

Multidisciplinary Biomedical Science

The MS Program in Multidisciplinary Biomedical Science (MBS) offers a rigorous curriculum in biomedical science combined with meaningful professional career development. MS MBS is intended for both domestic and international students who have some undergraduate STEM background. MS MBS offers a 30-hour non-thesis option (Plan II) that is ideal for students on the pre-health track, and a 40-hour, research-intensive thesis option (Plan I) for students interested in research-related careers.

Why MS MBS?

If you are on the pre-health track (e.g., pre-med; pre-dental; pre-PA; pre-pharmacy), you are interested in a career in biomedical research, or you are considering alternative careers (e.g., science education, scientific policy, science communication, biomedical sales), MS MBS may be the right Program for you.

Admission Requirements

To be considered for Direct Admission to MBS requires a 3.0 minimum overall GPA and successful completion of the following pre-requisites: Introductory Biology (BY 123-BY 124 if from UAB or equivalent) and Organic Chemistry (CH 235-CH 238 if from UAB or equivalent). Your pre-requisite GPA and your Biology-Chemistry-Physics-Math (or BCPM) GPAs will also be considered in our administrative review of your application. The GRE is not required. For international applicants, the minimum TOEFL and IELTS scores required for direct entry are 80 and 6.5, respectively.

Students are required to submit their transcripts, a personal statement, and two letters of recommendation (at least one is preferred from a current/former STEM teacher). Once these materials are received and the application fee is processed, applications will be reviewed in consideration of interviews.

Accelerated Learning Opportunities

MBS via the Accelerated Bachelors/Masters (ABM) Program

Multidisciplinary Biomedical Sciences offers an Accelerated Bachelors/Masters (ABM) option for high-achieving undergraduates. Distinct advantages of MBS-ABM include the use of up to 12 hours of shared credit that is applied to both your BS and MS degrees, taking graduate courses at the undergraduate tuition rate, and additional opportunities for academic advising and mentoring. The vast majority of MBS-ABM students are able to graduate with both their BS and MS degrees in 4 years, thus potentially making you more competitive for the next phase of your career trajectory. To be eligible for ABM, students must have met the following requirements prior to matriculating:

- Junior status (60 credit hours, 36 of these hours at UAB)
- Minimum 3.5 undergraduate GPA
- Completed the following pre-requisite courses: BY 123 , BY 124 , CH 235, CH 236, CH 237, and CH 238

MBS via Early Acceptance

The UAB Early Acceptance (EA) Program is designed for academically superior high-school students, allowing them to be admitted to MBS at the same time they are admitted to an undergraduate program. EA students may also utilize the ABM Program as a mechanism for admission to MBS.

Deadlines for all Applicants:

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

For More Information:

Please contact Ms. Jessamine Huffman (Program manager; msmbs@uab.edu ([jhcopcs@uab.edu](mailto:jhcopes@uab.edu))) or Dr. John Shacka (Program Director; shacka@uab.edu), or visit our website: <https://www.uab.edu/graduate/programs/msmbs>

M.S. in Multidisciplinary Biomedical Science

The M.S. Program in Multidisciplinary Biomedical Science (MS MBS) is intended for students to improve their readiness for many different career paths, including but not limited to: further graduate study (e.g., PhD programs), professional school (e.g., medical, dental, PA, pharmacy), research jobs in academia or industry, science education, scientific policy, science communication, or biomedical sales.

Thesis (Plan I) for Traditional Students

The Plan I MS in MBS thesis degree at UAB can be completed over the course of six semesters if full-time, including at least two summer semesters. 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 40 credit hours (28 hours = coursework; 12 hours = supervised research) and maintaining a minimum 3.0 GPA. Students must obtain a minimum C final grade in all required (non-elective) classes in order to graduate. However, only one C final grade is allowed among our three required core science courses - MBS 601, MBS 602, and MBS 603.

Coursework

Plan I students must complete the following required classes:

- 1) core science (MBS 601 (4 hours), MBS 602 (4 hours), MBS 603 (4 hours), 12 hours total)
- 2) biostatistics (BST 603, 3 hours) or equivalent with permission
- 3) five Colloquium courses (MBS 697 1 hour each, 5 hours total)
- 4) three-four semesters of non-thesis research (MBS 698, 6 hours total)
- 5) one-two semesters of thesis research (MBS 699, 6 hours total)
- 6) electives (8 hours total).

Students have the option of earning a concentration by completing at least nine elective credit hours in a single subject area. Note- this may require additional credit hours than are required for degree.

Research

Plan I students must complete five separate semesters of research totaling a minimum of 12 credit hours, including a minimum 6 hours of MBS 698 (non-thesis research) over three-four semesters, and a required minimum of 6 hours of MBS 699 (thesis research) over one-two semesters (at least one semester is required). When registered for MBS 698 or MBS 699, students are expected to work on average a minimum of 15-20 hours/week on their research projects. During their first semester in the program, before they start their research projects, students undergo a mentor match process to choose their faculty thesis adviser, with the expectation that this decision is made before the start of their second semester. 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 seven page "NIH-style" grant proposal, plus a separate reference section, that is adjusted to the scope of their research project, and vet their proposals in front of their committee. Students are expected to qualify for thesis candidacy by the end of their fourth semester in the Program. If there are any delays in this timeline, the student will be required to take additional credit hours of MBS 698 non-thesis research each semester, resulting in at least 7 or greater total hours of MBS 698, until they qualify for thesis candidacy. Following qualification for thesis candidacy, Plan I students are required to complete a thesis document of their research findings and defend it publicly as a presentation to their committee and others (e.g., students, lab members, family members), which is followed immediately by a private defense with their committee. Plan I students work on their research projects for five semesters, typically semesters 2-6 while in the Program. During their first semester in the program, Plan I students should register for zero hours of MBS 698, to accommodate the mentor match process. Before students begin their 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
Required MBS Coursework	20
MBS 601 Molecular and Cell Biology	
MBS 603 General Human Physiology	
MBS 602 Biochemistry and Cell Biology	
MBS 697 Colloquium for MBS Plan I Thesis Students (Must take five different sections for a total of 5 Credit Hours) ¹	
BST 603 Introductory Biostatistics for Graduate Biomedical Sciences ²	
Research³	12
MBS 698 Non-Thesis Research	
MBS 699 Thesis Research	
Electives^{4,5}	8
Total Hours	40

¹ For MBS 697 Colloquium: Students will take five distinct, 1-hour sections over the course of their plan of study, as listed below: 1) Mentor Match; 2) Journal Club; 3) Qualifying Exam Proposal; 4) Applying to Jobs or PhD Programs; 5) Thesis Defense.

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 enroll in MBS 698 (totaling 6 hours) for 4-5 semesters, and MBS 699 (totaling 6 hours) for 1-2 semesters (but a minimum of 1 semester). Total credit hours for MBS 698 and MBS 699 must equal a minimum of 12 hours. If students do not qualify for thesis candidacy after taking 6 hours of MBS 698 they will be required to take additional credit hours each semester until the semester they qualify.

⁴ Students may select from the following electives: ANTH 645, BT 650, BT 651, BY 511, BY 512, BY 527, BY 530, BY 531, BY 555, BY 595, BY 607, BY 614, BY 616, BY 617, BY 629, BY 633, BY 634, BY 636, BY 637, BY 640, BY 644, BY 647, BY 662, BY 674, BY 675, BY 677, CNBY 600, CNBY 610, CNBY 620, CNBY 625, CNBY 630, CNBY 635, CNBY 640, CNBY 645, CNBY 650, CNBY 660, CNBY 670, EPI 600, GGSC 610, GGSC 616, GGSC 620, GGSC 621, GGSC 634, GGSC 651, GGSC 691, GRD 617, GRD 709, GRD 713, GRD 735, HRP 526, INFO 601, INFO 602, INFO 603, INFO 604, INFO 610, INFO 612, INFO 662, LEAD 500, LEAD 520, LEAD 540, LEAD 580, LEAD 590, MBS 696, MENT 719, MIC 600, MIC 603, MIC 660, MIC 661, MIC 665, NBL 624, NBL 625, NBL 633, NBL 634, NBL 644, NBL 655, NBL 656, NBL 657, NBL 684, PHR 611, PHR 612, PHR 613, PHR 614, PHR 615, PHR 696, PSDO 630, PY 520, PY 620, PY 635, PY 653, PY 683, PY 687, RECM 701, RECM 707, RECM 708, RECM 722, RECM 727, RECM 739, RECM 745, RLM 706, RLM 774.

For other elective options please discuss first with the MBS Program Director before registering.

⁵ Students may choose to take three elective courses totaling at least 9 credit hours, in each of the below six areas, in pursuit of a specialized concentration. Note, obtaining a concentration is not required for our Program, and to do so students may incur an additional cost of tuition.

Bioinformatics: INFO 601, INFO 602, INFO 603, INFO 604, INFO 610, INFO 612

Cancer Biology: CNBY 600, CNBY 610, CNBY 620, CNBY 625, CNBY 630, CNBY 635, CNBY 640, CNBY 645, CNBY 650, CNBY 660, CNBY 670

Genetic and Genomic Sciences

(GGSC): GGSC 610, GGSC 616, GGSC 620,

GGSC 621, GGSC 634, GGSC 651, GGSC 691, BY 531, BY 634, BY 637

Immunology: MIC 600, MIC 603, MIC 660, MIC 661, MIC 665

Neuroscience:

NBL 624, NBL 625, NBL 633, NBL 634, NBL 644, NBL 655,

NBL 656, NBL 684, PY 635, PY 653, PY 683, PY 687

Pharmacology: PHR 611, PHR 612, PHR 613, PHR 614, PHR 615, PHR 696

Thesis (Plan I) for Accelerated Bachelor's/ Master's (ABM) Students

Undergraduates at UAB who meet qualifications for admission to the Accelerated Bachelor's/Master's (ABM) program, and/or who also received an early acceptance (EA) option for a MS program at UAB, may choose to complete the Plan I MS thesis degree in MBS. The Plan I MS in MBS ABM thesis degree at UAB can be completed over the course of five semesters, including at least one summer semester if full time. 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 40 credit hours (28 hours = coursework; 12 hours = supervised research) and maintaining a minimum 3.0 GPA. Students must obtain a minimum C final grade in all required (non-elective) classes in order to graduate.

However, only one C final grade is allowed among our three required core science courses - MBS 601, MBS 602, and MBS 603.

Coursework

Plan I students must complete the following required classes:

- 1) core science (MBS 601 (4 hours), MBS 602 (4 hours), MBS 603 (4 hours), 12 hours total)
- 2) biostatistics (BST 603, 3 hours) or equivalent with permission
- 3) four Colloquium courses (MBS 697 1 hour each, 4 hours total)
- 4) three-four semesters of non-thesis research (MBS 698, 6 hours total)
- 5) one-two semesters of thesis research (MBS 699, 6 hours total)
- 6) electives (9 hours total).

Students have the option of earning a concentration by completing at least nine elective credit hours in a single subject area. Because ABM students can share up to 12 hours of electives for both their B.S. and M.S. degrees, they may substitute one 3-hour elective for 3 hours of MBS 698, assuming they will have completed at least six hours of undergraduate research at the 300-level before graduation.

Research

Plan I ABM students must complete five separate semesters of research totaling a minimum of 12 credit hours, including a recommended 6 hours of MBS 698 (non-thesis research) over three-four semesters, and a required minimum of 6 hours of MBS 699 (thesis research) over one-two semesters (at least one semester is required). When registered for MBS 698 or MBS 699, students are expected to work on average a minimum of 15-20 hours/week on their research projects. 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 seven page "NIH-style" grant proposal, plus a separate reference section, that is adjusted to the scope of their research project, and vet their proposals in front of their committee. Students are expected to qualify for thesis candidacy by the end of their fourth semester in the Program. If there are any delays in this timeline, the student will be required to take additional credit hours of MBS 698 non-thesis research each semester, resulting in at least 7 or greater total hours of MBS 698, until they qualify for thesis candidacy. Following qualification for thesis candidacy, Plan I students are required to complete a thesis document of their research findings and defend it publicly as a presentation to their committee and others (e.g., students, lab members, family members), which is followed immediately by a private defense with their committee. Plan I students typically work on their research projects for all five semesters while they are in the program. Before students begin their 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
Required MBS Coursework	19
MBS 601 Molecular and Cell Biology	
MBS 603 General Human Physiology	
MBS 602 Biochemistry and Cell Biology	

MBS 697	Colloquium for MBS Plan I Thesis Students (Must take five different sections for a total of 5 Credit Hours) ¹	
BST 603	Introductory Biostatistics for Graduate Biomedical Sciences ²	
Research³		12
MBS 698	Non-Thesis Research	
MBS 699	Thesis Research	
Electives^{4,5,6,7}		9
Total Hours		40

¹ For MBS 697 Colloquium: Students will take four distinct, 1-hour sections over the course of their plan of study, as listed below:

- 1) Journal Club; 2) Qualifying Exam Proposal; 3) Applying to Jobs or PhD Programs; 4) Thesis Defense.

Note- it is assumed that Plan I ABM students are entering our program having matched prior with a mentor. If they are planning to match as an MBS student, they will need to take one additional section of MBS 697- the "Mentor Match" section, during their first semester in the program.

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 enroll in MBS 698 (totaling 6 hours) for 4-5 semesters, and MBS 699 (totaling 6 hours) for 1-2 semesters (but a minimum of 1 semester). Total credit hours for MBS 698 and MBS 699 must equal a minimum of 12 hours. If students do not qualify for thesis candidacy after taking 6 hours of MBS 698 they will be required to take additional credit hours each semester until the semester they qualify. In addition, as ABM students can utilize up to 12 hours of shared credit electives towards both degrees, they are allowed to replace 3 hours of MBS 698 with a 3-hour shared credit elective, assuming they will have completed at least 6 hours of undergraduate research at the 300-level before graduation.

⁴ Students may select from the following electives: ANTH 645, BT 650, BT 651, BY 511, BY 512, BY 527, BY 530, BY 531, BY 555, BY 595, BY 607, BY 614, BY 616, BY 617, BY 629, BY 633, BY 634, BY 636, BY 637, BY 640, BY 644, BY 647, BY 662, BY 674, BY 675, BY 677, CNBY 600, CNBY 610, CNBY 620, CNBY 625, CNBY 630, CNBY 635, CNBY 640, CNBY 645, CNBY 650, CNBY 660, CNBY 670, EPI 600, GGSC 610, GGSC 616, GGSC 620, GGSC 621, GGSC 634, GGSC 651, GGSC 691, GRD 617, GRD 709, GRD 713, GRD 735, HRP 526, INFO 601, INFO 602, INFO 603, INFO 604, INFO 610, INFO 612, INFO 662, LEAD 500, LEAD 520, LEAD 540, LEAD 580, LEAD 590, MBS 696, MENT 719, MIC 600, MIC 603, MIC 660, MIC 661, MIC 665, NBL 624, NBL 625, NBL 633, NBL 634, NBL 644, NBL 655, NBL 656, NBL 657, NBL 684, PHR 611, PHR 612, PHR 613, PHR 614, PHR 615, PHR 696, PSDO 630, PY 520, PY 620, PY 635, PY 653, PY 683, PY 687, RECM 701, RECM 707, RECM 708, RECM 722, RECM 727, RECM 739, RECM 745, RLM 706, RLM 774.

For other elective options please discuss first with the MBS Program Director before registering.

⁵ Students may choose to take three elective courses totaling at least 9 credit hours, in each of the below six areas, in pursuit of a specialized concentration.

Note, obtaining a concentration is not required for our Program, and to do so students may incur an additional cost of tuition. Also, as ABM students can utilize up to 12 hours of shared credit electives towards both degrees, they are allowed to replace 3 hours of MBS 698 with a 3-

hour shared credit elective, assuming they will have completed at least 6 hours of undergraduate research at the 300-level before graduation.

Bioinformatics: INFO 601, INFO 602, INFO 603, INFO 604, INFO 610, INFO 612

Cancer Biology: CNBY 600, CNBY 610, CNBY 620, CNBY 625, CNBY 630, CNBY 635, CNBY 640, CNBY 645, CNBY 650, CNBY 660, CNBY 670

Genetic and Genomic Sciences

(GGSC): GGSC 610, GGSC 616, GGSC 620, GGSC 621, GGSC 634, GGSC 651, GGSC 670, GGSC 691, BY 531, BY 634, BY 637

Immunology: MIC 600, MIC 601, MIC 602, MIC 603, MIC 604

Neuroscience:

NBL 624, NBL 625, NBL 633, NBL 634, NBL 644, NBL 657, NBL 684, PY 635, BY 607, BY 633, BY 637, BY 637

Pharmacology: PHR 611, PHR 612, PHR 613, PHR 614, PHR 615, PHR 696

⁶ Note: Only GGSC undergraduate MBS ABM students may take GGSC 670.

⁷ Note- Neuroscience ABM students may not take NBL 655 or NBL 656 since they take these courses at the 300-level.

Non-Thesis (Plan II) for Traditional MS Students

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. Students must obtain a minimum C final grade in all required (non-elective) classes in order to graduate. However, only one C final grade is allowed among our three required core science courses - MBS 601, MBS 602, and MBS 603.

Coursework

Plan II Traditional MS students must complete the following required classes:

- 1) Core Science (MBS 601 (4 hours), MBS 602 (4 hours), MBS 603(4 hours), 12 hours total)
- 2) Biostatistics (BST 603, 3 hours) or equivalent with permission
- 3) Non-Thesis Colloquium (MBS 695, 1 hour each, 2 hours total)
- 4) Biotechnology skills lab (BT 650, 2 hours, OR BT 651, 2 hours)
- 5) Electives (11 hours total). Students have the option of earning a concentration by completing at least nine of their elective credit hours in a single subject area.

Requirements		Hours
MBS 601	Molecular and Cell Biology	4
MBS 602	Biochemistry and Cell Biology	4
MBS 603	General Human Physiology	4
MBS 695	Professional Development Colloquium for Non-Thesis Students (Must take two different sections for a total of 2 Credit Hours) ¹	2
BT 650	Applications in Biotechnology I ²	2
BST 603	Introductory Biostatistics for Graduate Biomedical Sciences ³	3

Electives ^{4,5}	11
Total Hours	30

- ¹ Students are required to take two distinct sections of MBS 695: 1) Preparation for Professional School; and 2) Pre-Health Journal Club.
- ² Students may substitute BT 651 (spring semester) for BT 650 (fall semester).
- ³ 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.
- ⁴ Students may select from the following electives: ANTH 645, BY 511, BY 512, BY 527, BY 530, BY 531, BY 555, BY 595, BY 607, BY 633, BY 637, BY 637, BY 617, BY 629, BY 632, BY 633, BY 634, BY 636, BY 637, BY 640, BY 644, BY 645, BY 647, BY 648, BY 662, BY 674, BY 675, BY 677, CNBY 600, CNBY 610, CNBY 620, CNBY 625, CNBY 630, CNBY 635, CNBY 640, CNBY 645, CNBY 650, CNBY 660, CNBY 670, EPI 600, GGSC 610, GGSC 616, GGSC 620, GGSC 621, GGSC 634, GGSC 651, GGSC 691, GRD 617, GRD 709, GRD 713, GRD 735, HRP 526, INFO 601, INFO 602, INFO 603, INFO 604, INFO 610, INFO 662, LEAD 500, LEAD 520, LEAD 540, LEAD 580, LEAD 590, MBS 696, MBS 698, MENT 719, MIC 600, MIC 603, MIC 660, MIC 661, MIC 665, NBL 624, NBL 625, NBL 633, NBL 634, NBL 644, NBL 655, NBL 656, NBL 657, NBL 684, PHR 611, PHR 612, PHR 613, PHR 614, PHR 615, PHR 696, PSDO 630, PY 520, PY 620, PY 635, PY 653, PY 683, PY 687, RECM 701, RECM 707, RECM 708, RECM 722, RECM 727, RECM 739, RECM 745, RLM 706, RLM 774. For other elective options please discuss with the MBS Program Director.
- ⁵ Students may use 9 elective hours in one of the following themes to pursue a specialized concentration:

Bioinformatics: INFO 601, INFO 602, INFO 603, INFO 604, INFO 610, INFO 662

Cancer Biology: CNBY 600, CNBY 610, CNBY 620, CNBY 625, CNBY 630, CNBY 635, CNBY 640, CNBY 645, CNBY 650, CNBY 660, CNBY 670

Genetic and Genomic Sciences (GGSC): GGSC 610, GGSC 616, GGSC 620, GGSC 621, GGSC 634, GGSC 651, GGSC 691, BY 531, BY 634, BY 637

Immunology: MIC 600, MIC 603, MIC 660, MIC 661, MIC 665

Neuroscience: NBL 624, NBL 625, NBL 633, NBL 634, NBL 644, NBL 655, NBL 656, NBL 657, NBL 684, PY 635, PY 653, PY 683, PY 687,

Pharmacology: PHR 611, PHR 612, PHR 613, PHR 614, PHR 615, PHR 696

Non-Thesis (Plan II) for Accelerated Bachelor's/Master's (ABM) Program Students

Undergraduates at UAB who meet qualifications for admission the Accelerated Bachelor's/Master's (ABM) program, and/or who also received an early acceptance (EA) option for a MS program at UAB, may choose to complete the Plan II MS non-thesis degree in MBS. Plan II students will complete a rigorous curriculum of required core and elective classes related to the biomedical sciences. Up to 12 of these elective credit hours may be used as shared credit towards both their B.S. and M.S. degrees. Successful completion of the Plan II MSBMS degree requires passing 30 credit hours of coursework and maintaining a minimum 3.0 GPA. Students must obtain a minimum C final grade in all required (non-elective) classes in order to graduate. However, only one

C final grade is allowed among our three required core science courses - MBS 601, MBS 602, and MBS 603.

Coursework

Plan II Traditional MS students must complete the following required classes:

- 1) Core Science (MBS 601 (4 hours), MBS 602 (4 hours), MBS 603 (4 hours), 12 hours total)
- 2) Biostatistics (BST 603, 3 hours) or equivalent with permission
- 3) Non-Thesis Colloquium (MBS 695, 1 hour)
- 4) Electives (14 hours total). Students have the option of earning a concentration by completing at least nine of their elective credit hours in a single subject area.

Requirements		Hours
MBS 601	Molecular and Cell Biology	4
MBS 602	Biochemistry and Cell Biology	4
MBS 603	General Human Physiology	4
MBS 695	Professional Development Colloquium for Non-Thesis Students	1
BST 603	Introductory Biostatistics for Graduate Biomedical Sciences ¹	3
Electives ^{2,3,4,5}		14
Total Hours		30

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 select from the following electives:

ANTH 645, BY 511, BY 512, BY 527, BY 530, BY 531, BY 555, BY 595, BY 607, BY 614, BY 616, BY 617, BY 629, BY 632, BY 633, BY 634, BY 636, BY 637, BY 640, BY 644, BY 645, BY 647, BY 648, BY 662, BY 674, BY 675, BY 677, CNBY 600, CNBY 610, CNBY 620, CNBY 625, CNBY 630, CNBY 635, CNBY 640, CNBY 645, CNBY 650, CNBY 660, CNBY 670, EPI 600, GGSC 610, GGSC 616, GGSC 620, GGSC 621, GGSC 634, GGSC 651, GGSC 670, GGSC 691, GRD 617, GRD 709, GRD 713, GRD 735, HRP 526, INFO 601, INFO 602, INFO 603, INFO 604, INFO 610, INFO 662, LEAD 500, LEAD 520, LEAD 540, LEAD 580, LEAD 590, MBS 696, MBS 698, MENT 719, MIC 600, MIC 601, MIC 602, MIC 603, MIC 604, NBL 624, NBL 625, NBL 633, NBL 634, NBL 644, NBL 655, NBL 656, NBL 657, NBL 684, PHR 611, PHR 612, PHR 613, PHR 614, PHR 615, PSDO 630, PY 635, PY 653, PY 683, PY 687, RECM 701, RECM 707, RECM 708, RECM 722, RECM 727, RECM 739, RECM 745, RLM 706, RLM 774. For other elective options please discuss with the MBS Program Director.

³ Students may use 9 elective hours in one of the following themes to pursue a specialized concentration:

Bioinformatics: INFO 601, INFO 602, INFO 603, INFO 604, INFO 610, INFO 662

Cancer Biology (CNBY): CNBY 600, CNBY 610, CNBY 620, CNBY 630, CNBY 635, CNBY 640, CNBY 645, CNBY 650, CNBY 660, CNBY 670

Genetic and Genomic Sciences (GGSC): GGSC 610, GGSC 616, GGSC 620, GGSC 621, GGSC 634, GGSC 651, GGSC 670, GGSC 691, BY 531, BY 634, BY 637

Immunology: MIC 600, MIC 601, MIC 602, MIC 603, MIC 604

Neuroscience: NBL 624, NBL 625, NBL 633, NBL 634, NBL 644, NBL 657, NBL 684, PY 635, PY 653, PY 683, PY 687

Pharmacology: PHR 611, PHR 612, PHR 613, PHR 614, PHR 615, PHR 696

⁴ GGSC 670 is limited to MBS ABM students from the GGSC undergraduate program.

⁵ Neuroscience undergraduate ABM students are not allowed to take NBL 655 or NBL 656, since they already take these courses at the 300-level.

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.

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 695. Professional Development Colloquium for Non-Thesis Students. 1 Hour.

These variable topics will provide a rigorous overview of scientific reading, writing, and presenting skills, with a focus on career development. Students will complete in-class discussions and presentations related to health careers and will have at home writing assignments and peer review of other's work. When relevant to the discussion topic, responsible conduct of research (RCR) will be reviewed.

MBS 696. Special Topics. 0-3 Hours.

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

MBS 697. Colloquium for MBS Plan I Thesis Students. 1-2 Hour.

This required colloquium course will have variable professional development topics depending on the section enrolled. The overall goal of this course is for students to improve their writing and oral presentation skills, and to effectively review others' work by asking questions and editing/reviewing documents. Best practices will be introduced at the beginning of each class, followed by students completing in-class presentations or at-home writing assignments and reviews. When possible, scientific integrity in research will be a focus of in-class discussions.

MBS 698. Non-Thesis Research. 0-6 Hours.

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.

Prerequisites: GAC M