

ERTH 407 Energy & Mineral Resources
Lecture: MWF 9:30AM in POST 703

Fall 2021

Text: No textbook. Pdf files will be posted in the course “Resources” folder on the Lulima Course site.

Instructor: Greg Ravizza, POST 712, ravizza@hawaii.edu

Office hours: Typically, I am available by appointment & after class. I am also happy to meet via zoom. Please email me to make an appointment.

Course Objectives: ERTH 407 is designed to provide students with a broad understanding of energy, both renewable and non-renewable, and mineral resources, as well as the strategies envisioned for decarbonizing the global energy industry. This content is important for any student seeking to be an informed citizen because patterns of human energy and mineral resource consumption directly impact economic and environmental conditions, both locally and globally. Homework assignments are intended to familiarize students with concepts & calculations associated with quantifying energy consumption, forecasting changes in reserves of energy and mineral resources, and the impact of fossil fuel consumption on the global carbon cycle. Writing assignments are designed to improve the student’s ability to convey quantitative and technical content using the conventions common in the scholarly literature.

Content: A tentative schedule for the lecture topic is given by week below. Topics may be adjusted in response to student interests.

Week #	Topic
1	Overview of Energy: Sources and Consumption Patterns
2	Carbon Cycle, Photosynthesis & Energy Resources
3	Composition of natural hydrocarbons: Petroleum and Natural Gas
4	Fossil Fuels (Petroleum, Natural Gas & Coal): Reserves & Genesis
5	Fossil Fuels: Conventional Exploration & Recovery
6	Unconventional Fossil Fuel Resources.
7	Anthropogenic CO ₂ Mitigation
8	Nuclear Energy
9	Biofuels (& hydrogen production)
10	Renewables: Geothermal, Hydroelectric, Solar and Wind
11	More on renewable energy: Schemes to “decarbonize” human energy consumption. (Likely: “Gray”, “Blue” and “Green” hydrogen.)
12	Ore Deposits Background
13	Critical Minerals and Emerging Technologies.
14	Magmatic Ore Deposits
15	Hydrothermal Ore Deposits
16	Sedimentary & Supergene Ore Deposits

Lecture Images and required reading will be posted on the Lulima Course Web site in the Resources folder and will be organized by week. There is no textbook. Also note that for some weeks short video recordings will be posted in a [shared folder](#) on Google Drive to supplement lecture content. If I expect you to view these

videos before a specific lecture, I will give you at least 2 days notice.

Relationship to student learning objectives (SLO): EARTH 407 provides a broad overview of the various energy and mineral resources exploited by humans to fuel and build our industrial society. Learning this content will enhance students' ability to explain the relevance of geology and geophysics to human needs (SLO 1). Students are required to integrate a variety of geologic knowledge to provide an overview of a topic of their choice related to energy and mineral resources in written form as a term paper (SLO 4). Although it is not explicitly required many students consider the ethical implications of resource utilization.

ERTH 407 is designated as a writing intensive ("WI") course. Writing assignments will account for 50% of your final grade, and the combined length of the writing assignments will exceed 4000 words. There are 3 types of writing assignments required for the course which are outlined below. All "WI" assignments must be handed in electronically as a Microsoft word document or as a google doc via Laulima in order to streamline commenting, revision and grading. Students are required to be available for at least 3 one-to-one meetings with the instructor outside of regular class time to discuss their written work. Class enrollment cannot exceed 20 students.

- (1) **Figure Caption Writing:** Over the course of the semester each student will be required to write detailed figure captions to accompany 2 figures presented in lecture and/or from the reading as chosen by the instructor. Each caption is to be at least 400 words in length. This assignment is described in a separate hand out. It will be ongoing throughout the semester. (10% of course grade, 5% for each caption). The second figure caption will be part of your preparation for your final paper assignment.
- (2) **Essays related to course content:** Two essays (>800 word) based upon homework assignments. These essays will require students to critically analyze the assumption associated with required homework calculations and the quality/certainty of input data used in the homework calculations. (20% of course grade, 10% each essay)
- (3) **Final paper:** The final product (> 2500 words plus 3 appropriate figures, in text citations, and a properly formatted reference list) will be an overview of a topic related to energy or mineral resources that is of interest to the student, and approved by the instructor. Before preparing your paper, you will be required to submit to the instructor, for comment/approval, a preliminary reference list (8 sources minimum with at least 5 from the peer-reviewed literature), and at least 3 figures you intend to include in your paper. A separate handout gives more detail on this assignment. This project is intended to help students develop the ability to read and think critically and also to write objectively about scientific and technical subject matter using conventions common in scholarly scientific writing. (20% of the course grade, draft 10% and final version (post-revision) 10%.)

Testing & other Homework: The final grade for the course will reflect the students' performance on exams, lab assignments and on writing assignments outlined above. The

weighting is as follows: mid-term (20%), final exam (20%), homework assignments (10%), and writing assignments (50%; detailed above).

Attendance: *Attendance will not be taken at the lectures but it is expected.* Students are encouraged to regularly attend lecture because there is no textbook. If a student misses a lecture and wants to be apprised of lecture content, I encourage them to talk with me.

Title IX: The University of Hawai'i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community. Here are some of your options:

As a member of the University faculty, I am required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and student instructors cannot guarantee confidentiality, students will still have options about how their cases will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, use the **confidential resources available here:** <http://www.manoa.hawaii.edu/titleix/resources.html#confidential>

If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono Title IX Coordinator (808) 956-2299 t9uhm@hawaii.edu.

KOKUA: Any student who feels s/he may need an accommodation based on the impact of a disability is invited to contact me privately. I would be happy to work with you, and the KOKUA Program (Office for Students with Disabilities) to ensure reasonable accommodations in my course. KOKUA can be reached at (808) 956-7511 or (808) 956-7612 (voice/text) in room 013 of the Queen Lili'uokalani Center for Student Services.

Basic Needs: UH also has resource that aim to help students who are struggling to meet basic needs - "Basic needs include food and housing, childcare, mental health, financial resources and transportation, among others. Student basic needs security is critical for ensuring strong academic performance, persistence and graduation and overall student well being. If you or someone you know are experiencing basic needs insecurity, please see the following resources: [UH System Basic Needs.](#)"