

MECHANICAL ENGINEERING

About Mechanical Engineering

Mechanical engineers are traditionally concerned with the conception, design, implementation, and operation of mechanical systems. Common fields of work include aerospace, energy, manufacturing, machinery, and transportation. Due to the broad nature of the discipline, there is usually a high demand for mechanical engineers with advanced training.

The Department includes more than 30 faculty members and 200 graduate students, and is housed primarily within the recently renovated Macdonald Engineering Building. The Department contains state-of-the-art experimental facilities (including a major wind tunnel facility) and has extensive computational facilities. Professors within the Department collaborate widely with professors in other units, often through research centres including the Centre for Intelligent Machines (CIM); the McGill Institute for Advanced Materials (MIAM); and the Montreal Neurological Institute and Hospital (MNI). The research interests within the Department are very broad and fall largely within the following seven areas:

- Aerodynamics and fluid mechanics
- Biomechanics
- Combustion and energy systems
- Design and manufacturing
- Dynamics and control
- Materials and structures
- Vibrations, acoustics, and fluid-structure

Within these areas, specific topics of research are given in the following:

Aerodynamics and Fluid Mechanics

Experimental fluid mechanics and aerodynamics, aeroelasticity, and aeroacoustics; theoretical fluid mechanics; turbulence; mixing in turbulent flows; fluid flow control; fluid-structure interactions; computational fluid dynamics, multidisciplinary optimization, and computer flow visualization; heat transfer; combustion, shock wave physics, energetic materials, high-speed reacting flows, hypersonic propulsion, and alternative fuels.

Biomechanics

Biomechanics, biomaterials, blood and respiratory flows, mechanics of soft tissues, cardiovascular devices, image processing for medical diagnostics, and voice production.

Combustion and Energy Systems

Combustion, shock wave physics, heat transfer, and compressible gas dynamics.

Design and Manufacturing

Design theory and methodology, design optimization; biomimetics; machine tools and systems, manufacturing processes, and management and control; micro/nano machining; and wear and comminution processes.

Dynamics and Control

Multibody systems, legged and wheeled vehicles, compliant mechanisms, and kinematic geometry; tethered systems, lighter-than-air craft, and underwater vehicles; spacecraft dynamics and space robotics; modelling and simulation; fluid-structure interactions, nonlinear and chaotic dynamics; dynamics of bladed assemblies.

Materials and Structures

Composite materials; structural design, analysis, manufacturing, and processing; micro/nano mechanics; MEMS/NEMS; adaptive structures; thermomechanics, wave propagation, and computational mechanics.

Vibrations, Acoustics, and Fluid-Structure

Vibrations, acoustics, and fluid-structure interaction.

Mechanical Engineering Admission Requirements and Application Procedures

Admission Requirements

The general rules of Graduate and Postdoctoral Studies apply. Candidates who come from other institutions are expected to have an academic background equivalent to the undergraduate curriculum in mechanical engineering at McGill or to make up any deficiencies in a Qualifying Year.

Applicants to the M.Sc. (Thesis) program must hold an undergraduate degree (or equivalent) in Engineering or a degree in Physical, Math, or Computer Sciences.

Applicants to the M.Eng. (Non-Thesis) program must hold an undergraduate degree (or equivalent) in Mechanical Engineering.

Applicants to the M.Eng. (Aerospace) program must hold an undergraduate degree (or equivalent) in Engineering. Applicants must be proficient in French.

Applicants to the Ph.D. program must have successfully completed a master's degree program (or equivalent) in Engineering or the Physical Sciences. In exceptional circumstances, students with outstanding performance at the bachelor's level may be offered direct entry into the Ph.D. program (Ph.D. 1).

In the case of all programs, applicants must have successfully completed their prior degree(s) with a minimum CGPA equivalent to 3.3 on a scale of 4.0. Satisfaction of these minimum requirements does not guarantee admission. Applicants to graduate studies whose mother tongue is not English, and who have not completed an undergraduate or graduate degree from a recognized foreign institution where English is the language of instruction or from a recognized Canadian institution (anglophone or francophone), must submit official results of either a TOEFL or an IELTS test. The minimum score required is 92 for the Internet-based TOEFL test, with each component score not less than 20, or a minimum overall band of 7.0 on the IELTS test.

Application Procedures

McGill's online application form for graduate program candidates is available at mcgill.ca/gradapplicants/how-apply.

See University Regulations & Resources > Graduate > Graduate Admissions and Application Procedures > Application Procedures for detailed application procedures.

Please consult mcgill.ca/mecheng/grad for further details on required application documents.

Additional Requirements

The items and clarifications below are additional requirements set by this department:

- two official referee letters
- personal statement—one page
- curriculum vitae—please include a list of publications, if relevant

Application Dates and Deadlines

Application opening dates are set by Enrolment Services in consultation with Graduate and Postdoctoral Studies (GPS), while application deadlines are set by the Department of Mechanical Engineering and may be revised at any time. Applicants must verify all deadlines and additional documentation requirements well in advance on the Mechanical Engineering's website at mcgill.ca/mecheng/grad/admission/date.

Information on application procedures and deadlines is available at mcgill.ca/gradapplicants/how-apply/application-steps/application-deadlines.

Admission to graduate studies is competitive; accordingly, late and/or incomplete applications are considered only as time and space permit.

Available Programs

- Aerospace Engineering (Non-Thesis) (M.Eng.) (45 credits)
- Mechanical Engineering (Non-Thesis) (M.Eng.) (45 credits)
- Mechanical Engineering (Ph.D.)
- Mechanical Engineering (Thesis) (M.Sc.) (45 credits)

Program Overview

The Department offers programs of study leading to the M.Sc. and Ph.D. degrees in Mechanical Engineering. Both M.Sc. and M.Eng. programs are offered.

There are several options for completing master's degrees that do not involve the completion of a thesis. The M.Eng. program has more extensive course requirements and will appeal to students who desire to gain both a broad understanding of subjects within Mechanical Engineering as well as in-depth information in a specific area.

The **M.Eng. in Aerospace Engineering** is offered to students who wish to specialize in the general area of aerospace engineering. This degree is given in conjunction with Concordia University, Polytechnique Montréal, the Université Laval, the Université de Sherbrooke, and the École de Technologie Supérieure. Students registered at McGill are required to take two courses from two other institutions.

The aerospace industry is strongly established in Quebec. Representatives of the aerospace industry therefore requested that measures be taken to provide for qualified scientists in aerospace. Five universities offering courses in engineering came together to offer a master's degree program in the field of aeronautics and space technology. This program is offered to students who wish to specialize

in these disciplines. The industry's participation is a special feature of this program. The universities and the participating industries, with the cooperation of the Centre of Aerospace Manpower Activities in Quebec (CAMAQ), have formed a Coordinating Committee, CIMGAS, to arrange for industrial internships and case study courses for the students and to implement specific program developments to meet the needs of the industry.

The M.Eng. (Aerospace) program requires both coursework and an "Industrial Stage" (i.e., engineering work in an aerospace industry) of four months. Enrolment is limited to the number of industrial stages available, so admission to the program is typically quite competitive. While intended to be a full-time program, the M.Eng. Aerospace program may be completed on a part-time basis over a maximum of five years. By the time of completion of the program, graduates are extremely well-prepared to enter into a career in the aerospace industry.

Depending on their background, students would specialize in one of the three areas:

1. Aeronautics and Space Engineering
2. Avionics and Control
3. Aerospace Materials and Structures

Location

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