Smart Manufacturing 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.

Manufacturing continues to remain one of the leading contributors to the national GDP, and the growth and innovation within nearly all sectors of manufacturing can be attributed to data driven solutions. Smart manufacturing uses data generation and evaluation at various scales to help make informed decisions from control of specific equipment to the operation of an entire factory. Smart or intelligent manufacturing technologies being applied to increase productivity, improve quality, and reduce costs include digital engineering/design/manufacturing, robotics and automation, real-time data analytics, lean and agile process management, six sigma statistical process control, and additive manufacturing. Smarter, automated and more flexible companies need academically qualified and skilled manufacturing engineers.

Creating appropriate engineering solutions to the current problems facing industry and society often involves complex social, political, environmental and economic issues. The department provides graduates with an in-depth education in mathematics, science, engineering, and design, with a focus on smart or digital manufacturing processes, data analytics, predictive maintenance, system engineering, digital twins, methods and materials, as well as requiring a broad education in computing, economics, and the liberal arts. The department is committed to excellence in undergraduate education: student learning, classroom effectiveness, assessment, engineering design, professional ethics, student advising and opportunities for leadership.

Graduates typically work as manufacturing engineers in areas such as product and process development and design, quality control, advanced manufacturing, lean manufacturing, systems design and integrator, process and plant-facilities design, project management, and industrial engineering. After gaining industrial experience, graduates often move into organizational management positions. 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 Miami's Smart Manufacturing 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

Smart Manufacturing Engineering Program Criteria

The Smart Manufacturing Engineering curriculum also provides graduates with:

MFG 1: An ability to design manufacturing processes.

MFG 2: An ability to design products and the corresponding processing machinery.

MFG 3: An ability to create competitive advantage by manufacturing planning, strategy, and control.

MFG 4: An ability to analyze, synthesize, and control manufacturing operations using statistical methods.

MFG 5: An ability to make technical inferences about a manufacturing process by measuring process variables.

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, ECE, MME, CEC, EGM) that are used to fulfill requirements of the major, must be taken for a grade.

Divisional Policy

DOUBLE MAJORS: Students with two majors in the College of Engineering and Computing must take a minimum of 15 different/additional credit hours in their second major beyond the requirements of their first major.

Program Requirements

(128 semester hours minimum)

Note: MME 331, 435, 432 are offered only in the fall semester (typically) and MME 337, 433 are offered only in the spring semester (typically).

Code	Title	Credit Hours
Core Requirements		
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 251	Calculus II	4-5
or MTH 249	Calculus II	
MTH 246	Linear Algebra and Differential Equations for Engineers	4
PHY 181 & PHY 183	General Physics I and General Physics Laboratory I	5
PHY 182	General Physics II	4
STA 301	Applied Statistics	3 - 4
or STA 261	Statistics	
Engineering Science		
ECE 205	Electric Circuit Analysis I	4
MME 211	Static Modeling of Mechanical Systems	3
MME 223	Engineering Materials	3
MME 312	Mechanics of Materials	3
Manufacturing Engineering Core		
CEC 111	Imagination, Ingenuity and Impact I	2
CEC 112	Imagination, Ingenuity, and Impact II	2
MME 201	Modeling and Design in Engineering	2
MME 231	Manufacturing Processes	3
MME 232	Polymer Processes	3
MME 301	Product Design and Development	3
MME 305	Measurements and Instrumentation	3
MME 331	Advanced Manufacturing and Design	3
MME 334	Quality Planning and Control	3
MME 337	Manufacturing Automation	3
MME/CPB 341	Engineering Economics	3
STA 363	Introduction to Statistical Modeling	3
MME 411	Machine and Tool Design	3
MME 432	Digital Manufacturing	3
MME 433	Smart Factory	3
MME 435	Process Engineering (Engineering Processes)	3
MME 470	Special Topics in Mechanical Engineering	3
or STA 402	Statistical Programming	
or STA 404	Advanced Data Visualization	
Senior Capstone Engineering Design		
MME 448	Senior Design Project	2
MME 449	Senior Design Project	2
Technical Electives		
Select two of the following courses for a minimum of 6 credit hours: [1]		6
CPB 244	Introduction to Environmental Engineering	
CPB 482	Process Control	
CSE 174	Fundamentals of Programming and Problem Solving	
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	
ECO 202	Principles of Macroeconomics	
MME 311	Dynamic Modeling of Mechanical Systems	
MME 313	Fluid Mechanics	
MME 314	Engineering Thermodynamics	
MME 315	Mechanical Vibrations	
MME 321	System Modeling, Analysis, & Control	
MME 360	Special Topics	
MME 375	Human Robot Interaction	
MME/CPB 403	Heat Transfer	
MME 412	Advanced Mechanics of Materials	
MME 414	Engineering Thermodynamics II	
MME 451	Sustainability Considerations in Design and Development	
MME 495	Introduction to Applied Nonlinear Dynamics	
Total Credit Hours		**106-108**

[1] Other courses may be approved by petition.