

## Syllabus

GEOS 428-FE1 – 45953 / 628-FE1 - 45963, Spring 2009

### Elementary Scanning Electron Microscopy

Instructor: Ken Severin, [fnkps@uaf.edu](mailto: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, X5821

Home phone: 455-6552, cell 978-6369, calls are OK between 9am and 11pm

Assistants: Todd Sformo ([rfts@uaf.edu](mailto:rfts@uaf.edu)) and Thomas Kircher ([tkircher@gnu.org](mailto:tkircher@gnu.org))

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 SR-50 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. My hope is that students will learn how scanning electron microscopy can (or can't!) be applied to their own research.

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.

Lectures: Monday evenings, 233 Natural Science Building 6-8 PM.

LABS: Meet in Room 162 Natural Science Building and will be scheduled at the first lecture.

Reading material consists of articles gleaned from several sources; copies will be distributed at the first lecture.

[Lecture 1](#) (January 26) - Lab Scheduling, Lab Safety, and SEM Overview

[Lecture 2](#) (February 2) - Selecting appropriate operating conditions, sample preparation, ESEM

[Lecture 3](#) (February 9) - Qualitative elemental analysis, digital images and image processing

Mid Term Reports (March 23) - A celebration of spring and a no more than five minute talk from each student on "this is where I am in my project." **You must attend and present or you fail the class.**

[Lab 1](#) to be held before Lecture 2- Turning on the SEM, changing samples, getting an image (**Lab Assignment Due Feb. 9**)

[Lab 2](#) to be held between Lectures 2 and 3 - Sample preparation, Critical Point Drying, (**Lab Assignment Due March 2**)

[Lab 3](#) to be held after Lecture 3 - X-ray detection, optimizing operating conditions, ESEM (**Lab Assignment Due March 16**)

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 27**; the second group of talks will be **May 4**. Class members are expected to attend all talks.

**Grading is Pass/Fail Only. To pass you must:**

- 0) Show evidence of passing the UAF Passing the UAF Lab Safety Test (or equivalent) ([http://www.uaf.edu/safety/Lab\\_Safety\\_Class.htm](http://www.uaf.edu/safety/Lab_Safety_Class.htm))
- 1) Attend all three lectures and both final presentation sessions
- 2) Attend all three labs (not necessarily the one you signed up for)
- 3) Attend and present at the mid-term spring fest
- 4) Turn in all laboratory assignments on time.
- 5) Give your final talk (and poster for GEOS 628)

There will be no make-up lecture or laboratory sessions. Late assignments will not be accepted. Working together to obtain information is encouraged, but the work you turn in, and your final project, must be your own. If you wish to collaborate on your final project it must be cleared with me in writing no later than March 16.

It takes most folks about 10-20 hours of time on the SEM to become a fairly competent operator, and some 100+ hours to become somewhat 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 a short talk 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. **If you have any thoughts about using the SEM commercially, contact me first so I don't get in trouble** (and believe me, I won't go by myself!).

Students will conduct themselves in accordance with the "Student Code of Conduct" as put forward in the applicable University of Alaska Fairbanks Catalog.

**Disabilities Services:** The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. The assistants and I will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.

This syllabus is a contract between you as a student and me as an instructor and it cannot be changed after the first lecture. If you do not wish to be governed by it then do not take the class.