GG621 – Electron Microprobe Analysis

**Course meets:** MW 12.30-1.30 in POST 613 for 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 microprobe**  
- 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 microprobe;  
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 microprobe 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.