

GRADUATE STUDIES

MECHANICAL ENGINEERING

Graduate studies in mechanical engineering at Polytechnique are tailored for students who are interested in developing new design methods, elaborating manufacturing processes, studying and analyzing various physical phenomena, and learning about new technical tools for analysis and simulation.

They offer advanced training in fields focused on innovation, such as aerospace engineering, energy production and conversion, production and manufacturing, robotics, processes and materials, biomechanics and more.

TRAINING VIA RESEARCH

Whether they are aiming for a career in teaching, research, or cutting-edge industry, mechanical engineering graduate students at Polytechnique undertake a research-based program supported by top-quality supervision, with a vast range of research topics and specialized courses. Students also enjoy access to Polytechnique's high-calibre research equipment, some of it unique in Canada.

Our researchers maintain close ties with businesses, government laboratories and hospital research centres. They also collaborate with universities and research institutions internationally. As such, they take part in developing competitiveness in industry sectors such as aerospace, ground transportation, manufacturing, energy production and conversion, and biomechanics.

The Department of Mechanical Engineering is training the next generation of high-level scientists, and often provides opportunities for them to take part in major industry projects.

AREAS OF EXPERTISE

Solid mechanics

Characterization and behaviour of structural elements, structural dynamics (fluid interaction, structure, acoustics, static fluid sealing, instrumentation and sensors, modelling and simulation using finite elements).

Fluid mechanics

Digital simulation, unsteady aerodynamics, ice accretion, natural convection, plasmas.

Processes and materials

Composites, polymers and plastics (characterization and forming, process modelling), metal fatigue and fracturing (modelling of behaviour of metallic materials during manufacturing).

Manufacturing processes

Machining, assembly, characterization and behaviour of tool machines, computer-assisted manufacturing and metrology, fast prototyping and freeform fabrication, laser machining, microfabrication, forming by plastic deformation.

Robotics and mechatronics

Design, modelling and simulation of mechatronic systems.

Design

Power transmission, CFAO, hydraulic systems, geometric modelling, optimization and MDO.

Energy

Combustion and plasmas, building mechanics (thermal systems, wind power, turbomachines, heat transfer in porous materials).

Biomechanics - biomaterials

Computer-assisted surgery, biofluids and artificial heart, joint modelling, prosthesis and orthotics design, mechanobiology, quantitative imaging.

Aeronautics

Aircraft engines and satellites in situ monitoring, autonomous manufacturing, smart materials, productive metrology, optimization of composites and metals fuselages, propulsion, aerodynamics, turbulence, stability, high speed machining or robotic machining, meshing and modeling.

STATISTICS

- More than 80% of our professors have CRSNG grants;
- Average funding received by professors is above the Canadian average;
- 6 million dollars in funded and contracted research is awarded to faculty each year;
- Close to 275 student researchers at the graduate level.

OUR PARTNERS

Researchers in the Department of Mechanical Engineering at Polytechnique maintain strong collaborations with the industry, the hospital sector, and various government organizations, such as : Bell Helicopter, Bombardier, CAE, Safran, CHU Ste-Justine, Jewish General Hospital, Natural Sciences and Engineering Research Council of Canada (NSERC), Synergetic Research and Innovation in Aerospace (CRIAQ), Fonds de recherche du Québec - Nature et technologies (FRQNT), Canada Foundation for Innovation (CFI), G.E., Medtronic, Pratt & Whitney, etc.



RESEARCH UNITS

Research Groups and Laboratories

- Centre for Applied Research on Polymers and Composites (CREPEC), directed by Professor Basil D. Favis;
- Advanced Composite Centre for the aerospace industry, directed by Professor Eduardo Ruiz;
- CREPEC Mechanics Group, directed by Professor Rachid Boukhili;
- Research Group in Biomedical Sciences and Technologies (GRSTB), co-directed by Professors Michaël Buchmann and Carl-Éric Aubin;
- Biomechanics and Biomaterials Research Group (GRBB), directed by Professor L'Hocine Yahia;
- Product Development and Manufacturing Research Group (GRDFP), directed by Professor René Mayer;
- Fluid Dynamics Laboratory (LADYF), co-directed by Professors André Garon and Jérôme Vétel;
- CAE-R. Fraser Elliott Simulation and Modelling Laboratory, co-directed by Professors Luc Baron and Sofiane Achiche;
- Laboratory for Reaction and Multiphase Flows, directed by Pr Étienne Robert;
- Laboratory for Multiscale Mechanics (LM2), co-directed by Professors Martin Lévesque and Daniel Therriault;
- Laboratory for Acoustics and Vibration Analysis (LAVA), directed by Professor Annie Ross;
- Virtual Manufacturing Research Laboratory (LRFV), directed by Professor René Mayer;
- Polytechnique Montréal Robotics Laboratory, directed by Professor Lionel Birglen;
- Laboratory for materials preparation and observation (LAPOM), co-directed by Prs Myriam Brochu and Louis Laberge Lebel.

Research Chairs

- Tier 1 Canada Research Chair in Orthopedic Engineering, directed by Professor Carl-Éric Aubin;
- NSERC/Medtronic Industrial Research Chair in Spine Biomechanics, directed by Professor Carl-Eric Aubin;
- Research Chair in Pediatric Rehabilitation Engineering (CRME - CHU Ste-Justine), directed by Professor Maxime Raison;
- Sciences and Engineering Academic Teaching Chair, directed by the professor Ricardo Camarero (in the Maison des technologies de formation et d'apprentissage Roland-Giguère – MATI);
- Tier 2 Canada Research Chair in Fabricating Microsystems and Advanced Materials, directed by Professor Daniel Therriault;
- Tier 2 Canada Research Chair in Multiscale Modelling of Advanced Aerospace Materials, directed by Professor Martin Lévesque;
- NSERC/General Electric Industrial Research Chair in Two-Phase Flows, directed by Professor Stéphane Étienne.

INFORMATION

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