

# Biomedical Science, MS

## Learning Outcomes

Students will:

- demonstrate expertise in foundational aspects of molecular and cellular biology, particularly in a human biomedical context;
- develop hypotheses and experimental methods that can be used to explore questions in molecular biology;
- apply knowledge of biomedical science to human disease through translational research paradigms;
- describe fundamental techniques, statistical methods, and core principles of rigor and reproducibility in biomedical science;
- describe the range of career pathways in the sciences for the biomedical PhD;
- develop proficiency in reading and interpreting scientific literature; and
- develop skills in written and oral communication of scientific work.

## Cancer Biology

Students will:

- master foundational knowledge in cancer biology and demonstrate in-depth knowledge in their area of emphasis;
- understand and apply the scientific method, design experiments, and conduct research utilizing team-based collaboration, knowledge of current literature, and current laboratory methods;
- gain an appreciation of clinical management and therapeutic approaches to treat cancer;
- develop advanced skills in scientific writing and oral presentations in order to effectively communicate research progress and goals;
- exhibit and foster the highest ethical standards in the areas of education, publication, and scientific inquiry; and
- publish at least one first-author paper and write a grant application.

## Cell and Developmental Biology

Students will:

- master foundational knowledge in cellular and developmental biology;
- engage in designing and executing experiments to test scientific hypotheses;
- critically evaluate scientific findings;
- communicate scientific findings effectively to diverse audiences;
- exhibit and foster ethics in the areas of education, publication, and scientific inquiry; and
- become an effective teacher of the biological sciences.

## Molecular Medicine

Students will gain knowledge in:

- tracks for specialized coursework—demonstrate broad-based understanding of one of three tracks selected

by students in their second year of studies (metabolic disorders, cardiovascular biology, or molecular and cellular medicine);

- oral and written presentation of scientific data—demonstrate proficiency in scientific writing as evidenced by external fellowship application requirement; organize, defend, and communicate ideas effectively in scientific oral presentations and settings; opportunities to present posters, full-length seminar presentations, short-form data blitzes, lay audience elevator pitches; comprehensive exam; on-topic or off-topic NRSA-style research proposal that is orally defended to a comprehensive exam committee comprised of subject-matter experts; scientific editing and research communication core; and service promoted to students to get one-on-one instruction in scientific editing, focused especially on grant writing;
- experimental design—instruction on experiment design provided by their mentor, experiences in the critical thinking course, and in the basic biostatistics and experimental design course;
- proficiency in research—three laboratory rotations before affiliating to a lab, conduct research in a responsible and ethical manner, carry out an in-depth research project, and contribute intellectually and technically to all parts of its development, execution, and analysis; and
- professional skills development—journal clubs, a course in critical thinking, and career development series.

## Molecular Physiology and Biophysics

Students will:

- acquire knowledge and respect for principles of biomedical research ethics.
- demonstrate a basic knowledge of physiology and biophysics that will serve as the foundation for the student's academic, scholarly, and research endeavors;
- exhibit the necessary practical, methodological, and technical expertise to perform original experimental work in an area of physiological research;
- gain professional skills required for successful academic or research-based careers, including skills in publishing, grant writing, presentation, and teaching; and
- acquire knowledge and respect for principles of biomedical research ethics.