

## GL 9552A Advanced Mineral Deposit Geochemistry (combined with ES4432A)

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### *Schedule*

**Lectures:** 3 hrs per week, M-W-F 12:30-1:30, PAB-106

**"Tutorial" used as a make up time if necessary** 1 hr per week, W 1:30-2:30, BGS 1084

**Seminar:** 2 hrs per week, TBA

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### **Course Description**

The principles of metal concentration and deposition in magmatic and hydrothermal environments are examined. Natural and experimental data, including fluid inclusion, stable isotope, metal solubility, mineral stability and metal partition behaviour are used to develop genetic models for ore deposits, which form the basis of mineral exploration strategies.

### **Marking**

Graduate students will attend the same lectures as the undergraduate students and complete all assignments. In addition, recent journal articles will be assigned each week and these papers will be discussed in a seminar held only for the graduate students.

The **midterm** will be the same as the undergraduate course

The **final exam** will be given separately as a 30 minute **oral exam**, questions for the oral exam will cover both the lecture material (undergraduate lectures) as well as the papers from the seminars.

The **seminar mark**, is determined as follows: All students must read all papers but each week a different student will present an assigned paper to the class and distribute a handout. Weekly seminar marks will be based on the presentations (75%) and participation in the discussion (25%). Note that students are responsible all of the material in papers from the seminars.

Mid Term (joint with 4432A)	25%
Assignments	5%
Seminars	30%
Final Oral Exam	40%

**SYLLABUS**  
**Lecture Material Joint with ES4432A**

Introduction

- why are models important in economic geology

Stable Isotopes

- nomenclature, fractionation, thermodynamics
- O and H isotopic compositions of natural waters
- fluid-rock interactions
- C and S isotopes

Geothermometry

- estimation of lithostatic pressure
- use of phase equilibria
- thermodynamics of mineral exchange reactions
- isotope geothermometry

Diamonds

- igneous background
- kimberlites
- indicator minerals
- geothermometry and geobarometry of kimberlites and diamonds

Nickel Deposits

- review of deposit types
- constraints from experimental petrology
- sulphide-silicate melt partitioning
- depositional model

Platinum Group Element (PGE) and Chromium Deposits

- review of the Bushveld and Stillwater complexes
- constraints from phase equilibria
- sulphur solubility in silicate melts
- comparison of the origin of PGE and Ni deposits

Fluid Inclusions

- origin and classification of fluid inclusions
- interpretation of fluid inclusion data
- H<sub>2</sub>O-NaCl and H<sub>2</sub>O-CO<sub>2</sub> systems

Porphyry Copper Deposits

- review of deposit types
- geochemistry of alteration and mineralization
- fluid-melt partitioning and metal solubility in porphyry systems

Other Granite-Related Deposits (Mo, Sn, W)

- review of molybdenum, tin and tantalum deposits
- controls of metal solubility in granitic melts

## Gold Deposits

- review of epithermal and orogenic gold deposits
- behaviour of sulphur
- transport and deposition of gold
- fluid inclusions in gold deposits
- structural aspects of greenstone gold deposits

## Volcanogenic Massive Sulphide (VMS) Deposits

- environments of modern seafloor mineralizing systems
- hydrothermal alteration in VMS systems
- chemical reactions of Cu-Pb-Zn deposition
- isotopic constraints on the genesis of VMS deposits

## Sedimentary Exhalative (SEDEX) Deposits

- review of SEDEX deposits
- heat flow, fluid inclusions and isotopic constraints
- role of anoxic basins and interpretation of sulphur isotopic data
- comparison to VMS deposits

## Mississippi Valley Type (MVT) Deposits

- fluid inclusion characteristic
- transport and deposition of Pb-Zn
- isotopic and heat constraints

## *General Information*

**Statement on Academic Offences:** "Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: <http://www.uwo.ca/univsec/handbook/appeals/scholoff.pdf> ."

### **Student's responsibilities in the event of a medical issue:**

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see: [http://www.uwo.ca/univsec/handbook/appeals/accommodation\\_medical.pdf](http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf) .

### **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.