

GRADUATE STUDIES

MINERAL ENGINEERING

Graduate studies in mineral engineering provide professional training at the cutting edge of Earth sciences, as well as a chance to be part of internationally renowned research teams. They are also your gateway to a career in : Environmental studies / hydrogeology / geotechnics and geomechanics / pure and applied geophysics.

RESEARCH AREAS

Environment and Mine Waste Management

Reclamation of tailings impoundments and waste rock piles. Prevention and treatment of acid mine drainage (AMD) and contaminated neutral drainage (CND). Cover systems. Integrated management and valorization of mine wastes. Backfilling of underground stopes and open pits. Waste rock inclusions. Human health risk analysis. Effects of climate change on mining operations and site reclamation. Mining geotechnics. Saturated and unsaturated hydrogeology. Laboratory and field studies. Advanced numerical simulations.

Geomechanics

Stress and deformation measurements in the bedrock and development of existing testing methods. Characterization of geomechanical and hydrogeological properties of rocks and mine waste. Alkalinity reactivity. Congregated and aggregate petrography. Quarry material characterization. Stability analyses in discontinuous environments and site evaluation.

Geophysics

Near-surface methods for environmental applications, mineral exploration and water search using geophysics (electrical, electromagnetic, magnetism, gravimetry, groundpenetrating radar, radiometry, etc.). Smart systems for the automation of treatment methods and geophysical interpretation.

Geothermal Energy

Development of interpretation techniques for thermal response tests. Design and optimization of ground heat exchangers such as closed-loop, open-loop and standing column wells. Development of transfer functions and thermal resistance and capacity models. Coupled numerical simulation and analysis

combining hydrogeological, geochemical and thermal processes for geothermal applications. Development of groundwater treatment strategies for open-loop geothermal systems. Laboratory testing and in situ experimental validation at the mobile geothermal unit.

Hydrogeology

Water barriers, sealing liners and cover. Evaluation and monitor of works and sites. Hydrogeological and environmental problems caused by mine wastes. Hydrogeological mapping and contamination risks. Quality improvement of hydraulic tests in situ and development of interpretation methods. Laboratory tests quality improvement. Interaction of the geomaterials' hydraulic, mechanic and thermal properties.

Mining Geology

Geostatic modelling (multivariate methods and simulations, inverse methods) for environmental and mining applications, hydrogeological and contaminants mapping, operation optimisation, deposit evaluation, planning and control of mineral production and processing.

Tectonics

Study of brittle and ductile rock deformations, geological structures, mountain range formation and geodynamic evolution of continents and oceans. Reconstruction of the physical parameters of geological deformation (force, speed, rheology, temperature, pressure, stressors, etc.) Characterization of the rock's seismic and anisotropy properties for better interpretation of seismological data. Neotectonic and natural disaster mitigation.

THE DEPARTMENT OF CIVIL, GEOLOGICAL AND MINING ENGINEERING INCLUDES :

- 38 professors, most of whom are active researchers;
- 428 graduate students;
- five research chairs that focus on priority research areas and serve as exceptional forums of scientific exchange.



RESEARCH INSTITUTE ON MINES AND ENVIRONMENT

The Research Institute on Mines and Environment (RIME) UQAT-Polytechnique was founded in 2013 by the Université du Québec en Abitibi-Témiscamingue and Polytechnique Montréal. The only one of its kind in Quebec, this joint research program was created in association with several mining industry partners. Focused on the environment and wastes management, the Research Institute develops innovative environmental solutions for the entire life cycle of a mine.

The main research orientations of the RIME consist of seven major themes :

- Mine site reclamation
- Waste rock pile construction
- Waste rock inclusions in tailings impoundments
- Integrated management of mine wastes
- Prediction of water quality
- Arctic conditions
- Water treatment

THE CANADIAN INTERNATIONAL RESOURCES AND DEVELOPMENT INSTITUTE (CIRDI)

CIRDI is a coalition of the University of British Columbia, Simon Fraser University and École Polytechnique de Montréal, working in partnership with the Canadian Government, civil society and industry. It is a centre of expertise in improving and strengthening resource governance.

Its members work in close collaboration with all parties involved in natural resources development in order to identify better ways to use their resources to ensure prosperity. The parties involved are local, regional and national governments as well as communities and businesses associated with the extractive sector.

GEOTHERMAL UNIT

The Department of Civil, Geological and Mining Engineering's geothermal unit is designed to study ground heat exchangers under real operating conditions, carry out high power thermal response tests, compare different groundwater treatment strategies for open-loop systems and ultimately, measure the energy consumption of a geothermal system for a virtual ten-storey building.

The main unit's devices include four 14KW heat pumps, a 24,000-watt water heater, a control and data acquisition system, a groundwater treatment system. The unit is currently connected to a 300 m standing column well and a 150 m injection well.

HYDROGEOLOGY AND MINING ENVIRONMENT LABORATORY

This laboratory is equipped to carry out field related tests on top of being one of the two best-reputed Canadian laboratories for non-saturated materials testing. It also has the necessary acquisition and data treatment material and electronic equipment to carry out field tests (pumping, permeability, groundwater sampling, non-saturated phenomena, etc.).

Every year, about twenty students benefit from the laboratory's equipment and its personnel's know-how for all kinds of groundwater and mining activities.

INFORMATION

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POLYTECHNIQUE
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