiences, and will submit a short written reflection. These weekly reflections will constitute 5% of your grade. You will have two weeks you may skip this assignment over the course of the semester, to allow flexibility around busy times in your schedule.

At the end of the semester, you will write a longer reflection paper synthesizing your thoughts after having learned about a wide range of women geoscientsts over the course of the semester. A draft of this final reflection paper will be due on Tuesday December 4, in advance of an in-class discussion, and you will then have time to revise your paper over the following week before the deadline on Tuesday December 11, the last day of classes. This final reflection paper will constitute 5% of your grade.

Further details about the reflection prompts and a selected list of awesome women geoscientists past and present along with recommended readings about them will be provided in class and on the course website.

In-class activities and pre-class assignments:

We will do many in-class activities in this course, often in a cooperative group setting. This is designed to help you synthesize and apply the new content and skills you are learning in class. I will not assign you a traditional "participation" grade based on attendance or my subjective assessment of your in-class comments, since this type of assessment is prone to bias. However, the work you complete in these activities will contribute towards your grade and your presence in class and your active and engaged participation will be key to your success.

In addition, there will often be short pre-class homework assignments for lecture. As these assignments are typically linked with preparations for in-class activities, late assignments will not be accepted without prior notification.

Labs:

This class includes a weekly 3-hour lab period. Labs are mandatory and make-up labs will not be offered for unexcused absences. You will get additional information from your lab instructors. You cannot pass this class if you do not earn a passing grade in lab. We will do our best to cover relevant material in the lecture prior to or concurrent with your lab.

Assessment:

Lecture grade – 70% of your final grade

Debates/pre-debate briefs (x2)	20%
Midterm exam	15%
Final exam	15%
Women in Geosciences reflections	10%
In-class activities + class preparation	10%

Lab grade – 30% of your final grade

Wellesley grading policy:

This course complies with the Wellesley College grading policy (http://www.wellesley.edu/registrar/grading/gradingpolicyfaq). While that policy asks faculty to hold each 100- and 200-level course with 10 or more students to an average of no higher than 3.33, it does not require faculty to grade on a "curve." **There is no arbitrary limit on the number of A's, B's, C's etc., and every student will be assigned the grade they earn and deserve according to the grading standards of the college**.

Guiding Principles:

The assessment scheme is designed for students with diverse interests and experiences. Thus 'good exam-takers' are not highly favored over students who do well on written assignments or more practical projects without a time limit. In addition, the assessment scheme is designed so that a poor grade on any one assignment or exam, completed on one given day, doesn't dictate your final grade.

Class policies:

Office hours and email:

I will be available for drop-in meetings during my office hours, which will be scheduled based on a poll of all students in my classes and then announced both in class and on the course website. In addition to my scheduled office hours, you are welcome to make an appointment with me at a mutually convenient time. The best ways to set a meeting are to catch me in class or email me. I will respond to your email as soon as I can, usually within 48 hours and often much sooner. However, do not count on more rapid e-mail turn-around time just before exams or other deadlines!

Accessibility and accommodations:

It is my goal to create a learning experience that is as accessible as possible. If you anticipate any issues related to the format, materials, or requirements of this course, please meet with me outside of class so we can explore potential options.

If you are a student with a disability or condition, either long-term or temporary, and need or think you may need disability-related accommodations, I will be glad to work with you and with Disability Services to accommodate your needs for this course. If you are unsure but suspect you may have an undocumented need for accommodations, you are encouraged to contact Disability Services. They can provide assistance, including screening and referral for assessments. If your accommodation needs include modifications for assessments (e.g. exams), I particularly encourage you to reach out to Disability Services early in the semester to request that they submit a letter to me outlining your accommodation needs, so that we will have time to discuss a plan together prior to the midterm or other early deadlines.

Disability Services can be reached at disabilityservices@wellesley.edu, at 781-283-2434, by scheduling an appointment online at their website www.Wellesley.edu/disability, or by visiting their offices on the 3rd floor of Clapp Library, rooms 316 and 315.

Academic integrity and the Wellesley Honor Code:

You are encouraged to study and collaborate with other members of the class, and developing your ability to work in a team is indeed a key goal of this class. However, independent assigned work you turn in must reflect your own understanding and ideas. If you are feeling stressed about work for this or other classes in a way that leaves you tempted to cheat as a way to catch up or improve your grade, please instead come talk to me so that we can discuss a plan that will allow you to succeed and learn.

Key dates:

Tue. Sept. 25	Debate #1: Earthquakes
Tue. Oct. 23	Midterm exam
Fri. Nov. 16	Debate #2: Geoengineering climate
Tue. Dec. 4	Due (before class): Draft reflection paper on women geoscientists
Tue. Dec. 11	Due (5pm): Final reflection paper on women geoscientists
Dec. 14-20	Scheduled final exam

Schedule:

This schedule is a fluid document and may change as the semester progresses. Changes will be announced in class and posted to the course website. Reading assignments (to be posted on the course website) should be completed BEFORE the topic is covered in class.

Week	Tuesday	Friday	Lab Topic
Sept. 4 and 7	Intro, logistics, Earth system science	The scientific process	No labs
Sept. 11 and 14	**No class – Rosh Hashanah**	Plate tectonics	#1 – Maps in the geosciences
Sept. 18 and 21	Plate tectonics	Earthquakes and volcanoes	#2 – Minerals
Sept. 25 and 28	Debate #1: Earthquakes	Rock cycle; minerals	#3 – Igneous rocks
Oct. 2 and 5	Igneous rocks	Sedimentary rocks, depositional environments	#4 – Rocky Ledge field trip
Oct. 9 and 12	**No class – Fall break**	Metamorphism	No labs
Oct. 16 and 19	Dating the rock record: Relative geologic time	Dating the rock record: Absolute geologic time	#5 – Sedimentary + Metamorphic Rocks
Oct. 23 and 26	Midterm exam	Earth's changing climate	#6 – Geologic Time/Grand Canyon
Oct. 30 and Nov. 3	**No class – Tanner**	Evidence of glaciation (field trip)	Individual oral exam sessions
Nov. 6 and 9	Earth's climate over geologic time	Earth's climate over geologic time	#7 – Geologic structures
Nov. 13 and 16	Climate in the Anthropocene	Debate #2: Geoengineering climate	#8 - Streams
Nov. 20 and 23	Hydrologic cycle, freshwater resources	**No class – Thanksgiving break**	No labs
Nov. 27 and 30	Groundwater, water scarcity	Climate change and the hydrologic cycle	#9 - Groundwater
Dec. 4 and 7	The face of geosciences DUE: Draft reflection paper on women geoscientists	Synthesis: connections among Earth systems	No labs
Dec. 11 and 14	**No class – AGU Fall Meeting** DUE: Final reflection paper on women geoscientists	**No class – Beginning of finals period**	No labs
Dec. 14-20	Scheduled final exam		