

GL 9508 Analytical Geochemistry

Course Outline - Winter 2017

Instructor: Robert Linnen

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Schedule

Lectures: 1 hr per week, date and location to be determined

Seminar: 2 hrs per week, date and location to be determined

Seminars will take place the weeks of January 9, 16, 30, February 6, 13, 27, March 6, 13, 20, 27 and April 3, 10. Make-up lectures/seminars may be needed for the week of March 6th owing to participation at the PDAC conference, depending on the course schedule.

Course Description

A variety of techniques are used to analyze wholerock (bulk techniques) including X-ray Fluorescence (XRF), Induced Coupled Plasma-Mass Spectrometry and Atomic Emission Spectroscopy (ICP-MS and ICP-AES), Laser Induced Breakdown Spectroscopy (LIBS) and a variety of specialized techniques. Different techniques are used to obtain point chemical analyses of minerals such as Scanning Electron Microscopy-Energy Dispersive System (SEM-EDS), Quantitative Evaluation of Minerals by SEM (QEMSCAN), Mineral Liberation Analysis (MLA), Electron Microprobe Analysis (EMPA), Cathodoluminescence (CL), Secondary Ion Mass Spectroscopy (SIMS), Laser Ablation ICP-MS (LA-ICP-MS), Infrared Spectroscopy (IR) and Raman Spectroscopy. The basic theory and practice for these techniques will be introduced and interpretation of data emphasized.

WHAT ARE THE PRINCIPAL OBJECTIVES OF THIS COURSE?

The interpretation of geochemical data requires an understanding of the theory behind the analysis, the strengths, limitations and errors of the technique and how geochemical data can be applied to testing geological hypotheses. This course introduces a number of analytical techniques that are applied to determining the compositions of rocks and minerals, which are then applied to geological problems.

There is no formal text. **Notes will be posted on the 9508 OWL website.**

Course Structure

The instructor will present a one-hour lecture per week of a new analytical topic. The seminar will consist of discussing papers that show applications of the technique for the week, problem solving with analytical data, or a combination of both.

Marking

Seminar	50%
Final Exam	50%

Seminar: One or more students will present a seminar on a journal paper each week. The seminar mark will consist of 75% is for presentations and 25% participation in the seminars of others. Students must participate in all seminars. A maximum of one seminar can be missed if a valid reason is given and the rest of the seminar mark will be pro-rated. Valid reasons for missing a seminar include medical, compassionate, religious holidays, personal (family or work) obligations. The instructor and student will agree upon what is valid, but in the case where there is no consensus advice from the Dean's office will be sought. However, In the case of a missed lecture or seminar, students are nevertheless responsible for all material in the course for the final exam.

Final Exam: The final exam will be a three hour, written exam and will consist of a combination of short answer (possibly involving calculations) and essay questions.

Topics

Bulk (wholerock) chemical techniques

- 1) X-Ray Fluorescence (XRF)
- 2) Induced Coupled Plasma-Mass Spectrometry (ICP-MS), Induced Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES)
- 3) Laser Induced Breakdown Spectroscopy (LIBS)
- 4) Specialized techniques: Fire Assay and analysis of F, B, S, Se, Hg, Cl, REE Fe^{3+}/Fe^{2+} , S^{6+}/S^{2-} .

Point Analysis (minerals)

- 5) Scanning Electron Microscopy-Energy Dispersive System (SEM-EDS)
- 6) Quantitative Evaluation of Minerals by SEM (QEMSCAN), Mineral Liberation Analysis (MLA)
- 7) Electron Microprobe Analysis (EMPA)
- 8) Cathodoluminescence (CL)
- 9) Secondary Ion Mass Spectroscopy (SIMS)
- 10) Laser Ablation ICP-MS (LA-ICP-MS)
- 11) Infrared Spectroscopy (IR)
- 12) Raman Spectroscopy

General Information

General Information

University of Western Ontario policies are listed at http://www.uwo.ca/univsec/academic_policies/. Scholastic offences are taken seriously and graduate students are directed to read the policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf

A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here:

https://studentservices.uwo.ca/secure/medical_document.pdf

Accommodation for Illness

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http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf

Mental Wellbeing

Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

Accessibility Statement

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x.82147 for any specific question regarding an accommodation. Students are not required to sit for more than one hour at a time. For additional information please see

www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_disabilities.pdf