

BIOMEDICAL SCIENCES (MS)

Students enrolled in MS degree programs are provided the opportunity to gain mastery of the scientific background of their discipline and their specific research problem. Such mastery is acquired from didactic instruction and individual study of the scientific literature.

The MS degree is an important component of the GSBS educational program. Although many students currently bypass the MS portion of the PhD program, the school continues to recognize the value of studies for the MS degree for some PhD students, as well as for students seeking graduate training available through individualized or specialized MS programs.

General Course Requirements

Students are required to complete a minimum of 36 credit hours of coursework to obtain the degree of the Master of Science (MS) in Biomedical Sciences. Students in a MS degree program who have completed graduate courses in the general area of biomedical sciences at another institution that were not used to earn a degree or certificate may request that the credit hours earned elsewhere be used toward the GSBS degree requirement. Approval of these requests are at the discretion of the Dean. The student must have received at least a B (if the course awards letter grades of A, B, C or F) or P (if the course was graded pass/fail) in the course to be awarded GSBS credit hours. The grades from courses taken at other institutions will not be used in the calculation of the cumulative grade point average.

Seminar Presentation Skills Training Course Requirement

MS students in Biomedical Sciences are required to register and pass the Seminar Presentation Skills Training course (GS21 1221 Seminar Presentation Skills Training) every semester they are enrolled in the degree program. The aim of this course is to

1. expose MS students to a broad range of current research topics in biomedical sciences and related fields,
2. give the students a place to practice presentations, provide positive feedback and exchange ideas among their peers, and
3. strengthen the MS community by creating a space where all MS students can come together to hear a research presentation from senior MS trainees and be able to network with other students in the program.

Note: MS students in the Biomedical Sciences program who are in their final semester and plan to register for only 1 credit hour may request a waiver from the course director and may be excused from enrolling in GS21 1221 Seminar Presentation Skills Training. Approval is granted on a case-by-case basis and requires that a petition for defense has been approved and received by the GSBS Office of Academic Affairs prior to registration.

Students enrolled in the Genetic Counseling and Medical Physics specialized MS programs are not required to register for this course.

Ethics Course Requirement

All MS students (including those completing an MS in a specialized area) are required to pass an ethics course (either GS21 1051 Ethical Dimensions of the Biomedical Sciences or GS21 1181 Biomedical Ethics for the Genetic Counselor). The aims of these courses are to provide

students with a framework to recognize, examine, and resolve ethical conflicts in their professional lives. These courses, and two online ethics modules, "Data Acquisition and Management" and "Responsible Authorship and Publication," must be completed before the student petitions for candidacy.

Petition to Candidacy for the MS Degree

A petition to candidacy for the Master of Science degree must be submitted to the Academic Standards Committee for approval. The petition consists of the program of work, the specific aims of the proposed research, the Student Acknowledgment and Pledge to adhere to the Student Code of Conduct in addition to other GSBS rules. It also requires the approval for the Advisory Committee Chair, Program Director, Dean of the Office of Academic Affairs, and the Academic Standards Committee. The program of work should indicate the courses that will be used to satisfy remaining curriculum requirements for the MS, which may include courses taken, in progress, and/or planned. Students must be admitted to candidacy before receiving credit for the first semester of *Thesis*. The petition should be submitted within one year of matriculation into the MS program. If an extension is requested, written justification must be provided to the Academic Standards Committee for its approval.

Defense of the MS Thesis

During the final semester of *Thesis*, the student must submit for approval by the Dean a form to request the defense of the MS thesis. This form, along with a one-page abstract of the research, an electronic version of the thesis for submission to anti-plagiarism software, and a PDF of the thesis for format verification must be submitted to the GSBS Office of Academic Affairs at least 14 days before the scheduled thesis defense. The Office of Academic Affairs will check to be certain that all courses included in the program of work have been completed. If all is in order, an announcement of the thesis defense will be posted in the weekly GSBS newsletter. If the program of work has not been completed, the student and the Advisory Committee will be notified and the thesis defense will not be permitted until the required courses have been completed.

Completion of the MS Requirements

The MS degree will not be issued until the student has successfully completed the following requirements:

- oral defense of the thesis
- approval of the thesis by the Advisory Committee
- submission of the unbound thesis to the GSBS Office of Academic Affairs for the Dean's signature
- receipt of all grades
- submission of completed exit forms to the Office of Academic Affairs

The MS degree will be awarded on the last day of the semester in which all requirements are completed. The student must be registered for *Thesis* in the final semester in which requirements are met.

All requirements for the MS degree must be completed within three years of matriculation into the MS program. Students that wish to register for classes beyond the three-year limit may only do so with the express, written permission of the Dean. Students admitted to the GSBS for the purpose of obtaining an MS degree and who wish to complete a PhD must reapply for admission to the PhD degree program and be selected, at the recommendation of the Admissions Committee, by the Dean. Matriculation to the PhD program is contingent upon completion of all MS requirements prior to enrolling in the PhD program.

Operating within this general framework for the MS degree in Biomedical Sciences are the individualized MS degree option and two specialized programs, Genetic Counseling and Medical Physics. All degrees awarded will be termed Masters of Science in Biomedical Sciences.

Individualized MS Degree: Biomedical Sciences

Qualified students may be admitted to the GSBS to pursue an MS degree in Biomedical Sciences or, with approval of the Program Director, in a Program area. With the advice and consent of the Advisory Committee and approval by the Dean, the student will construct a plan of study, including didactic coursework and a thesis topic appropriate to his or her particular interests. The degree can be completed in two years of full-time study, although students are permitted three years for completion of degree requirements.

Curriculum

The MS program of work must include at least:

- one credit hour of GS21 1051 Ethical Dimensions of the Biomedical Sciences,
- two online Ethics modules,
- six credit hours of GS00 1520 Research in Biomedical Science (P/F),
- six credit hours of GS00 1910 Thesis for Master of Science,
- twelve credit hours of didactic courses, graded A/F,
- one credit hour of GS21 1221 Seminar Presentation Skills Training for each semester in which the student is enrolled in the degree program – (Students in the Genetic Counseling and Medical Physics specialized programs are exempt from this requirement)
- up to eleven credit hours of additional coursework to achieve a cumulative of 36 total credit hours.

The majority (over 50%) of the 12 credit hours of graded coursework and the 36 total credit hours, plus the majority of any additional coursework required by the Academic Standards Committee or the student's Advisory Committee, must be taken in residence at the GSBS.

MS Thesis

Laboratory studies provide opportunities to gain technical facility with the methods required for investigation. In view of the wide range of fields of knowledge in which the MS degree is awarded, it is not feasible to set specific requirements for this degree.

The preparation of the MS thesis should provide the student with an:

- in depth understanding of the field of study,
- experience in formulating a research problem within the framework of contemporary knowledge,
- ability to present the rationale for the technical approach to be taken in solving the problem,
- ability to present valid and reproducible results obtained by the application of methodology appropriate to the problem,
- and capability to formulate a coherent analysis of the results and the conclusions drawn from this analysis.

The acquisition of technical expertise should be the major objective of students at the MS degree level, and the MS thesis should demonstrate

the student's mastery of the knowledge and technology required for the solution of the research problem. While studies at the MS level may place less emphasis than those at the PhD level on the scope and magnitude of the intellectual contribution, the MS thesis should demonstrate the student's creativity and critical thinking in the solution of a scientific problem. The thesis should be an original document written by the student.