

BIOMEDICAL SCIENCES, M.S.

The Biomedical Science Graduate Program at the University of South Carolina School of Medicine offers a two year course of graduate study and significant research opportunities leading to the Master of Science (MS) degree with a major in biomedical science. Students have the option in this degree program of electing to complete a research-based thesis project or a non-thesis, coursework based program of study. Biomedical science is a multidisciplinary field of study aimed at advancing our knowledge of human disease. Scientists working in the USC SOM Biomedical Science program have diverse interests ranging from the study of molecular and cellular processes to the study of organ systems and whole organism functions. This interdisciplinary program prepares students for careers in biomedical fields including research positions in academia and industry. The MS degree is also ideal for students seeking advanced preparation for entry into professional (medical, dental, veterinary) schools. The program provides a broad foundation of knowledge in the basic medical sciences with an opportunity to focus further on a specific discipline(s) including immunology, neuroscience, cardiovascular biology, complimentary medicine and others.

The program is administered by the Biomedical Sciences Graduate Director in consultation with the Graduate Education Committee and the Biomedical Sciences Graduate Committee. These committees include faculty representatives from all of the School of Medicine Basic Science departments.

Learning Outcomes

1. Students will demonstrate an understanding of the scientific principles underlying biomedicine.
2. Students will demonstrate an understanding of responsible conduct of research and ethical issues related to biomedical research including animal use human subjects in research data management collaborative science authorship (including plagiarism) conflicts of interest and peer review.
3. Students will obtain entry into desired professional schools (medical, dental, graduate, etc) or obtain desired employment in the biomedical field following graduation from the School of Medicine Biomedical Sciences MS program. While this outcome does not directly assess student knowledge or appropriateness of the curriculum it is an important measure of program success.

Curriculum

The two year curriculum presents multiple training components designed to prepare students for a career in biomedical fields. In the first year of the two year program, there is a core of basic medical science courses together with multidisciplinary laboratory courses on research methods, facilities, and major equipment. These must be passed with a B average. The student will also participate in the Biomedical Sciences seminar programs that are designed to expose the student to modern, cutting-edge research in diverse biomedical areas.

In the second year, the MS student finishes required courses and performs research with a selected mentor. This can either be laboratory research or library research. The former leads to a thesis based upon a research hypothesis and data generated by the student. It is hoped that data generated by the student will also lead to the publication of research paper(s). The library-based research program requires the student to conduct an extensive literature review focused on a

specific topic of interest. This leads to a thesis reviewing published literature and addressing current deficiencies in the area. It is hoped that this will culminate in the publication of a review paper by the student-mentor team. Opportunities for laboratory or library research are in such current areas of interest as cancer, reproductive biology, biodefense, complementary medicine, immunology, cell and molecular biology, neuroscience, microbiology, vision science, developmental biology, cardiovascular biology, AIDS and many more specialties. A detailed description of research activities within the biomedical science program may be found at the School of Medicine web site: <http://www.med.sc.edu>.

Admission Standards

An applicant must have a baccalaureate degree or its equivalent from an accredited college or university. Undergraduate courses should include two semesters each of biology, physics, inorganic chemistry, and organic chemistry as well as some math (preferably through calculus).

Admission is determined by the Dean of The Graduate School after recommendation by the Director of the Biomedical Science Graduate Program and the Biomedical Science Graduate Advisory Committee. Criteria examined include an appraisal of courses taken, grades achieved, letters of recommendation, research experience, and the student's statement of purpose for graduate study. Applicants may designate a preferred academic specialization, but, because of the interdisciplinary nature of biomedical research, applications are reviewed by all departmental directors.

A GPA average of 3.00 or better is required in both the major and overall.

Application Information

Inquiries concerning admission and requests for printed program information should be directed to:

School of Medicine Office of Graduate Studies
University of South Carolina
Columbia, SC 29208
telephone: 803-216-3321
e-mail: biomedicalsciences@uscmed.sc.edu

Degree Requirements (32 Hours)

Thesis Based MS Option

The MS degree in Biomedical Sciences requires the completion of a series of core courses in basic biomedical topics as well as elective courses in focused areas. The MS degree in Biomedical Science requires at least 32 graduate credit hours. For students electing to engage in research and complete a thesis as part of their degree, no more than 6 hours combined of research (BMSC 780, MCBA 780, MBIM 780 or PPHH 780) and thesis preparation (BMSC 799) may be applied to the required 32 hours. However, students completing a thesis must take at least 1 hour of thesis preparation (BMSC 799) as part of the six research/thesis preparation hours. Of the 32 credit hours, at least 50 percent must be in courses numbered 700 or above, exclusive of thesis preparation credit. Not more than 6 hours of independent study, special topics, or directed research other than thesis research are permitted, unless justified by the program of study and approved by the Dean of the Graduate School. The remainder of the requirements may include courses numbered from 500 to 699 taken for graduate credit. As many as 12 hours of study may be taken in USC schools and colleges other than the School of Medicine; this option provides great flexibility to individually tailor programs and draw on the wider resources of a comprehensive

university. The remaining hours should be from courses within the Biomedical Sciences graduate program.

The curriculum consists of required core courses in the basic medical sciences and additional elective courses that depend upon the interest and career goals of the student.

Core Courses

Include the following:

Course	Title	Credits
Select one of the following:		3-4
BMSC 707	Biochemistry for the Biomedical Sciences	
BMSC 754	Biomedical Biochemistry I	
BIOL 717	Biological Chemistry	
BMSC 700	Introduction to Biomedical Research	1
or BMSC 703	Communication Skills for Pre-Health Professions: Basics and Practice	
BMSC 706	Responsible Conduct of Biomedical Research	2
BMSC 801	Seminar in Biomedical Science	2
Select one of the following:		3-4
BMSC 702	Medical Cell Biology I	
BMSC 708	Human Cell and Molecular Biology for Biomedical Sciences	
BIOL 714	Advanced Cell Biology	
Total Credit Hours		11-13

Comprehensive Assessment # Students will demonstrate their ability to synthesize and integrate knowledge across the biomedical discipline via writing and oral defense of the thesis. While focused on a specific biomedical research topic, the thesis will incorporate ideas that span the biomedical field. Likewise, the thesis defense will address topics and issues that span the biomedical sciences including ethical issues in biomedical research. The thesis and defense thereof will be evaluated by the student's MS Advisory Committee.

Non-Thesis Option

Students who elect to pursue the Biomedical Sciences MS degree non-thesis option are required to complete the core course work outlined for the thesis option, but in lieu of 6 hours of research credit take an additional 6 hours of course work to better prepare them for their ultimate career goals. This track requires at least 32 graduate credit hours. Of the 32 credit hours, at least 50 percent must be in courses numbered 700 or above. Not more than 6 hours of independent study or special topics are permitted, unless justified by the program of study and approved by the Dean of the Graduate School. The remainder of the requirements may include courses numbered from 500 to 699 taken for graduate credit. As many as 12 hours of study may be taken in USC schools and colleges other than the School of Medicine; this option provides great flexibility to individually tailor programs and draw on the wider resources of a comprehensive university. The remaining hours should be from courses within the Biomedical Sciences graduate program.

Comprehensive Assessment # Since individuals pursuing the non-thesis option do not write a thesis, these students will demonstrate their mastery of basic science concepts through the completion of a comprehensive exam given at the end of their course work. This exam will be assembled and evaluated by the student's MS Advisory Committee

and should reflect the course work completed during the student's program of study.

Health Professional Sciences Concentration

This concentration provides further curriculum focus in content areas needed for health professionals and is ideal for students pursuing a non-thesis MS degree. In addition to the core classes required for the non-thesis MS degree, individuals pursuing this concentration must complete the following elective course work as part of the required 32 hours.

Course	Title	Credits
MBIM 710	Basic and Clinical Immunobiology	3
PHPH 701	Physiology for Health Sciences	6
Select two of the following:		
BMSC 740	Human Anatomy for Health Sciences	6
PATH 711	Experimental Pathology	3
BIOL 530	Histology	4

Applied Biotechnology Concentration (12 hours)

This concentration provides hands-on training on a range of techniques and instrumentation currently used in basic research in pharmaceutical laboratories, biotech companies, and biomedical research laboratories.

It is ideal for students pursuing a thesis MS degree. In addition to the core classes required for the MS degree, individuals pursuing this concentration must complete the following elective coursework as part of the required 32 hours.

Course	Title	Credits
MCBA 740	Biological Microscopic Imaging	3
MCBA 741	Molecular Imaging Methods of Biomedical Research	3
MCBA 742	Biological Micro Imaging II	3
MCBA 743	Molecular Imaging Methods in Biomedical Research II	3
MCBA 720	Special Topics in Microscopic Anatomy	1
BIOS 700	Introduction to Biostatistics	3
BMSC 780	Biomedical Research	5
BMSC 799	Thesis Preparation	1