



MEMORANDUM

To: Executive Committee of Faculty Council (April 8, 2025)
Faculty Council (April 29, 2025)

From: Professor Julie Audet
Vice-Dean, Graduate Studies

Date: March 23, 2025

Re: Closure of Graduate Fields in Biomedical Engineering

REPORT CLASSIFICATION

This is a major policy matter that will be considered by the Executive Committee for endorsing and forwarding to Faculty Council for vote as a regular motion (requiring a simple majority of members present and voting to carry).

BACKGROUND

In addition to MAsC, PhD and MEng programs, the Institute of Biomedical Engineering (BME) offers fields of study in Neural/Sensory Systems Rehabilitation (MEng, MAsC, PhD); Biomaterials, Tissue Engineering and Regenerative Medicine (MEng, MAsC, PhD); Nanotechnology, Molecular Imaging and Systems Biology (MEng, MAsC, PhD); Engineering in a Clinical Setting (MEng, MAsC, PhD); and Clinical Engineering (PhD).

PROPOSED

It is proposed to fully close the above-mentioned fields. Although they were created to advertise areas of research strength within BME, the unit never formally grouped degree program students into these specific fields, and program requirements did not change according to the student's field of study. Furthermore, these fields no longer represent the way BME's research themes are currently organized and named.

CONSULTATION PROCESS

Consultations were conducted involving BME faculty. The impact of the closure on divisional and other program/units has been considered, as has the impact on students. The proposal was approved by the Faculty's Engineering Graduate Education Committee in March 2025.

RECOMMENDATION FOR COUNCIL

THAT the graduate fields in Biomedical Engineering, as described in Report 3789, be closed effective August 31, 2025.

University of Toronto

Major Modification Proposal

Closure of an Existing Program or Program Structure (Graduate or Undergraduate)

Closures proposed:	<p>Graduate Fields in Biomedical Engineering:</p> <p>Master of Applied Science (MASc):</p> <ul style="list-style-type: none"> • Biomaterials, Tissue Engineering and Regenerative Medicine • Engineering in a Clinical Setting • Nanotechnology, Molecular Imaging and Systems Biology • Neural/Sensory Systems and Rehabilitation <p>Master of Engineering (MEng):</p> <ul style="list-style-type: none"> • Biomaterials, Tissue Engineering and Regenerative Medicine • Engineering in a Clinical Setting • Nanotechnology, Molecular Imaging and Systems Biology • Neural/Sensory Systems and Rehabilitation <p>Doctor of Philosophy (PhD):</p> <ul style="list-style-type: none"> • Biomaterials, Tissue Engineering and Regenerative Medicine • Clinical Engineering • Engineering in a Clinical Setting • Nanotechnology, Molecular Imaging and Systems Biology • Neural/Sensory Systems and Rehabilitation
Department/unit if applicable:	Institute of Biomedical Engineering (BME)
Faculty/academic division:	Faculty of Applied Science & Engineering (FASE)
Department/unit contact:	Prof. Hai-Ling Margaret Cheng, Associate Director, Graduate Studies Jason Wen, Education Officer
Faculty/academic division contacts:	Prof. Julie Audet, Vice-Dean, Graduate Caroline Ziegler, Faculty Governance & Programs Officer
Date when admissions were administratively suspended:	January 1, 2021 (Clinical Engineering in the PhD) June 7, 2024 (all other fields, MASc, MEng, PhD)
Effective date of full closure:	August 31, 2025
Version date:	March 23, 2025

Framework for UTQAP Closures

UTQAP processes support a structured approach for creating, reflecting on, assessing, and developing plans to change and improve academic programs and units in the context of institutional and divisional commitments and priorities.

The University of Toronto (U of T), in its [*Statement of Institutional Purpose*](#) (1992), articulates its mission as a commitment "to being an internationally significant research university, with undergraduate, graduate, and professional programs of excellent quality." Thus "quality assurance through assessment of new program proposals and review of academic programs and units in which they reside is a priority for the University...:

The quality of the scholarship of the faculty, and the degree to which that scholarship is brought to bear in teaching are the foundations of academic excellence. More generally, all of the factors that contribute to collegial and scholarly life —academic and administrative complement, research and scholarly activity, infrastructure, governance, etc.—bear on the quality of academic programs and the broad educational experience of students. ([*Policy for Approval and Review of Academic Programs and Units*](#) (2010))

The University's approach to quality assurance is built on two primary indicators of academic excellence: the quality of the scholarship and research of faculty; and the success with which that scholarship and research is brought to bear on the achievement of Degree Level Expectations.

These indicators are assessed by determining how our scholarship, research and programs compare to those of our international peer institutions and how well our programs meet their Degree Level Expectations.

Program and Program Structure Closure

Proposals for program closures are vehicles of academic change. The University of Toronto views the closing of academic activities as a normal and positive part of quality assurance and program evolution. There are a number of possible reasons for closing a program including low enrolment, a changing disciplinary landscape and poor quality of the academic program. These reasons may be articulated in external review reports or may be identified by members of the University community.

This template (last updated by the Office of the Vice-Provost, Academic Programs on May 16, 2024) aligns with UTQAP requirements and will help to ensure that all evaluation criteria established by the Quality Council are addressed in bringing forward a proposal. Divisions may have additional requirements that should be integrated into the proposal.

Steps	Dates
Decanal sign-off (Dean or designate)	January 2025
VPAP sign-off	March 19, 2025
FASE Engineering Graduate Education Committee (EGEC) approval	March 2025
Faculty/divisional council (approval of program structures, freestanding minors, fields, concentrations, category 1 certificates)	April 29, 2025
AP&P (approval of program closures: undergraduate specialists/majors; diplomas)	n/a
Academic Board (approval of degree, graduate program, joint program closures)	n/a
Executive Committee of Governing Council (executive confirms degree, graduate program, joint program closures)	n/a
Report to AP&P	May 2025
Include in OVPAP's annual report to Quality Council	July 2025

1. Executive Summary

- *Provide a brief summary of the closure being proposed.*

The Institute of Biomedical Engineering (BME) in the Faculty of Applied Science and Engineering (FASE) offers three full time graduate programs: the research-intensive Master of Applied Science (MAsc) and Doctor of Philosophy (PhD), and the professional Master of Engineering (MEng).

BME also offers the following fields of study:

- Neural/Sensory Systems Rehabilitation (MEng, MAsc, PhD)
- Biomaterials, Tissue Engineering and Regenerative Medicine (MEng, MAsc, PhD)
- Nanotechnology, Molecular Imaging and Systems Biology (MEng, MAsc, PhD)
- Engineering in a Clinical Setting (MEng, MAsc, PhD)
- Clinical Engineering (PhD only)

The field in Clinical Engineering in the PhD was suspended to admissions, effective January 1, 2021. The remaining fields in each of the MAsc, MEng and PhD were suspended to admissions, effective June 7, 2024.

This proposal is to fully close all of the above-mentioned fields. Although they were created to advertise areas of research strength within BME, the unit never formally grouped degree program students into these specific fields, and program requirements did not change according to the student's field of study. Since the existing fields were never used to formally classify or group students in any University systems, the existing fields will close. Additionally,

these fields no longer represent the way BME's research themes are currently organized and named.

2. Academic Rationale

- *Discuss the academic rationale for the closure including alignment with the unit's academic plan and connection to any previous reviews.*
- *Discuss any resource implications.*

In 2014 BME brought forward a major modification proposal to establish four new fields in the MASc, MEng and PhD programs: Neural/Sensory Systems and Rehabilitation; Biomaterials, Tissue Engineering and Regenerative Medicine; Nanotechnology, Molecular Imaging and Systems Biology; and Engineering in a Clinical Setting. These fields were in addition to an already existing field in Clinical Engineering in the PhD. These fields were intended to articulate and advertise the unit's areas of research strength; however, the fields primarily functioned to facilitate informal matching between students and potential supervisors. Students do not apply to these fields, are not admitted or enrolled in a field, and do not graduate with a field designation on their academic record. After a change of leadership in 2017, BME underwent internal reorganization and streamlining, including a renaming of the unit in 2020 (from Institute of Biomaterials & Biomedical Engineering to Institute of Biomedical Engineering). The existing fields are no longer representative of BME's research themes.

3. Impact of Closure on Divisional and Other Programs/Units

- *Discuss the impact on the nature and quality of the division's program of study including the impact of closure on other units including inter-divisional and inter-institutional agreements/contracts.*

BME program fields have no impact on divisional and other programs/units. The proposal to close BME program fields does not involve any change to the MEng, MASc, or PhD degree requirements. There are no changes to the MASc, MEng or PhD programs, including to the admission and completion requirements, or their program learning outcomes as a result of the closure of the fields.

4. Impact on Students

- *Provide the current enrolment showing breakdown by year of study in the program or option being closed.*

Table 1: Graduate Breakdown

Status	POSt Cd	Transcript Title	# Active Students
OPEN	BEFLDBTRMC	Field (MASC): Biomaterials, Tissue Engineering and Regenerative Medicine	0
OPEN	BEFLDBTRMG	Field (MEng): Biomaterials, Tissue Engineering and Regenerative Medicine	0
OPEN	BEFLDBTRPH	Field (PhD): Biomaterials, Tissue Engineering and Regenerative Medicine	0
OPEN	BEFLDCBEPH	Field (PhD): Clinical Engineering	0
OPEN	BEFLDENCMC	Field (MASC): Engineering in a Clinical Setting	0
OPEN	BEFLDENCMG	Field (MEng): Engineering in a Clinical Setting	0
OPEN	BEFLDENCPH	Field (PhD): Engineering in a Clinical Setting	0
OPEN	BEFLDNMSMC	Field (MASC): Nanotechnology, Molecular Imaging and Systems Biology	0
OPEN	BEFLDNMSMG	Field (MEng): Nanotechnology, Molecular Imaging and Systems Biology	0
OPEN	BEFLDNMSPH	Field (PhD): Nanotechnology, Molecular Imaging and Systems Biology	0
OPEN	BEFLDNSSMC	Field (MASC): Neural/Sensory Systems Rehabilitation	0
OPEN	BEFLDNSSMG	Field (MEng): Neural/Sensory Systems Rehabilitation	0
OPEN	BEFLDNSSPH	Field (PhD): Neural/Sensory Systems Rehabilitation	0

- Referring to the table above, discuss the impact on and accommodation of any students currently enrolled in the program.

There is no impact on new or continuing students as they do not enrol in the fields. The identified fields were not used to formally group students in university systems. Although the fields were created as Subject POSTs in ROSI, BME did not use the codes to track students. The fields have not appeared on students' transcripts.

5. Consultation

- Discuss consultation with affected divisions, units, faculty and students.

Since 2018-19 there have been multiple consultations within BME's faculty group on the plan to close the fields. There have been no concerns because faculty do not engage with the

fields. Like faculty, students do not engage with the fields and will not be impacted by the change.

Faculty members will be notified by the BME Director's office about the closure of the fields. The fields will be removed from the Introduction section of the SGS Calendar.

Appendix A: Current Calendar Copy with Changes Shown in Red

Biomedical Engineering

Biomedical Engineering: Introduction

Faculty Affiliation

Applied Science and Engineering

Degree Programs

Biomedical Engineering

Note: admissions to all fields have been administratively suspended; however, **admissions to the program remain open.** Students are not required to select a field to complete the program.

MASc

- ~~Fields:~~

- ~~○ Biomaterials, Tissue Engineering and Regenerative Medicine;~~
- ~~○ Engineering in a Clinical Setting;~~
- ~~○ Nanotechnology, Molecular Imaging and Systems Biology;~~
- ~~○ Neural/Sensory Systems and Rehabilitation~~

MEng

- ~~Fields:~~

- ~~○ Biomaterials, Tissue Engineering and Regenerative Medicine;~~
- ~~○ Engineering in a Clinical Setting;~~
- ~~○ Nanotechnology, Molecular Imaging and Systems Biology;~~
- ~~○ Neural/Sensory Systems and Rehabilitation~~

- Emphases:

- Engineering and Globalization;
- Entrepreneurship, Leadership, Innovation and Technology (ELITE);
- Forensic Engineering

PhD

- ~~Fields:~~

- ~~○ Biomaterials, Tissue Engineering and Regenerative Medicine;~~
- ~~○ Clinical Engineering;~~
- ~~○ Engineering in a Clinical Setting;~~
- ~~○ Nanotechnology, Molecular Imaging and Systems Biology;~~
- ~~○ Neural/Sensory Systems and Rehabilitation~~

Clinical Engineering

MHSc (admissions have been administratively suspended)

Collaborative Specializations

The following collaborative specializations are available to students in participating degree programs as listed below:

- **Cardiovascular Sciences**
 - Biomedical Engineering, MASC, PhD
- **Developmental Biology**
 - Biomedical Engineering, MASC, PhD
 - Clinical Engineering, MHSc
- **Genome Biology and Bioinformatics**
 - Biomedical Engineering, PhD
- **Musculoskeletal Sciences**
 - Biomedical Engineering, MASC, PhD
- **Neuromodulation**
 - Biomedical Engineering, MASC, PhD
- **Neuroscience**
 - Biomedical Engineering, MASC, PhD
 - Clinical Engineering, MHSc
- **Resuscitation Sciences** (admissions have been administratively suspended)
 - Biomedical Engineering, PhD
 - Clinical Engineering, MHSc
- **Robotics**
 - Biomedical Engineering, MASC, PhD

Overview

The Institute of Biomedical Engineering (BME) offers facilities for research in biomedical engineering and for three educational programs leading to master's and doctoral degrees.

Biomedical engineering is a multidisciplinary field that integrates engineering and biology/medicine. It uses methods, principles, and tools of engineering, physical sciences, and mathematics to solve problems in the medical and life sciences for the study of living systems; the enhancement and replacement of those systems; the design and construction of systems to measure basic physiological parameters; the development of instruments, materials, and techniques for biological and medical practice; and the development of artificial organs and other medical devices. By its nature, the majority of the institute's work is interdisciplinary.

Contact and Address

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MEng Program

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Biomedical Engineering: Biomedical Engineering MASc

The **Master of Applied Science (MASc) program** is a research-stream, thesis-based program which provides a strong academic foundation for students who want to become immersed in the discipline of biomedical engineering. This program is designed to offer students challenging and rewarding research opportunities within the context of using engineering principles to enhance the quality of our health-care system.

~~The MASc program is offered in the fields of 1) Biomaterials, Tissue Engineering and Regenerative Medicine; 2) Engineering in a Clinical Setting; 3) Nanotechnology, Molecular Imaging and Systems Biology; and 4) Neural/Sensory Systems and Rehabilitation. **Note: admissions to the MASc fields have been administratively suspended; however, the program remains open to new enrolments.**~~

MASc Program

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the institute's additional admission requirements stated below.
- A bachelor's degree in dentistry, engineering, medicine, or one of the physical or biological sciences from a recognized university with a minimum academic standing of mid-B or 3.0 grade point average (GPA) in the final two years of study or over senior-level courses.

Completion Requirements

- **Coursework.** The program normally comprises **at least 2.0 full-course equivalents (FCEs)** including:
 - Two of the following (1.0 FCE):
 - [BME1477H](#) *Biomedical Engineering Project Design and Execution*
 - [BME1478H](#) *Coding for Biomedical Engineers*

- [BME1479H](#) *Statistical Discovery Techniques for Biomedical Researchers*
 - Two half-course electives relevant to the student's area of research (1.0 FCE).
- Students must participate in:
 - Either [BME1010H](#) or [BME1011H](#) *Graduate Seminar* series.
 - [JDE1000H](#) *Ethics in Research*.
 - Health and safety training workshops.
- Successful completion of a **research thesis**. ~~in at least one of the biomedical engineering research fields: 1) Biomaterials, Tissue Engineering and Regenerative Medicine; 2) Engineering in a Clinical Setting; 3) Nanotechnology, Molecular Imaging and Systems Biology; and 4) Neural/Sensory Systems and Rehabilitation.~~

Mode of Delivery: In person

Program Length: 5 sessions full-time (typical registration sequence: FWS-FW)

Time Limit: 3 years full-time

Biomedical Engineering: Biomedical Engineering MEng

The **Master of Engineering (MEng) program** is an accelerated, professional program with a focus on the design and commercialization of biomedical devices. Students will have the opportunity to take on applied design challenges and meet the growing demands of this industry through a four-month practical experience through internships, research projects, or practical course activities.

~~The MEng program is offered in the fields of 1) Biomaterials, Tissue Engineering and Regenerative Medicine; 2) Engineering in a Clinical Setting; 3) Nanotechnology, Molecular Imaging and Systems Biology; and 4) Neural/Sensory Systems and Rehabilitation. **Note: admissions to the MEng fields have been administratively suspended; however, the program remains open to new enrolments.**~~

The MEng program can be taken on a full-time, extended full-time, or part-time basis.

MEng Program (Full-Time and Part-Time Options)

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy BME's additional admission requirements stated below.
- A four-year bachelor's degree in engineering, medicine, dentistry, or one of the physical or biological sciences from a recognized university, with at least a mid-B average (3.0 grade point average [GPA]) in the final two years of study or over senior-level courses.

Completion Requirements

- **Coursework.** Students must successfully complete a total of **5.0 full-course equivalents (FCEs)** as follows:
 - At least 2.0 FCEs in biomedical engineering courses; these include all BME and joint BME course offerings.
 - At least 1.0 FCE in commercialization and entrepreneurship courses such as [BME1800H](#), [BME1801H](#), [BME1802H](#), and [BME1405H](#). Completion of either [BME1800H](#) or [BME1801H](#) is required for graduation.
 - A 1.0 FCE *Practical Experience in Applied Research* course in biomedical device development, usually over one session for a full-time placement ([BME1899Y](#)) or over three sessions for a part-time placement ([BME1898Y](#)). ~~The placement must be in at least one of the following biomedical engineering research fields: 1) Biomaterials, Tissue Engineering and Regenerative Medicine; 2) Engineering in a Clinical Setting; 3) Nanotechnology, Molecular Imaging and Systems Biology; or 4) Neural/Sensory Systems and Rehabilitation.~~ The practical experience course can be taken in academic research and teaching laboratories, government institutions, health-care facilities, in the industry, or in health-care consulting firms.
 - The remaining 1.0 FCE can be two half courses in either biomedical engineering, commercialization and entrepreneurship, or any graduate-level course the student is interested in.
- All courses must be at the graduate level, which includes both 500- and 1000-level. Students can take a maximum of one 500-level course.
- Health and safety training workshops.
- Students have the option of completing an emphasis in Engineering and Globalization; Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE); or Forensic Engineering as part of their degree program. Please see details in the Biomedical Engineering Emphases section.

Mode of Delivery: In person

Program Length: 3 sessions full-time (typical registration sequence: FWS); 9 sessions part-time (typical registration sequence: FWS-FWS-FWS)

Time Limit: 2 years full-time; 6 years part-time

MEng Program (Extended Full-Time Option)

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy BME's additional admission requirements stated below.
- A four-year bachelor's degree in engineering, medicine, dentistry, or one of the physical or biological sciences from a recognized university, with at least a mid-B

average (3.0 grade point average [GPA]) in the final two years of study or over senior-level courses.

Completion Requirements

- **Coursework.** Students must successfully complete a total of **5.0 full-course equivalents (FCEs)** as follows:
 - At least 2.0 FCEs in biomedical engineering courses; these include all BME and joint BME course offerings.
 - At least 1.0 FCE in commercialization and entrepreneurship courses such as [BME1800H](#), [BME1801H](#), [BME1802H](#), and [BME1405H](#). Completion of either [BME1800H](#) or [BME1801H](#) is required for graduation.
 - A 1.0 FCE *Practical Experience in Applied Research* course in biomedical device development, usually over one session for a full-time placement ([BME1899Y](#)) or over three sessions for a part-time placement ([BME1898Y](#)). ~~The placement must be in at least one of the following biomedical engineering research fields: 1) Biomaterials, Tissue Engineering and Regenerative Medicine; 2) Engineering in a Clinical Setting; 3) Nanotechnology, Molecular Imaging and Systems Biology; or 4) Neural/Sensory Systems and Rehabilitation.~~ The practical experience course can be taken in academic research and teaching laboratories, government institutions, health-care facilities, in the industry, or in health-care consulting firms.
 - The remaining 1.0 FCE can be two half courses in either biomedical engineering, commercialization and entrepreneurship, or any graduate-level course the student is interested in.
- All courses must be at the graduate level, which includes both 500- and 1000-level. Students can take a maximum of one 500-level course.
- Health and safety training workshops.
- Students have the option of completing an emphasis in Engineering and Globalization; Entrepreneurship, Leadership, Innovation and Technology in Engineering (ELITE); or Forensic Engineering as part of their degree program. Please see details in the Biomedical Engineering Emphases section.

Mode of Delivery: In person

Program Length: 6 sessions full-time (typical registration sequence: FWS-FWS)

Time Limit: 3 years full-time

Biomedical Engineering: Biomedical Engineering PhD

The **Doctor of Philosophy (PhD) program** offers courses and a strong research thesis component. Students emerge from this program ready to pursue careers in academia, medicine, industry, and government. Students with a particular interest in conducting biomedical engineering research with a primary clinical focus may pursue a field in clinical engineering within the Biomedical Engineering PhD program.

Applicants may enter the PhD program via one of three routes: 1) following completion of an appropriate master's degree; 2) transfer from the University of Toronto MASc or MHSc program; or 3) direct entry following completion of an appropriate bachelor's degree.

~~Note: admissions to the PhD fields have been administratively suspended; however, the program remains open to new enrolments.~~

~~Fields: 1) Biomaterials, Tissue Engineering and Regenerative Medicine; 2) Engineering in a Clinical Setting; 3) Nanotechnology, Molecular Imaging and Systems Biology; 4) Neural/Sensory Systems and Rehabilitation~~

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the institute's additional admission requirements stated below.
- Applicants must have a master's degree in dentistry, engineering, medicine, or one of the physical or biological sciences with an overall average of at least B+ (3.3 grade point average [GPA]) from a recognized university.

Completion Requirements

- **Coursework.** Normally, students must complete **at least 1.0 full-course equivalents (FCEs)** including:
 - Two of the following (1.0 FCE):
 - [BME1477H](#) *Biomedical Engineering Project Design and Execution*;
 - [BME1478H](#) *Coding for Biomedical Engineers*; or
 - [BME1479H](#) *Statistical Discovery Techniques for Biomedical Researchers*.
- ~~Students are also expected to pursue a **thesis topic** relevant to at least one of the following Biomedical Engineering research fields: 1) Biomaterials, Tissue Engineering and Regenerative Medicine; 2) Engineering in a Clinical Setting; 3) Nanotechnology, Molecular Imaging and Systems Biology; and 4) Neural/Sensory Systems and Rehabilitation.~~
- Within 12 months of registration, students must pass a **qualifying examination** covering the broad field of biomedical engineering appropriate to their background.
- Successful completion of a **thesis**, representing an original investigation in biomedical engineering.
- Students will continue to meet with their supervisory committee at least once every 12 months until recommendation for the **departmental oral examination** is made. On the recommendation of the supervisory committee and special approval from their department Graduate Chair or Coordinator, candidates have the opportunity to waive the departmental oral examination and proceed directly to the **Doctoral Final Oral Examination**.
- Students must participate in:

- Either [BME1010H](#) or [BME1011H](#) *Graduate Seminar* series;
- [JDE1000H](#) *Ethics in Research*;
- Health and safety training workshops.

Mode of Delivery: In person

Program Length: 4 years full-time (typical registration sequence: Continuous)

Time Limit: 6 years full-time

PhD Program (Transfer)

Transfer Requirements

- Highly qualified master's students (MHSc students in Clinical Engineering or MASc students in any field) may be considered for transfer into the PhD program in any of the five fields. MASc and MHSc students who transfer to a PhD must fulfil the admission requirements listed under the specific field of the PhD program they are transferring to.

Completion Requirements

Program Requirements for MASc Transfer Students

- **Coursework.** Students who transfer from the MASc program in Biomedical Engineering must complete the total course requirements for both degrees: 2.0 full-course equivalents (FCEs) at the master's level plus 1.0 FCE at the PhD level, for **a total of 3.0 FCEs**:
 - Students must complete two of the following (1.0 FCE):
 - [BME1477H](#) *Biomedical Engineering Project Design and Execution*;
 - [BME1478H](#) *Coding for Biomedical Engineers*; or
 - [BME1479H](#) *Statistical Discovery Techniques for Biomedical Researchers*.
 - Elective courses relevant to the student's area of research (2.0 FCEs)

Program Requirements for MHSc Transfer Students

- **Coursework.** Students who transfer from the MHSc program in Biomedical Engineering must complete the total course requirements for both degrees: 4.0 FCEs at the master's level plus 1.0 FCE at the PhD level, for **a total of 5.0 FCEs**:
 - [BME1405H](#) *Clinical Engineering Instrumentation I* and [BME1436H](#) *Clinical Engineering Surgery*.
 - Students must complete two of the following (1.0 FCE):
 - [BME1477H](#) *Biomedical Engineering Project Design and Execution*;
 - [BME1478H](#) *Coding for Biomedical Engineers*; or

- [BME1479H](#) *Statistical Discovery Techniques for Biomedical Researchers*.
- Two half-course electives relevant to the student's area of research (1.0 FCE).
- [BME4444Y](#) *Practical Experience Course* in health-care facilities, the medical device industry, or health-care consulting firms. The practical experience course must total a minimum of 625 hours.

All PhD Students

- ~~Students are also expected to pursue a **thesis topic** relevant to at least one of the following Biomedical Engineering research fields: 1) Biomaterials, Tissue Engineering and Regenerative Medicine; 2) Engineering in a Clinical Setting; 3) Nanotechnology, Molecular Imaging and Systems Biology; and 4) Neural/Sensory Systems and Rehabilitation.~~
- Within 12 months of registration, students must pass a **qualifying examination** covering the broad field of biomedical engineering appropriate to their background.
- Successful completion of a **thesis**, representing an original investigation in biomedical engineering.
- Students will continue to meet with their supervisory committee at least once every 12 months until recommendation for the **departmental oral examination** is made. On the recommendation of the supervisory committee and special approval from their department Graduate Chair or Coordinator, candidates have the opportunity to waive the departmental oral examination and proceed directly to the **Doctoral Final Oral Examination**.
- Students must participate in:
 - Either [BME1010H](#) or [BME1011H](#) *Graduate Seminar* series;
 - [JDE1000H](#) *Ethics in Research*;
 - Health and safety training workshops.

Mode of Delivery: In person

Program Length: 5 years full-time (typical registration sequence: Continuous)

Time Limit: 7 years full-time

PhD Program (Direct-Entry)

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the institute's additional admission requirements stated below.
- Direct entry with a bachelor's degree may be considered in exceptional circumstances. Applicants must have an undergraduate degree in dentistry, engineering, medicine, or one of the physical or biological sciences.

Completion Requirements

- **Coursework.** Normally, students must complete **3.0 full-course equivalent (FCE)** including:
 - Two of the following (1.0 FCE):
 - [BME1477H](#) *Biomedical Engineering Project Design and Execution*;
 - [BME1478H](#) *Coding for Biomedical Engineers*; or
 - [BME1479H](#) *Statistical Discovery Techniques for Biomedical Researchers*.
- ~~Students are also expected to pursue a **thesis topic** relevant to at least one of the following Biomedical Engineering research fields: 1) Biomaterials, Tissue Engineering and Regenerative Medicine; 2) Engineering in a Clinical Setting; 3) Nanotechnology, Molecular Imaging and Systems Biology; and 4) Neural/Sensory Systems and Rehabilitation.~~
- Successful completion of a **thesis**, representing an original investigation in biomedical engineering.
- Students will continue to meet with their supervisory committee at least once every 12 months until recommendation for the **departmental oral examination** is made. On the recommendation of the supervisory committee and special approval from their department Graduate Chair or Coordinator, candidates have the opportunity to waive the departmental oral examination and proceed directly to the **Doctoral Final Oral Examination**.
- Students must participate in:
 - Either [BME1010H](#) or [BME1011H](#) *Graduate Seminar* series;
 - [JDE1000H](#) *Ethics in Research*;
 - Health and safety training workshops.

Mode of Delivery: In person

Program Length: 5 years full-time (typical registration sequence: Continuous)

Time Limit: 7 years full-time

~~Biomedical Engineering: Biomedical Engineering PhD; Field: Clinical Engineering~~

~~The PhD program offers courses and a strong research thesis component. Students emerge from this program ready to pursue careers in academia, medicine, industry, and government. Students with a particular interest in conducting biomedical engineering research with a primary clinical focus may pursue a field in clinical engineering within the Biomedical Engineering PhD program.~~

~~Applicants may enter the PhD program via one of three routes: 1) following completion of an appropriate master's degree; 2) transfer from the University of Toronto MAsc or MHSc program; or 3) direct entry following completion of an appropriate bachelor's degree.~~

~~Effective January 2021, admissions to this field have been administratively suspended.~~

~~Field: Clinical Engineering~~

~~Minimum Admission Requirements~~

~~PhD Program~~

- ~~• Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the institute's additional admission requirements stated below.~~
- ~~• Applicants must have a master's degree in dentistry, engineering, medicine, or one of the physical or biological sciences with an overall average of at least B+ (3.3 grade point average [GPA]) from a recognized university.~~

~~Completion Requirements~~

- ~~• **Coursework.** Normally, students must complete **at least 1.0 full-course equivalent (FCE)** including:
 - ~~○ Two of the following (1.0 FCE):~~
 - ~~▪ BME1477H *Biomedical Engineering Project Design and Execution*;~~
 - ~~▪ BME1478H *Coding for Biomedical Engineers*; or~~
 - ~~▪ BME1479H *Statistical Discovery Techniques for Biomedical Researchers*.~~
 - ~~○ If a student does not have a formal degree in clinical engineering, 0.5 FCE from one of the BME clinical engineering courses (BME1405H, BME1436H, BME1439H, or BME4444Y) is required. A student who possesses protracted professional engineering experience (five or more years) will be exempt from this requirement.~~~~
- ~~• Students must (1) conduct their research in a clinical environment and (2) be co-supervised by both engineering and health science faculty. The primary supervisor must be BME-appointed; however, the co-supervisor could be from a clinical unit other than BME but must be appointed to SGS.~~
- ~~• Within 12 months of registration, students must pass a **qualifying examination** covering the broad field of biomedical engineering appropriate to their background.~~
- ~~• Successful completion of a **thesis**, representing an original investigation in biomedical engineering.~~
- ~~• Students will continue to meet with their supervisory committee at least once every 12 months until recommendation for the **departmental oral examination** is made. On the recommendation of the supervisory committee and special approval from their department Graduate Chair or Coordinator, candidates have~~

the opportunity to waive the departmental oral examination and proceed directly to the **Doctoral Final Oral Examination**.

- ~~Students must participate in:~~
 - ~~Either BME1010H or BME1011H Graduate Seminar series;~~
 - ~~JDE1000H Ethics in Research;~~
 - ~~Health and safety training workshops.~~

Mode of Delivery: In person

Program Length: 4 years full-time (typical registration sequence: Continuous)

Time Limit: 6 years full-time

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PhD Program (Transfer)

Transfer Requirements

- ~~Highly qualified master's students (MHS&c students in Clinical Engineering or MAS&c students in any field) may be considered for transfer into the PhD program in any of the five research fields. To be eligible to transfer to the PhD, Clinical Engineering MHS&c students must complete 3.0 full-course equivalents (FCEs) within the MHS&c curriculum.~~
- ~~MHS&c students who transfer to a PhD in the field of Clinical Engineering must fulfil the PhD program requirements listed below. MHS&c students who transfer to the other PhD fields must fulfil the program requirements of the PhD field as described in the applicable section.~~

Completion Requirements

Program Requirements for MAS&c Transfer Students

- ~~**Coursework.** Students who transfer from the MAS&c program in Biomedical Engineering must complete the total course requirements for both degrees: 2.0 full-course equivalents (FCEs) at the master's level plus 1.0 FCE at the PhD level, for a total of 3.0 FCEs:~~
 - ~~Students must complete two of the following (1.0 FCE):~~
 - ~~BME1477H Biomedical Engineering Project Design and Execution;~~
 - ~~BME1478H Coding for Biomedical Engineers; or~~
 - ~~BME1479H Statistical Discovery Techniques for Biomedical Researchers.~~
 - ~~Elective courses relevant to the student's area of research (2.0 FCE's).~~
 - ~~If a student does not have a formal degree in clinical engineering, 0.5 FCE from one of the BME clinical engineering courses (BME1405H, BME1436H, BME1439H, or BME4444Y) is required. A student who possess protracted professional engineering experience (five or more years) will be exempt from this requirement.~~

Program Requirements for MHSc Transfer Students

- ~~Coursework.~~ Students who transfer from the MHSc program in Biomedical Engineering must complete the total course requirements for both degrees: 4.0 FCEs at the master's level plus 1.0 FCE at the PhD level, for a total of 5.0 FCEs:
 - ~~BME1405 Clinical Engineering Instrumentation and BME1436 Clinical Engineering Surgery.~~
 - Students must complete two of the following (1.0 FCE):
 - ~~BME1477H Biomedical Engineering Project Design and Execution;~~
 - ~~BME1478H Coding for Biomedical Engineers; or~~
 - ~~BME1479H Statistical Discovery Techniques for Biomedical Researchers.~~
 - Two half-course electives relevant to the student's area of research (1.0 FCE).
 - ~~BME4444Y Practical Experience Course~~ in health care facilities, the medical device industry, or health care consulting firms. The practical experience course must total a minimum of 625 hours.

All PhD Students

- ~~Students must (1) conduct their research in a clinical environment and (2) be co-supervised by both engineering and health science faculty. The primary supervisor must be BME-appointed; however, the co-supervisor could be from a clinical unit other than BME but must be appointed to SGS.~~
- ~~Within 12 months of registration, students must pass a **qualifying examination** covering the broad field of biomedical engineering appropriate to their background.~~
- ~~Successful completion of a **thesis**, representing an original investigation in biomedical engineering.~~
- ~~Students will continue to meet with their supervisory committee at least once every 12 months until recommendation for the **departmental oral examination** is made. On the recommendation of the supervisory committee and special approval from their department Graduate Chair or Coordinator, candidates have the opportunity to waive the departmental oral examination and proceed directly to the **Doctoral Final Oral Examination**.~~
- ~~Students must participate in:~~
 - ~~Either BME1010H or BME1011H Graduate Seminar series;~~
 - ~~JDE1000H Ethics in Research;~~
 - ~~Health and safety training workshops.~~

Mode of Delivery: In person

Program Length: 5 years full-time (typical registration sequence: Continuous)

Time Limit: 7 years full-time

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PhD Program (Direct-Entry)

Minimum Admission Requirements

- Applicants are admitted under the General Regulations of the School of Graduate Studies. Applicants must also satisfy the institute's additional admission requirements stated below.
- Direct entry with a bachelor's degree may be considered in exceptional cases. Applicants must have an undergraduate degree in dentistry, engineering, medicine, or one of the physical or biological sciences.

Completion Requirements

- **Coursework.** Normally, students must complete **at least 3.0 full-course equivalent (FCE)** including:
 - Two of the following (1.0 FCE):
 - BME1477H *Biomedical Engineering Project Design and Execution*;
 - BME1478H *Coding for Biomedical Engineers*; or
 - BME1479H *Statistical Discovery Techniques for Biomedical Researchers*.
 - Elective courses relevant to the student's area of research (2.0 FCEs).
 - If a student does not have a formal degree in clinical engineering, 0.5 FCE from one of the BME clinical engineering courses (BME1405H, BME1436H, BME1439H, or BME4444Y) is required. A student who possesses protracted professional engineering experience (five or more years) will be exempt from this requirement.
- Students in the Clinical Engineering field must (1) conduct their research in a clinical environment and (2) be co-supervised by both engineering and health science faculty. The primary supervisor must be BME-appointed; however, the co-supervisor could be from a clinical unit other than BME but must be appointed to SGS.
- Within 12 months of registration, students must pass a **qualifying examination** covering the broad field of biomedical engineering appropriate to their background.
- Successful completion of a **thesis**, representing an original investigation in biomedical engineering.
- Students will continue to meet with their supervisory committee at least once every 12 months until recommendation for the **departmental oral examination** is made. On the recommendation of the supervisory committee and special approval from their department Graduate Chair or Coordinator, candidates have the opportunity to waive the departmental oral examination and proceed directly to the **Doctoral Final Oral Examination**.
- Students must participate in:
 - Either BME1010H or BME1011H *Graduate Seminar* series;
 - JDE1000H *Ethics in Research*;

~~o Health and safety training workshops.~~

~~**Mode of Delivery:** In person~~

~~**Program Length:** 5 years full-time (typical registration sequence: Continuous)~~

~~**Time Limit:** 7 years full-time~~