

Biomedical Science

Director

- Prabhat Goswami

Graduate degrees: MS in biomedical science; PhD in biomedical science

Website: <https://biomed.medicine.uiowa.edu/>

The University of Iowa Biomedical Science Program is a first-year umbrella program that provides students the opportunity to explore multiple disciplines prior to affiliating with one of seven PhD programs.

The first year curriculum is tailored to enhance a student's education goals for the PhD program(s) in which they are most interested. Students choose from more than 280 laboratories for three different research rotations. At the end of the first year, students select their thesis laboratory and graduate program. Successful completion culminates with a PhD in biomedical science and affiliation with a respective subprogram.

Students select from one of seven subprograms:

- cancer biology;
- cell and developmental biology;
- experimental pathology;
- free radical and radiation biology;
- molecular medicine;
- molecular physiology and biophysics; or
- pharmacology.

Visit the Biomedical Science Program website for more information.

Programs

Graduate Programs of Study

Majors

- Master of Science in Biomedical Science
- Doctor of Philosophy in Biomedical Science

Admission

The Biomedical Science Program is sufficiently flexible to accommodate students with a relatively wide range of backgrounds. Students with a bachelor's degree in any of the biological, biochemical, engineering, or physical sciences who have a strong desire to pursue a research-oriented career are encouraged to apply. Students must have:

- a bachelor's degree from a regionally accredited American college or university or an equivalent degree from another country as determined by the Office of Admissions; and
- a minimum grade-point average of 3.00 or higher or the equivalent from another country as determined by the Office of Admissions.

Facilities

Biomedical science researchers benefit from state-of-the-art core research facilities and research support facilities. Much of the research is interdisciplinary, with collaborations coordinated through major research centers, institutes, and

programs. The main biomedical research campus consists of over half a million square feet in seven buildings that connect directly with University of Iowa Health Care through tunnels and skywalks. The interconnectedness of the campus facilitates basic and translational collaboration across the entire college.

Financial Support

Students receive stipend and tuition support. Continued support beyond the first year is guaranteed, provided that satisfactory progress toward degree completion is accomplished. Sources of support include departmental funds, training grants, research grants, and individual fellowships. Several offices on campus provide support for graduate trainees seeking to obtain prestigious fellowship awards to support their training.

Career Advancement

The Biomedical Science Program prepares students for successful careers as researchers, educators, and future leaders in the international biomedical workforce. The core biomedical science curriculum has elements that highlight career diversity for PhD students and professional development for scientific careers. In addition, the Grad Success Center in the Graduate College provides opportunities for further development and one-on-one guidance for those searching for jobs and navigating pathways into scientific careers.

Courses

- Biomedical Science Courses [p. 1]
- Cancer Biology Courses [p. 2]

Biomedical Science Courses

BMED:5207 Principles of Molecular and Cellular Biology **3 s.h.**

Structure of DNA, RNA, and Protein; DNA replication, genetic and epigenetic regulation; RNA production and processing; protein production and post-translation modification; cellular membranes and trafficking; cytoskeleton and regulation of cell junctions and migration; signal transduction and regulation of cell cycle and apoptosis; didactic lectures and group discussion of primary research publications.

BMED:5208 Topics in Principles of Molecular and Cellular Biology **1 s.h.**

Research literature discussion that parallels subjects discussed in BMED:5207. Corequisites: BMED:5207.

BMED:7270 Scholarly Integrity/Responsible Conduct of Research I **0 s.h.**

Training in principles of scholarly integrity and the responsible conduct of research; facilitated discussions of case studies; student/mentor responsibilities in pursuit of scholarly work (ownership, authorship, plagiarism/falsification/fabrication of data); student/mentor relationships and intellectual dialogues (communication, collaboration, grievance management); student responsibilities to institution/scholarly community/society (intellectual property, conflict of interest, fiscal responsibilities, protection of human/animal subjects). Requirements: successful completion of CITI online training (greater than 80% score for each module) and enrollment in Graduate College degree-seeking program. Recommendations: minimum first-year graduate standing (PhD, MS/MA), and involvement in mentored research activities (extramurally or intramurally funded).

BMED:7271 Scholarly Integrity/Responsible Conduct of Research II **0 s.h.**

Training in principles of scholarly integrity and the responsible conduct of research; facilitated discussions of case studies; student/mentor responsibilities in pursuit of scholarly work (ownership, authorship, plagiarism/falsification/fabrication of data); student/mentor relationships and intellectual dialogues (communication, collaboration, grievance management); student responsibilities to institution/scholarly community/society (intellectual property, conflict of interest, fiscal responsibilities, protection of human/animal subjects). Requirements: successful completion of CITI online training (greater than 80% score for each module) and enrollment in Graduate College degree-seeking program. Recommendations: minimum of first-year graduate standing (PhD, MS/MA) and involvement in mentored research activities (extramurally or intramurally funded).

BMED:7604 Scholarly Integrity/Responsible Conduct of Research I **0 s.h.**

Training in principles of scholarly integrity and the responsible conduct of research; facilitated discussions of case studies; student/mentor responsibilities in pursuit of scholarly work (ownership, authorship, plagiarism/falsification/fabrication of data); student/mentor relationships and intellectual dialogues (communication, collaboration, grievance management); student responsibilities to institution/scholarly community/society (intellectual property, conflict of interest, fiscal responsibilities, protection of human/animal subjects); meets responsible conduct of research training obligation for postdocs and faculty holding an NIH K award. Requirements: successful completion of CITI online training (greater than 80% score for each module).

BMED:7605 Scholarly Integrity/Responsible Conduct of Research II **0 s.h.**

Training in principles of scholarly integrity and the responsible conduct of research; facilitated discussions of case studies; student/mentor responsibilities in pursuit of scholarly work (ownership, authorship, plagiarism/falsification/fabrication of data); student/mentor relationships and intellectual dialogues (communication, collaboration, grievance management); student responsibilities to institution/scholarly community/society (intellectual property, conflict of interest, fiscal responsibilities, protection of human/animal subjects); meets responsible conduct of research training obligation for postdocs and faculty holding an NIH K award. Requirements: successful completion of CITI online training (greater than 80% score for each module).

BMED:7777 Biomedical Science Seminar **1 s.h.**

Foundational professional development in writing and oral presentation skills; presentations from local and visiting professors focusing on career pathways for biomedical scientists; students practice presenting their research in rotation presentations with detailed feedback.

BMED:7888 Biomedical Science Research **arr.**

Research experience in biomedical science graduate program faculty member's lab; students rotate in three labs during their first year to provide a range of biomedical research experience before choosing a dissertation research mentor.

Cancer Biology Courses

CBIO:3310 Practical Data Science and Bioinformatics **3 s.h.**

Understanding how to access large biological data sets and use them to answer biological questions is an important skill for researchers; immersive introduction to computational handling of data; how to access and analyze publicly available data; critically evaluate data quality and analysis in context of measuring gene expression; basic coding in R/RStudio, plotting and data display, fitting and regression, statistical inference, statistical models, downloading and data wrangling; basic introduction to machine learning (clustering); for students with no computational background. Prerequisites: BIOL:1411 with a minimum grade of C- and BIOL:1412 with a minimum grade of C-. Requirements: college algebra. Recommendations: BMB:3110, or BMB:3120 and BMB:3130, or other upper-level life sciences courses. Same as BMB:3310, MMED:3310.

CBIO:5500 Topics in Cancer Biology **1 s.h.**

Discussion and presentation of new scientific literature in cancer biology fields; how to evaluate and critically interpret scientific literature, data, and conclusions; journal club format. Requirements: admission to cancer biology graduate program.

CBIO:6000 Seminar: Cancer Research **1 s.h.**

Attendance at seminar presentations of cutting-edge science in the field of cancer biology; presentations by experts in the field and trainees. Requirements: admission to cancer biology graduate program.

CBIO:6500 Research in Cancer Biology **arr.**

Research experience through research rotations and conduction of dissertation research in cancer research laboratories. Requirements: admission to cancer biology graduate program.

CBIO:7000 Clinical Connections **1 s.h.**

Shadowing experiences arranged with clinicians who are treating cancer patients at University of Iowa Health Care. Requirements: admission to cancer biology graduate program.

CBIO:7001 Molecular and Cellular Biology of Cancer **3 s.h.**

Fundamental aspects of oncology at cellular and molecular levels; mechanisms of cancer initiation and progression, oncogene action, DNA damage and repair, carcinogenesis by radiation, chemicals, viruses; tumor immunology, anticancer therapies. Offered spring semesters. Prerequisites: BMED:5207. Requirements: strong basic science background. Same as FRRB:7001, PATH:7001.

CBIO:7500 Crafting a Scientific Proposal **1 s.h.**

Training in areas of scientific writing and development of a scientific proposal; students develop a proposal related to, but not identical to, the proposal for the comprehensive exam. Requirements: admission to cancer biology program.