

MOLECULAR BIOSCIENCE (M.S.)

Seton Hall University embraces the principle that effective and meaningful assessment is an integral part of the educational process. This principle is at the heart of our commitment to meeting our responsibilities to our students, professions, and the communities that we serve.

University Assessment Site » (<https://www.shu.edu/assessment/>)

The Master of Science (M.S.) Program (p. 1) in the Department of Biological Sciences offers a challenging and current curriculum in the field of biological sciences. The program engages a diverse and responsive faculty with excellent teaching skills and scholarship activities. The program integrates rigorous academic coursework, research opportunities, and professional development activities to prepare students for careers in science, industry, and academia. The M.S. program offers a M.S. in Molecular Biosciences (p. 1), with the option of concentrations in Neuroscience (<http://catalogue.shu.edu/graduate/college-arts-sciences/department-biological-sciences/molecular-biosciences-neuroscience-ms/>) or Microbiology (<http://catalogue.shu.edu/graduate/college-arts-sciences/department-biological-sciences/molecular-biosciences-microbiology-ms/>), or a minor in Business Administration (<http://catalogue.shu.edu/graduate/college-arts-sciences/department-biological-sciences/molecular-biosciences-business-minor-ms/>).

Program Goals and Objectives

Goal 1: Expand Student Knowledge in the Field of Biological Sciences

Objective 1.1: Cellular and Molecular Basis of Life

Students will learn in-depth complex biological concepts at the cellular and molecular levels. Specifically, students will be able to explain the molecular basis for the form and function of cells, describe the relationship between structure and function at the cellular and molecular levels, and understand the cellular basis of physiological and developmental processes.

Objective 1.2: Research Methods and Laboratory Skills

Students will be exposed to various research techniques through coursework and independent research projects. Specifically, students will be able to select and use appropriate techniques and methodologies for research, successfully complete laboratory procedures, and abide by laboratory rules and regulations.

Objective 1.3: Integration of Acquired Knowledge and Skills

Students will develop the ability to integrate their knowledge and skills in practical and research settings. Specifically, students will demonstrate an understanding of biological systems and modern biotechnology, identify gaps and limitations in scientific knowledge, formulate hypotheses, and conduct data analysis.

Goal 2: Further Develop Skills Related to the Biological Sciences

Objective 2.1: Critical Thinking

Students will develop skills of observation and critical reading of texts and environments, interpret representations of data and models, understand hypotheses and conclusions, identify gaps in knowledge, formulate scientific questions, and recognize the synthesis of new ideas. Specifically, students will be able to identify questions that can be addressed scientifically, interpret data and draw conclusions scientifically, and demonstrate the ability to read, understand, and critically review scientific papers.

Objective 2.2: Scientific Information and Technology Literacy

Students will excel in scientific literature search, develop proficiency in accurate data collection, conduct proper calibration and use of scientific instrumentation, and develop appropriate use of scientific techniques in experimental design. Specifically, students will be able to select, use, and appropriately cite articles from primary literature for their written assignments and final thesis.

Objective 2.3: Numeracy

Students will develop the ability to reason and apply complex numerical concepts and equations in their fields of study and research while drawing relevant scientific conclusions. Specifically, students will be able to statistically analyze scientific data and use mathematical equations to predict or explain biological phenomena.

Objective 2.4: Communication

Students will communicate scientific observations, analyses, and arguments in written format typically required by their future professions. Specifically, students will be able to discuss biological processes using precise scientific terminology, prepare written or oral reports in standard scientific format using appropriate analytical tools and presentation software, present at professional societies and conferences, and answer questions from the public or their committee following or during an oral presentation.

Goal 3: Apply Knowledge and Skills of Biological Sciences to the Greater Good of Society

Objective 3.1: Opportunities and Limitations in the Application of Biological Knowledge, Skills, and Research

Students will be able to integrate scientific biological knowledge within a social, political, and/or historical context while recognizing both the potential and limitations of scientific application. Specifically, students will be able to apply scientific processes including designing and conducting experiments and examining hypotheses, place their research in a broader scientific context based on current literature, and evaluate the work of their peers.

Objective 3.2: Professional and Career Development

Students will acquire skills necessary for career advancement and lifelong learning. Specifically, students will be able to implement the knowledge, skills, and values of biological sciences into occupational pursuits, making them attractive candidates in the job market.

Degree Requirements for M.S. in Molecular Bioscience Program

In addition to the general University and College requirements for the degree, the Department of Biological Sciences requires the candidate to complete the following:

Plan A - With Research Thesis

1. Complete a total of 31 credits as follows:

Code	Title	Hours
Plan A - With Research Thesis		
<i>Required Courses</i>		
BIOL 6113	Biostatistics	3
BIOL 6231	Molecular Biology	3
BIOL 8201	Biology Sem for MS Students	1
BIOL 8202	Biol Seminar for MS Student	1
Select two: (Two thesis courses are required for the degree. However, the student may register for more than two as needed)		6
BIOL 8601	Research for MS Thesis I	
BIOL 8602	Res for Master's Thesis II	
BIOL 8603	Res for Master's Thesis III	
BIOL 8604	Res for Master's Thesis IV	
BIOL 8605	Res in Master's Thesis V	
Subtotal		14
<i>Graduate Biology Courses</i>		
17 credits in graduate biology courses; at least half of the courses must have a laboratory component. If students would like to obtain a concentration in microbiology or neuroscience, they must take 9 credits of concentration-related coursework		17
Subtotal		17
Total Hours		31

2. Research Thesis Requirements:

- Make an oral presentation of the thesis at the Graduate Biology Seminar.
- Submit an acceptable thesis based on laboratory research three months before the expected degree completion date.
- Conduct an oral defense two weeks before the expected degree completion date.

Plan B - With Library Thesis

1. Complete a total of 34 credits as follows:

Code	Title	Hours
Plan B - With Library Thesis		
<i>Required Courses</i>		
BIOL 6113	Biostatistics	3
BIOL 6231	Molecular Biology	3
BIOL 8201	Biology Sem for MS Students	1
BIOL 8202	Biol Seminar for MS Student	1
Select one: topics course		1
BIOL 7291	Select Topics - Mol Biol	
BIOL 7491	Select Topics-Microbiology	
BIOL 7493	Select Topics-Neuroscience	

Subtotal	9
<i>Graduate Biology Courses</i>	
25 credits in graduate biology courses; at least half of the courses must have a laboratory component. If students would like to obtain a concentration in microbiology or neuroscience, they must take 9 credits of concentration-related coursework.	25
Subtotal	25
Total Hours	34

2. Library Thesis Requirements:

- Prepare a library research paper in conjunction with a Selected Topics course. The Selected Topics course must be taken two semesters before the expected completion of the degree.
- Make an oral presentation of the thesis at the Graduate Biology Seminar during the last semester.

Microbiology Concentration

While completing the general M.S. Molecular Bioscience requirements, students should complete 9 credits of the coursework listed below to obtain a microbiology concentration.

Code	Title	Hours
Select three: *		
Microbiology Concentration		
BIOL 6333	Cell Culture Techniques	
BIOL 6412	Molecular Virology	
BIOL 6421	Microbial Physiology	
BIOL 6242	Immunology	
Total Hours		9

* Must take 9 credits of microbiology-related coursework:

Neuroscience Concentration

While completing the general M.S. Molecular Bioscience requirements, students should complete 9 credits of the coursework listed below to obtain a neuroscience concentration.

Code	Title	Hours
Select three: *		
Neuroscience Concentration		
BIOL 6115	Fundamentals of Neuroscience	
BIOL 6216	Recombinant DNA Technology	
BIOL 6323	Neuroendocrinology	
BIOL 6335	Methods in Neuroscience	
Total Hours		9

* Must take 9 credits of neuroscience-related coursework: