

## Description of Graduate Departments

### 1) *Basic Science*

- a) **Department of Biochemistry** - Biochemistry occupies a central place in the life sciences and encompasses traditional disciplines such as molecular biology and cell biology and newer areas such as bioinformatics. The Department boasts a large faculty (over 50 members and growing) whose research spans the breadth that is biochemistry today. Our faculty members have active research programs in signal transduction and regulation, membranes and transport, proteomics and bioinformatics, molecular medicine, molecular cell biology, protein folding, gene expression and development, and biomolecular structure and function. The Department offers programs leading to M.Sc. and Ph.D. degrees and attracts students from universities in Ontario, across Canada and around the world. These research-intensive programs are complemented by courses on selected topics in biochemistry. Biochemistry graduate students present their research in a dynamic weekly seminar series. Our Ph.D. graduates go on to successful post-doctoral fellowships and careers in research and in the private sector.
- b) **Department of Immunology** - The Department operates as an integrated, collaborative community with approximately 65 investigators in 7 research sites in Toronto, which includes hospital-based university-affiliated research institutes. The Department strives to advance biomedical discoveries in Immunology, increase the understanding of fundamental Immunological principles and develop new applications for immune based therapies. The Department's research is in one of eight fields in Immunology: Adaptive Immunity, Innate Immunity, Developmental Immunology, Autoimmunity, Cancer Immunology, Infectious Disease, Immune Deficiency and Transplantation Immunology. The Department offers doctoral stream research training leading to a PhD degree, or, an MSc degree in the field of Applied Immunology, which is a non-thesis graduate program that is geared to provide advanced training in designing, implementing and evaluating Immunological techniques that measure immune responses.
- c) **Department of Laboratory Medicine and Pathobiology (LMP)** - The Graduate Program in Laboratory Medicine and Pathobiology (LMP) offers a unique educational opportunity for students seeking MSc or PhD degrees in the Life/ Biomedical Sciences. Thesis based research is centered on questions that address mechanisms of disease, and is supervised by graduate faculty who are leaders in their fields. We currently have over 170 faculty members and 200 graduate students participating in our program, and the diversity of studies represented is remarkable – ranging from oncology, infectious diseases, and neuropathology to immune/ blood disorders to cardiovascular and respiratory diseases. Close connections of the department with the University of Toronto's teaching hospitals sets the stage for translational projects that combine basic science and clinical research. These interactions are highly effective, leading to new discoveries that accelerate progress in personalized medicine and health. The program emphasizes robust interaction among students and faculty in all areas of Pathobiology. Graduate coursework, student seminars, faculty lectures, and the annual LMP Graduate Research Conference organized by our graduate student association all provide great

opportunities for learning about the latest advances across the biomedical research spectrum. Students who wish to further enhance training in their specific discipline can do so by participating in hospital based seminar groups, U of T collaborative programs, and by attending/presenting at scientific conferences.

- d) **Department of Molecular Genetics** - The Department has over 100 faculty members, including luminaries at the forefront of diverse fields that span the frontiers of biological research and discovery in the 21st Century: Cellular and Molecular Structure and Function; Computational and Systems Biology; Functional Genomics and Proteomics; Genetic Models of Development and Disease; Molecular Medicine and Human Genetics; and Molecular Microbiology and Infectious Disease. The Department has over 250 graduate students who are engaged in top-flight research in the M.Sc. and Ph.D. Programs in Molecular Genetics. There are two training tracks: the quantitative biology track provides quantitative scientists with a foundation in modern biology and mentors them towards leadership in cutting-edge interdisciplinary research. The computational biology track provides biologists with an immersive curriculum towards leadership in the new discipline of computational molecular genetics. The Department also offers two professional degree programs: a professional M.Sc. in Genetic Counseling, which is certified by the American Board of Genetic Counseling, and is taught by 40 professorial faculty members, lecturers and instructors. In addition, starting in September 2028, the new Medical Genomics MHSc professional master's program will begin.
- e) **Department of Medical Biophysics** - The central focus of the Department is the application of research disciplines spanning through biological and physical science to the problems of medicine. The approach is unique in many respects and has been driven throughout the 50-year history by of the Department's principal research challenge: cancer. In fact, the Department has its roots in the Ontario Cancer Institute's original Biology and Physics Divisions and has retained much of this structure: almost all of the laboratories are in hospital-based institutes and translation of our work into clinical medicine is the shared goal. Our programs embrace students from backgrounds in Molecular and Cell Biology, Physiology, Biochemistry and Chemistry as well as Physics, Mathematics, Engineering, Computer Science and beyond. The diversity of our Faculty and the preponderance of multi-disciplinary projects reflect these backgrounds. The focus of the department is on research. There are 220 graduate students and 120 faculty members in the Department. The M.Sc. program is a common entry point, but the emphasis is on the Ph.D. program. Our graduates hold leading position in fields ranging from Academia, Pharma & Biotechnology to Government, Education and Professional practice (Medicine, Law and Business). Graduate research cuts across the conventional boundaries of physics, engineering, chemistry, mathematics, biology and medicine. Interdisciplinary research is thus at the heart of our program. The Department emphasizes both basic and translational research. Major research themes include Quantitative Oncology, Cancer Diagnosis & Therapy, Medical Physics & Imaging, Image Guided Therapy & Intervention, Data Science, Computational Biology, Structural Biology, Nano-medicine, Regenerative Medicine & Stem Cells, Cardiovascular and Neuroscience.

- f) **Department of Nutritional Sciences** - The Department of Nutritional Sciences is unique in North America in that it is situated in the Faculty of Medicine. This, together with its close linkages with UofT's Dalla Lana School of Public Health, allows the department to fully explore the relationships between nutrition and human health and disease, and to influence clinical practice and public health programs. It also creates unique opportunities for collaboration with the highest concentration of university-affiliated hospitals, clinicians and health researchers in North America. Although the department is centered in the Basic Sciences sector of the faculty, its activities include not only basic science but also clinical and community aspects of nutrition and food and nutrition policy. These activities that range from 'bench to bedside to populations' make it a model of integration within the whole of the health sciences complex at the University of Toronto, enabling a full exploration of the relationships between nutrition and human health to influence both clinical practice and public health policy. The department offers BSc, MSc, and PhD degree programs, and offers a professional Master of Public Health (MPH) degree in the field of Nutrition and Dietetics (formerly Community Nutrition) jointly with the Dalla Lana School of Public Health. There are some 80 graduate students and 50 graduate faculty in the Department.
- g) **Department of Pharmacology and Toxicology** - The department offers MSc and PhD degrees in Pharmacology. The graduate program has over 100 MSc and PhD students. In the MSc program, students can choose from one of two fields of study: the thesis-based MSc or the course-based Applied Clinical Pharmacology MSc. In both fields of study, students must complete coursework that introduces fundamental pharmacological principles and research concepts. In the thesis-based MSc, students are trained to conduct research under the supervision of one or more Graduate Faculty members. Students devote themselves to a specific area of pharmacological research and present their research findings in a thesis and defend their findings at an MSc examination. In the course-based Applied Clinical Pharmacology MSc, students will engage in research and hands-on training via a course-based format in academic, commercial, health care and government settings. Courses will feature a breadth of fundamental and applied pharmacology topics with emphasis on translational research. In the PhD program, students conduct independent original research under the supervision of one or more Graduate Faculty members. Students in the PhD program will conduct thesis research at an advanced level compared to the MSc program and ultimately will present their investigations in a PhD thesis and defend their research at a PhD Final Oral Examination through the School of Graduate Studies. In addition, PhD students will acquire training in basic pharmacological principles and research concepts through graduate pharmacology courses. The research focus of the Department include: biochemical and molecular pharmacology; cardiovascular pharmacology; clinical pharmacology; drug addiction; drug metabolism, distribution and pharmacokinetics; neuropharmacology; immune-pharmacology; psychopharmacology; pharmacokinetics; and toxicology.
- h) **Department of Physiology** - The Department of Physiology offers graduate programs leading to the Master of Science and Doctor of Philosophy degrees. Research ranges from the gene level to the organism level in areas including endocrinology and diabetes; reproduction endocrinology; fetal physiology, pregnancy, and parturition; neuroendocrinology; cardiorespiratory regulation;

gastrointestinal motility; sensory physiology; motor control; brain development and aging; ionic channels and synaptic transmission; excitability, ultrastructure and plasticity of the brain. Research within the Department of Physiology is organized into four Research Platforms: Cardiovascular, Endocrine and Diabetes, Neuroscience, Reproduction and Development. Depth within each of the four platforms is accomplished through specialized seminars, graduate courses and student scientific presentations. The Department has developed a new professional master's degree program, Medical Physiology, which, pending governance approval is expected to begin in September 2019.

**2) Translational**

- a) **Institute of Medical Science (IMS)** - IMS is the largest graduate Department in the FoM with over 600 faculty and 500 students. The department is the primary graduate unit for Clinical Departments and the graduate unit of choice for MDs who wish to become clinician scientists. The Department offers MSc and PhD theses based degrees, as well as two professional degree programs, Masters of Health Science in Translational Research and Master of Science in Biomedical Communication. In addition, the Professional Master's Degree in Medical Radiation Sciences will be closing in the next academic year, and a new Diploma course in Health Research will begin in January 2019. The IMS offers research in biomedical sciences, clinical sciences, health sciences research and population health. Research themes include: cancer; cardiovascular/musculoskeletal/respiratory; endocrine/gastroenterology; infection/immunology; neuroscience/brain health; population health/education; and regenerative medicine/development.

**3) Rehabilitation Sciences**

- a) **Department of Occupational Therapy and Occupational Sciences** - The Program offers an MScOT professional degree over a two-year period, which includes both coursework and fieldwork. As of September 2018, the program expanded to the University of Toronto at Mississauga (UTM). There will be when fully enrolled, 80 students over two years at UTM and 180 students over two years at the downtown campus. The Professional Conceptual Framework of the Program emphasizes 6 areas: Occupation, Leadership, Interprofessional Collaboration; Diversity & Inclusion; Client-centeredness; and Professionalism.
- b) **Department of Physical Therapy** - The Master of Science in Physical Therapy is a 24-month professional program leading to entry to practice. The [MScPT Best Practices Curriculum](#) is designed to integrate systems, research and internship components organized in 12 units to maximize educational principles. There are 108 students enrolled each of the two years of the program. The program consists of course work and clinical placements throughout the TAHSN hospitals and the community. In addition, there is a Master of Science in Physical Therapy Advanced Standing Option which is a professional graduate degree program that allows eligible physical therapists who are currently registered for independent practice with their provincial regulating body in Canada, and who have completed an appropriate Bachelor degree in physiotherapy, to acquire the entry-to-practice degree. This program is offered in an online,

learning environment with one on-campus residency. Themes of research, business, and professional practices are integrated throughout the curriculum. Students complete a group research project during this one-year program.

- c) **Department of Speech-Language Pathology** - The program offer a professional MSc degree over two years, incorporating both coursework and clinical placements. The MSc program prepares students for professional practice in speech-language pathology. Academic and clinical experiences are integrated to provide the skills required for assessing and treating a wide variety of individuals with communication and swallowing disorders. The MSc program can only be completed on a full-time basis. The innovative curriculum enables graduates to bridge the gap between the theoretical knowledge learned in the classroom and practical applications in today's demanding and evolving practice environments. Several key features of the curriculum enhance the quality of student learning and foster theory-to-practice integration, including: (a) explicit learning objectives, reflecting the skills and abilities of exemplary practitioners; (b) a capstone portfolio, in which students document achievement of these learning objectives; (c) strong links between the academic and internship portions of the curriculum; (d) systematic development of student competencies across the curriculum, with particular emphasis on research evidence as the foundation for professional practice; (e) integrative learning experiences, which enable students to deepen, integrate, and apply concepts and principles from related academic courses; (f) teaching clinics, in which students evaluate and develop professional skills in a supportive learning environment; and (g) clearly specified internship expectations that ensure consistent development of professional competencies for all students.
- d) **Rehabilitation Sciences Institute (RSI)** - RSI is the doctoral stream program (MSc and PhD) for the Departments of Physical Therapy, Occupational Science and Occupational Therapy and Speech-Language Pathology. Rehabilitation science is an integrated science dedicated to the study of human function and participation and its relationship to health and well-being. The academic activities of RSI students cover the full breadth of rehabilitation sciences and the 70 RSI faculty members are distributed throughout the University of Toronto, including teaching hospitals and research institutes. The program has 5 recognized fields: Movement Science; Occupational Science; Rehabilitation Health Services Studies; Rehabilitation Technology Sciences; and Social & Cognitive Rehabilitation Sciences.