

Collaborative Graduate Program with a Specialization in

Biomedical Engineering

MASc & PhD

Why Graduate Studies in Biomedical Engineering?

Biomedical Engineering involves the application of engineering principles to understand, modify, or control biological systems with the objective of generating solutions to health-related problems. This area is diverse and multidisciplinary, bringing in concepts from chemistry, cell biology, mechanics, bioelectricity, mathematics, and physiology. This multidisciplinary nature is reflected in our collaborative biomedical engineering Master's and PhD programs. These programs link the graduate programs in Chemical, Electrical, and Mechanical Engineering and provide shared learning experiences with interdisciplinary content. The MASc and PhD programs also bring students from a variety of backgrounds together to learn about research methodology and professional practice from world renowned research faculty in the field of Biomedical Engineering.

Why Queen's?

At Queen's, the departments of Chemical, Electrical and Computer, and Mechanical and Materials Engineering have formally collaborated to support this graduate biomedical engineering program. Through this innovative program, our graduate students have opportunities to access courses and co-supervisors in each department, to collaborate with top researchers, and to take courses in Anatomy, Cell Biology, and Biochemistry. Graduates with a specialization in Biomedical Engineering find employment opportunities in areas including the pharmaceutical industry, the biomedical device industry, health care support (e.g., Health Canada), as



"...The community feel is really important to me. I would say the resources here at Queen's are really amazing as well as facilities. We're really able to ask any questions and really dive deep into answering those questions." - Michael Shepertycky, PhD Candidate, Mechanical and Materials Engineering

well as academic research and teaching.

Program Structure

- MASc (2 years, full time)
- PhD (4 years, full time)

All MASc and PhD students must fulfill course work and other requirements of their home departments, successfully complete two mandatory core courses in Biomedical Engineering (CBME 801 and 802), and undertake a thesis project in one or more of the designated research areas.

Research Areas

- **Biomaterials:** developing natural and synthetic materials to facilitate repair of damaged or diseased tissues and organs
- **Biomechanics and Prosthetics:** studying whole body and limb biomechanics and designing medical implants and prosthetics
- **Tissue Engineering and Regenerative**

Medicine: developing laboratory grown functional replacement tissues and cell encapsulation devices

- **Biomedical and Intelligent Systems:** research and experimentation in robotics, computer vision, discrete-event systems, bioinformatics, wearable sensors, machine learning and artificial intelligence, biosignal analysis, and human machine interfaces (HMIs)
- **Cell Mechanics and Mechanobiology:** This research area investigates how mechanical forces and the physical properties of cells, tissues, and biomaterials influence disease diagnosis, progression, and treatment. By measuring and modulating properties such as stiffness, viscosity, deformation, and force transmission, it aims to identify mechanical biomarkers, understand how altered mechanics drive disease, and develop mechanically informed therapeutic strategies, especially for lethal tumors.



Faculty Research and Supervision

BIOMATERIALS

- Brian Amsden — Chemical Engineering
- Kevin De France — Chemical Engineering
- Lindsay Fitzpatrick — Chemical Engineering
- Laura Wells — Chemical Engineering
- Heidi Ploeg — Mechanical and Materials Engineering
- Lidan You — Mechanical and Materials Engineering
- Roshni Rainbow — Mechanical and Materials Engineering
- Yongjun Lai — Mechanical and Materials Engineering

BIOMECHANICS AND PROSTHETICS

- Claire Davies — Mechanical and Materials Engineering
- Kevin Deluzio — Mechanical and Materials Engineering
- Il-Yong Kim — Mechanical and Materials Engineering
- Yongjun Lai — Mechanical and Materials Engineering
- Qingguo Li — Mechanical and Materials Engineering
- Michael Rainbow — Mechanical and Materials Engineering
- Xian Wang — Mechanical and Materials Engineering
- Amy Wu — Mechanical and Materials Engineering
- Heidi Ploeg — Mechanical and Materials Engineering
- Lidan You — Mechanical and Materials Engineering

BIOMEDICAL AND INTELLIGENT SYSTEMS

- Michael Greenspan — Electrical and Computer Engineering
- Nasim Montazeri Ghahjaverestan — Electrical and Computer Engineering
- Keyvan Hashtrudi-Zaad — Electrical and Computer Engineering
- Michael Korenberg — Electrical and Computer Engineering
- Karen Rudie — Electrical and Computer Engineering
- Ali Etemad — Electrical and Computer Engineering
- Shideh Kabiri Ameri — Electrical and Computer Engineering
- Xian Wang — Mechanical and Materials Engineering

TISSUE ENGINEERING AND REGENERATIVE MEDICINE

- Brian Amsden — Chemical Engineering
- Kevin De France — Chemical Engineering
- Lindsay Fitzpatrick — Chemical Engineering
- Laura Wells — Chemical Engineering
- Carlos Escobedo — Chemical Engineering
- Roshni Rainbow — Mechanical and Materials Engineering

Application FAQs

What do I need to know to Apply?

- Please review the admission requirements of the appropriate home department for academic prerequisites and documentation necessary for admission into the desired graduate program.
- Applications must be submitted directly to the Queen's School of Graduate Studies and Postdoctoral Affairs, which can be done online. In that application, students must identify which of the participating departments they wish to identify as their home department (e.g., Chemical, Mechanical and Materials, or Electrical and Computer Engineering). Usually, this is the department aligned with the applicant's undergraduate engineering degree.
- The online SGSPA Application Form asks "Describe (in a sentence or two) your Research Interest(s)". This is where students should enter "Collaborative Master's/PhD in Biomedical Engineering" to indicate their interest in the specialization. Later in the form, students are asked to provide a "Statement of Interest". Students can use this section to expand on the nature of their interest in Biomedical Engineering.

DEADLINES

- Please refer to the appropriate home department for program specific application deadlines.

What about Funding?

Fellowships and teaching assistantships are available through the University and are automatically considered upon admission. Full-time students are encouraged to seek external financial support and to apply for NSERC, CIHR, and OGS graduate scholarships.

Please refer to the appropriate home department for program specific funding packages.

For more information, contact the representative of the Department that is best aligned with your research interests.

CHEMICAL ENGINEERING

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ELECTRICAL AND COMPUTER ENGINEERING

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MECHANICAL AND MATERIALS ENGINEERING

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<https://smithengineering.queensu.ca/programs/graduate/collaborative/biomedical/>