COURSE SYLLABUS
ERTH325 -- GEOCHEMISTRY

Instructor: Ken Rubin

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Course Content:

This course focuses on the chemistry of the natural world and the chemical evolution of the Earth over geological time. We will discuss practical and theoretical geochemistry, with an emphasis on how chemical principles are used to study Earth Sciences. The course is composed of three modules:

(a) geochemical fundamentals

(b) natural and anthropogenically perturbed aspects of the Earth's hydrosphere and its interaction with surficial rocks, sediments, soils, the biosphere and the atmosphere

(c) the origin and evolution of Earth (crust-mantle-core) and the solar system through nuclear and high temperature chemical processes.

Topics:

Geochemical Fundamentals

- The Elements; basic principles of inorganic chemistry, periodic properties
- Thermodynamics and chemical reactions, solubility
- Aquatic Chemistry, pH-pE, Biology and redox
- Organic Chemistry

Low temperature geochemistry - The hydrologic cycle

- Chemical Processes, Photosynthesis/respiration, Aquatic Microbial Biochemistry in rain, rivers, lakes, estuaries

Low temperature geochemistry - Sedimentary geochemistry

- Chemical weathering, soil formation, geochemistry of clays.
- The oceans, marine chemistry, primary productivity, Gaia, Marine Sediments: a record of environmental global history, light isotope geochemistry.
- Global Climate: Present and Future, atmospheric CO_2

High temperature geochemistry - Planetary geochemistry

- Age and Origin of the Solar System.
- Cosmochemistry, formation of the elements and nebular processes
- Planet formation, differentiation of the Earth.
- igneous processes
- Radiogenic isotope geology/Geochronology

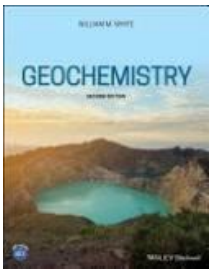
Assessment and Grading:

You will have a variety of exercises this semester to help you learn the material and demonstrate as much. I use points and then assign grades at the end of the semester using a "semi-curve" (i.e., I don't base grades on the standard 90%=A, 80%=B, etc. formula, but instead, compare overall class performance and the performance of highest and lowest scoring assignments to devise a scoring formula). If you are ever concerned about your performance in the class, come by my office and speak with me. Although I don't assign letter grades until the end of the semester, I can tell you at any time approximately "how you stand". Class participation/attendance is not mandatory, but it can make the difference in borderline grading situations. Grades will be based on:

a. midterm exam (25%)
b. problem sets (30%)
c. course journal (20%)
d. written final project (25%).

Please turn assignments in on time. *Grading penalties of 10% per day will apply unless a valid reason for a late assignment is discussed with me ahead of time.*

ERTH325 -- ENVIRONMENTAL GEOCHEMISTRY - Spring 2022



Reading and Text:

Reading assignments are from White, Geochemistry (Wiley-Blackwell); The book should be available in the bookstore. *Supplemental Reading:* will be provided as needed. Reading will likely take 3 hours per week. I have access to unedited pdfs from an older version of the White book if someone prefers this, but if you use them it will your responsibility to check them against a copy of the written book for consistency (for instance end of chapter homework problems).

Class Format:

This is a lecture course, *expecting in-person learning, with hybrid/online elements if circumstances dictate.* I encourage students to actively ask questions in class, particularly if the discussion isn't clear of if you want more information. Most important material will be discussed in class, but is typically covered in more detail in the reading assignments. Keeping up with the reading will help you get the most out of the lectures.

Lecture Notes:

Download as adobe acrobat files from Laulima. See also the schedule on the course website. Notes are not required reading, nor are they a substitute for taking your own notes or reading the text. They are a guide to lecture content. Also, the notes include supplemental figures discussed in class that are not in the textbook. These will be useful for homework assignments and studying for exams.

ERTH Learning Objectives:

ERTH department has defined 5 learning objectives for the undergraduate degree program related to Relevance of Geology and Geophysics, Technical knowledge, Scientific method, Oral and written skills, and Evaluating Phenomena. This course directly incorporates content relevant to 4 of those:

- SLO1 - throughout the course you will learn about the relevance of geochemistry to understanding and providing for human needs, and to impacts on society and planet Earth.
- SLO2 - you will solve problems using real world data sets
- SLO4 - you will reconstruct knowledge in a written report (final project).
- SLO5 - in all assignments you will evaluate, interpret, and summarize basic principles to explain complex phenomena at the interfaces of chemistry, geology, biology, hydrology, soil science, and geography

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 in the community. Some of your options are:
- **As members of the University faculty, your instructors are 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 your instructors cannot guarantee confidentiality, you will still have options about how your case 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.