Syllabus: GEOS F600-F01 Fall 2008 CRN 74694
Introduction to X-ray Spectrometry
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After completing this course the student should be able to critically evaluate electron microprobe and x-ray fluorescence (XRF) analyses of materials. Students will be exposed to the theoretical and practical aspects of obtaining microprobe and XRF analyses.

Lectures will deal mainly with the theoretical aspects of x-ray spectrometry, while labs will focus on the mechanics of obtaining analyses from the electron microprobe and Axios XRF housed in the Department of Geology and Geophysics. At the conclusion of the course the student will present (via a 10 minute talk and 8-10 page paper) an analytical protocol that uses one or both of these techniques. Do not get the project for this class confused with a project where you are making scientific interpretations based on the data: For GEOS F600 you should be concerned with the quality of the data. To encourage this, you are limited to the analysis of three final project samples until you have a draft of your final paper approved. Notice that in the vast majority of cases the quality of the data you need is determined by the problem you are studying. No one has a big enough checkbook to get "the absolute best data" and rarely is "the absolute best data" even definable. You are welcome to use any data you gather in this class for any other classes you are taking (but if you are going to use the data commercially, talk to me first). Talks are open to the general community, expect written and oral comments from classmates and others. You will be expected to understand both the precision and the accuracy of your analyses, and to understand how your analyses are affected by sample preparation, beam (electron or x-ray)-sample interactions, and analytical conditions.

Lectures: Mondays, 2:15-4:15, 237 Reichardt Building (unless otherwise noted!)
Labs: each student will have one scheduled three-hour lab session/week which meets somewhere around the Microprobe Lab, 156A NSF. Labs will be scheduled at the first class. Students will typically need 3-6 hours of additional lab time per week. I can't emphasize enough that the more time you put in with the instruments, the more comfortable you will be with them.

	Lecture	**Laboratory**
Sept. 8	Electron microprobe and XRF overview / organizational stuff	Lab Tour Basic probe operation
Sept. 15	Characteristics/terminology of X-ray spectra	Probe - EDS more probe operation
Sept. 22	X-ray/solid interaction - mass absorption coefficients	WDS-XRF semi-quant **Lab One (Probe EDS) Due**
Sept. 29	X-ray Fluorescence Analysis **Quiz 1**	WDS-XRF full-quant
Oct. 6	Microprobe Design Error Analysis/ Counting Statistics	Thin Sections / Sample Prep more probe **LAB2 (XRF-semi) Due**
Oct. 13	No Class	No Lab
Oct. 20	Probe for Windows	Probe for Windows
Oct. 27	Elemental Mapping and X-ray Detectors **Quiz 2**	Probe for Windows **LAB3 (XRF-full) Due**
Nov. 3	Electron/solid interaction - implications for electron microprobe analysis.	Probe (Ken gone Tues-Wed)
Nov. 10	Electron Microprobe Quantitative Methods	Probe **LAB5 (PROBE-Analytical Routine) Due**
Nov. 17	Bence Albe Correction Methods **Quiz 3**	Projects **Project must be approved by Nov. 17**

	Lecture	Laboratory
Nov 24	Electron Microprobe Quantitative Methods – what we really do.	Projects **LAB4 (PROBE-STATS) Due**
Dec 1	Paper Review, published and other classes **Quiz 4**	Projects
Dec. 8	Student Presentations Last day to turn in draft of final paper if you want comments.	**LABX (PROBE-IMAGE) Due** ***FINAL PAPER DUE Dec. 17***

Grading: Your final grade will be based on:
0) Passing the UAF Lab Safety Test (or equivalent) (http://www.uaf.edu/safety/Lab_Safety_Class.htm)
1) Labs (8% Each - Total 40%) - LabX is optional, you can get up to 8% "extra credit" for it.
2) Quizzes (8% each - Total 24% - Toss the lowest score, but you do have to take them all)
3) Oral presentation (15%)
4) Written project report (20%)
5) Instructor's overall evaluation 1%

A	96-100	B+	89-93	C+	82-85	D+	73-75
A-	93-96	B	87-89	C	78-82	D	72-73
		B-	85-87	C-	75-78	D-	70-72
						F	<70

Text: Goldstein, JI, Newbury, DE, Joy, DC, Lyman, CE, Echlin, P, Lifshin, E, Sawyer, L, and Michael, JR. 2003. Scanning electron microscopy and X-ray microanalysis. Kluwer Academic / Plenum Publishers, New York. 689 pages plus CD. This is the third edition, and there are some changes from the second. There are several similar books from the same group in the library.

Other reading material – much of the material is duplicated from one text to another, but every author presents things slightly differently, so if you have problems with a concept in one it is a good idea to check out the topic in another.

Potts PJ. 1987. Potts PJ. 1987. A Handbook of Silicate Rock Analysis. Blackie. Glasgow, UK. 622 pages. A great reference but WAY pricey (and I think out of print now).

Reed, SJB. 1996. Electron microprobe analysis and Scanning Electron Microscopy in Geology. Cambridge University Press, Cambridge. 201 pages.

Williams, KL. 1987. An introduction to X-ray spectrometry : X-ray fluorescence and electron microprobe analysis. Allen and Unwin, London. 370 pages. Also out of print.

Dr. James Wittke (Northern Arizona University) has a very nice set of notes and references at http://jan.ucc.nau.edu/~wittke/Microprobe/Probe.html

Oxford Instruments (http://www.x-raymicroanalysis.com/pages/main/main.htm) has some nice introductory information on both EDS and WDS as well.

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 the instructor and it cannot be changed after the first lecture. If you do not wish to be follow it then do not take the class.