

GRADUATE STUDIES

CIVIL ENGINEERING

The Department of Civil, Geological and Mining Engineering offers graduate study programs in civil engineering based on innovative research activities, high-quality guidance by professors of international calibre and well-equipped laboratories. By completing research projects on specific problems with industry collaboration, the programs offered will allow the development of skills that are sought by employers and that are essential to the pursuit of a career in research. Furthermore, courses outside the civil engineering program provide a multidisciplinary dimension to the training.

AREAS OF EXPERTISE

Environment

Water supply. Drinking water treatment. Water analysis techniques. Treatment of municipal and industrial wastewater. Water pollution. Environmental microbiology. Water resources. Environmental impact assessment.

Geotechnics

Soil behaviour. Time-deformation response, compressibility, and consolidation relations. Sensitive and varved clays. Water flow in soils. Soil dynamics. Seismic responses. Numerical modelling. Laboratory tests and field tests. Earth-supported structures. Earth and rock-filled dams. Shallow and deep foundations. Slope stability. Foundations and infrastructure problems in urban areas. Soil improvement. Rock mechanics.

Hydraulics

Fluid mechanics. Hydrology. Free surface flow. Sediment transport. Hydraulic structures. Hydroelectric plants. Stratified flows. Turbulence. Transitional flows. Network hydraulics. Waterway hydraulics. Estuary hydrodynamics. Numerical and physical modelling. Propagation of surface waves. Meteorology. Computer-aided design (CAD). Integrated and sustainable rainwater management. Optimal design and management of drinking water distribution networks. Hydraulic safety of dams. Hydrological modelling of nested basins. Sustainable management of water resources and adaptation measures to climate change.

Structures

Design, structural behaviour, building safety, reliability and rehabilitation studies, bridges, concrete dams and other civil engineering works. Steel, wood, reinforced and prestressed concrete structures. Dynamic study of structures and seismic engineering. Constitutive model and linear and non-linear analysis (plasticity and cracking of materials and structures). Advanced concrete technologies. Experimental research and hybrid simulations on large-scale models at the Hydro-Québec structures laboratory.

Transportation

Transportation planning. Supply and demand analysis. Traffic flow theory and traffic control. Modelling of mobility behaviours and the use of different means of transportation including public transport, active modes (walking and cycling) and alternatives (bike sharing, car sharing, carpooling, microtransit). Microdata processing and analysis. Geographic information systems (GIS) in transportation. Spatial analysis methods. Transportation simulation and models. Intelligent transportation systems. Sustainable mobility indicators.

Civil Engineering Project Management

Financing and budgeting. Planning and follow-up. Negotiation. Law and framework of civil engineering projects. Decision-making support. Civil engineering drafts. Project set up and progress. Information management system. Teamwork.

BUILDING A SUSTAINABLE SOCIETY WITH CIVIL ENGINEERING

Civil engineering research activities are centered on resource optimization and infrastructure performance in the broadest sense of the term, including, amongst others, constructions, networks, buildings, dams, roads, excavations, bridges and water management. These research activities are part of a "sustainable" vision that involves the integration of studies on security and risks, and consideration of normal and extreme conditions.



THE DEPARTMENT OF CIVIL, GEOLOGICAL AND MINING ENGINEERING INCLUDES :

- 38 professors, most of whom are active researchers;
- 428 graduate students including 358 in civil engineering;
- five research chairs (summarized below) that focus on priority research areas and serve as exceptional forums of scientific exchange.



RESEARCH CHAIRS

CANADA RESEARCH CHAIR IN EARTHQUAKE-RESISTANCE DESIGN AND CONSTRUCTION OF BUILDING STRUCTURES

Founded in October 2003, this chair examines structural design and building construction to improve the response of building structures to major seismic events. Researchers enjoy the facilities of Polytechnique's new structural engineering laboratory, one of Canada's largest.

NSERC INDUSTRIAL RESEARCH CHAIR IN DRINKING-WATER TREATMENT

Created in 1992, this chair focuses on four main areas: biological treatment, disinfection by-products, water quality in distribution systems (regrowth and corrosion) and treatment processes for small communities. Research is conducted at full-scale drinking water treatment plants and at pilot-scale installations, with the focus on meeting future water quality requirements.

CANADA RESEARCH CHAIR ON SOURCE WATER PROTECTION

Created in September 2007, this chair uses hydraulic and hydrological models to advance knowledge on the microbial contaminants found in drinking-water sources. More specifically, it studies the relationship between various environmental factors (precipitation, snowmelt, etc.), microbial contaminant density and the presence of cyanobacteria.

RESEARCH CHAIR ON EVALUATION AND IMPLEMENTATION OF SUSTAINABILITY IN TRANSPORTATION (MOBILITÉ CHAIR)

In 2010, the City of Montréal, the Agence métropolitaine de transport (AMT), the Ministère des Transports du Québec and the Société de transport de Montréal (STM) joined forces with Polytechnique Montréal to create the MOBILITÉ Chair, whose mission is to evaluate the impact of transportation projects, policies and plans on sustainable development through research, experimentation and methodological development.

CANADA RESEARCH CHAIR ON MOBILITY OF PEOPLE

Launched in September 2016, the Chair takes interest in the interactions between the means of transportation for the purpose of understanding the complementary and competitive relationships they maintain to sustain daily movement. It is interested in passive data flow valorizations in order to track the usage of the different systems and transportation networks (car, public transport, car sharing, bike sharing, active modes, etc.) and their variability through the days, weeks and months.

INFORMATION

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POLYTECHNIQUE
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