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

#### **Overview**

The College of Engineering offers a dual-degree program that culminates with students receiving a Bachelor of Science in Mechanical Engineering and a Master of Science in Biomedical Engineering concurrently. The program is intended for exceptional students who are admitted to the graduate program in their junior year. Students applying for this program must have a grade point average of at least 3.0. The two degrees are awarded simultaneously when the combined requirements have been met for both degrees.

- · Juniors who have maintained at least a 3.0 GPA have the option to apply for admission to the 5-year BS ME-MS BME program.
- Those who are accepted into this accelerated program must maintain at least a 3.0 GPA and a minimum of a 3.0 GPA for the final 30 credit hours.
- Up to 6 credit hours of Technical electives earned during the fourth year can be counted toward the 30 credit hours required for the MS degree.
- · 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 ME/MS BME program then all the requirements for the specific BS Concentration must be completed for graduation with the BS degree.

### **Admission Requirements**

Juniors in the Mechanical and Aerospace Engineering department of the University of Miami who have maintained at least a 3.0 GPA may apply to the dual degree program. Qualified students are strongly advised to apply to the dual degree program as early as possible in their junior year to facilitate academic advising and course selection in the second semester of their junior year. Students opting for an M.S. degree in a discipline different from their B.S. degree may need to take some prerequisite coursework. Before submitting an application, students should discuss the program and possibility of entering with an academic adviser.

#### **Curriculum Requirements**

Code	Title	Credit Hours		
BS IN MECHANICAL ENGINEERING REQUIREMENTS (120 CREDIT HOURS)				
Engineering Courses				
CAE 210	Mechanics of Solids I	3		
ECE 205	Principles of Electrical EngineeringI	3		
ISE 311	Applied Probability and Statistics	3		
EGN 123	Computing and Digital Solutions for the future (can also be EGN 110 or EGN 114)	3		
MAE 112	Introduction to Engineering II	2		
MAE 202	Dynamics	3		
MAE 207	Mechanics of Solids II	3		
MAE 241	Measurements Laboratory	3		
MAE 301	Engineering Materials Science	3		
MAE 302	Mechanical Behavior of Materials	3		
MAE 303	Thermodynamics	3		
MAE 309	Fluid Mechanics	3		
MAE 310	Heat Transfer	3		
MAE 341	Mechanical Design I	3		
MAE 342	Mechanical Design II	3		
MAE 351	Mechanics Laboratory	2		
MAE 362	Computer Analysis of Mechanical and Aerospace Engineering Problems	3		
MAE 404	Experimental Engineering Laboratory	2		
MAE 412	System Dynamics	3		
MAE 415	Automatic Control	3		
MAE 441	Design of Fluid and Thermal Systems	3		
MAE 442	Capstone Design Project-I	3		
MAE 443	Capstone Design Project-II	3		

Math and Science Courses		
MTH 151	Calculus I for Engineers	5
MTH 162	Calculus II	4
MTH 211	Calculus III	3
MTH 311	Introduction to Ordinary Differential Equations	3
CHM 151	Chemistry for Engineers	3
CHM 153	Chemistry Laboratory for Engineers	1
PHY 221	University Physics I	3
PHY 222	University Physics II	3
PHY 223	University Physics III	3
PHY 224	University Physics II Lab	1
PHY 225	University Physics III Lab	1
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)		
MS IN BIOMEDICAL ENGINEERING REQUIREMENTS (30 CRI	EDIT HOURS)	
Graduate Level Electives		18
Two physiology courses		6
BME 601	Biochemistry and Cellular Physiology for Engineers	
BME 602	Human Physiology for Engineers	
BME 603	Neurophysiology for Engineers	
BME 612	Regulatory Control of Biomedical Devices	3
BME 707	Master's Project I	1
BME 708	Master's Project II	2
Total Credit Hours		150

## **Plan of Study**

Freshman Year		
Fall		Credit Hours
EGN 123	Computing and Digital Solutions for the future (can also be EGN 110 or EGN 114)	3
WRS 105	First-Year Writing I	3
MTH 151	Calculus I for Engineers	5
PHY 221	University Physics I	3
	Credit Hours	14
Spring		
MAE 112	Introduction to Engineering II	2
CAE 210	Mechanics of Solids I	3
WRS 107	First-Year Writing II: STEM	3
MTH 162	Calculus II	4
PHY 222	University Physics II	3
PHY 224	University Physics II Lab	1
	Credit Hours	16

Fall  MAE 207 Mechanics of Solids II 3  ISE 311 Applied Probability and Statistics 3  INTH 212 Cedit Hours 16  Spring  Credit Hours 16  Credit Hours 16  Credit Hours 16  Lounior Vear  Fall  MAE 302 Mechanical Behavior of Materials 3  MAE 309 Fluid Mechanics 3  MAE 309 Fluid Mechanics 3  MAE 309 Fluid Mechanics 10 Essign I 1  Introduction to Ordinary Differential Equations 3  MAE 341 Mechanical Design I 1  Introduction to Ordinary Differential Equations 3  MAE 301 Engineering Materials Science 3  MAE 301 Engineering Materials Science 3  MAE 302 Mechanical Leging I 3  MAE 303 MAE 304 Mechanical Benaptive of Materials 3  MAE 305 MAE 305 MECHANIC Conditions 3  MAE 306 Computer Malerials Science 3  MAE 307 MAE 308 MAE 309 Mechanical Leging I 3  MAE 309 MAE 300 Mechanics Mechanical Design I 3  MAE 301 Mechanics Laboratory 3  Spring  MAE 301 Mechanics Laboratory 4  MAE 302 Mechanics Laboratory 5  Credit Hours 17  Credit Hours 17
ISE 311         Applied Probability and Statistics         3           MTH 211         Calculus III         3           PHY 223         University Physics III         1           PHY 225         University Physics III Lab         1           PS Cognate (PS Elective) 1         3           Credit Hours         16           Spring           MAE 202         Dynamics         3           MAE 241         Measurements Laboratory         3           CHM 151         Chemistry for Engineers         3           CHM 153         Chemistry Laboratory for Engineers         1           ECE 205         Principles of Electrical Engineering-I         3           HA Cognate (HA Elective) 1         3           Credit Hours         16           MAE 302         Mechanical Behavior of Materials         3           MAE 302         Mechanical Behavior of Materials         3           MAE 303         Thermodynamics         3           MAE 304         Mechanical Design I         3           MTH 311         Introduction to Ordinary Differential Equations         3           MAE 301         Fordit Hours         18
MTH 211 Calculus III 3 PHY 223 University Physics III 3 PHY 225 University Physics III 1ab 1 PS Cognate (PS Elective) 1  Credit Hours 16  Spring
PHY 223         University Physics III Lab         1           PS Cognate (PS Elective) 1         3           Credit Hours         16           Spring           MAE 202         Dynamics         3           MAE 11         Measurements Laboratory         3           CHM 151         Chemistry for Engineers         3           CHM 153         Chemistry Laboratory for Engineers         1           ECE 205         Principles of Electrical Engineering-I         3           HA Cognate (HA Elective) 1         3           Credit Hours         16           MAE 302         Mechanical Behavior of Materials         3           MAE 303         Thermodynamics         3           MAE 309         Fluid Mechanics         3           MAE 309         Fluid Mechanics         3           MAE 311         Introduction to Ordinary Differential Equations         3           MAE 324         Mechanical Design I         3           MAE 301         Heat Transfer         3           MAE 302         Mechanical Design II         3           MAE 303         Heat Transfer         3           MAE 304         Mechanical Design II         3
PHY 225         University Physics III Labh         1           PS Cognate (PS Elective) <sup>1</sup> Credit Hours         16           Spring         ME 202         Dynamics         3           MAE 241         Measurements Laboratory         3           CHM 151         Chemistry for Engineers         3           CHM 153         Chemistry Laboratory For Engineers         1           ECE 205         Principles of Electrical Engineering-I         3           HA Cognate (HA Elective) <sup>1</sup> 7           Vanior Year         16           Summer Hamman Agency of Materials         3           MAE 302         Mechanical Behavior of Materials         3           MAE 303         Thermodynamics         3           MAE 309         Fluid Mechanics         3           MAE 309         Fluid Mechanics         3           MAE 301         Introduction to Ordinary Differential Equations         3           MAE 303         Affordure         3           Spring         18           Spring         18           MAE 301         Heat Transfer         3           MAE 302         Mechanics Laboratory         2           MAE 303         Mechanics Laboratory
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MAE 202         Dynamics         3           MAE 241         Measurements Laboratory         3           CHM 151         Chemistry for Engineers         1           ECE 205         Principles of Electrical Engineering-I         3           HA Cognate (HA Elective) 1         7           Credit Hours         16           Junior Year           Fall           MAE 302         Mechanical Behavior of Materials         3           MAE 303         Thermodynamics         3           MAE 309         Fluid Mechanics         3           MAE 341         Mechanical Design I         3           MAE 342         Mechanical Design I         3           MAE 301         Engineering Materials Science         3           MAE 301         Engineering Materials Science         3           MAE 302         Mechanical Design II         3           MAE 303         Thermodynamics         3           Serior         Credit Hours         18           Spring         3         3           MAE 301         Engineering Materials Science         3           MAE 302         Mechanical Design II         3           MAE 303         C
MAE 241         Measurements Laboratory         3           CHM 151         Chemistry for Engineers         3           CHM 153         Chemistry Laboratory for Engineers         1           SCE 205         Principles of Electrical Engineering—I         3           HA Cognate (HA Elective) <sup>1</sup> 3           Credit Hours         16           Junior Year           Earl           MAE 302         Mechanical Behavior of Materials         3           MAE 303         Thermodynamics         3           MAE 309         Fluid Mechanics         3           MAE 309         Fluid Mechanical Design I         3           MAE 311         Introduction to Ordinary Differential Equations         3           MAE 342         Mechanical Mesisser         18           Spring         18           Credit Hours         18           MAE 301         Heat Transfer         3           MAE 310         Heat Transfer         3           MAE 351         Mechanics Laboratory         2           MAE 362         Computer Analysis of Mechanical and Aerospace Engineering Problems         3           PS Cognate (PS Elective)         1
CHM 151       Chemistry for Engineers       3         CHM 153       Chemistry Laboratory for Engineers       1         ECE 205       Principles of Electrical Engineering—I       3         3HA Cognate (HA Elective) 1       3         Credit Hours       16         Junior Year         Fall         MAE 302       Mechanical Behavior of Materials       3         MAE 303       Thermodynamics       3         MAE 303       Thermodynamics       3         MAE 303       Mechanical Design I       3         ME 341       Mechanical Design I       3         ME 400       Credit Hours       18         Spring       18         MAE 301       Engineering Materials Science       3         MAE 301       Heat Transfer       3         MAE 342       Mechanical Design II       3         MAE 362       Computer Analysis of Mechanical and Aerospace Engineering Problems       3         PS Cognate (PS Elective) 1       3         Credit Hours       17         Senior Year         Earl     <
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ECE 205         Principles of Electrical Engineering-I         3           HA Cognate (HA Elective) 1         Credit Hours         16           Junior Year           Fall           MAE 302         Mechanical Behavior of Materials         3           MAE 303         Thermodynamics         3           MAE 309         Fluid Mechanics         3           MAE 341         Mechanical Design I         3           MH 311         Introduction to Ordinary Differential Equations         3           HA Cognate (HA Elective)         3           Credit Hours         18           Spring           MAE 301         Engineering Materials Science         3           MAE 301         Heat Transfer         3           MAE 310         Heat Transfer         3           MAE 32         Mechanics Laboratory         2           MAE 362         Computer Analysis of Mechanical and Aerospace Engineering Problems         3           PS Cognate (PS Elective) 1         3           Credit Hours         17           Senior Year           English Healt Sequence Fine Problems         3           Ale 20 <td< td=""></td<>
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Credit Hours         16           Junior Year           Fall           MAE 302         Mechanical Behavior of Materials         3           MAE 303         Thermodynamics         3           MAE 309         Fluid Mechanics         3           MAE 341         Mechanical Design I         3           Tredit Hours         18           Spring           MAE 301         Engineering Materials Science         3           MAE 301         Heat Transfer         3           MAE 310         Heat Transfer         3           MAE 342         Mechanical Design II         3           MAE 362         Computer Analysis of Mechanical and Aerospace Engineering Problems         3           PS Cognate (PS Elective) 1         Credit Hours         17           Senior Year           Fall           MAE 404         Experimental Engineering Laboratory         2
Junior Year           Fall           MAE 302         Mechanical Behavior of Materials         3           MAE 303         Thermodynamics         3           MAE 309         Fluid Mechanics         3           MAE 341         Mechanical Design I         3           MTH 311         Introduction to Ordinary Differential Equations         3           HA Cognate (HA Elective)         3           Credit Hours         18           Spring           MAE 301         Engineering Materials Science         3           MAE 310         Heat Transfer         3           MAE 342         Mechanical Design II         3           MAE 351         Mechanics Laboratory         2           MAE 362         Computer Analysis of Mechanical and Aerospace Engineering Problems         3           Security Felicitive) 1         3           Security Felicity Hours         17           Security Hours         17           Security Hours         17           Security Hours         2           MAE 404         Experimental Engineering Laboratory         2
Fall           MAE 302         Mechanical Behavior of Materials         3           MAE 303         Thermodynamics         3           MAE 309         Fluid Mechanics         3           MAE 341         Mechanical Design I         3           MTH 311         Introduction to Ordinary Differential Equations         3           HA Cognate (HA Elective)         3           Credit Hours         18           Spring           MAE 301         Engineering Materials Science         3           MAE 310         Heat Transfer         3           MAE 342         Mechanical Design II         3           MAE 351         Mechanics Laboratory         2           MAE 362         Computer Analysis of Mechanical and Aerospace Engineering Problems         3           PS Cognate (PS Elective)         17           Senior Year           Fall           MAE 404         Experimental Engineering Laboratory         2           MAE 404         Experimental Engineering Laboratory         3           MAE 404         System Dynamics         3
MAE 302       Mechanical Behavior of Materials       3         MAE 303       Thermodynamics       3         MAE 309       Fluid Mechanics       3         MAE 341       Mechanical Design I       3         MTH 311       Introduction to Ordinary Differential Equations       3         HA Cognate (HA Elective)       3         Credit Hours       18         Spring         MAE 301       Engineering Materials Science       3         MAE 310       Heat Transfer       3         MAE 342       Mechanical Design II       3         MAE 351       Mechanical Design II       3         MAE 362       Computer Analysis of Mechanical and Aerospace Engineering Problems       3         PS Cognate (PS Elective) 1       3         Credit Hours       17         Senior Year         Fall         MAE 404       Experimental Engineering Laboratory       2         MAE 404       Experimental Engineering Laboratory       3         MAE 402       System Dynamics       3
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MAE 309       Fluid Mechanics       3         MAE 341       Mechanical Design I       3         MTH 311       Introduction to Ordinary Differential Equations       3         Credit Hours       18         Spring         MAE 301       Engineering Materials Science       3         MAE 310       Heat Transfer       3         MAE 342       Mechanical Design II       3         MAE 351       Mechanics Laboratory       2         MAE 362       Computer Analysis of Mechanical and Aerospace Engineering Problems       3         PS Cognate (PS Elective)       3         Credit Hours       17         Senior Year         Fall       Experimental Engineering Laboratory       2         MAE 404       Experimental Engineering Laboratory       2         MAE 412       System Dynamics       3
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MTH 311       Introduction to Ordinary Differential Equations       3         HA Cognate (HA Elective)       Credit Hours       18         Spring         MAE 301       Engineering Materials Science       3         MAE 310       Heat Transfer       3         MAE 342       Mechanical Design II       3         MAE 351       Mechanics Laboratory       2         MAE 362       Computer Analysis of Mechanical and Aerospace Engineering Problems       3         PS Cognate (PS Elective)       17         Senior Year         Fall         MAE 404       Experimental Engineering Laboratory       2         MAE 404       Experimental Engineering Laboratory       2         MAE 412       System Dynamics       3
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Spring           MAE 301         Engineering Materials Science         3           MAE 310         Heat Transfer         3           MAE 342         Mechanical Design II         3           MAE 351         Mechanics Laboratory         2           MAE 362         Computer Analysis of Mechanical and Aerospace Engineering Problems         3           PS Cognate (PS Elective) <sup>1</sup> 3           Credit Hours         17           Senior Year           Fall           MAE 404         Experimental Engineering Laboratory         2           MAE 412         System Dynamics         3
MAE 301 Engineering Materials Science 3 MAE 310 Heat Transfer 3 MAE 342 Mechanical Design II 3 MAE 351 Mechanics Laboratory 2 MAE 362 Computer Analysis of Mechanical and Aerospace Engineering Problems 3 PS Cognate (PS Elective) 3 Credit Hours 17 Senior Year Fall MAE 404 Experimental Engineering Laboratory 2 MAE 412 System Dynamics 3
MAE 310 Heat Transfer 3  MAE 342 Mechanical Design II 3  MAE 351 Mechanics Laboratory 2  MAE 362 Computer Analysis of Mechanical and Aerospace Engineering Problems 3  PS Cognate (PS Elective) 1  Credit Hours 17  Senior Year  Fall  MAE 404 Experimental Engineering Laboratory 2  MAE 412 System Dynamics 3
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MAE 351 Mechanics Laboratory 2 MAE 362 Computer Analysis of Mechanical and Aerospace Engineering Problems 3 PS Cognate (PS Elective) 1 Credit Hours 17 Senior Year Fall MAE 404 Experimental Engineering Laboratory 2 MAE 412 System Dynamics 3
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MAE 404 Experimental Engineering Laboratory 2 MAE 412 System Dynamics 3
MAE 412 System Dynamics 3
MAE 441 Design of Fluid and Thermal Systems 3
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Technical elective taken as graduate course
MAE 442 Capstone Design Project-l 3
Graduate Level Course 3
Credit Hours 17
Spring
MAE 415 Automatic Control 3
MAE 443 Capstone Design Project-II 3
HA Cognate (HA Elective) 1 3
PS Cognate (Adv. PS Elective) <sup>1</sup>
Graduate Level Course 3
Credit Hours 15

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

Fifth Year (Graduate)		
Fall		
BME 602	Human Physiology for Engineers	3
BME 612	Regulatory Control of Biomedical Devices	3
BME 707	Master's Project I	1
BME elective <sup>3</sup>		3
	Credit Hours	10
Spring		
BME 601 or 603	Biochemistry and Cellular Physiology for Engineers or Neurophysiology for Engineers	3
BME 708	Master's Project II	2
BME elective		3
BME elective		3
	Credit Hours	11
	Total Credit Hours	150

You must complete a minimum of 1 PS cognate and 1 HA cognate to be selected from the list of available cognates. Each cognate should be a minimum of three courses (9 credit hours).

Technical Electives are advanced courses in mathematics, science or engineering, approved by the Faculty Advisor, as appropriate for individual objectives.