

# Mechanical Engineering- Bachelor of Science in Engineering

For information, contact the Department of Mechanical and Manufacturing Engineering, 56 Garland Hall, 513-529-0710.

This program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Mechanical Engineering encompasses the design, analysis, production and operation of machines and systems. It requires the ability to use principles from mathematics, science, and engineering, perform research, create mathematical and physical models, simulate and test working conditions, and synthesize different elements in order to obtain the optimum design of a specific product or process.

The increasing sophistication of products and systems requires academically qualified mechanical engineers who can apply state-of-the-art tools and methods of engineering. Examples include computer-aided engineering/design/manufacturing, finite-element analysis, computational fluid mechanics, robotics, heat transfer, dynamics, and advanced machine and tool design.

The mechanical engineer of the 21st century must be able to think critically in broader contexts because engineering solutions to problems in contemporary society often involve complex social, political, environmental and economic issues. Miami's mechanical engineering program provides students with a broad mechanical engineering foundation supplemented by courses in manufacturing engineering, electrical engineering, computer science, chemical/biological engineering, economics, mathematics, physics, chemistry, biology, and a strong liberal arts component that includes fine arts, humanities, social science, and global/intercultural perspectives.

Graduates have the opportunity to work in a diverse spectrum of professional fields. These include design, development, research, manufacturing, production, project management, technical sales, and field support and service. Many mechanical engineers work in manufacturing-related areas, in the analysis and design of myriad products, and in other sectors of the economy such as medicine, law and government service. Graduates are also prepared to continue their education at the graduate level. Graduating seniors are encouraged to take the Fundamentals of Engineering examination, which is the first of two examinations that lead to becoming a licensed professional engineer.

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## Program Educational Objectives

Graduates of the Mechanical Engineering program are expected to attain or achieve the following Program Educational Objectives within a few years of graduation:

- Advance in their chosen profession and/or in their pursuit of an advanced degree.
- Demonstrate leadership and teamwork characterized by Miami University's Code of Love & Honor.

- Apply sound engineering principles and skills to synthesize innovative solutions to customer needs and challenges.
- Execute responsibilities in an ethical manner.

## Student Outcomes

The Student Outcomes, from ABET Engineering Accreditation Commission (EAC) criteria, prepare graduates of the Mechanical and Manufacturing Engineering programs to attain the Program Educational Objectives.

- EAC (1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- EAC (2) An ability to apply engineering design to produce solutions that meet specified needs with consideration to public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- EAC (3) An ability to communicate effectively with a range of audiences
- EAC (4) An ability to recognize ethical and professional responsibilities
- EAC (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
- EAC (6) An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgment to draw conclusions
- EAC (7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

## Mechanical Engineering Program Criteria

The Mechanical Engineering curriculum also provides graduates with:

MCH 1: An ability to apply principles of engineering, basic science and mathematics (including multivariate calculus and differential equations) to solve engineering problems.

MCH 2: An ability to model, analyze, design and realize physical systems, components or processes.

MCH 3: The preparation to work professionally in either thermal or mechanical systems areas.

## Departmental Honors

If you excel in your studies, you may qualify for the University Honors Program or the program for Honors in Mechanical and Manufacturing Engineering. As a senior in these programs, you will have the opportunity to work closely with the faculty on research projects of interest.

## Credit/No Credit Policy

All courses in chemistry, physics, biology, mathematics, statistics and those in the College of Engineering and Computing (CPB, CSE, CYB, ECE, MME, CEC, EGM) that are used to fulfill requirements of the major, must be taken for a grade.

## Divisional Policy

Multiple Majors: Students with two or more majors in the College of Engineering and Computing must take a minimum of 15 unique, additional credit hours in each major.

## Program Requirements

Minimum of 127 semester hours<sup>1</sup>

Code	Title	Credit Hours
<b>Core Requirements</b>		
CHM 141 & CHM 144	College Chemistry and College Chemistry Laboratory	5
ECO 201	Principles of Microeconomics	3
ENG 313	Technical Writing	3
MTH 151	Calculus I	4
MTH 246	Linear Algebra and Differential Equations for Engineers	4
MTH 251 or MTH 249	Calculus II	4-5
MTH 252	Calculus III	4
PHY 181 & PHY 183	General Physics I and General Physics Laboratory I	5
PHY 182	General Physics II	4
STA 301 or STA 261	Applied Statistics Statistics	3 - 4
<b>Engineering Science</b>		
ECE 205	Electric Circuit Analysis I	4
MME 211	Static Modeling of Mechanical Systems	3
MME 223	Engineering Materials	3
MME 311	Dynamic Modeling of Mechanical Systems	3
MME 312	Mechanics of Materials	3
MME/CPB 313	Fluid Mechanics	3
MME/CPB 314	Engineering Thermodynamics	3
<b>Mechanical Engineering Core</b>		
CEC 111	Imagination, Ingenuity and Impact I	2
CEC 112	Imagination, Ingenuity, and Impact II	2
MME 231	Manufacturing Processes	3
MME 201	Modeling and Design in Engineering	2
MME 202	Numerical Methods in Engineering	3
MME 305	Measurements and Instrumentation	3
MME 321	System Modeling, Analysis, & Control	3
MME/CPB 341	Engineering Economics	3
MME/CPB 403	Heat Transfer	3
MME 411	Machine and Tool Design	3
MME 415	Thermal-Fluid Studio	2
<b>Senior Capstone Engineering Design</b>		
MME 448	Senior Design Project	2
MME 449	Senior Design Project	2
<b>Complete Any One Track (6 hours)</b>		<b>6</b>
Track 1: Mechanics (select 2 courses)		
MME 412	Advanced Mechanics of Materials	

MME 470	Special Topics in Mechanical Engineering (Fracture Mechanics)	
Track 2: Thermal Fluids (select 2 courses)		
MME 413	Introduction to Compressible Flow	
MME 414	Engineering Thermodynamics II	
Track 3: Dynamics and Controls (select 2 courses)		
MME 315	Mechanical Vibrations	
MME 436	Control of Dynamic Systems	
MME 495	Introduction to Applied Nonlinear Dynamics	
<b>Technical electives</b>		
Select one of the following courses for a minimum of three credit hours: <sup>2</sup>		3
CPB 244	Introduction to Environmental Engineering	
CPB 423	Biomechanics	
CPB 482	Process Control	
CSE 153 or CSE 174	Introduction to C/C++ Programming Fundamentals of Problem Solving and Programming	
CSE 271	Object-Oriented Programming	
CSE 273	Optimization Modeling	
CSE 372	Stochastic Modeling	
ECE 287	Digital Systems Design	
ECE 291	Energy Systems Engineering	
ECE 302	MATLAB and its engineering applications	
ECE 304	Electronics	
ECE 306	Signals and Systems	
MME 331	Advanced Manufacturing and Design	
MME 334	Quality Planning and Control	
MME 337	Manufacturing Automation	
MME 360	Special Topics	
MME 375	Human Robot Interaction	
MME 435	Process Engineering	
MME 451	Sustainability Considerations in Design and Development	
<b>Total Credit Hours</b>		<b>103-105</b>

<sup>1</sup> A minimum of 127 semester credit hours is required for graduation, which includes completion of the requirements for the Miami Plan.

<sup>2</sup> Other courses may be approved by petition.