### **B.S./M.S. IN BIOMEDICAL ENGINEERING**

#### Overview

The Department of Biomedical Engineering offers a dual-degree program that culminates with students receiving both Bachelor of Science and Master of Science (BS/MS) in Biomedical Engineering concurrently. This program is available only to qualified students enrolled in the undergraduate program in Biomedical Engineering at the University of Miami. This program is intended to give qualified Biomedical Engineering students the opportunity to acquire both a baccalaureate degree (BSBE) and a Master of Science (MSBE) degree in five years rather than the 4 plus 2 years (approximately) that is traditionally expected. The two degrees are awarded simultaneously when the combined requirements have been met for both degrees.

- Juniors enrolled in BME who have maintained at least a 3.0 CGPA have the option to apply for admission to the combined BS-MS in Biomedical Engineering program.
- Those who are accepted into this accelerated program must maintain at least a 3.0 CGPA and a minimum of a 3.0 GPA for the final 30 credit hours to meet the requirements of the Graduate School.
- Up to 6 credit hours of engineering electives earned during the fourth year can be counted toward the 30 credit hours required for the MS degree. If their schedule allows, students may be able to complete an additional 6 credits of graduate classes during their fourth year.
- · Students must be registered for a minimum of 12 undergraduate credit hours per semester in their fourth year.
- · Students can register for a maximum of 6 graduate credit hours in each semester of their fourth year.
- If a student needs to withdraw from the BS/MS BME program then all the requirements for the BS degree must be completed for graduation with the BS BME degree.

### **Admission Requirements**

The dual BS/MS program is available only to qualified undergraduate students enrolled in the Department of Biomedical Engineering. Typically, students must have undergraduate student status and a cumulative G.P.A. of at least 3.0 at the time of application.

Qualified students must apply prior to the beginning of final exams in the second semester of their junior year. Students are strongly advised to apply to the BS/MS program as early as possible in their junior year to facilitate academic advising and course selection in the second semester of their junior year. Before submitting an application, interested students should discuss the program and the possibility of entering the program with an academic advisor.

### **Curriculum Guidelines**

In the dual-degree BS/MS program in the Department of Biomedical Engineering, the first four years of the curriculum are altered as follows:

- In the senior year, up to two 3-credit Undergraduate Engineering Electives can be replaced with 3-credit Graduate Engineering Electives
- If their schedule allows, students may be able to register for an additional 6 credits of graduate courses in the senior year.

In the fifth year, BS/MS students complete their graduate course requirements, including completion of the MS Project (BME 707 and BME 708). Students in the BS/MS program must also complete exactly two physiology courses chosen from BME 601, BME 602, BME 603 as part of their graduate requirements.

Graduate Engineering Electives taken in the senior year must be chosen from dual-enrollment engineering course offerings, with the approval of their academic advisor. The credits of Graduate Engineering Electives completed in the fourth year are counted toward the 30 credits required for the MS degree.

Students admitted in the dual degree BS/MS program can take a maximum of six (6) graduate credits per semester in their senior year, for a maximum of twelve (12) graduate credits per year, without incurring additional costs if they are full-time undergraduate students during this period. Students should register for courses towards their graduate degree as "G" credits and not as "U" credits. These registrations must be completed prior to taking courses. Retroactive add/drops will not be processed.

To register for graduate credits during their senior year, students must be in senior status and must complete and submit the Graduate School's Application for Undergraduates to Take Graduate Coursework (https://www.grad.miami.edu/policies-and-forms/forms/) form. This form must accompany the Add/Drop and/or Course Request form to ensure that students are registered with the correct registration status.

In the Senior year, students must be registered for a minimum of 12 undergraduate credits each semester to maintain full-time status as an undergraduate student. After completing the senior year, students must register as graduate students.

### **Graduation Requirements**

Students accepted into the dual degree program must maintain at least a 3.0 Cumulative GPA, and meet all other pertinent Graduate School requirements, including a minimum of 3.0 GPA in the credits applied toward the MS degree.

# **Curriculum Requirements**

#### **BSBE/MSBE**

Students in the BSBE/MSBE program are required to complete the following courses for the dual degree::

Code	Title	Credit Hours
BSBE REQUIREMENTS (128 CREDIT HOURS)		
Engineering Courses		
EGN 110	Innovation and Entrepreneurship in Engineering	1-3
EGN 114	Global Challenges Addressed by Engineering and Technology	3
BME 112	Introduction to Biomedical Engineering	2
BME 211	Introduction to Programming for Biomedical Engineers	3
BME 221	(NEW COURSE: Biomedical Design I)	1
BME 222	(NEW COURSE: Biomedical Project I)	2
BME 321	(NEW COURSE: Biomedical Design II)	1
BME 322	(NEW COURSE: Biomedical Project II)	2
BME 335	Biomaterials	3
BME 336	(NEW COURSE: Living Systems Engineering)	3
BME 340	(NEW COURSE: Biomedical Instrumentation I)	4
BME 341	(NEW COURSE: Biomedical Instrumentation II)	3
BME 360	(NEW COURSE: Applied Biotransport)	3
BME 370	(NEW COURSE: Biomedical Signal Analysis)	3
BME 375	Fundamentals of Biomechanics	3
BME 420	(NEW COURSE: Capstone Project I)	3
BME 421	(NEW COURSE: Capstone Project II)	3
BME 512	Regulatory Control of Biomedical Devices	3
Engineering Electives		15
Math and Science Courses		
BIL 150	General Biology	4
BIL 151	General Biology Laboratory	1
BME 265	Medical Systems Physiology	4
BME 310	Mathematical Analysis in Biomedical Engineering	3
BME 312	Biomedical Statistics and Data Analysis	3
CHM 113	Chemistry Laboratory I	1
CHM 121	Principles of Chemistry	4
MTH 151	Calculus I for Engineers	5
MTH 162	Calculus II	4
MTH 311	Introduction to Ordinary Differential Equations	3
PHY 106	College Physics Laboratory I	1
PHY 201	University Physics I for the Sciences	4
PHY 202	University Physics II for the Sciences	4
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 107	First-Year Writing II: STEM	3
Quantitative Skills:		
MTH 151	Calculus I for Engineers (fulfilled through the major)	
Areas of Knowledge:		
Arts and Humanities Cognate		9
People and Society Cognate		9
STEM Cognate (9 credits) (fulfilled through the major)		
MSBE REQUIREMENTS (30 CREDIT HOURS)		
Engineering electives taken as graduate courses		6
1		-1

Two physiology courses chosen from BME 601, BME 602, BME 603		6
BME 707	Master's Project I	1
BME 708	Master's Project II	2
Five additional graduate courses		15
Total Credit Hours		158

# **Curriculum Requirements**

### **BSBE/MSBE (Pre-Med Track)**

Students in the BSBE/MSBE Pre-Med track complete the same core curriculum, with a special set of electives that meet the medical school admission requirements:

BSBE REQUIREMENTS (133 CREDIT HOURS)           Engineering Courses         ECN 110         Innovation and Entrepreneurship in Engineering         1-3           ECN 1114         Global Challenges Addressed by Engineering and Technology         3           BME 211         Introduction to Biomedical Engineering         2           BME 221         (NEW COURSE: Biomedical Design I)         1           BME 222         (NEW COURSE: Biomedical Project I)         2           BME 323         (NEW COURSE: Biomedical Project II)         2           BME 326         (NEW COURSE: Biomedical Project II)         2           BME 336         (NEW COURSE: Biomedical Project II)         2           BME 336         (NEW COURSE: Biomedical Project II)         2           BME 336         (NEW COURSE: Biomedical Instrumentation I)         4           BME 340         (NEW COURSE: Biomedical Instrumentation II)         3           BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 375         (NEW COURSE: Biomedical Instrumentation II)         3           BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           BME 371         (NEW COURSE: Capstone Project I)         3           BME 420         (NEW COURSE: Capstone Project II)         3	Code	Title	Credit Hours
EGN 110         Innovation and Entrepreneurship in Engineering         1-3           EGN 114         Global Challenges Addressed by Engineering and Technology         3           BME 111         Introduction to Biomedical Engineering         2           BME 211         Introduction to Programming for Biomedical Engineers         3           BME 221         (NEW COURSE: Biomedical Project I)         2           BME 222         (NEW COURSE: Biomedical Project I)         2           BME 321         (NEW COURSE: Biomedical Project II)         1           BME 322         (NEW COURSE: Biomedical Project III)         2           BME 335         Biomaterials         3           BME 336         (NEW COURSE: Biomedical Instrumentation I)         4           BME 340         (NEW COURSE: Biomedical Instrumentation II)         3           BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 370         (NEW COURSE: Biomedical Instrumentation II)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Biomedical Signal Analysis)         3           BME 512         Regulatory Control of Biomedical Devices         3           BME 512         Regulatory Control of Biomedical Devices         3	BSBE REQUIREMENTS (133 CREDIT HOURS)		
EGN 114         Global Challenges Addressed by Engineering and Technology         3           BME 112         Introduction to Biomedical Engineering         2           BME 221         (NEW COURSE: Biomedical Project Signature)         3           BME 222         (NEW COURSE: Biomedical Design I)         1           BME 322         (NEW COURSE: Biomedical Project I)         2           BME 322         (NEW COURSE: Biomedical Project II)         2           BME 335         Biomaterials         3           BME 336         (NEW COURSE: Biomedical Instrumentation I)         4           BME 340         (NEW COURSE: Biomedical Instrumentation II)         3           BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 360         (NEW COURSE: Biomedical Instrumentation II)         3           BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Gaptione Project II)         3           BME 421         (NEW COURSE: Gaptione Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           BME 513         General Biology         4           BIL 150         General Bi	Engineering Courses		
BME 112         Introduction to Biomedical Engineering         2           BME 211         Introduction to Programming for Biomedical Engineers         3           BME 222         (NEW COURSE: Biomedical Design I)         1           BME 222         (NEW COURSE: Biomedical Project I)         2           BME 321         (NEW COURSE: Biomedical Project II)         2           BME 335         Biomaterials         3           BME 336         (NEW COURSE: Biomedical Project II)         4           BME 336         (NEW COURSE: Biomedical Instrumentation I)         4           BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 340         (NEW COURSE: Biomedical Instrumentation II)         3           BME 360         (NEW COURSE: Applied Biotransport)         3           BME 375         Fundamentals of Biomechanics         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project I)         3           BME 422         (NEW COURSE: Capstone Project I)         3           BME 423         (REW COURSE: Capstone Project I)         3           BME 426         (REW COURSE: Capstone Project II) <td>EGN 110</td> <td>Innovation and Entrepreneurship in Engineering</td> <td>1-3</td>	EGN 110	Innovation and Entrepreneurship in Engineering	1-3
BME 211         Introduction to Programming for Biomedical Engineers         3           BME 221         (NEW COURSE: Biomedical Design I)         1           BME 222         (NEW COURSE: Biomedical Project I)         2           BME 321         (NEW COURSE: Biomedical Design II)         1           BME 322         (NEW COURSE: Biomedical Project II)         2           BME 335         Biomaterials         3           BME 336         (NEW COURSE: Biomedical Instrumentation I)         4           BME 340         (NEW COURSE: Biomedical Instrumentation I)         3           BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 370         (NEW COURSE: Biomedical Instrumentation II)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 422         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 30         General Biology         4           BIL 150         General Biology         4 <td>EGN 114</td> <td>Global Challenges Addressed by Engineering and Technology</td> <td>3</td>	EGN 114	Global Challenges Addressed by Engineering and Technology	3
BME 221         (NEW COURSE: Biomedical Design I)         1           BME 222         (NEW COURSE: Biomedical Project I)         2           BME 321         (NEW COURSE: Biomedical Project II)         2           BME 332         (NEW COURSE: Biomedical Design II)         1           BME 335         Biomaterials         3           BME 336         (NEW COURSE: Living Systems Engineering)         3           BME 340         (NEW COURSE: Biomedical Instrumentation I)         4           BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 360         (NEW COURSE: Applied Biotransport)         3           BME 375         Fundamentals of Biomedical Signal Analysis)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           BME 515         Regulatory Control of Biomedical Devices         4           BIL 150         General Biology         4           BIL 151         General Biology         4           BIL 152         General Biology         4           <	BME 112	Introduction to Biomedical Engineering	2
BME 222         (NEW COURSE: Biomedical Project I)         1           BME 321         (NEW COURSE: Biomedical Design II)         1           BME 332         (NEW COURSE: Biomedical Project II)         2           BME 335         Biomaterials         3           BME 336         (NEW COURSE: Living Systems Engineering)         3           BME 340         (NEW COURSE: Biomedical Instrumentation I)         4           BME 341         (NEW COURSE: Biomedical Instrumentation III)         3           BME 360         (NEW COURSE: Biomedical Instrumentation III)         3           BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project I)         3           BME 512         Regulatory Control of Biomedical Devices         4           BME 151         General Biology         4           BIL 150         General Biology Laboratory         1           BIL 161         Evolution and Biodiversity         4           BME 202         Mexical Systems Physiology         4           BME 303         Mathematical Analysis in Biomedical Engineering         3	BME 211	Introduction to Programming for Biomedical Engineers	3
BME 321         (NEW COURSE: Biomedical Design II)         1           BME 322         (NEW COURSE: Biomedical Project II)         2           BME 335         Biomaterials         3           BME 336         (NEW COURSE: Living Systems Engineering)         3           BME 340         (NEW COURSE: Biomedical Instrumentation I)         4           BME 341         (NEW COURSE: Biomedical Instrumentation III)         3           BME 360         (NEW COURSE: Applied Biotransport)         3           BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           BIL 150         General Biology         4           BIL 151         General Biology Laboratory         1           BIL 160         Evolution and Biodiversity Laboratory         1           BIM 301         Biochemistry for the Biomedical Sciences         4           BMB 402         Medical Systems Physiology         4           BME 312         Biomedical Statistics and Data Analysis         3	BME 221	(NEW COURSE: Biomedical Design I)	1
BME 332         (NEW COURSE: Biomedical Project II)         2           BME 335         Biomaterials         3           BME 336         (NEW COURSE: Living Systems Engineering)         3           BME 340         (NEW COURSE: Biomedical Instrumentation I)         4           BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 360         (NEW COURSE: Biomedical Signal Analysis)         3           BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           Math and Science Courses         3           BIL 150         General Biology         4           BIL 161         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity Laboratory         1           BMB 401         Biochemistry for the Biomedical Sciences         4           BME 265         Medical Systems Physiology         4           BME 310 <td>BME 222</td> <td>(NEW COURSE: Biomedical Project I)</td> <td>2</td>	BME 222	(NEW COURSE: Biomedical Project I)	2
BME 335         Biomaterials         3           BME 336         (NEW COURSE: Biomedical Instrumentation I)         4           BME 340         (NEW COURSE: Biomedical Instrumentation II)         3           BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 360         (NEW COURSE: Applied Biotransport)         3           BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           MAth and Science Courses         8           BIL 160         General Biology         4           BIL 161         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity Laboratory         1           BME 265         Medical Systems Physiology         4           BME 310         Mathematical Analysis in Biomedical Engineering         3           BME 312         Biomedical Statistics and Data Analysis         3           CHM 113         Chemistry Laboratory         1           CHM 205 </td <td>BME 321</td> <td>(NEW COURSE: Biomedical Design II)</td> <td>1</td>	BME 321	(NEW COURSE: Biomedical Design II)	1
BME 335         Biomaterials         3           BME 336         (NEW COURSE: Biomedical Instrumentation I)         4           BME 340         (NEW COURSE: Biomedical Instrumentation II)         3           BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 360         (NEW COURSE: Applied Biotransport)         3           BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           MAth and Science Courses         8           BIL 160         General Biology         4           BIL 161         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity Laboratory         1           BME 265         Medical Systems Physiology         4           BME 310         Mathematical Analysis in Biomedical Engineering         3           BME 312         Biomedical Statistics and Data Analysis         3           CHM 113         Chemistry Laboratory         1           CHM 205 </td <td>BME 322</td> <td>(NEW COURSE: Biomedical Project II)</td> <td>2</td>	BME 322	(NEW COURSE: Biomedical Project II)	2
BME 340         (NEW COURSE: Biomedical Instrumentation I)         4           BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 360         (NEW COURSE: Applied Biotransport)         3           BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           MATH and Science Courses         3           BIL 150         General Biology         4           BIL 151         General Biology Laboratory         1           BIL 160         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity Laboratory         1           BIL 161         Evolution and Biodiversity Laboratory         1           BMB 401         Biochemistry for the Biomedical Sciences         4           BME 265         Medical Systems Physiology         4           BME 312         Biomedical Statistics and Data Analysis         3           CHM 113         Chemistry Laboratory I         1           CHM 20	BME 335	Biomaterials	
BME 341         (NEW COURSE: Biomedical Instrumentation II)         3           BME 360         (NEW COURSE: Applied Biotransport)         3           BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           Math and Science Courses         3           BIL 150         General Biology         4           BIL 151         General Biology Laboratory         1           BIL 160         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity Laboratory         1           BMB 401         Biochemistry for the Biomedical Sciences         4           BME 265         Medical Systems Physiology         4           BME 310         Mathematical Analysis in Biomedical Engineering         3           BME 312         Biomedical Statistics and Data Analysis         3           CHM 113         Chemistry Laboratory I         1           CHM 121         Principles of Chemistry         4           CHM 225	BME 336	(NEW COURSE: Living Systems Engineering)	3
BME 360         (NEW COURSE: Applied Biotransport)         3           BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           3BME 375         Fundamentals of Biomechanics         3           3BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           Math and Science Courses         8           BIL 150         General Biology         4           BIL 151         General Biology Laboratory         1           BIL 160         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity Laboratory         1           BIL 161         Evolution and Biodiversity Laboratory         1           BMB 401         Biochemistry for the Biomedical Sciences         4           BME 265         Medical Systems Physiology         4           BME 310         Mathematical Analysis in Biomedical Engineering         3           BME 312         Biomedical Statistics and Data Analysis         3           CHM 113         Chemistry Laboratory I         1           CHM 205         Chemistry Laboratory I         1           CHM 205	BME 340	(NEW COURSE: Biomedical Instrumentation I)	4
BME 370         (NEW COURSE: Biomedical Signal Analysis)         3           BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           Math and Science Courses         8           BIL 150         General Biology         4           BIL 161         General Biology Laboratory         1           BIL 160         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity Laboratory         1           BMB 401         Biochemistry for the Biomedical Sciences         4           BME 265         Medical Systems Physiology         4           BME 310         Mathematical Analysis in Biomedical Engineering         3           BME 312         Biomedical Statistics and Data Analysis         3           CHM 113         Chemistry Laboratory I         1           CHM 205         Chemistry Laboratory I         1           CHM 205         Chemistry Chemistry         4           CHM 206         Organic Reactions and Synthesis Laboratory         2           CHM 221         Introdu	BME 341	(NEW COURSE: Biomedical Instrumentation II)	3
BME 375         Fundamentals of Biomechanics         3           BME 420         (NEW COURSE: Capstone Project I)         3           BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           Math and Science Courses           BIL 150         General Biology         4           BIL 151         General Biology Laboratory         1           BIL 160         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity Laboratory         1           BMB 401         Biochemistry for the Biomedical Sciences         4           BME 265         Medical Systems Physiology         4           BME 310         Mathematical Analysis in Biomedical Engineering         3           BME 312         Biomedical Statistics and Data Analysis         3           CHM 113         Chemistry Laboratory I         1           CHM 205         Chemistry Laboratory         1           CHM 206         Organic Reactions and Synthesis Laboratory         2           CHM 221         Introduction to Structure and Dynamics         4           CHM 222         Organic Reactions and Synthesis         4           MTH 151         Calcul	BME 360	(NEW COURSE: Applied Biotransport)	3
BME 420       (NEW COURSE: Capstone Project I)       3         BME 421       (NEW COURSE: Capstone Project II)       3         BME 512       Regulatory Control of Biomedical Devices       3         Math and Science Courses         BIL 150       General Biology       4         BIL 151       General Biology Laboratory       1         BIL 160       Evolution and Biodiversity       4         BIL 161       Evolution and Biodiversity Laboratory       1         BMB 401       Biochemistry for the Biomedical Sciences       4         BME 265       Medical Systems Physiology       4         BME 310       Mathematical Analysis in Biomedical Engineering       3         BME 312       Biomedical Statistics and Data Analysis       3         3       Chemistry Laboratory I       1         4HM 131       Chemistry Laboratory I       1         4HM 205       Chemical Dynamics Laboratory       2         4HM 206       Organic Reactions and Synthesis Laboratory       2         4HM 221       Introduction to Structure and Dynamics       4         4HM 222       Organic Reactions and Synthesis       4         4HM 151       Calculus I for Engineers       5         5HH 162       Calculus	BME 370	(NEW COURSE: Biomedical Signal Analysis)	3
BME 421         (NEW COURSE: Capstone Project II)         3           BME 512         Regulatory Control of Biomedical Devices         3           Math and Science Courses         BIL 150         General Biology         4           BIL 151         General Biology Laboratory         1           BIL 160         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity Laboratory         1           BMB 401         Biochemistry for the Biomedical Sciences         4           BME 265         Medical Systems Physiology         4           BME 310         Mathematical Analysis in Biomedical Engineering         3           BME 312         Biomedical Statistics and Data Analysis         3           CHM 113         Chemistry Laboratory I         1           CHM 205         Chemical Dynamics Laboratory         4           CHM 205         Chemical Dynamics Laboratory         2           CHM 221         Introduction to Structure and Dynamics         4           CHM 222         Organic Reactions and Synthesis         4           MTH 151         Calculus I for Engineers         5           MTH 162         Calculus II         4           MTH 311         Introduction to Ordinary Differential Equations	BME 375	Fundamentals of Biomechanics	3
BME 512 Regulatory Control of Biomedical Devices  Math and Science Courses  BIL 150 General Biology Laboratory 1 BIL 151 General Biology Laboratory 1 BIL 160 Evolution and Biodiversity 4 BIL 161 Evolution and Biodiversity Laboratory 1 BIMB 401 Biochemistry for the Biomedical Sciences 4 BME 265 Medical Systems Physiology 4 BME 310 Mathematical Analysis in Biomedical Engineering 3 BME 312 Biomedical Statistics and Data Analysis 3 CHM 113 Chemistry Laboratory 1 CHM 121 Principles of Chemistry 4 CHM 205 Chemical Dynamics Laboratory 1 CHM 206 Organic Reactions and Synthesis Laboratory 2 CHM 221 Introduction to Structure and Dynamics 4 CHM 222 Organic Reactions and Synthesis Aboratory 4 MTH 151 Calculus I for Engineers 5 MTH 162 Calculus II Introduction to Ordinary Differential Equations 3 PHY 106 College Physics Laboratory I 1 Introduction to Ordinary Differential Equations 1 Introduction to Ordinary Differential Equations 3 Introduction to Ordinary Differential Equations 1	BME 420	(NEW COURSE: Capstone Project I)	3
Math and Science CoursesBIL 150General Biology4BIL 151General Biology Laboratory1BIL 160Evolution and Biodiversity4BIL 161Evolution and Biodiversity Laboratory1BMB 401Biochemistry for the Biomedical Sciences4BME 265Medical Systems Physiology4BME 310Mathematical Analysis in Biomedical Engineering3BME 312Biomedical Statistics and Data Analysis3CHM 113Chemistry Laboratory I1CHM 221Principles of Chemistry4CHM 205Chemical Dynamics Laboratory2CHM 221Introduction to Structure and Dynamics4CHM 222Organic Reactions and Synthesis4CHM 222Organic Reactions and Synthesis4MTH 151Calculus I for Engineers5MTH 162Calculus II4MTH 311Introduction to Ordinary Differential Equations3PHY 106College Physics Laboratory I1	BME 421	(NEW COURSE: Capstone Project II)	3
BIL 150       General Biology       4         BIL 151       General Biology Laboratory       1         BIL 160       Evolution and Biodiversity       4         BIL 161       Evolution and Biodiversity Laboratory       1         BMB 401       Biochemistry for the Biomedical Sciences       4         BME 265       Medical Systems Physiology       4         BME 310       Mathematical Analysis in Biomedical Engineering       3         BME 312       Biomedical Statistics and Data Analysis       3         CHM 113       Chemistry Laboratory I       1         CHM 121       Principles of Chemistry       4         CHM 205       Chemical Dynamics Laboratory       1         CHM 206       Organic Reactions and Synthesis Laboratory       2         CHM 221       Introduction to Structure and Dynamics       4         CHM 222       Organic Reactions and Synthesis       4         MTH 151       Calculus I for Engineers       5         MTH 162       Calculus II       4         MTH 311       Introduction to Ordinary Differential Equations       3         PHY 106       College Physics Laboratory I       1	BME 512	Regulatory Control of Biomedical Devices	3
BIL 151       General Biology Laboratory       1         BIL 160       Evolution and Biodiversity       4         BIL 161       Evolution and Biodiversity Laboratory       1         BMB 401       Biochemistry for the Biomedical Sciences       4         BME 265       Medical Systems Physiology       4         BME 310       Mathematical Analysis in Biomedical Engineering       3         BME 312       Biomedical Statistics and Data Analysis       3         CHM 113       Chemistry Laboratory I       1         CHM 121       Principles of Chemistry       4         CHM 205       Chemical Dynamics Laboratory       1         CHM 206       Organic Reactions and Synthesis Laboratory       2         CHM 221       Introduction to Structure and Dynamics       4         CHM 222       Organic Reactions and Synthesis       4         MTH 151       Calculus I for Engineers       5         MTH 151       Calculus II       4         MTH 311       Introduction to Ordinary Differential Equations       3         PHY 106       College Physics Laboratory I       1	Math and Science Courses		
BIL 160         Evolution and Biodiversity         4           BIL 161         Evolution and Biodiversity Laboratory         1           BMB 401         Biochemistry for the Biomedical Sciences         4           BME 265         Medical Systems Physiology         4           BME 310         Mathematical Analysis in Biomedical Engineering         3           BME 312         Biomedical Statistics and Data Analysis         3           CHM 113         Chemistry Laboratory I         1           CHM 121         Principles of Chemistry         4           CHM 205         Chemical Dynamics Laboratory         1           CHM 206         Organic Reactions and Synthesis Laboratory         2           CHM 221         Introduction to Structure and Dynamics         4           CHM 222         Organic Reactions and Synthesis         4           MTH 151         Calculus I for Engineers         5           MTH 162         Calculus II         4           MTH 311         Introduction to Ordinary Differential Equations         3           PHY 106         College Physics Laboratory I         1	BIL 150	General Biology	4
BIL 161       Evolution and Biodiversity Laboratory       1         BMB 401       Biochemistry for the Biomedical Sciences       4         BME 265       Medical Systems Physiology       4         BME 310       Mathematical Analysis in Biomedical Engineering       3         BME 312       Biomedical Statistics and Data Analysis       3         CHM 113       Chemistry Laboratory I       1         CHM 121       Principles of Chemistry       4         CHM 205       Chemical Dynamics Laboratory       1         CHM 206       Organic Reactions and Synthesis Laboratory       2         CHM 221       Introduction to Structure and Dynamics       4         CHM 222       Organic Reactions and Synthesis       4         MTH 151       Calculus I for Engineers       5         MTH 162       Calculus II       4         MTH 311       Introduction to Ordinary Differential Equations       3         PHY 106       College Physics Laboratory I       1	BIL 151	General Biology Laboratory	1
BMB 401 Biochemistry for the Biomedical Sciences  4 BME 265 Medical Systems Physiology  4 BME 310 Mathematical Analysis in Biomedical Engineering  3 BME 312 Biomedical Statistics and Data Analysis  3 CHM 113 Chemistry Laboratory I  1 CHM 121 Principles of Chemistry  4 CHM 205 Chemical Dynamics Laboratory  1 CHM 206 Organic Reactions and Synthesis Laboratory  2 CHM 221 Introduction to Structure and Dynamics  4 CHM 222 Organic Reactions and Synthesis  4 CHM 222 Calculus I for Engineers  5 MTH 151 Calculus I for Engineers  5 MTH 162 Calculus II  MTH 311 Introduction to Ordinary Differential Equations  3 PHY 106 College Physics Laboratory I	BIL 160	Evolution and Biodiversity	4
BME 265         Medical Systems Physiology         4           BME 310         Mathematical Analysis in Biomedical Engineering         3           BME 312         Biomedical Statistics and Data Analysis         3           CHM 113         Chemistry Laboratory I         1           CHM 121         Principles of Chemistry         4           CHM 205         Chemical Dynamics Laboratory         1           CHM 206         Organic Reactions and Synthesis Laboratory         2           CHM 221         Introduction to Structure and Dynamics         4           CHM 222         Organic Reactions and Synthesis         4           MTH 151         Calculus I for Engineers         5           MTH 162         Calculus II         4           MTH 311         Introduction to Ordinary Differential Equations         3           PHY 106         College Physics Laboratory I         1	BIL 161	Evolution and Biodiversity Laboratory	1
BME 310 Mathematical Analysis in Biomedical Engineering  Biomedical Statistics and Data Analysis  CHM 113 Chemistry Laboratory I  CHM 121 Principles of Chemistry  CHM 205 Chemical Dynamics Laboratory  CHM 206 Organic Reactions and Synthesis Laboratory  CHM 221 Introduction to Structure and Dynamics  CHM 222 Organic Reactions and Synthesis  MTH 151 Calculus I for Engineers  MTH 162 Calculus II  MTH 311 Introduction to Ordinary Differential Equations  3  Biomedical Engineering  3  3  3  3  3  3  4  5  6  7  7  8  8  8  8  8  8  8  8  8  8  8	BMB 401	Biochemistry for the Biomedical Sciences	4
BME 312 Biomedical Statistics and Data Analysis 3 CHM 113 Chemistry Laboratory I 1 CHM 121 Principles of Chemistry 4 CHM 205 Chemical Dynamics Laboratory 1 CHM 206 Organic Reactions and Synthesis Laboratory 2 CHM 221 Introduction to Structure and Dynamics 4 CHM 222 Organic Reactions and Synthesis 4 MTH 151 Calculus I for Engineers 5 MTH 162 Calculus II 4 MTH 311 Introduction to Ordinary Differential Equations 3 PHY 106 College Physics Laboratory I 1	BME 265	Medical Systems Physiology	4
CHM 113         Chemistry Laboratory I         1           CHM 121         Principles of Chemistry         4           CHM 205         Chemical Dynamics Laboratory         1           CHM 206         Organic Reactions and Synthesis Laboratory         2           CHM 221         Introduction to Structure and Dynamics         4           CHM 222         Organic Reactions and Synthesis         4           MTH 151         Calculus I for Engineers         5           MTH 162         Calculus II         4           MTH 311         Introduction to Ordinary Differential Equations         3           PHY 106         College Physics Laboratory I         1	BME 310	Mathematical Analysis in Biomedical Engineering	3
CHM 121         Principles of Chemistry         4           CHM 205         Chemical Dynamics Laboratory         1           CHM 206         Organic Reactions and Synthesis Laboratory         2           CHM 221         Introduction to Structure and Dynamics         4           CHM 222         Organic Reactions and Synthesis         4           MTH 151         Calculus I for Engineers         5           MTH 162         Calculus II         4           MTH 311         Introduction to Ordinary Differential Equations         3           PHY 106         College Physics Laboratory I         1	BME 312	Biomedical Statistics and Data Analysis	3
CHM 205         Chemical Dynamics Laboratory         1           CHM 206         Organic Reactions and Synthesis Laboratory         2           CHM 221         Introduction to Structure and Dynamics         4           CHM 222         Organic Reactions and Synthesis         4           MTH 151         Calculus I for Engineers         5           MTH 162         Calculus II         4           MTH 311         Introduction to Ordinary Differential Equations         3           PHY 106         College Physics Laboratory I         1	CHM 113	Chemistry Laboratory I	1
CHM 206         Organic Reactions and Synthesis Laboratory         2           CHM 221         Introduction to Structure and Dynamics         4           CHM 222         Organic Reactions and Synthesis         4           MTH 151         Calculus I for Engineers         5           MTH 162         Calculus II         4           MTH 311         Introduction to Ordinary Differential Equations         3           PHY 106         College Physics Laboratory I         1	CHM 121	Principles of Chemistry	4
CHM 221 Introduction to Structure and Dynamics 4 CHM 222 Organic Reactions and Synthesis 4 MTH 151 Calculus I for Engineers 5 MTH 162 Calculus II 4 MTH 311 Introduction to Ordinary Differential Equations 3 PHY 106 College Physics Laboratory I 1	CHM 205	Chemical Dynamics Laboratory	1
CHM 222         Organic Reactions and Synthesis         4           MTH 151         Calculus I for Engineers         5           MTH 162         Calculus II         4           MTH 311         Introduction to Ordinary Differential Equations         3           PHY 106         College Physics Laboratory I         1	CHM 206	Organic Reactions and Synthesis Laboratory	2
MTH 151 Calculus I for Engineers 5 MTH 162 Calculus II 4 MTH 311 Introduction to Ordinary Differential Equations 3 PHY 106 College Physics Laboratory I 1	CHM 221	Introduction to Structure and Dynamics	4
MTH 162 Calculus II 4 MTH 311 Introduction to Ordinary Differential Equations 3 PHY 106 College Physics Laboratory I 1	CHM 222	Organic Reactions and Synthesis	4
MTH 311 Introduction to Ordinary Differential Equations 3 PHY 106 College Physics Laboratory I 1	MTH 151	Calculus I for Engineers	5
PHY 106 College Physics Laboratory I 1	MTH 162	Calculus II	4
	MTH 311	Introduction to Ordinary Differential Equations	3
PHY 201 University Physics I for the Sciences 4	PHY 106	College Physics Laboratory I	1
	PHY 201	University Physics I for the Sciences	4

#### B.S./M.S. in Biomedical Engineering

PHY 202	University Physics II for the Sciences	4
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 107	First-Year Writing II: STEM	3
Quantitative Skills:		
MTH 151	Calculus I for Engineers (fulfilled through the major)	
Areas of Knowledge:		
Arts and Humanities Cognate		9
People and Society Cognate		9
STEM Cognate (9 credits) (fulfilled through the major)		
MSBE REQUIREMENTS (30 CREDIT HOURS)		
Two physiology courses chosen from BME 601, BME 602, B	ME 603	6
BME 707	Master's Project I	1
BME 708	Master's Project II	2
Seven additional graduate courses		21
Total Credit Hours		163

# **Suggested Plan of Study**

	· · · · · · · · · · · · · · · · · · ·	
Freshman Year		
Fall		Credit Hours
BIL 150	General Biology	4
BIL 151	General Biology Laboratory	1
EGN 114	Global Challenges Addressed by Engineering and Technology	3
MTH 151	Calculus I for Engineers	5
WRS 105	First-Year Writing I	3
	Credit Hours	16
Spring		
BME 112	Introduction to Biomedical Engineering	2
CHM 113	Chemistry Laboratory I	1
CHM 121	Principles of Chemistry	4
EGN 110	Innovation and Entrepreneurship in Engineering	1-3
MTH 162	Calculus II	4
WRS 107	First-Year Writing II: STEM	3
	Credit Hours	17
Sophomore Year		
Fall		
BME 211	Introduction to Programming for Biomedical Engineers	3
BME 221		1
MTH 311	Introduction to Ordinary Differential Equations	3
PHY 106	College Physics Laboratory I	1
PHY 201	University Physics I for the Sciences	4
PS/HA Cognate <sup>1</sup>		3
	Credit Hours	15
Spring		
BME 222		2
BME 265	Medical Systems Physiology	4
BME 310	Mathematical Analysis in Biomedical Engineering	3
PHY 202	University Physics II for the Sciences	4
PS/HA Cognate <sup>1</sup>		3
	Credit Hours	16
1		'

Junior Year		
Fall		
BME 312	Biomedical Statistics and Data Analysis	3
BME 321	bioineuleal Statistics and Data Analysis	1
BME 340		4
BME 370		3
BME 375	Fundamentals of Biomechanics	3
Engineering Elective <sup>2</sup>	Tundamentals of Diomechanics	3
Engineering Licetive	Credit Hours	17
Spring	Cieult i louis	17
BME 322		2
BME 335	Biomaterials	3
BME 341	Biolifacettaio	3
BME 360		3
Engineering Elective <sup>2</sup>		3
PS/HA Cognate <sup>1</sup>		3
1 G/TII/ Gognate	Credit Hours	17
Senior Year	oreal riouro	
Fall		
BME 336		3
BME 420		3
BME 512	Regulatory Control of Biomedical Devices	3
Graduate Engineering Elective <sup>3</sup>	ga.a.c., coc. 2.cca. 2ccc	3
Graduate Course <sup>4</sup>		3
PS/HA Cognate <sup>1</sup>		3
	Credit Hours	18
Spring		
BME 421		3
PS/HA Cognate <sup>1</sup>		3
PS/HA Cognate <sup>1</sup>		3
Engineering Elective <sup>2</sup>		3
Graduate Engineering Elective <sup>3</sup>		3
Graduate Course <sup>4</sup>		3
	Credit Hours	18
Fifth Year (Graduate)		
Fall		
BME 707	Master's Project I	1
Graduate Course <sup>4</sup>		3
Graduate Course <sup>4</sup>		3
Graduate Course <sup>4</sup>		3
	Credit Hours	10
Spring		
BME 708	Master's Project II	2
Graduate Course <sup>4</sup>		3
Graduate Course <sup>4</sup>		3
	Credit Hours	8
	Total Credit Hours	152
4		

PS/HA Cognate: Students must complete a minimum of 1 People & Society (PS) cognate and 1 Humanities & Arts (HA) cognate, to be selected from the list of available cognates (https://cognates.miami.edu/). Each cognate should be a minimum of 3 courses (minimum of 9 credits).

Students complete 15 credits of Engineering Electives, which can include a minor in another engineering discipline. Engineering Electives can be chosen from any BME or other engineering course offerings. Students should map their elective sequence in advance to ensure that electives taken in the junior year satisfy the pre-requisites of the electives that they wish to take in the senior year.

- Graduate Engineering Electives must be selected from 600 level dual-enrollment BME or engineering course offerings. BME 601, BME 602, and BME 603 or any other 600 level course that does not also have a 500 level section cannot be counted as graduate engineering electives.
- Graduate courses are 600 or 700 level courses chosen from the BME course offerings with the approval of the advisor. Up to 6 credits of graduate courses can be taken in other engineering disciplines.

## **Suggested Plan of Study**

#### **Pre-Med Track**

Freshman Year		
Fall		Credit Hours
BIL 150	General Biology	4
BIL 151	General Biology Laboratory	1
EGN 114	Global Challenges Addressed by Engineering and Technology	3
MTH 151	Calculus I for Engineers	5
WRS 105	First-Year Writing I	3
	Credit Hours	16
Spring		
BME 112	Introduction to Biomedical Engineering	2
CHM 113	Chemistry Laboratory I	1
CHM 121	Principles of Chemistry	4
EGN 110	Innovation and Entrepreneurship in Engineering	1-3
MTH 162	Calculus II	4
WRS 107	First-Year Writing II: STEM	3
	Credit Hours	17
Sophomore Year		
Fall		
BIL 160	Evolution and Biodiversity	4
BIL 161	Evolution and Biodiversity Laboratory	1
BME 221		1
CHM 205	Chemical Dynamics Laboratory	1
CHM 221	Introduction to Structure and Dynamics	4
MTH 311	Introduction to Ordinary Differential Equations	3
PS/HA Cognate <sup>1</sup>		3
	Credit Hours	17
Spring		
BME 211	Introduction to Programming for Biomedical Engineers	3
BME 222		2
CHM 222	Organic Reactions and Synthesis	4
PHY 106	College Physics Laboratory I	1
PHY 201	University Physics I for the Sciences	4
PS/HA Cognate <sup>1</sup>		3
	Credit Hours	17
Junior Year		
Fall		
BMB 401	Biochemistry for the Biomedical Sciences	4
BME 265	Medical Systems Physiology	4
BME 310	Mathematical Analysis in Biomedical Engineering	3
BME 321		1
CHM 206	Organic Reactions and Synthesis Laboratory	2
PHY 202	University Physics II for the Sciences	4
	Credit Hours	18
Spring		
BME 312	Biomedical Statistics and Data Analysis	3

BME 322		2
BME 335	Biomaterials	3
BME 340		4
BME 370		3
BME 375	Fundamentals of Biomechanics	3
	Credit Hours	18
Senior Year		
Fall		
BME 336		3
BME 341		3
BME 420		3
PS/HA Cognate <sup>1</sup>		3
PS/HA Cognate <sup>1</sup>		3
Graduate Course <sup>2</sup>		3
	Credit Hours	18
Spring		
BME 360		3
BME 421		3
BME 512	Regulatory Control of Biomedical Devices	3
PS/HA Cognate <sup>1</sup>		3
PS/HA Cognate <sup>1</sup>		3
Graduate Course <sup>2</sup>		3
	Credit Hours	18
Fifth Year (Graduate)		
Fall		
BME 707	Master's Project I	1
Graduate Course <sup>2</sup>		3
	Credit Hours	13
Spring		
BME 708	Master's Project II	2
Graduate Course <sup>2</sup>		3
Graduate Course <sup>2</sup>		3
Graduate Course <sup>2</sup>		3
	Credit Hours	11
	Total Credit Hours	163

PS/HA Cognate: Students must complete a minimum of 1 People & Society (PS) cognate and 1 Humanities & Arts (HA) cognate, to be selected from list of available cognates (https://cognates.miami.edu/). Each cognate should be a minimum of 3 courses (minimum of 9 credits). Students in Premed Track are highly encouraged to choose cognates that include PSY 110 and SOC 101.

Graduate courses are 600 or 700 level courses chosen from the BME course offerings with the approval of the advisor. Up to 6 credits of graduate courses can be taken in other engineering disciplines.