Syllabus

GEOS 428-FE1 – 33904 /628-FE1 - 33917, Spring 2006

Elementary Scanning Electron Microscopy

Instructor: Ken Severin, fnkps@uaf.edu
Office 324 NSB, X5821

SEM Lab: 162 NSB, X5452

Office hours by appointment. Please try email to set one up. I can often be found in the probe lab, 156 NSB, X5820
Home phone: 455-6552, cell 978-6369, calls are OK between 9am and 11pm

TA: Luke Bruner, ftblb1@uaf.edu

Students completing this class will have become acquainted with the basic theory and operation of a scanning electron microscope and have a rudimentary understanding of sample preparation for scanning electron microscopy. Students will learn to operate the Advanced Instrumentation Laboratory's ISI-40 SEM and to obtain digital images with the Iridium Digital Imaging System as well as to use the SEM's Kevex Energy Dispersive X-ray spectrometer for qualitative elemental analysis.

The lecture portion class will consist of three two-hour lectures held during the first three weeks of the semester. There will be three three-hour laboratory sessions, held over the first few weeks of the semester. For the rest of the semester students are free to work on a project of their own choice.

Lecture 1 (January 23) - Lab Scheduling, Lab Safety, and SEM Overview
Lecture 2 (January 30) - Selecting appropriate operating conditions, sample preparation, ESEM
Lecture 3 (February 6) - Qualitative elemental analysis, digital images and image processing

Lab 1 to be held before Lecture 2- Turning on the SEM, changing samples, getting an image (**Lab Assignment Due Feb. 6**)
Lab 2 to be held between Lectures 2 and 3 - Sample preparation, Critical Point Drying, (**Lab Assignment Due Feb. 27**)
Lab 3 to be held after Lecture 3 - X-ray detection, optimizing operating conditions, ESEM (**Lab Assignment Due March 20**)

It takes the typical new user some 10-20 hours of time on the SEM to become a fairly competent operator, and some 100+ hours to become an expert. Practice is the key. **You do not need to be an expert to successfully complete the class!** Successful completion of the course includes attending all lab sessions and completing the lab assignments, as well as presenting, both orally and in writing, a short paper on data gathered in an independent project. Projects need not be scientifically complex (using the SEM artistically is OK too), but must emphasize the use of the SEM. Students enrolled in GEOS 628 will also present a single panel (maximum 35" X 35") poster.

The emphasis of the final project should be less on the "scientific meaning" of the project and more on "how scanning electron microscopy makes this study possible." An example might be "I looked at four pumice samples and was able to see that the vesicles were different sizes. This is how I had to prep the samples, operate the machine, and the SEM let me see things I couldn't otherwise see." The comments about what the vesicle size means in term of volcano evolution, while interesting, are not necessary for this class. Feel free to use the data gathered in this class

for other non-commercial projects you may have this semester.

Papers should be no more than 1000 words and should contain approximately 4 images or X-ray analyses. Talks will be 10 minutes **MAXIMUM** and will be criticized by the other members of the class as well as interested outsiders. Posters and the first set of talks will be presented **April 24**; the second group of talks will be **May 1**. Class members are expected to attend all talks. Papers are due **May 10 by 5pm**.

Grading is Pass/Fail Only. You must attend all laboratory sessions, turn in all laboratory assignments and your paper (and poster for GEOS 628), give your talk and attend the other talks to pass. **Late assignments will not be accepted.**