GG621 – Electron Microprobe Analysis

Course meets: MW 12.30-1.30 in POST 613 for the theoretical part, and about 6 weekly 3-hr blocks (to be determined by everyone’s schedule) at the probe for the lab part.

Prerequisites: Mineralogy, Physics, Chemistry. Contact instructor for override if necessary.

Instructor: Eric Hellebrand
Contact: ericwgh@hawaii.edu
Office: POST 612B
Probe lab: POST 621
Phone: x6193

Course content:
This aim of this graduate-level course is to provide an introduction to electron microprobe analysis. It is required for all users of the UH electron microprobe. The course is divided into a (a) theoretical part, held in the classroom, and (b) a practical hands-on part at the electron microprobe.

(a) Theoretical background of Electron Microprobe Analysis
- Theory of electron-solid interaction
- Components of the electron microprobe
- Wavelength- and energy-dispersive spectrometry
- Data acquisition and conversion of intensities into concentrations
- Data quality

(b) Operation of the UH electron microscope
- Sample preparation, carbon coating
- Basic software operation, focusing, imaging, EDS
- Setting up a WDS analysis from scratch
- Automated analysis, element mapping
- 1-day research project for each student

GG Learning Objectives:
GG department has defined 4 learning objectives for the graduate degree program related to (1) Technical knowledge, (2) Scientific method, (3) Communicate geological results, and (4) Employability. This course directly incorporates content relevant to those:

SLO1: You will learn the physics of x-ray generation, and basic operation of the electron microscope;
SLO2: Throughout the course, you will learn how to design an experiment safely and effectively, how to acquire high-quality data, and how to critically evaluate the quality of your data and other people’s published results;
SLO3: You will write the “Analytical methods” section of a scientific publication using data you acquired on your own during the 1-day probe project;
SLO4: Experience with operation of an electron microscope is a valuable asset within the fields of earth and planetary sciences, mineral physics and material sciences, engineering and many other fields that rely on the microanalysis of solids.

Course Goals:
This course is about autonomously operating the electron microprobe in order to obtain micron-scale chemical compositions of solid materials. The theoretical part teaches the required
background and assesses data quality and potential pitfalls. The lab part introduces the stepwise operation of the software intensive electron microprobe.

**Assessment and Grading:**
Grading is based on
(a) a written test that covers both theoretical knowledge and practical aspects learned during the course; (40%)
(b) a 1-full-day project for each student to demonstrate analytical proficiency on the electron microprobe, by setting up a series of quantitative WDS analyses from scratch, followed by; (40%)
(c) a written report that emphasizes the analytical conditions and also includes a quantitative evaluation of the data quality. (20%)

Class participation is mandatory.

**Sexual Harassment** 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 members of the University faculty, your instructors (including me) 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 (and see below). [http://www.manoa.hawaii.edu/titleix/resources.html#confidential](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; or contact me and I will take you to the Title IX office.

**Confidential Reporting** University of Hawaii students, faculty and staff have an important resource to confidentially report violations of laws, rules, regulations and UH policies. A whistleblower hotline launched in June 2016 further advances the university's commitment to encourage and enable any member of UH or the general public to make good faith reports of misconduct. University of Hawaii Whistleblower website: [https://secure.ethicspoint.com/domain/media/en/gui/40480/index.html](https://secure.ethicspoint.com/domain/media/en/gui/40480/index.html)

UH Whistleblower Hotline: 1-855-874-2849
For more information go to UH News at [http://go.hawaii.edu/coj](http://go.hawaii.edu/coj)