

Multidisciplinary Biomedical Science

If you're interested in careers in research science, scientific policy, science communication, science education, biomedical sales, and more, the Masters of Science in Multidisciplinary Biomedical Sciences might be for you. This program is intended for domestic and international students that have some undergraduate STEM field training and wish to increase their knowledge of basic medical sciences.

Admissions Requirements

Direct-admittance to the MSMBS program requires a minimum 3.0 GPA overall, and a minimum 3.0 GPA in at least two of following courses at the 200 level or above: Biochemistry, Cell Biology, Genetics, Developmental Biology, Molecular Biology, Organic Chemistry, or Physiology. GRE is not required. The minimum TOEFL score is 80.

Students are required to submit their transcripts, a personal statement, and three letters of recommendation. Once these materials are received and the application fee is processed, applications will be reviewed.

Accelerated Learning Opportunities

Accelerated Bachelors/Masters (ABM)

Multidisciplinary Biomedical Sciences offers an Accelerated Bachelors/Masters (ABM) (<http://catalog.uab.edu/graduate/admission/#text>) option for high-achieving undergraduate students. The following courses are approved for shared credit for students pursuing an ABM in MBS: PY 687, PY 693, BY 626, BY 629, BY 637, BY 655, BY 656, BY 668, BY 674, MBS 612, NBL 610, GGSC 610, GGSC 691, GRD 617, MBS 611, GGSC 620, GGSC 690, PY 653, NBL 625, NBL 633, EPI 600, BY 540, BY 511, BY 696, BY 501, BY 605, BY 618, BY 633, BY 634, BY 637, BY 640, BY 675, BY 611.

Early Acceptance

Early Acceptance Programs are designed for academically superior high-school students. Early Acceptance Programs allow high achieving students to be admitted to the MBS program at the same time they are admitted to an undergraduate program.

Eligible students are required to maintain a 3.5 undergraduate GPA and complete the following pre-requisite courses: BY 123, BY 124, CH 237 (with labs).

The following courses are recommended for Early Acceptance students, but not required: BY 116, BY 210, BY 311, BY 330, CH 460.

Deadlines

- **Fall:** August 1
- **Spring:** December 1
- **Summer:** May 1

Careers

The MSMBS is intended as a terminal degree for students desiring many disparate career paths, including but not limited to: research scientists, scientific policy, science communication, science education, biomedical sales, and further graduate study.

M.S. in Multidisciplinary Biomedical Science

The MS in Multidisciplinary Biomedical Science (MBS) is intended as a terminal degree for students desiring many different career paths, including but not limited to: research (laboratory jobs in academia or industry), further graduate study (e.g. PhD), professional school (e.g. medical or dental), science education, scientific policy, science communication, or biomedical sales.

Thesis (Plan I)

The Plan I MS in MBS thesis degree at UAB can be completed over the course of five semesters if full-time, including at least one summer semester. Plan I students will complete a rigorous mentored research project in addition to a curriculum of required core and elective classes related to the biomedical sciences.

Successful completion of the Plan I MS in MBS degree requires passing 45 credit hours (30 hours = coursework; 15 hours = supervised research) and maintaining a minimum 3.0 GPA.

Coursework

Plan I students must complete the following required classes: 1) core science (MBS 601 (4 hours), 602 (4 hours), 603 (4 hours), 12 hours total); 2) critical thinking (GRD 617, 3 hours); 3) biostatistics (BST 603, 3 hours) or equivalent with permission; 4) three semesters of colloquium (MBS 697 (1 hour), 3 hours total); 5) three-four semesters of non-thesis research (MBS 698 (3 hours), 9-12 hours total); 6) one-two semesters of thesis research (MBS 699, 3-6 hours total); and 7) electives (9 hours total). Students have the option of earning a concentration by completing their elective credit hours in a single subject area. Students must obtain a minimum C final grade in all required (non-elective) classes in order to graduate.

Research

Plan I students must complete five separate semesters of research, including three-four semesters of MBS 698 (non-thesis research) and one-two semesters of MBS 699 (thesis research, at least one semester is required). When registered for MBS 698 or MBS 699, students are expected to work on average a minimum of 12-15 hours/week on their research projects. Students are expected to have chosen a faculty thesis adviser early in the first semester they are registered for MBS 698. Plan I students will form a committee of three faculty that is chaired by their thesis adviser and are required to hold a minimum of three committee meetings (1: introductory; 2: qualifying exam; 3: thesis defense; additional meetings may be needed depending on student progress). The thesis project must be approved by the student's committee. For the qualifying exam, Plan I students are expected to prepare a 4-6 page "NIH-style" grant proposal of their research project and present this to their committee. Plan I students are also required to subsequently complete a thesis document of their research findings and defend this to their committee. Research projects performed by Plan I students should be able to be completed within 5 semesters. Before students can perform research they must complete all lab-specific safety training. Students must also complete Responsible Conduct of Research (RCR) training for MS students before the end of their first semester registered for MBS 698.

Requirements		Hours
MBS 601	Molecular and Cell Biology	4
MBS 603	General Human Physiology	4
MBS 602	Biochemistry and Cell Biology	4
MBS 697	Colloquium in Biomedical Science	3
GRD 617	Critical Thinking and Scientific Integrity for Masters Students	3
BST 603	Introductory Biostatistics for Graduate Biomedical Sciences ¹	3
Research ²		
MBS 698	Non-Thesis Research	12
MBS 699	Thesis Research	3
Electives ^{3, 4}		
Total Hours		45

- ¹ In place of BST 603, students may take one of the following statistics courses, with permission of the Course Director and MBS Program Director: BST 601, BST 611.
- ² Students may enroll in MBS 698 for 3-4 semesters, and MBS 699 for 1-2 semesters (but a minimum of 1 semester). Total credit hours for MBS 698 and MBS 699 must equal a minimum of 15 hours. Students may take one extra semester of MBS 698 or MBS 699 in lieu of one 3 hour elective course, for a total of 18 research hours.
- ³ Students may select from the following electives: BY 501, BY 511, BY 527, BY 531, BY 540, BY 618, BY 620, BY 626, BY 629, BY 633, BY 634, BY 637, BY 640, BY 668, EPI 600, GRD 703, GRD 705, GRD 706, GRD 707, GRD 708, GRD 709, GRD 711, GRD 713, GRD 716, GRD 719, GRD 727, GRD 730, GRD 733, GRD 734, GRD 735, GRD 744, GRD 745, GRD 749, INFO 510 INFO 601, INFO 602, INFO 603, INFO 604, INFO 612, INFO 651, INFO 662, INFO 696, INFO 697, MIC 600, MIC 601, MIC 602, MIC 603, MIC 604, NBL 610, NBL 625, NBL 630, NBL 633, NBL 634, NBL 655, NBL 656, PHR 611, PHR 612, PHR 613, PHR 614, PY 653, PY 663, PY 687, PY 693. For other elective options please discuss with the MBS Program Director.
- ⁴ Students may use their 9 elective hours in one of the following themes to pursue a specialized concentrations:
Pharmacology: PHR 611, PHR 612, PHR 613, PHR 614
Neuroscience: NBL 610, NBL 625, NBL 630, NBL 633, NBL 634, NBL 655, NBL 656, PY 653, PY 663, PY 687, PY 693
Immunology: MIC 600, MIC 601, MIC 602, MIC 603, MIC 604
Genetic and Genomic Sciences (GGSC): GGSC 610, GGSC 615, GGSC 620, GGSC 635, GGSC 665, GGSC 670, GGSC 690, GGSC 691, BY 531, BY 634, BY 637
Bioinformatics: INFO 510, INFO 601, INFO 602, INFO 603, INFO 604, INFO 612, INFO 651, INFO 662, INFO 696, INFO 697

Non-Thesis (Plan II)

The Plan II MSBMS non-thesis degree at UAB can be completed over the course of three semesters if full-time, including one summer semester. Plan II students will complete a rigorous curriculum of required core and elective classes related to the biomedical sciences.

Successful completion of the Plan II MSBMS degree requires passing 30 credit hours of coursework and maintaining a minimum 3.0 GPA.

Coursework

Plan II students must complete the following required classes: 1) core science (MBS 601 (4 hours), 602 (4 hours), 603 (4 hours), 12 hours total); 2) critical thinking (GRD 617, 3 hours); 3) biostatistics (BST 603, 3 hours) or equivalent with permission; 4) colloquium (MBS 697, 1 hour); 5) skills lab (BT 650, 2 hour, OR BT 651, 2 hour) and 6) electives (9 hours total). Students have the option of earning a concentration by completing their elective credit hours in a single subject area. Students must obtain a minimum C final grade in all required (non-elective) classes in order to graduate.

Requirements		Hours
MBS 601	Molecular and Cell Biology	4
MBS 602	Biochemistry and Cell Biology	4
MBS 603	General Human Physiology	4
MBS 697	Colloquium in Biomedical Science	1
BT 650	Applications in Biotechnology I ¹	2
GRD 617	Critical Thinking and Scientific Integrity for Masters Students	3
BST 603	Introductory Biostatistics for Graduate Biomedical Sciences ²	3
Electives ^{3, 4}		
Total Hours		30

- ¹ Students may substitute BT 651 (spring semester) for BT 650 (fall semester).
- ² In place of BST 603, students may take one of the following statistics courses, with permission of the Course Director and MBS Program Director: BST 601, BST 611.
- ³ Students may select from the following electives: BY 501, BY 511, BY 527, BY 531, BY 540, BY 618, BY 620, BY 626, BY 629, BY 633, BY 634, BY 637, BY 640, BY 668, EPI 600, GRD 703, GRD 705, GRD 706, GRD 707, GRD 708, GRD 709, GRD 711, GRD 713, GRD 716, GRD 719, GRD 727, GRD 730, GRD 733, GRD 734, GRD 735, GRD 744, GRD 745, GRD 749, INFO 510 INFO 601, INFO 602, INFO 603, INFO 604, INFO 612, INFO 651, INFO 662, INFO 696, INFO 697, MBS 698, MIC 600, MIC 601, MIC 602, MIC 603, MIC 604, NBL 610, NBL 625, NBL 630, NBL 633, NBL 634, NBL 655, NBL 656, PHR 611, PHR 612, PHR 613, PHR 614, PY 653, PY 663, PY 687, PY 693. For other elective options please discuss with the MBS Program Director.
- ⁴ Students may use their 9 elective hours in one of the following themes to pursue a specialized concentrations:
Pharmacology: PHR 611, PHR 612, PHR 613, PHR 614
Neuroscience: NBL 610, NBL 625, NBL 630, NBL 633, NBL 634, NBL 655, NBL 656, PY 653, PY 663, PY 687, PY 693
Immunology: MIC 600, MIC 601, MIC 602, MIC 603, MIC 604
Genetic and Genomic Sciences (GGSC): GGSC 610, GGSC 615, GGSC 620, GGSC 635, GGSC 665, GGSC 670, GGSC 690, GGSC 691, BY 531, BY 634, BY 637
Bioinformatics: INFO 510, INFO 601, INFO 602, INFO 603, INFO 604, INFO 612, INFO 651, INFO 662, INFO 696, INFO 697

Courses

MBS 601. Molecular and Cell Biology. 4 Hours.

This course will provide a broad but rigorous overview of molecular biology. Cell structure between prokaryotes and eukaryotes will be compared and contrasted. DNA structure/organization will be discussed with respect to replication and repair mechanisms. Mendelian, non-Mendelian and chromosomal bases of genetics will also be discussed. Transcription and translation will be discussed in detail, along with their respective regulatory mechanisms. Throughout this course there will be a focus on intracellular organelles that contribute to the generation and regulation of DNA, RNA and protein. Finally, when possible, relevance to human disease will be presented and discussed.

Prerequisites: BY 124 and BY 124L

MBS 602. Biochemistry and Cell Biology. 4 Hours.

This course will cover the structure, function and metabolism of biological macromolecules including proteins, carbohydrates, lipids and nucleotides. A rigorous overview of pathways will be discussed that are important for the effective metabolism of macromolecules (e.g. glycolysis, citric acid cycle) and generation of energy for cells. The last part of this course will discuss membrane structure and function, and will provide an overview of eukaryotic cell signaling.

MBS 603. General Human Physiology. 4 Hours.

This course begins with the study of basic cell function, then proceeds to a rigorous overview of specific human organ systems.

MBS 611. Foundations of Pharmacology & Toxicology. 3 Hours.

This course will provide students with an overview of the discipline of Pharmacology or the science of the mechanism and regulation of drug action. Processes will be discussed that affect most drugs and xenobiotics including absorption, distribution, metabolism and elimination. The course will provide students with concepts that will be applicable to understanding the activity and regulation of drugs discussed in the Systems Pharmacology courses. Concepts presented in the course will be advantageous to all students in understanding therapeutic drug use or in appreciating drug use and action in many different research settings.

MBS 612. Systems Pharmacology I. 3 Hours.

This course will introduce the student to the use, mechanism of action and physiological properties of major families of drugs that affect the cardiovascular system, autonomic nervous system (ANS) and central nervous system (CNS). Lectures will provide an overview of nervous/cardiovascular system physiology as well as pathophysiology that results from various diseases, disorders and injuries. Drugs used to treat these conditions and their mechanisms of action will be described in detail. Both classical drugs and newer classes of drugs will be discussed for both their therapeutic value and also their use in different research settings. This course will be taught using a combination of traditional didactic lectures and student participation through discussion of seminal research papers and presentations. This course is a companion course to BMS 613 (Systems Pharmacology II).

MBS 613. Systems Pharmacology II. 3 Hours.

This course will introduce drug use, mechanism of action and physiological properties of major drug families, with a focus on specific organ systems (endocrine, gastrointestinal and renal systems). In addition, this course will also cover specific classes of drugs for cancer treatment specifically related to the organ systems covered in the course. This course is divided into three "modules". Each module has its own exam. In addition, there are graded student presentations at the end of the semester, topics of discussion to be determined. This course is a companion course to MBS 612 (Systems Pharmacology I).

MBS 614. Toxicology and Drug Development. 3 Hours.

This course is designed to provide students with an introduction to the field of toxicology and its association with pharmacology. This course will also provide an overview of the thought processes associated with defining drug targets and developing drug candidates. The course is separated into two modules: 1) introduction to toxicological issues associated with the drug and xenobiotic exposure; 2) introduction to the process of identifying a drug target, and developing and validating a drug that pharmacologically interacts with the target.

MBS 696. Special Topics. 1-3 Hour.

To be determined by the Program Director and prospective Course Directors.

MBS 697. Colloquium in Biomedical Science. 1 Hour.

This required colloquium course will be taught using a journal club format. Students will be taught to critically review scientific literature, while gaining effective written and oral scientific communication skills. Students working in small groups will be responsible for choosing a current biomedical research article and sharing their review of this article in a Power Point (PPT) presentation. Student audience members will be responsible for asking questions during the presentation and for submitting a review of each article in abstract form. The Course Director will provide initial instruction in the critical review, presentation and written summary of scientific literature. Topics to be covered include: critical review (background and rationale for study; identification of hypothesis; description of methods used; presentation of results and their interpretation; indicate significance of study and describe next step experiments), effective communication of research articles via Power Point presentations; and writing assignments based on articles discussed in class. When possible, scientific integrity in research will be a focus of in-class discussions.

MBS 698. Non-Thesis Research. 1-6 Hour.

Students may perform independent study in a research laboratory setting. This work may contribute toward concentration credits subject to Program Director approval.

MBS 699. Thesis Research. 1-6 Hour.

Supervised independent research.