

ERTH302 Igneous and Metamorphic Petrology Syllabus

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Schedule: Monday-Wednesday lectures (11:30-12:20) and Thursday lab (1:30-4:20pm)

Textbook: An Introduction to Igneous & Metamorphic Rocks (John Winter).

Field trips: Two field trips during lab periods (Makapu'u and Old Pali Rd.), and a weekend field trip to Maui

Grade: Labs (60%), semester project (20%), midterm exam (10%), homework (10%).

Content objectives

Become a 'master of rocks'. The main objective of this course is to get students acquainted with a wide range of igneous and metamorphic rocks and their corresponding geological settings. Deductive skills (such as identifying minerals and other phases, understanding their geologic occurrence and inferring environmental conditions from the mineral assemblage, texture, and tectonic setting) will be emphasized over memorization of nomenclature, although we will also examine why mineral and rock names are important and may convey great meaning. The petrogenesis of igneous and metamorphic rocks (the source 'DNA' of a given rock, its temperature, pressure, path through the earth's crust, its interactions with other rocks and/or magmatic bodies) will be explored through different geodynamic contexts of the Earth. The importance of basic sciences (specifically chemistry and physics) in gleaning geological processes from hand samples will be emphasized throughout the course.

Learning Implementation

Conducting and communicating hands-on science. The recent eruptive sequence at Kilauea Volcano (the 2018 Leilani eruption) provide an extraordinary opportunity to examine magmatic processes that generate igneous rocks. We will examine, with a variety of techniques, samples that were collected during and after this eruption. Students will conduct a semester-long project using samples (e.g. from the 2018 Kilauea eruption, other locations in the Hawaiian Islands, or other localities). The goal will be to recover as much information as possible from these samples through observations, identification of petrological clues, in order to constrain the geological history. The goals of these activities are to scaffold upon the students' prior knowledge of igneous rocks (introduced in EARTH200 and developed in EARTH301); apply and practice new observational and analytical skills; address frontier science questions pertaining to the plumbing systems and dynamics of Hawaiian volcanoes; and gain experience communicating scientific content in accord with accepted norms—both orally and in writing.

This course uses writing to promote the learning of course materials. The class is restricted to 20 students, in order to promote meaningful professor-student interaction on each student's writing. A total of 14 weekly lab assignments, expected to represent ~0.75 to 1 page of writing each, will be assessed on the clarity of expression as well as the quality of the content, with these components contributing equally to the lab grade. In addition, students will document and discuss their observations, interpretations, and conclusions of the semester-long project in a written report 3-4 written pages long (plus figures, plots, interpretative sketches). Students will be given feedback in the form of written and oral comments on at least two drafts prior to submission of the final report. Taken together, the labs, semester report drafts and final version constitute a substantial amount of writing: a minimum of 4,000 words (~16 pages). The

portion of the course grade that is based solely on the evaluation of written work is 40%; that is, half each of the lab and semester report components (tabulated as $0.5 \cdot 60\% + 0.5 \cdot 20\% = 40\%$).

SLOs - Student Learning Objectives

This course objectives encompass three levels of maturity in all five categories articulated by the Department of Earth Sciences programmatic SLO's for the BS degree.

- The course *introduces* the relevance of Earth Sciences to society (SLO 1a) and uses scientific ethics (4c).
- The course *develops* understanding of the impact of geology and geophysics on society and human needs, particularly with regard to understanding planet Earth (1b). It utilizes computer applications to support quantitative understanding of geologic data and processes (2b) and it develops skills in field methods (2d). Students gain experience articulating scientific problems (3a) and communicating orally (4a) explanations of complex Earth phenomena (5c), as they deepen skills in evaluating, interpreting, and summarizing basic principles of igneous and metamorphic petrology (major subdisciplines of Earth Science; 5a), and examining the linkages between Earth Sciences and other basic sciences (5b).
- A major focus of this course is practicing the scientific method. Students achieve *proficiency* in analyzing a problem (3a), solving problems (3b), and communicating science in written format (4b)

Disability access: If you have a disability and related access needs the Department will make every effort to assist and support you. For confidential services, students are encouraged to contact the Office for Students with Disabilities (known as Kōkua) located on the ground floor (Room 013) of the Queen Lili'uokalani Center for Student Services. URL: www.hawaii.edu/kokua and email: kokua@hawaii.edu

Academic Dishonesty: Academic dishonesty will be reported, and any exams or assignments affected by dishonesty will receive "0" credit and cannot not be retaken.

Title IX: The University of Hawaii 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. For more information regarding sex discrimination and gender-based violence, the University's Title IX resources and the University's Policy, go to: <http://www.hawaii.edu/titleix>