

Graduate / Modular Course in Exploration Geophysics



GEOL 5956

**DECEMBER
6 - 15, 2023**

10-day intensive course in geophysical methods as applied to mineral exploration, 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 commonly 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. There will also be talks from industry representatives discussing the importance of airborne geophysical methods in exploration, and how borehole EM is used in the search for 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 Notes

Colour digital images of all presentations will be provided in Adobe pdf format. Notes remain the intellectual property of the presenter and may contain unpublished and/or confidential and copyrighted information, not for reproduction.

Course Costs for Industry Participants

On campus:

\$2,750 (CAD) + HST = \$3,107.50 (CAD) for the full course or
\$300 (CAD) + HST per day =
\$339 (CAD) per day.

Remote:

\$1,200 (CAD) + HST = \$1,356 (CAD) for the full course, or
\$120 (CAD) + HST =
\$135.60 (CAD) per day.

Course Costs for Enrolled University Students

Laurentian students are to follow standard registration procedure. Graduate students enrolled in other Ontario universities will register through the Ontario Visiting Graduate Student Program and pay fees directly to their university.

All other students are required to complete the online registration form and process at hes.laurentian.ca/modular-courses#5956.

Participants are responsible for their own travel, lodging, and meals.

Course Coordinator

Dr. Richard Smith, *Harquail School of Earth Sciences/MERC*
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Laurentian University
Université Laurentienne

HARQUAIL School of Earth Sciences
Ecole des sciences de la Terre

MERC

Mineral Exploration Research Centre
at the HARQUAIL School of Earth Sciences

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2023 Tentative Schedule and Lecturers

DAY 1 – WEDNESDAY, DECEMBER 6

- 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, DECEMBER 7

- 0900 - 1030 Gravity methods, theory and instrumentation (Bill Spicer, Exiro Minerals)
- 1100 - 1230 Gravity methods: Applications (Bill Spicer)
- 1330 - 1500 Gravity methods: Applications (Bill Spicer)
- 1530 - 1700 Gravity methods: Lab Exercise (Richard Smith)

DAY 3 – FRIDAY, DECEMBER 8

- 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 4 – SATURDAY, DECEMBER 9

- 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 and muon tomography): Case Studies (Rob Hearst)
- 1530 - 1700 Electrical, IP: Lab Exercise (Rob Hearst)

DAY 5 – SUNDAY, DECEMBER 10

- 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, DECEMBER 11

- 0900 - 1030 3D BHEM modelling software introduction (Josh Lymburner, Sudbury Integrated Nickel Operations, A Glencore Company)
- 1100 - 1230 3D BHEM modelling software Lab Exercise (Josh Lymburner)
- 1330 - 1500 Airborne methods AFMAG, gravity (Bob Lo, Consultant)
- 1530 - 1700 Airborne methods gravity gradiometry (Bob Lo)

DAY 7 – TUESDAY, DECEMBER 12

- 0900 - 1030 Seismic methods, theory (Dr Saeid Cheragh, Laurentian University)
- 1100 - 1230 Seismic methods: data acquisition and processing (Dr Saeid Cheragh)
- 1330 - 1600 Seismic methods Lab Exercise (Drs Richard Smith and Saeid Cheraghi)
- 1630 - 1730 Seismic methods: case histories (Alan King)

DAY 8 – WEDNESDAY, DECEMBER 13

- 0900 - 1030 Borehole logging methods, terminology and survey design (Roxanne Leblanc and Steve Reese, DGI Geoscience)
- 1100 - 1230 Borehole logging methods: physical properties and application and Lab Exercise (Roxanne Leblanc and Steve Reese)
- 1330 - 1500 Borehole logging methods: Structure and Lab Exercise (Roxanne Leblanc and Steve Reese)
- 1530 - 1600 Borehole logging methods: Maximizing value (Roxanne Leblanc and Steve Reese)
- 1600 - 1700 Borehole logging methods: Case histories (Alan King)

DAY 9 – THURSDAY, DECEMBER 14

- 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, DECEMBER 15

- 0900 - 1000 Public domain geophysics and its application (Saurav Biswas and Dr John (Yanni) Evangelatos, Ontario Geological Survey)
- 1030 - 1130 Interpretation of regional geophysical data sets, background (Richard Smith, Saurav Biswas and Dr John (Yanni) Evangelatos)
- 1130 - 1500 Interpretation of regional geophysical data sets Lab Exercise (Saurav Biswas, Richard Smith and Dr John (Yanni) Evangelatos)
- 1500 Close

Campus map



Zone 1

- 1 Vale Living with Lakes Centre
- 1a Watershed Centre
- 2 Willet Green Miller Centre
- 3 Maintenance and Security Building
- 4 Fraser Building and Auditorium
- 5 Cliff Fielding Building
- 6 Science II Building and Doran Planetarium
- 7 Science I Building
- 8 J.N. Desmarais Library
- 9 Classroom Building
- 10 Arts Building
- 11 Dining Hall
- 12 R.D. Parker Building / Welcome Centre / Atrium myLaurentian Hub
- 13 Indigenous Sharing and Learning Centre (ISLC)

Zone 2

- 14 Student Centre
- 15 West Residence
- 16 Mature Student Residence
- 17 Single Student Residence
- 18 University College Residence
- 19 East Residence

Zone 3

- 20 Huntington Residence

Zone 4

- 21 Alphonse Raymond Pavilion
- 22 Laurentian Child and Family Centre/ Garderie Touche-à-Tout
- 23 Education Building
- 24 Cardiovascular and Metabolic Research Lab
- 25 Health Sciences Education Resource Centre
- 26 Student Recreation Centre
- 27 B.F. Avery Physical Education Centre
- 28 Sports Stadium

Downtown

- 29 McEwen School of Architecture
- 30 Telegraph Building
- 31 Workshop Building

Parking

- P1 - P12, P14, P16:** Reserved parking
- P15:** General parking
- A-B-C-D-E-H:** Pay and Display/HOTSPOT
- F:** Half-hour complimentary parking
- G:** Metered parking

Laurentian University - Main campus



McEwen School of Architecture - Downtown location



laurentian.ca/campus-maps





Logistics

Timing

Sessions begin at 9 a.m. sharp.
Please arrive early.

Location

Executive Learning Centre (ELC)
Room FA-386, Fraser Building

Parking

Metered lots at the cost of \$8 per day

Coffee

Tim Hortons outlets located on campus.
Breaks scheduled from 10:30 to 11 a.m.
and from 3 to 3:30 p.m.

Lunches

At students' discretion. Dining Hall and
Tim Hortons open Monday to Friday;
Tim Hortons also open weekends.

For campus food locations and hours,
visit Chartwells' website at:

dineoncampus.ca/laurentian

What to Bring

Bring a pen and paper for notetaking.

Windows-based laptops are
recommended for many of the lab
exercises and for Windows-based
program downloads.

Travel and Accommodations

Travel and accommodations are
at the students' discretion.

*Nearest accommodations to campus
include:*

- Travelway Inn and Travelodge,
both located on Paris Street
- Holiday Inn on Regent Street

All enrolled students are subject to the Laurentian's Academic Integrity Policy.
Please reference the following website:

laurentian.ca/policies-accountability/policies.

Registration

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Further information may be found at hes.laurentian.ca.

For other information about GEOL 5956, please contact: rsmith@laurentian.ca



Laurentian University
Canada's Mining University

Mineral Exploration Research Centre
Harquail School of Earth Sciences

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