

**Methods in Analytical Geochemistry**

Fall Semester 2011, 2 credit hours

**Instructor:** Dr. Peter E Sauer**G444 or G690**

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**Course Objectives:** *Methods in Analytical Geochemistry* is designed as an overview of basic collection and preparation of water, soil and rock samples for elemental analysis by analytical geochemical techniques used in environmental and exploration geology, as well as, geochemical studies. It is designed to give background and context to published data sets for critical evaluation. It also serves as an opportunity to develop scientific writing skills.

Course participant evaluation is based on: a) bi-weekly lab book evaluations (including write-ups, data plots, analytical accuracy, and neatness) [50%]; b) participation in summary lab/classroom/field discussions [20%]; c) evaluation of a final, three-page, method write-up [30%]\*. *Graduate students taking the class for G690 (graduate credit) will have an additional short written assignment.*

Website with resources for G444 can be found by: <http://www.indiana.edu/~ereg444/index.htm>. This website is a work in progress, feel free to make suggestions.

<b>Time:</b> 1:25-3:20 pm, for lecture Tuesdays, plus ~two additional hours per week to be scheduled week-by-week	<b>Rms.</b> MSB2 -102 (lectures) and 453 (labs)
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<b>Syllabus</b>		
Date		Topic
<b><i>Water sampling, handling, field measurements and analysis</i></b>		
Week 1	30 Aug	Introduction: Lab book expectations, units and measures, sample collection and stabilization, lab safety, and development of a hypothesis and sampling scheme
Week 2	6 Sep	<b>Field trip #1:</b> Sampling for cation and anion concentrations, and trace metals and field measurements of alkalinity, temperature, pH, redox potential, and specific conductance
Week 3	13 Sep	Ion chromatography (IC) for anions, versus a gravimetric method
Week 4	20 Sep	Atomic absorption spectrometry (AAS) for cations and metals
Week 5	27 Sep	Trace metals and metal isotopes (visiting instructor; Prof. Wasylenki)
Week 6	4 Oct	Data handling and presentation
<b><i>Soil sampling, handling, field measurements and analysis</i></b>		
Week 7	11 Oct	<b>Field trip #2:</b> Sampling schemes (profiles, transects, and stream samples) and storage, field measurements, and descriptions
Week 8	18 Oct	Moisture content, sample ashing, and loss on ignition (LOI) Sample preparation: crushing and grinding (contamination sources)
Week 9	25 Oct	X-ray Fluorescence (XRF) Major and selected trace element composition by fused disk and pressed powder pellets
Week 10	1 Nov	Eltra carbon (total and organic) and sulfur analysis
Week 11	8 Nov	Data handling and presentation
<b><i>Rock sample handling, and analysis</i></b>		
Week 12	15 Nov	Wet chemical analysis of geologic materials—getting solid samples into solution
Week 13	22 Nov	Inductively coupled plasma (ICP) analysis of geologic materials <i>Thanksgiving Holiday, no laboratory sessions scheduled</i>
Week 14	29 Nov	Sequential extractions
Week 15	6 Dec	Data handling and presentation

**Method Papers Due:** Tues., 13 December, of finals week by 5:00 pm. *Syllabus is subject to change.*

**Reserve Readings (Geology Library, 6th Floor, listed under the course number G444):**

*Standard Methods for the Examination of Water and Wastewater 21st Edition*. Published by the American Public Health Association, American Waterworks Association and the Water Environment Federation, 2005. QD 142 .A53

Tufte, E., 2001, *The Visual Display of Quantitative Information*. Graphics Press. QA276.3 .T83

**General Information:**

The following are links to reference pages located on the internet. These links may prove useful during the course for various assignments, or as general references. Feel free to suggest others you might find.

**Safety and Health:**

Includes MSDS information, and IU's Environmental Health and Safety Department

<http://www.ehs.indiana.edu/>

<http://siri.org/msds/links.html>

<http://siri.org/msds/>

**Chemistry Notes:**

Sites contain various types of information regarding the elements and reactions we will be discussing in class.

<http://pubs.acs.org/>

<http://www.webelements.com/>

<http://www.chemcenter.org/>

<http://www.chemdex.org/>

[http://www.chemsoc.org/viselements/pages/periodic table.html](http://www.chemsoc.org/viselements/pages/periodic_table.html)

<http://webbook.nist.gov/chemistry/>

**Miscellaneous:**

<http://www.epa.gov/>

<http://www.usgs.gov/>

[http://wwwbrr.cr.usgs.gov/projects/GWC\\_coupled/phreeqc/faq.html](http://wwwbrr.cr.usgs.gov/projects/GWC_coupled/phreeqc/faq.html)