

Modular Course in Exploration Geophysics

GEOL 5956

December 6-15, 2017

Harquail School of Earth Sciences (HES)
Laurentian University

Course Description: 10-day intensive course in geophysical methods as they are applied to mineral exploration is being offered by the Harquail School of Earth Sciences (HES) and the Mineral Exploration Research Centre (MERC) at Laurentian University. The course will be classroom based with lectures in the morning and early afternoon and laboratory exercises in the late afternoon. Topics to be covered include the physical properties of rocks and how these can be inferred from geophysical data. The role that geophysics plays in mineral exploration programs will also be discussed. The course is structured such that each day will cover one of the methods used in mineral exploration. In each case, the material will be presented by an academic or industry person who is an expert in that method. The specific methods covered are gravity methods, magnetic methods, electrical and induced polarization methods, electromagnetic methods, gamma-ray spectrometry, reflection seismology, borehole methods and airborne methods. There will also be talks from industry representatives discussing the importance of geophysical methods in exploration, and how borehole EM is used in the search and delineation of conductive ore. The final day will be a presentation by staff from the Ontario Geological Survey on the role that public domain data can have in the mineral exploration process. A regional interpretation of public domain data will also be undertaken. The course does not rely heavily in mathematics, but attempts to impart an understanding of the basic scientific principles. There is a strong emphasis on case studies and laboratory exercises.

Prerequisites: Advanced undergraduate-level courses in *Geology*. **Course Format:** lectures, laboratory practicals, and problem sets. **Course Credit:** 3 credits, applicable toward thesis-based or coursework-based MSc programs and PhD programs; also applicable toward continuing education and professional development requirements for Professional Registration. A participation certificate will be issued on request. **Grading:** Laboratory practicals and problem sets 100%.

Course Coordinator: *Dr Richard Smith* (Harquail School of Earth Sciences/MERC).

Course Costs for Professional participants: CDN\$2500.00 (CDN) + 13% GST for the entire course (including all digital course notes, materials etc) or CDN\$300.00 + 13% GST per day for individual course days (including relevant course notes). For more details see the registration form (see **Registration** section below for how to request a registration form).

Course Costs for Enrolled students: Graduate students enrolled in other Ontario universities will not pay fees directly to Laurentian, but their home institution, as they can enroll through the Ontario Visiting Graduate Student program. Laurentian students should enroll through the normal channels.

Course notes: Colour digital images of all presentations will be provided in Adobe pdf format. Those requiring a hardcopy binder of black and white images should request this in advance from Ms Roxane Mehes (contact information below). A payment of CDN\$100.00 is required prior to the course or receiving the course notes.

All participants are responsible for their own travel, lodging, and meals.

Registration: Ms. Roxane Mehes, Harquail School of Earth Sciences, Laurentian University, 935 Ramsey Lake Road, Sudbury, ON P3E 2C6 Canada, Tel: +1 (705) 673-6575, Fax: +1 (705) 675-4898, e-mail: rmehes@laurentian.ca

Further information may be found at: <http://des.laurentian.ca/> under Modular Courses. For other information about the course please contact: rsmith@laurentian.ca

Tentative schedule

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GEOL 5956 6-15 December, 2017

Day 1 – Wednesday 6 December 2017

0900-0915 Course Logistics – Richard Smith
0915-1030 Role of geophysics in exploration – Richard Smith
1100-1230 Rock properties and an overview of geophysical methods – Richard Smith
1330-1500 Modelling and inversion of geophysical data – Richard Smith
1530-1700 My experiences in exploration geophysics – Ben Polzer, Vale Research

Day 2 – Thursday 7 December 2017

0900-1030 Gravity methods, theory and instrumentation – Bill Spicer, KGHM International
1100-1230 Gravity methods: Applications – Bill Spicer
1330-1500 Gravity methods: Applications – Bill Spicer
1530-1700 Gravity methods **Lab Exercise** – Richard Smith

Day 7 – Friday 8 December 2017

0900-1030 Magnetic methods, theory and instrumentation – Richard Smith
1100-1230 Magnetic methods: Applications – Richard Smith
1330-1500 Magnetic methods: Applications and Case Histories – Richard Smith
1530-1700 Magnetic methods **Lab Exercise** – Richard Smith

Day 3 – Saturday 9 December 2017

0900-1030 Electrical and IP methods, theory and instrumentation – Rob Hearst, Quantec Geosciences
1100-1230 Electrical and IP: Applications – Rob Hearst
1330-1500 Electrical and IP: Case Studies – Rob Hearst
1530-1700 Electrical and IP methods **Lab Exercise** – Rob Hearst

Day 5 – Sunday 10 December 2017

0900-1030 Electromagnetic methods, theory and instrumentation – Richard Smith
1100-1230 Electromagnetic: Applications – Richard Smith
1330-1500 Electromagnetic: Case Studies – Richard Smith
1530-1700 Electromagnetic methods **Lab Exercise** – Richard Smith

Day 6 – Monday 11 December 2017

0900-1030 3D EM modelling software introduction – Warren Hughes, Sudbury Integrated Nickel Operations, A Glencore Company.
1100-1230 3D EM modelling software **Lab Exercise** – Warren Hughes
1330-1500 Airborne methods AFMAG, gravity – Bob Lo, Consultant
1530-1700 Airborne methods gravity gradiometry Bob Lo

Day 4 – Tuesday 12 December 2017

0900-1030 Seismic methods, theory – Dr Gerhard Pratt, Western University
1100-1230 Seismic methods: data acquisition – Dr Gerhard Pratt
1330-1500 Seismic methods: processing and case histories – Dr Gerhard Pratt and Alan King
1530-1700 Seismic methods **Lab Exercise** – Dr Gerhard Pratt

Day 8 – Wednesday 13 December 2017

0900-1030 Borehole logging methods, terminology and survey design – Chris Drielsma and Vince Gerrie, DGI Geoscience
1100-1230 Borehole logging methods: physical properties and application and **Lab Exercise** – Chris Drielsma and Vince Gerrie
1330-1500 Borehole logging methods: Structure and **Lab Exercise** – Chris Drielsma and Vince Gerrie
1530-1600 Borehole logging methods: Maximizing value – Chris Drielsma and Vince Gerrie
1600-1700 Borehole logging methods: Case histories – Alan King

Day 9 – Thursday 14 December 2017

0900-1030 Gamma-ray spectrometry methods, theory and instrumentation – Rob Shives, GamX Inc
1100-1230 Gamma-ray spectrometry methods: Applications and case studies – Rob Shives
1330-1500 Gamma-ray spectrometry methods: Case studies – Rob Shives
1530-1700 Gamma-ray spectrometry methods **Lab Exercise** – Rob Shives.

Day 10 – Friday 15 December 2017

0900-1000 Public domain geophysics and its application – Desmond Rainsford and Saurav Biswas, Ontario Geological Survey
1030-1130 Interpretation of regional geophysical data sets, background – Desmond Rainsford and Saurav Biswas
1130-1500 Interpretation of regional geophysical data sets **Lab Exercise** – Desmond Rainsford and Saurav Biswas
1500 Close

Laurentian University

Mineral Exploration Research Centre
Harquail School of Earth Sciences
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Telephone: (705) 675-1151 x6575; Facsimile: (705) 675-4898
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Université Laurentienne

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LOGISTICS

Timing: Please arrive a few minutes prior to 9:00 am, as we will start promptly at 9:00 am.

Location: The course will be presented in Room B8045, the Paleo Lab on the 8th floor of the Willet Green Miller Centre (WGMC). The address of the WGMC is 933 Ramsey Lake Road, Sudbury, Ontario, P3E 6B5. The address is for the rear (north) entrance, to get to the front entrance, continue east past the rear of the building, turn right at the lights on University Drive, the WGMC is the first building on the right. See building #2 on the map on the following page.

Parking: Payment is required for all campus parking at \$2/hour or \$8 per day. There are metered visitor lots around campus. Some accept credit cards; all accept \$2 and \$1 coins. Look for the blue "Pay here for parking" signs. The attached map shows the meter lots A, B, C, D and E in grey circles. Budget some extra time to find a lot on campus and walk to the Willet Green Miller Centre (WGMC). Start saving your loonies and twonies now! Note: some days the booms for Parking Lot P15 (General Parking) are up, in which case parking there is free, so always first check the entrance to Lot P15 off South Bay Rd (see map below)

Coffee: Will be available on the 8th floor. Coffee breaks are 1030 to 1100 and 1500 to 1530.

Lunches: Will be available for purchase in the Great Hall (#10 on map), except on weekends. Tim Horton's (#8) or Starbucks (#7 on map) also serves lunch and are open 1000 to 1500 on weekends.

What to Bring: Bring a pen and paper for making notes etc. Laptops are used for many of the lab exercises and some programs are distributed for installation which are Windows based. Bring a (Windows) laptop if you have one.

Travel and Accommodation: Please make your own plans for travel and accommodation. The closer hotels to campus are the Travelway Inn, Paris St; The Travelodge, Paris St; The Holiday Inn, Regent St. These hotels are a twenty or twenty five minute walk to the WGMC. There are many other hotels in Sudbury.

Course notes: Students may purchase a hardcopy of the course notes for \$100 before the course. The notes are primarily small black and white images of each powerpoint slide. We also plan to distribute digital pdf files in colour at no cost. *NOTE: The notes for this course remain the intellectual property of the presenter and may contain unpublished and/or confidential information and copyrighted figures. The notes must not be copied under any circumstances and extra copies will not be sold to anyone except registered course participants.*

MERC graduate student subsidy: Graduate students enrolled at other (non-Laurentian) universities Sudbury qualify for a subsidy to partially reimburse them for their out-of-pocket expenses. Students may be reimbursed up to \$500.00 with original/itemized receipts for food, accommodations, gas, car rental, bus fare. For food, the university has a limit of \$51 per day for meals and will not reimburse for any alcoholic beverages. Forms will be distributed to qualifying students during the course and the reimbursements will come approximately two month after the final form has been returned. Keep appropriate receipts!

Mineral Exploration Research Centre
Centre de recherche en exploration minérale



- 1 Vale Living with Lakes Centre
- 2 Willet Green Miller Centre
- 3 Fraser Building and Auditorium
- 4 Science II Building and Doran Planetarium
- 5 Science I Building
- 6 J.N. Desmarais Library
- 7 Classroom Building
- 8 Arts Building
- 9 Dining Hall
- 10 R.D. Parker Building
- 11 Indigenous Sharing and Learning Centre
- 12 West Residence
- 13 Mature Student Residence
- 14 Single Student Residence
- 15 University College Residence
- 16 East Residence
- 17a University of Sudbury
- 17b Lucien Matte Residence
- 18 Huntington University and Residence
- 19 Thorneloe University and Residence
- 20 Alphonse Raymond Building
- 21 Laurentian Child and Family Centre | La garderie Touche-à-Tout
- 22 School of Education
- 23 Cardiovascular and Metabolic Research Lab
- 24 Health Sciences Education Resource Centre
- 25 Northern Ontario School of Medicine
- 26 Student Recreation Centre
- 27 B.F. Avery Physical Education Centre
- 28 Sports Stadium

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