

GRADUATE STUDIES

CHEMICAL ENGINEERING

Graduate studies in chemical engineering are characterized by a range of innovative and multidisciplinary research activities. They are offered in a stimulating educational environment under the supervision of experienced and internationally renowned professors.

The Department of Chemical Engineering consists of 29 professors, four research fellows and eight associate professors, who supervise over 110 students in our research programs (about 85 PhD and 25 master's candidates). The large number of PhD students attests to the high level of research activity in the Department.

AREAS OF EXPERTISE

Bioprocess and Biopharmaceutical Engineering

Design and characterization of bioreactors for optimal culture of plant, insect and mammalian cells. Monitoring and control of cell culture. Kinetic and metabolic modeling, Metabolic Flux Analysis (MFA), Metabolic Control Analysis (MCA). Cell engineering and molecular biology. Biosensors. Production of metabolites, recombinant protein and viruses for gene therapy. Bioprocess control. Purification, quality and bioactivity assessments of bioproducts.

Energy and Process Integration

Process modelling, analysis and simulation. Circuit closure, effluent reduction, waste treatment. Material and energy integration. Data reconciliation, pinch analysis. Process dynamics and control, advanced process control techniques.

Environment and Sustainable Development

Hazardous waste treatment (solid, liquid & gaz). Physico-chemical, biological and thermal processes. Bioremediation. Risk and impact assessment. Life Cycle Assessment/Management (LCA / LCM). Sustainable development. Eco-design.

Polymers

Polymer activities in the department of are part of a scientific cluster, the Research Center for High Performance Polymer and Composite Systems, CREPEC. Our research topics are the following : polymer / biopolymer blends and nanoparticles with sophisticated morphologies and interfaces for high performance applications. Rheology of biopolymers,

biocomposites, nanocomposites and polysaccharides / protein hybrid systems, emulsions, hydrogels. Processing, morphology, structure interrelationship for polymers. New polymer recycling technologies. Polymers and energetic materials, propellant powders, chemical propulsion and explosives. Active multilayer films and nanofiber structures for functional applications in packaging, biomedical and detection. Interface control of soft materials. Materials of high specific surface area including porous hydrogels and polymers, emulsions. High-performance and biomedical applications.

Process Engineering

Computer-Aided Design. Kinetics of catalytic processes. Reactor design and modeling. Simulation and Control. Operations related to catalytic powder processes (aerogels, cryogels, fluidized beds). Operation of catalytic circulating and turbulent fluid bed reactors. Gas technology. Solid and hazardous waste incineration. Process design for thermal treatment of solids in fluidized beds. Catalytic combustion.

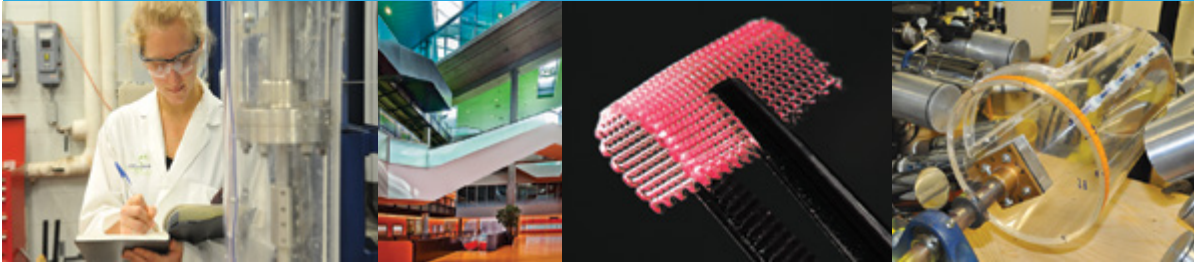
All new students admitted to a graduate research program receive up to \$1,000 to help cover the cost of purchasing a laptop.

OUTLOOK FOR THE FUTURE

Our society is at a turning point when it comes to natural-resource use, environmental problems and the aging population. However, the search for technological solutions to most of these issues is an integral part of chemical engineering studies and research. Our future graduates can therefore expect to confront many interesting and stimulating challenges of great importance over the course of their careers.

RESEARCH PARTNERS

ACM Composites, Advanomic, Alcoa, ArcelorMittal, Arkema, Beauce Composites, Bell Canada, Bell Gaz, Biomomentum, Bombardier Inc., Cambior, Camoplast, CANMET, Cascades, ChitoMed, Constellium, CNRC (IRB et IMI), CNR-ICPET, CRIAQ, CRSNG, CTGN, Mouvement des Caisses Desjardins, Domtar, Dupont, Eco Entreprises Québec/Recyc-Québec, Écolomondo, Écolosol, EDF, Equip Int'l, Ford, FPIinnovations, FRQ-SANTE (FRSQ), FQRNT, FQRSC, Gaz de France, GM, Hydro Aluminium, Hydro-Québec, IAMGOLD, IBM, IRSC, IRSST, Kruger, LVMH, Mata, Merck, Metso, Michelin, Nestlé, Northern Telecom, OCP, groupe, Oligo Medic, OSLsoft, Papier Masson Ltée, POSCO, Praxair, Procter & Gamble, Prolamina, Pultrusion Technique, Pyrowave, Re-Community, Rheolution Inc., RioTinto Alcan, RioTinto Fer et Titan, RONA, Saputo, Shell, SNC Lavalin, SNECMA, Société des alcools du Québec, Solvay, Teck Cominco, Tembec, TOTAL, UMICORE, Vale, VEOLIA Environnement, Ville de Montréal, 3C Software, 3M.



Research, which is key to training the highly qualified personnel demanded by industry, is omnipresent in the Department, which includes many research centres, chairs and research units and groups. Furthermore, researchers from several Canadian research institutes, including FPIinnovations, the National Research Council, the CANMET-Energy Diversification Research Laboratory (CANMET-EDRL) and the R&D centre TOTAL, are leading research projects at the Department.

RESEARCH CENTRES, CHAIRS, UNITS AND GROUPS

- NSERC-Industry Research Chair on Safe, Smart and Sustainable Packaging 3SPack;
- International Life Cycle Chair;
- Canada Research Chair in Intensified Mechano-chemical Processes for Sustainable Biomass Conversion;
- Canada Research Chair in Computational Thermodynamics for High Temperature Sustainable Processes;
- Canada Research Chair on High Temperature, High Pressure Heterogeneous Catalysis;
- TOTAL Industrial Chair in Hydrodynamic Modelling of Multiphase Processes at Extreme Conditions;
- CIRAIG - International Reference Centre on Life Cycle of Products, Processes and Services;
- CIRODD - Interdisciplinary Research Centre on Sustainable Development Operationalization;
- Centre for Research in Computational Thermochemistry (CRCT);
- Research Chair on advanced waste recovery;
- Research Centre for High-Performance Polymer and Composite Systems (CREPEC);
- Biotechnology and Pharmaceutical Processes Research Unit;
- Biomedical Science and Technologies Research Centre;
- PhotoSEL - Photochemical Surface Engineering Laboratory;
- Research Centre in Industrial-Flow Processes (URPEI);
- NSERC Strategic Network in Value Chain Optimization.

INFORMATION

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POLYTECHNIQUE
MONTRÉAL

WORLD-CLASS
ENGINEERING

