BIOLOGICAL AND BIOMEDICAL SCIENCES

The Master of Science in Biological and Biomedical Science (MSBS) degree program is directed towards students who wish to continue their education towards a pre-health graduate program (e.g. medical, dental, pharmacy), doctoral programs, or be employed in science-related jobs in academia or industry. The program will be built on core course requirements (15credits) that will cover topics such as molecular and cellular biology, research design, and statistics but will allow room to meet individual career goals in health-related programs, doctoral study, or research.

The program will be available as a traditional 2-year as well as a 4+1 bachelor's to master's program in order to maximize student opportunity. The degree will offer two different tracks to fit student needs and strength, with a total of 30 credits divided between coursework and research, depending on the track chosen. This program will be a good fit for students who enjoy conducting scientific research and/or are aiming to raise their academic standing before applying to medical or academic graduate programs, or those who desire a terminal degree to work as a researcher in academic institutions or industry.

Research Facilities

For students who choose a research track, The Department of Natural Sciences (https://umdearborn.edu/casl/departments/natural-sciences/) offers graduate students extensive access to research equipment and space. Students will have access to core facilities on the University of Michigan Ann Arbor campus. Additionally, with 31 tenure-track faculty and a number of externally and internally funded research laboratories, students will have many options in terms of research specialization and mentoring.

Admission Prerequisites

The MSBS Program anticipates that applicants have a foundation and experience in basic science and math akin to the University of Michigan-Dearborn's Biological Sciences (https://umdearborn.edu/casl/undergraduate-programs/areas-study/biological-sciences/) program. Students with undergraduate degrees not directly related to biological sciences may be admitted to the program as long as they have taken BIOL140 or an equivalent course through an accredited program and an upper-level cellular/molecular biology course and meet all other admissions guidelines. It is suggested that such students contact the graduate program coordinator for more information at umd-caslgrad@umich.edu or MSBS Program Director (Dr. John Abramyan - abramyan@umich.edu) prior to submitting an application.

2-year Application Requirements

An applicant to the program should hold a B.A. or a B.S. degree in biological sciences or related field from an accredited program with a minimum cumulative grade point average of 3.0 (on a 4.0 scale). Individuals with grades less than a 3.0 average may be considered, but should submit evidence of potential for success in the MSBS program. Standardized tests, such as GRE, are not required, however GRE scores may be substituted in place of low GPA. Students with undergraduate degrees not directly related to biological sciences may be admitted to the program as long as they have taken BIOL140 or an equivalent course through an accredited program and an upper-level cellular/molecular biology course and meet all other admissions guidelines. Students may contact the graduate program coordinator for more information at umd-caslgrad@umich.edu prior to submitting an application. A statement of purpose that clearly describes career goals and specific reasons for pursuing the MS in Biological and Biomedical Sciences program, including any potential research collaborations with faculty, is required.

Accelerated 4+1 Option Program Application Requirements

Participation in the 4+1 program is limited to students who:

- Are enrolled in an undergraduate program at UM-Dearborn
- Have completed at least 60 undergraduate credit hours
- Have earned a cumulative GPA of at least 3.25
- Are not enrolled in two undergraduate programs or in a dual-degree program in their undergraduate or graduate program.

Admission to the 4+1 program is at the discretion of the Department of Natural Sciences Graduate Committee. Students must submit a letter of recommendation from a UM-Dearborn faculty member or instructor and official transcripts.

Double Counting Credits

The 4+1 Masters program allows current UM-Dearborn undergraduate students to complete both their undergraduate degree and an M.S. in Biological and Biomedical Sciences in an accelerated format. 4+1 students can double-count a maximum of 12 credit hours of 500-level courses that are equivalent to courses in their undergraduate degree requirements. Courses eligible to be double-counted include (undergraduate equivalent noted): BCHM 580/480, BIOL 502/402, BIOL 504/BIOL/BBS404, BIOL 512/412, BIOL 552/452, BIOL 555/BIOL/MICR455, BIOL 560/460, BIOL 574/474, BIOL 576/476, MICR 505/MICR/BIOL405, PHYS 522/422, STAT 531/431. The double-counted classes appear on both the undergraduate and graduate transcripts. Students are graded based on the graduate grading scheme for all graduate courses elected. Please see the current Accelerated Masters policies (http://catalog.umd.umich.edu/academic-policies-graduate/accelerated-masters-programs/) for more information.

Students enrolled in the 4+1 program will receive 3 credits instead of 4 when they enroll in a 500-level equivalent course. Students may not double-count a course previously taken at the 400-level and assessed based on the undergraduate grading scheme.

Requirements for admitted students

Students must attain a grade of B or better in each 500-level class to be double-counted or transferred to the graduate program. Failure to do so may result in removal from the 4+1 program. A minimum cumulative GPA of 3.0 or higher is required for good academic standing and for graduation.

Plan Options

- Plan A (Research/Thesis) - Requires the undertaking of a research project under the supervision of a tenure-track faculty member as an advisor, culminating in the preparation and submission of a thesis for review and approval, and to present an oral defense of the thesis. The scope of the research topic for the thesis should be defined in such a way that a full-time student can complete the requirements for a master's degree in 12 months (or three semesters) following the completion of coursework by regularly scheduling graduate research credits. Oral defense required.
  - 30 credits: Requires 12 credits of research (6 credits of graduate independent research [BIOL599] + 6 credits of Master's Thesis

[BIOL 699]) and 18 credits of required coursework split between 15 credits of core classes and a 3 credit elective course.

- Plan B (Coursework) - Requires a minimum of 30 credits to be earned through coursework only. No oral defense required
  - 30 credits: 15 credits of core courses and 15 credits of elective courses.

Graduation Requirements

All master's degree students must complete 30 credits at the 500-course level or higher. A minimum cumulative GPA of 3.0 or higher is required for good academic standing in each term and for graduation. A course in which a grade lower than a C is earned cannot be used to fulfill degree requirements.

Requirements

Code	Title	Credit Hours
Core Courses		
BIOL 500	Graduate Seminar in Biology	3
BIOL 561	Advances in Molecular, Cellular, and Developmental Biology	3
BIOL 562	Methods in Molecular, Cellular, and Developmental Biology	3
NSCI 505	Research Design	3
STAT 530	Applied Regression Analysis	3
Elective Courses		
Select 15 credits from the following:		15
BCHM 580	Biochemical Pharmacology	
BIOL 502	Physiology of Excitable Cells	
BIOL 504	Mechanisms of Chronic Human Disease	
BIOL 512	Vertebrates	
BIOL 552	Med & Env Toxicology	
BIOL 555	Immunology	
BIOL 560	Sequence Analysis and Bioinformatics	
BIOL 574	Molecular Biology	
BIOL 576	Cancer Cell Biology	
BIOL 599	Graduate Independent Research (see Plan A Thesis Option below)	
BIOL 699	Master's Thesis (see Plan A Thesis Option below)	
MICR 505	Environmental and Public Health Microbiology	
PHYS 522	Biomedical Imaging	
STAT 531	Machine Learning and Computational Statistics	
Total Credit Hours		**30**

Two Options for a MSES Degree

- **Plan A. Thesis Option** 30 credit hours -12 credits of research (6 credits of graduate independent research [BIOL599] + 6 credits of Master's Thesis [BIOL 699]) and 18 credits of required coursework split between 15 credits of core classes and a 3 credit elective course.
- **Plan B. Coursework Option** 30 credit hours (15 credit hours core, 15 credit hours electives 500 level or above). *Not recommended for students interested in pursuing a doctoral degree.

Graduation Requirements

All master's degree students must complete 30 credits at the 500-course level or higher. A minimum cumulative GPA of 3.0 or higher is required for good academic standing in each term and for graduation. A course in which a grade lower than a C is earned cannot be used to fulfill degree requirements.

Learning Goals

1. Expand understanding of biological concepts, theories and research techniques, as well as integrate new knowledge into existing scientific frameworks.
2. Formulate appropriate questions, formulate and test hypotheses, and apply contemporary research techniques through the use of appropriate methodology and instrumentation.
3. Solve problems through evidence-based concepts using empirical data, records, and notes/documentation, while operating according to ethical standards of research practice and academic integrity.
4. Conceptualization and communication of topics of contemporary focus in the biomedical sciences to diverse constituencies in good oral, visual and written form.