

Biochemistry Graduate Courses

2026–2027 Academic Year

Registration notes

- Course offerings are subject to change. Courses with fewer than five registered students may be cancelled due to insufficient enrolment.
- Biochemistry 9552 runs continuously over the Fall and Winter terms. Students must enrol in the Fall term to continue in the Winter term and receive course credit; Winter-only registration is not available.

Fall 2026 Course Offerings

BIOCHEM 9511: Systems and Synthetic Biology

0.25 credit

This course examines the latest developments in synthetic biology, a broad field focused on making biology easier to engineer. Advances in chemistry, biology, computer science, and engineering have positioned synthetic biology at the forefront of new developments in medicine, energy, and the environment. Emerging areas will be considered in the context of the Human Genome Project–Write, with emphasis on genome synthesis and assembly, DNA storage (information and biological function), DNA delivery (genome transplantation), DNA editing (including CRISPR), and ethics.

BIOCHEM 9552: Quantitative Approaches in the Biomedical Sciences

0.5 credit · Fall and Winter

Quantitative approaches are now used throughout biomedical research, and training in advanced statistics, computation, and data science has become increasingly important for modern research programs. This course provides Biochemistry graduate students with an efficient introduction to quantitative tools and techniques relevant to their research, regardless of prior training. Topics include programming, software development, permutation and randomization testing, stochastic modelling, machine learning, artificial intelligence, generative modelling, data cleaning, and visualization.

BIOCHEM 9703: Chemical Biology

0.25 credit

This course begins with a broad overview of chemical biology, with special emphasis on protein synthesis using non-canonical amino acids, the use of small molecules to probe cellular functions and protein–protein interactions, and chemical-genetic approaches to drug discovery. Following the lectures, each student will lead a journal club and discussion session. Students will also write a one-page News & Views article on an area of chemical biology.

MEDSCI 9506: Data Science

0.25 credit

Data science is an increasingly important tool for integrating the large and heterogeneous datasets generated in biomedical and clinical settings. This learning block provides a foundational understanding of the role of data science in research design, data collection, analysis, interpretation, and the communication of findings to diverse audiences. Students will explore the ethical and legal implications of data privacy, security, and storage in the context of big data, artificial intelligence, and open science. The course also considers the potential of data science skills and tools to advance research while supporting the responsible conduct of research.

Winter 2027 Course Offerings

BIOCHEM 9501: Scientific Writing

0.25 credit

This course prepares students to write scientific documents such as abstracts, manuscripts, and grant applications. Students are expected to participate actively in critiques of writing samples provided by the instructors and to create writing samples for in-class assignments.

Course sections:

- Mechanics and style of writing, including punctuation, word usage, and effective sentences and paragraphs (Session 1)
- Scientific writing, including editing, writing for a lay audience, and creating a scientific paper (Sessions 2–5)
- Career choices and the development of effective CVs (Session 6)

BIOCHEM 9510: Protein Structure Determination: Theory, Practice, Analysis and Validation (NMR Spectroscopy Emphasis)

0.25 credit

This course is intended for students who use X-ray and/or NMR structures in their work. It provides a deeper understanding of structure-determination methods and a more comprehensive knowledge of how to analyze and validate structures in the Protein Data Bank. Approximately 40% of the course covers the theory and fundamentals of experimental structure determination by X-ray crystallography (9509S) or NMR spectroscopy (9510S); the two courses are offered in alternate years. Practical topics include protein preparation, data collection and analysis, structure solution, and refinement. The remaining content addresses the use of both NMR- and X-ray-derived structures, including chemical restraints, structure quality and reliability, problem areas or ambiguities, and comparison of related structures. Complementary methods may include homology modelling, CD spectroscopy, calorimetry, X-ray and/or light scattering, and analytical ultracentrifugation.

BIOCHEM 9516: Cancer Biology (Precision Oncology)

0.25 credit

This course examines the biochemical and mechanistic basis underlying the development and application of molecular-targeted therapies for precision cancer medicine. Proven examples and emerging approaches will be highlighted, with a central focus on signal-transduction pathways, including protein kinases, and strategies for targeting these pathways in cancer treatment. Following an introductory lecture, students will lead journal club and discussion sessions based on the primary literature. Students will also complete a knowledge translation assignment comprising a News & Views article, a press release, and an invention disclosure based on a recent advance in the field, along with a short presentation.

BIOCHEM 9549: High-Throughput Transcriptomics: Technologies and Data Interpretation

0.5 credit

This course provides the foundational knowledge required to use state-of-the-art transcriptomic technologies and available datasets. Topics include current technologies, experimental-design considerations, access to publicly available data, and the analysis and interpretation of results. The course is suitable for life sciences students who generate or use transcriptomic data in their projects, as well as students with backgrounds in statistics, mathematics, computer science, or engineering who are interested in developing new methods for transcriptomic data analysis.

BIOCHEM 9552: Quantitative Approaches in the Biomedical Sciences

0.5 credit · Continuation from Fall

Quantitative approaches are now used throughout biomedical research, and training in advanced statistics, computation, and data science has become increasingly important for modern research programs. This course provides Biochemistry graduate students with an efficient introduction to quantitative tools and techniques relevant to their research, regardless of prior training. Topics include programming, software development, permutation and randomization testing, stochastic modelling, machine learning, artificial intelligence, generative modelling, data cleaning, and visualization.