

Modular Course in Exploration Geophysics

GEOL 5956

December 4-13, 2019

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 continuing professional development requirements for Professional Registration. A participation certificate will be issued on request with hours listed. **Grading:** Laboratory practicals and problem sets 100%.

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

Course Costs for Professional participants: CDN\$2750.00 (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). Companies can share a course registration amongst multiple staff. Discuss with Roxane Mehes, contact details below.

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. Other students see the registration form.

Course notes: Colour digital images of all presentations will be provided in Adobe pdf format.

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 and lecturers
Modular Course in Exploration Geophysics
GEOL 5956 4-13 December, 2019

Day 1 – Wednesday 4 December 2019

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, Nova Mining Exploration Solutions

Day 2 – Thursday 5 December 2019

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– Friday 6 December 2019

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

Day 4 – Saturday 7 December 2019

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

Day 5 –Sunday 8 December 2019

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 9 December 2019

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

Day 7 – Tuesday 10 December 2019

0900-1030 Seismic methods, theory– Dr Mostafa Naghizadeh, Laurentian University
1100-1230 Seismic methods: data acquisition and processing – Dr Mostafa Naghizadeh
1330-1600 Seismic methods **Lab Exercise** – Dr Mostafa Naghizadeh
1630-1730 Seismic methods: case histories – Alan King

Day 8 – Wednesday 11 December 2019

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 12 December 2019

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 13 December 2019

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
935 Ramsey Lake Road, Sudbury, Ontario, Canada P3E 2C6
Telephone: (705) 675-1151 x6575; Facsimile: (705) 675-4898
E-mail : HES@laurentian.ca or MERC@laurentian.ca

Université Laurentienne

Centre de recherche en exploration minérale
Harquail Ecole des Sciences de la terre
935 Chemin du lac Ramsey, Sudbury (Ontario) Canada P3E 2C6
Téléphone: (705) 675-1151 x6575; Télécopieur: (705) 675-4898
Courrier électronique: HES@laurentian.ca ou MERC@laurentian.ca

Modular Course in Exploration Geophysics

GEOL 5956

December 4-13, 2019

Harquail School of Earth Sciences
Laurentian University

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 the Executive Learning Centre (ELC), Room FA-386 of the Fraser Building, building 3 on the attached map.

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. Lots A and E are large lots close to the Fraser Building. On the first day, budget some extra time to find a lot on campus and walk to the ELC. 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 at Tim Hortons or Starbucks on Campus (Buildings 6 and 7). 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 (building 7) or Starbucks (building 6) also serves lunch and might be open weekends. For campus food locations and hours check <http://www.dineoncampus.ca/laurentian/menus/locations>

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: We 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.*

Academic integrity and Grade Appeals policy

Students caught cheating or plagiarizing will be subject to the Laurentian Policy on academic integrity.

<https://intranet.laurentian.ca/policies/2017.09.19%20-%20Policy%20and%20Procedures%20on%20Academic%20Integrity%20-%20EN.pdf>

Laurentian Grade Appeal Policy and Procedure, see

<https://intranet.laurentian.ca/policies/2017.09.19%20Grade%20Appeal%20Policy%20-%20EN.pdf>

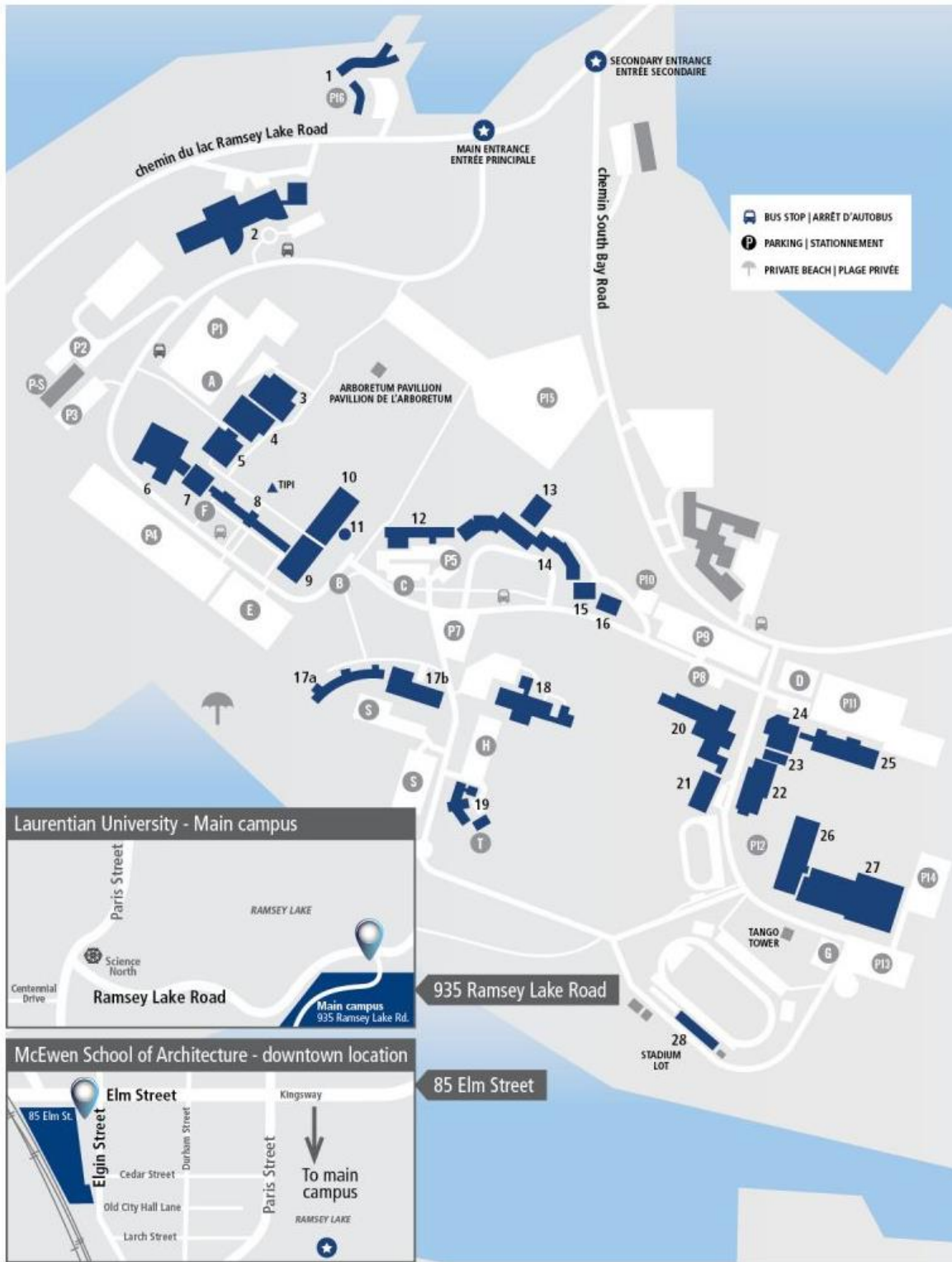
Laurentian University

Mineral Exploration Research Centre
Harquail School of Earth Sciences
935 Ramsey Lake Road, Sudbury, Ontario, Canada P3E 2C6
Telephone: (705) 675-1151 x6575; Facsimile: (705) 675-4898
E-mail : HES@laurentian.ca or MERC@laurentian.ca

Université Laurentienne

Centre de recherche en exploration minérale
Harquail Ecole des Sciences de la terre
935 Chemin du lac Ramsey, Sudbury (Ontario) Canada P3E 2C6
Téléphone: (705) 675-1151 x6575; Télécopieur: (705) 675-4898
Courrier électronique: HES@laurentian.ca ou MERC@laurentian.ca

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

- P-S Parking and Security
- P1 - P14 and P16 Reserved parking
- P15 General parking
- A-B-C-D-E Pay and Display parking
- F Half hour complementary parking
- G Metered parking
- H-S-T Affiliated university parking

Laurentian University
 Mineral Exploration Research Centre
 Harquail School of Earth Sciences
 935 Ramsey Lake Road, Sudbury, Ontario, Canada P3E 2C6
 Telephone: (705) 675-1151 x6575; Facsimile: (705) 675-4898
 E-mail : HES@laurentian.ca or MERC@laurentian.ca

Université Laurentienne
 Centre de recherche en exploration minérale
 Harquail Ecole des Sciences de la terre
 935 Chemin du lac Ramsey, Sudbury (Ontario) Canada P3E 2C6
 Téléphone: (705) 675-1151 x6575; Télécopieur: (705) 675-4898
 Courrier électronique: HES@laurentian.ca ou MERC@laurentian.ca