Earth Science 4451Y: Applied Geophysics Laboratory

12 hours lectures (generally one/two per week)	12 units
36 hours labs (generally 3 per week)	18 units
48 hours tutorials (includes field trips)	24 units
	Total: 60 units

Calendar description (see http://www.westerncalendar.uwo.ca/2008/pg212.html#3796)

An introduction to geophysical techniques used for environment studies, as well as exploration for mineral deposits and hydrocarbons. Techniques covered will include gravity, magnetic, seismic and electromagnetic field methods. Data acquisition and basic data processing and interpretation will be covered, together with an introduction to data analysis using MATLAB.

Prerequisite(s): Earth Sciences 2220A/B, or the former Earth Sciences 320a/b, or permission of the Department.

Notes: The course is taught during the fall term, with lectures and laboratories held in the first four weeks of term, followed by a week of field camp, and follow-up lectures and labs focused on delivering a comprehensive final report by the end of term. The course is to be offered in co-operation with other institutions, including Queen's University, with possible participation of one or two geophysical contractors on-site. UWO students enrolled in the Specialization or Honors Specialization in Geophysics are partially subsidized by the Department. However, all students are expected to contribute toward transportation, lodging and equipment rental costs (currently estimated at $450).

Instructors: Dr. Gerhard Pratt gpratt2@uwo.ca, Arlsan Akhmetov aakhmeto@uwo.ca

Field trip (absence from Campus): The course contains a mandatory five day field trip to the Calabogie and Admaston areas south and east of Ottawa (roughly six hours drive from London). You will not be able to attend your other classes during the four days of term from October 14th-17th. Please ensure you discuss this with other course instructors. If required I am happy to write to them on your behalf.

Course objectives: Students completing the course will

- Be able to operate proficiently basic geophysical instrumentation
- Be able to design and carry out geophysical surveys to meet industry needs in mineral exploration, environmental engineering and petroleum exploration
- Be able to reduce and interpret data arising from such surveys
- Be able to communicate the results of the surveys through professionally written reports and presentations

Field Safety

Students are expected to be familiar with and comply with the University Off-Campus Activity Safety Policies. A safety plan will be prepared by the students in consultation with the instructors prior to departure on the field exercise. A blank Safety Planning Record is attached.

Equipment

Students will make use of Department Geophysical Equipment, and may further be using equipment loaned to us by local geophysical companies. Some of this equipment is expensive. Students are expected to treat all equipment with care. Students are allowed to sign out equipment for additional work, design projects etc only after they have received training.

Evaluation:

15% Written lab reports on field testing of geophysical instruments (first five weeks)
15% Written proposal for field work at Calabogie and Admaston field sites.
15% Oral debriefing following the field trip.
55% Final fieldwork reports.

Reporting

1. Individual reports on field testing of instruments (5% per report, three in total)

The objective is produce a report on the proper functioning of each instrument, and to make recommendations for field procedures to be used during the Calabogie and Admaston field trip. The field test data should be quantitatively compared with expected geology and anomalies in the area to document the correct instrument response. Reports on the following instruments are required:

Week 1-2: (Sept 8th)	Gravity, Magnetics
Week 2: (Sept 15th)	Georadar
Week 3: (Sept 22nd)	Seismic
Week 4: (Sept 29th)	TBA

Students must submit each weekly report before they will be permitted to participate in the next week's field test exercise. These reports are to be written individually, although collaboration with base maps and data plotting is encouraged. The field tests must be fully documented, all data must be reduced and quantitative interpretations and/or conclusions must accompany the reports. A *brief* discussion of the instruments used (name and model), where and why the exercise was done, and how the data were collected is required. Conclusions should be written with regard to the functioning of the instrument and any recommended field procedures to be used.

Field test reports are to be approximately 750 words per instrument used. Excessive length will be penalized! The field data should be clearly represented in the form of graphs, figures or tables, as appropriate. Base maps should clearly show the location of each survey, and of any anomalies located.

A *suggested* format for the field test reports is:

Objectives: Discussion of where and why survey was performed
Instruments: Instruments used, operating principles and what exactly is measured (be brief)
Procedure: Brief review of survey procedure (specific to each geophysical method), including setup
Results: Brief discussion of results, addressing sources and magnitude of errors and limitations
Data analysis and interpretation: This is where you describe what you think your data mean (refer back to the objectives)
Conclusions and recommendations: I don't mind if this is very brief, but it must be suitable
Bibliography: Include a correctly formatted reference to the manual, and any other material you used.

Standards/Assessment of reports Professional standards in written work are critical in this course.

- Your reports are expected to be clearly written to a high standard.
- Figures are expected to be of a high quality, numbered and captioned below, and *included* within the text.
- You must refer to each Figure at least once in the text to provide context.
- Maps are essential: they must be legible, with a legend, scale, North arrow etc.
- Appendices are allowed for presentation of large volumes of data, but must be summarized within the text.
- A bibliography is always required, and correct referencing style is expected.
- Any formulas are to be treated as a part of the text, and punctuated accordingly *and numbered*.
- Formulas must be either derived or properly referenced, and any previous results (mathematical, geophysical, or geological) must be referenced.
- Reports must be double spaced – this is so I can write plenty of comments on your work.

A list of my "pet peeves" when marking student written work is given at the end of this document. Avoid these like the plague and you will find you can achieve excellent marks in the course (really).

2. Design proposal for fieldwork at the Calabogie the and Admaston sites (15%)

One single proposal is expected from the group for each of the two field sites, in response to the Request for Proposal attached below. Students are expected to organize themselves as a "design team" to prepare these proposals. As with all written work in this course, this must be professionally presented to a high standard. The proposals should consist of at least:

i) Cover letter with your names and signatures
ii) Signed Safety Plan (this must be delivered one week prior to departure)
iii) Geological/geophysical summaries for the two areas
iv) Proposed field layouts for each survey type (magnetic, gravity, EM, resistivity, radar, seismics, ...).
v) An itinerary with daily timetables and team assignments
vi) A complete equipment list, including computer resources required at the motel.
vii) *Personnel list, identifying each participant with a particular responsibility*

Careful attention must be paid to write a proposal that can be carried out in the time available. The resulting proposal will serve as a field manual during the field trip - we will not depart for the field work until this document is submitted. We will discuss the proposal on our arrival at the motel on our first evening - students should be prepared to defend the proposal and modify accordingly at this stage.

3. Oral debriefing following Calabogie and Admaston field trip (15%).

All students must participate in this group exercise equally. This should include at least: visual summaries of the data collected (maps, representative profiles) preliminary evaluation of the data with regard to the fieldwork proposals detailed plan for follow-up work (data reduction, geophysical modelling). Students will give two presentations (ie. one on each site). A total time of one hour only (for both sites), including questions, is allotted.

These are presentations to management on the success (or otherwise) of the field excursion, and a specific proposal for data reduction, geophysical modelling and final reporting. A management board will be appointed, to be made up of faculty members who *did not* take part in the field trips. Student marks will consist of two components: presentation and content.

4. Final fieldwork reports (55%)

Two separate reports are required, one for each field site (Admaston and Calabogie). Each student must prepare their reports individually, although students are encouraged to organize the tasks of data processing, and data modelling in such a way as to equalize the workload amongst themselves. Nevertheless, *all written work submitted will be considered to be the independent work of the student who submits it.*

Reports should contain approximately 3000 words *per site*. Insufficient or excessive length will be penalized. It is suggested your reports follow this format:

Abstract
Table of contents
Introduction
Geological setting
Geophysical survey methods
Data reduction
Integrated interpretation
Conclusions / recommendations
Bibliography
Appendices

Figures should appear within the body of the text. Appendices may be used to present large volumes of data without interrupting the flow of the report. In the past students have jointly compiled and submitted a single appendix containing *all* relevant field data. This is acceptable and encouraged, but each individual report must be properly illustrated with figures from this appendix when making reference, e.g. to a particular interpretation.

Earth Science 4451Y, 2008 Course schedule

Week 1 (Sept 8th-14th):

Mon: Course introduction, lab on gravity/magnetics
Tues: Lecture on Gravity/Magnetics

Week 2 (Sept 15th-21st):

Mon: Reports on Gravity/Magnetics due, lab on georadar
Tues: Lecture on georadar

Week 3 (Sept 22nd -Sept 28th):

Mon: Reports on georadar due. Lab on Seismics
Tues: Lecture on seismics

Week 4 (Sept 29th -Oct 5th):

Mon: Reports on Seismics due. Lab TBA
Tues: Lecture TBA

Week 5 (Oct 6th -Oct 13th):

Mon: Reports due. Introduction to Field Sites.
Tues: Preparation of design proposals for Field Sites.

Week 6: Field trip to Calabogie and Admaston: Depart Monday, October 13th, 6 pm. Return to London, Saturday, October 16th.

Week 7 (Oct 16th -Oct 20th):

Mon: Student presentations: field trip debrief.
Tues: No lecture

Week 8 (Oct 20th -Oct 26th):

Mon: Introduction to seismic data processing. Lab on seismic processing
Tues: Lecture on seismic processing

Week 8 (Oct 27th – Nov 2nd):

Mon: Continuation of seismic processing lab
Tues: No lecture

Week 9 (Nov 3rd -Nov 9th):

Mon: No lecture or lab. Open for field trip modelling/processing/writing up etc.
Tues: No lecture
Fri: **Major field trip written reports due 4:30 pm. Course ends.**

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

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/medical.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