

# B.S. IN MECHANICAL ENGINEERING

<http://www.coe.miami.edu/dept-mac/>

## Overview

The University of Miami Department of Mechanical and Aerospace Engineering offers a B.S. in Mechanical Engineering with the option to pursue concentrations in Aerospace Engineering or in Internal Combustion Engines.

### Aerospace Engineering Concentration:

The mission of the aerospace engineer is to design and manufacture payload carrying vehicles to travel distances at the lowest cost in the shortest period of time. The training of the aerospace engineer is by demand multidisciplinary and by spirit pioneering. It includes aerodynamics, propulsion, advanced materials, structures, controls, robotics, electronics and computer usage.

An option has been developed to allow students at the University of Miami to have a concentration of courses in Aerospace Engineering. This concentration in aerospace is built on the existing accredited degree program in Mechanical Engineering.

### Internal Combustion Engines Concentration:

This program is designed to acquaint the mechanical engineering student with the fundamental science and engineering underlying the design of both conventional and high performance internal combustion engines and the fundamentals of emission formation in combustion systems, automobile mechanisms and structures including vibrations and noise. Included are studies of conventional fuels and synthetic fuels of the future such as hydrogen and methanol.

## Curriculum Requirements for the Mechanical Engineering Major

Code	Title	Credit Hours
<b>Engineering Courses</b>		
CAE 210	Mechanics of Solids I	3
ECE 205	Principles of Electrical Engineering-I	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
MAE Technical Electives		6
Technical Elective		3
<b>Math and Science Courses</b>		
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
<b>General Education Requirements</b>		
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)		
<b>Total Credit Hours</b>		<b>129</b>

## Curriculum Requirements for the Mechanical Engineering Major with a Concentration in Aerospace Engineering

Code	Title	Credit Hours
<b>Engineering Courses</b>		
CAE 210	Mechanics of Solids I	3
ECE 205	Principles of Electrical Engineering-I	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 362	Computer Analysis of Mechanical and Aerospace Engineering Problems	3
MAE 351	Mechanics Laboratory	2
MAE 371	Aerodynamics	3
MAE 404	Experimental Engineering Laboratory	2
MAE 415	Automatic Control	3
MAE 442	Capstone Design Project-I	3
MAE 443	Capstone Design Project-II	3
MAE 441	Design of Fluid and Thermal Systems	3
MAE 470	Introduction to Aerospace Structures	3
MAE 473	Aerospace Propulsion	3

MAE 471	Flight Dynamics	3
<b>Math and Science Courses</b>		
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
<b>Additional Requirements</b>		
WRS 105	First-Year Writing I	3
WRS 107	First-Year Writing II: STEM	3
Arts and Humanities Cognate		9
People and Society Cognate		9
MAE 412	System Dynamics	3
<b>Total Credit Hours</b>		<b>132</b>

## Curriculum Requirements for the Mechanical Engineering Major with a Concentration in Internal Combustion Engines

Code	Title	Credit Hours
<b>Engineering Courses</b>		
CAE 210	Mechanics of Solids I	3
ECE 205	Principles of Electrical Engineering-I	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
MAE 503	Internal Combustion Engines	3
MAE 514	Advanced Internal Combustion Engines Experimental Studies	3

MAE 521	Exhaust Emission Control	3
<b>Math and Science Courses</b>		
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
<b>Additional Requirements</b>		
WRS 105	First-Year Writing I	3
WRS 107	First-Year Writing II: STEM	3
Arts and Humanities Cognate		9
People and Society Cognate		9
<b>Total Credit Hours</b>		<b>129</b>

### Technical Electives

Code	Title	Credit Hours
MAE 503	Internal Combustion Engines	3
MAE 514	Advanced Internal Combustion Engines Experimental Studies	3
MAE 521	Exhaust Emission Control	3

## Plan of Study for the Mechanical Engineering Major

Freshman Year		Credit Hours
<b>Fall</b>		
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
<b>Credit Hours</b>		<b>14</b>
<b>Spring</b>		
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
<b>Credit Hours</b>		<b>16</b>
<b>Sophomore Year</b>		
<b>Fall</b>		
MAE 207	Mechanics of Solids II	3
ISE 311	Applied Probability and Statistics	3
MTH 211	Calculus III	3
PHY 223	University Physics III	3
PHY 225	University Physics III Lab	1
PS Cognate (PS Elective) <sup>1</sup>		3
<b>Credit Hours</b>		<b>16</b>

<b>Spring</b>		
MAE 202	Dynamics	3
MAE 241	Measurements Laboratory	3
ECE 205	Principles of Electrical Engineering-I	3
CHM 151	Chemistry for Engineers	3
CHM 153	Chemistry Laboratory for Engineers	1
HA Cognate (HA Elective) <sup>1</sup>		3
<b>Credit Hours</b>		<b>16</b>
<b>Junior Year</b>		
<b>Fall</b>		
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
PS Cognate (PS Elective) <sup>1</sup>		3
<b>Credit Hours</b>		<b>18</b>
<b>Spring</b>		
MAE 301	Engineering Materials Science	3
MAE 310	Heat Transfer	3
MAE 342	Mechanical Design II	3
MAE 351	Mechanics Laboratory	2.00
MAE 362	Computer Analysis of Mechanical and Aerospace Engineering Problems	3
HA Cognate (HA elective) <sup>1</sup>		3
<b>Credit Hours</b>		<b>17</b>
<b>Senior Year</b>		
<b>Fall</b>		
MAE 404	Experimental Engineering Laboratory	2.00
MAE 412	System Dynamics	3
MAE 441	Design of Fluid and Thermal Systems	3
MAE 442	Capstone Design Project-I	3
Technical Elective <sup>2</sup>		3
PS Cognate <sup>1</sup>		3
<b>Credit Hours</b>		<b>17</b>
<b>Spring</b>		
MAE 443	Capstone Design Project-II	3
MAE 415	Automatic Control	3
MAE Technical Elective <sup>3</sup>		3
MAE Technical Elective <sup>3</sup>		3
HA Cognate (Adv. HA Elective) <sup>1</sup>		3
<b>Credit Hours</b>		<b>15</b>
<b>Total Credit Hours</b>		<b>129</b>

## Plan of Study for the Mechanical Engineering Major with a Concentration in Aerospace Engineering

<b>Freshman Year</b>		
<b>Fall</b>		
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
		<b>Credit Hours</b>

PHY 221	University Physics I	3
<b>Credit Hours</b>		<b>14</b>
<b>Spring</b>		
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
<b>Credit Hours</b>		<b>16</b>
<b>Sophomore Year</b>		
<b>Fall</b>		
MAE 207	Mechanics of Solids II	3
ISE 311	Applied Probability and Statistics	3
MTH 211	Calculus III	3
PS Cognate (PS Elective) <sup>1</sup>		3
PHY 223	University Physics III	3
PHY 225	University Physics III Lab	1
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
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) <sup>1</sup>		3
<b>Credit Hours</b>		<b>16</b>
<b>Junior Year</b>		
<b>Fall</b>		
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
PS Cognate (PS Elective) <sup>1</sup>		3
<b>Credit Hours</b>		<b>18</b>
<b>Spring</b>		
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
MAE 371	Aerodynamics	3
<b>Credit Hours</b>		<b>17</b>
<b>Senior Year</b>		
<b>Fall</b>		
MAE 404	Experimental Engineering Laboratory	2
MAE 412	System Dynamics	3
MAE 441	Design of Fluid and Thermal Systems	3
MAE 442	Capstone Design Project-I	3
MAE 471	Flight Dynamics	3

MAE 473	Aerospace Propulsion	3
<b>Credit Hours</b>		<b>17</b>
<b>Spring</b>		
MAE 443	Capstone Design Project-II	3
MAE 415	Automatic Control	3
MAE 470	Introduction to Aerospace Structures	3
HA Cognate (HA Elective) <sup>1</sup>		3
PS Cognate (Adv. PS- Elective) <sup>1</sup>		3
HA Cognate (Adv. HA Elective) <sup>1</sup>		3
<b>Credit Hours</b>		<b>18</b>
<b>Total Credit Hours</b>		<b>132</b>

<sup>1</sup> 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).

## Plan of Study for the Mechanical Engineering Major with a Concentration in Internal Combustion Engines

<b>Freshman Year</b>		
<b>Fall</b>		<b>Credit Hours</b>
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
<b>Credit Hours</b>		<b>14</b>
<b>Spring</b>		
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
<b>Credit Hours</b>		<b>16</b>
<b>Sophomore Year</b>		
<b>Fall</b>		
MAE 207	Mechanics of Solids II	3
ISE 311	Applied Probability and Statistics	3
MTH 211	Calculus III	3
PHY 223	University Physics III	3
PHY 225	University Physics III Lab	1
HA Cognate (HA Elective) <sup>1</sup>		3
<b>Credit Hours</b>		<b>16</b>
<b>Spring</b>		
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
PS Cognate (PS Elective) <sup>1</sup>		3
<b>Credit Hours</b>		<b>16</b>

<b>Junior Year</b>		
<b>Fall</b>		
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
PS Cognate (PS Elective) <sup>1</sup>		3
	<b>Credit Hours</b>	<b>18</b>
<b>Spring</b>		
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
MAE 503	Internal Combustion Engines	3
	<b>Credit Hours</b>	<b>17</b>
<b>Senior Year</b>		
<b>Fall</b>		
MAE 404	Experimental Engineering Laboratory	2
MAE 412	System Dynamics	3
MAE 441	Design of Fluid and Thermal Systems	3
MAE 442	Capstone Design Project-I	3
MAE 514	Advanced Internal Combustion Engines Experimental Studies	3
HA Cognate (HA Elective) <sup>1</sup>		3
	<b>Credit Hours</b>	<b>17</b>
<b>Spring</b>		
MAE 415	Automatic Control	3
MAE 443	Capstone Design Project-II	3
MAE 521	Exhaust Emission Control	3
HA Cognate (Adv. HA Elective) <sup>1</sup>		3
PS Cognate (Adv. PS Elective) <sup>1</sup>		3
	<b>Credit Hours</b>	<b>15</b>
	<b>Total Credit Hours</b>	<b>129</b>

## Mission

The mission of the Department of Mechanical and Aerospace Engineering is to provide excellent undergraduate education in aerospace engineering and undergraduate and graduate education in mechanical engineering that will prepare graduates to meet Society's changing needs and aspirations.

The mission of the Mechanical Engineering program is to provide excellent undergraduate education in Mechanical Engineering that will prepare graduates to meet society's changing needs and aspirations.

## Goals

The educational objectives of the undergraduate Mechanical Engineering (B.S.M.E.) Program are to prepare graduates, within a few years after graduation, to be:

- working as a professional or as an entrepreneur in an area related to mechanical engineering, and/or
- exhibiting lifelong learning by pursuing or having completed a graduate or professional degree and/or demonstrated professional development.

## Student Learning Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.



4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.