

# MECHANICAL ENGINEERING

**Home Department:** Mechanical Engineering (<https://my.kettering.edu/academics/departments/mechanical-engineering>)

## Department Head:

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## Program Overview

The Bachelor of Science in Mechanical Engineering (<https://www.kettering.edu/programs-and-degrees/mechanical-engineering>) (ME) prepares students for a broad range of careers associated with the design and implementation of mechanical systems involving the conversion, transmission, and utilization of energy. Mechanical engineering courses that provide breadth in the discipline include design, dynamics, engineering materials, thermodynamics, fluid mechanics, heat transfer, vibrations, systems analysis, and associated laboratories. Large and well-equipped laboratories in experimental mechanics, heat transfer, fluid mechanics, engines, vibrations, hydraulics, instrumentation, and automotive emissions support the mechanical engineering program.

Mechanical Engineering students may elect to customize their degree by taking a set of elective courses in a specific area; either by pursuing a Specialty within the Mechanical Engineering program or by pursuing a Minor (<http://catalog.kettering.edu/undergrad/academic-programs/minors>) with non-Mechanical Engineering programs. For more details see Mechanical Engineering Program Specialties or Minors.

Mechanical Engineering students may elect to customize their degree by taking a set of elective courses in a specific area; either by pursuing a Specialty within the ME program or by pursuing a Minor with non-ME programs. For more details see "Mechanical Engineering Program Specialties" or "Minors".

The program in Mechanical Engineering is accredited by the Engineering Accreditation Commission of ABET (<http://www.abet.org>).

## Program Educational Objectives

With their Kettering education as a foundation, within a few years of graduation, graduates will attain:

- A reputation for working effectively and ethically in diverse professional environments.
- Leadership in their profession while actively pursuing lifelong learning and contributing to progress within their field.
- The ability to practice responsible decision making and apply best practices to their professional endeavors.

## Program Curriculum Requirements

### First Year Experience

FYE-101	First Year Foundations	1
<i>Credit Hours Subtotal:</i>		1

### General Education

COMM-101	Written & Oral Communication I	4
COMM-301	Written & Oral Communication II	4
ECON-201	Economic Principles	4

HUMN-201	Introduction to Humanities	4
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
SSCI-201	Introduction to the Social Sciences	4
Advanced Humanities Elective		4
Advanced Social Science Elective		4
<i>Credit Hours Subtotal:</i>		32

### Basic Sciences

CHEM-135	Principles of Chemistry	4
& CHEM-136	and Principles of Chemistry Lab	
PHYS-114	Newtonian Mechanics	4
& PHYS-115	and Newtonian Mechanics Laboratory	
PHYS-224	Electricity and Magnetism	4
& PHYS-225	and Electricity and Magnetism Laboratory	
Math/Science Elective <sup>4</sup>		4
<i>Credit Hours Subtotal:</i>		16

### Mathematics

MATH-101	Calculus I	4
or MATH-101X	Calculus I	
Select one of the following:		4
MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II - Honors	
MATH-203	Multivariate Calculus	4
or MATH-203H	Multivariate Calculus - Honors	
MATH-204	Differential Equations & Laplace Transforms	4
or MATH-204H	Differential Equations and Laplace Transforms - Honors	
MATH-305	Numerical Methods and Matrices	4
MATH-408	Probability and Statistics	4
<i>Credit Hours Subtotal:</i>		24

### Mechanical Engineering Required Courses

EE-212	Applied Electrical Circuits	3
MECH-231L	Signals for Mechanical Systems Lab <sup>1</sup>	1
IME-100	Interdisciplinary Design and Manufacturing	4
Select one of the following:		4
IME-301	Engineering Materials <sup>(EP-342 only if dual degree ME/EP)</sup>	4
or EP-342	Materials Science and Nanotechnology	
MECH-100	Engineering Graphical Communication	4
MECH-210	Statics	4
MECH-212	Mechanics of Materials	4
MECH-300	Computer Aided Engineering	4
MECH-310	Dynamics	4
MECH-311	Introduction to Mechanical System Design	4
MECH-312	Mechanical Component Design I	4
MECH-320	Thermodynamics	4
MECH-322	Fluid Mechanics	4
MECH-330	Dynamic Systems with Vibrations	4
MECH-420	Heat Transfer	4

MECH-422	Energy Systems Laboratory	4
MECH-430	Dynamic Systems with Controls	4
<i>Credit Hours Subtotal:</i>		68
<b>Electives</b>		
Two Free Electives <sup>3</sup>		8
Two Mechanical Engineering Electives <sup>2</sup>		8
Mechanical Engineering Senior Design Project		4
<i>Credit Hours Subtotal:</i>		20
<b>Culminating Undergraduate Experience</b>		
CUE-495	Culminating Undergraduate Experience Introductory Course (No credit, Pass/Fail)	
Select one of the following:		4
CUE-495C	Co-op Thesis	
CUE-495E	Intra/Entre/Social E-ship Thesis	
CUE-495P	Professional Practice Thesis	
CUE-495R	Research Thesis	
<i>Credit Hours Subtotal:</i>		4
Total Credit Hours		165

**(Minimum) Total Credits Required for the Program: 161**

- <sup>1</sup> Students pursuing an Electrical Engineering minor take EE-210/EE-211 in lieu of MECH-231L/EE-212.
- <sup>2</sup> ME electives are described as: Any 300-599 level BIOL, CE, CHEM, CHME, CS, ECE, EE, EP, IME, ISYS, MATH (except pre-calc and college math), MECH, or PHYS that is not used to complete core degree requirements. In addition, BUSN-372/BUSN-303, BUSN-373/BUSN-304, KETT-540, and MGMT-546/BUSN-411 also qualify as M.E. Electives.
- <sup>3</sup> Free electives are described as: Any Kettering University course except any course that consists of an elementary nature when advanced topics have been mastered, and any course that consists of topics, which are very similar to topics which have been mastered.
- <sup>4</sup> Math/Science elective is described as: Any level BIOL, CHEM, MATH or PHYS that is not used to complete core degree requirements.

## Mechanical Engineering Program Specialties

Students majoring in Mechanical Engineering may select a specialty consisting of 20 credit hours of courses focused in a particular area. Specialties may include both required and elective courses. First Six Semesters are common to all Mechanical Engineering Students. Senior I through Senior III representative programs are given for each specialty.

A Mechanical Engineering specialty provides students a depth of study in preparation for a career within an industrial sector and/or as a foundation for graduate study. However, the student's degree is Mechanical Engineering and the selected specialty does not prevent students from working within any industry. The primary advantage is to provide a "jump start" over mechanical engineering graduates from other schools with traditional degree programs. Courses are subject to cancellation due to low enrollment.

### Alternative Energy Specialty

MECH-526	Fuel Cell Science & Engineering	4
MECH-527	Energy and the Environment	4

MECH-528	Bio and Renewable Energy Lab	4
MECH-545	Hybrid Electric Vehicle Propulsion	4
MECH-521	Energy and Environmental Systems Design	4

### Automotive Engineering Design Specialty

MECH-548	Vehicle Design Project	4
Select three of the following:		12
MECH-516	Introduction to Finite Element Analysis with Structural Applications	
MECH-540	Introduction to Internal Combustion Engines and Automotive Power Systems	
MECH-541	Advanced Automotive Power Systems	
MECH-542	Chassis System Design	
MECH-544	Introduction to Automotive Powertrains	
MECH-545	Hybrid Electric Vehicle Propulsion	
MECH-546	Vehicle Systems Dynamics	
Select one of the following:		4
Any course previously listed		
IME-575	Failure Analysis	
KETT-540	Environmentally Conscious Design	
MECH-510	Analysis and Design of Machines and Mechanical Assemblies	
MECH-515	Failure and Material Considerations in Design	
MECH-526	Fuel Cell Science & Engineering	
MECH-550	Automotive Bioengineering: Occupant Protection and Safety	
MECH-551	Vehicular Crash Dynamics and Accident Reconstruction	
Other courses with the approval of the automotive faculty		

### Bioengineering Application Specialty

#### Required Courses

MECH-350	Introduction to Bioengineering Applications	4
MECH-554	Bioengineering Applications Project	4

#### Electives

Select three of the following:		12
BIOL-141 & BIOL-142	General Biology and General Biology Lab	
BIOL-241 & BIOL-242	Human Biology and Human Biology Lab	
BIOL-341	Anatomy and Physiology	
MECH-550	Automotive Bioengineering: Occupant Protection and Safety	
MECH-551	Vehicular Crash Dynamics and Accident Reconstruction	
PHYS-354	Medical Physics Principles	

### Machine Design & Advanced Materials Specialty

MECH-516	Introduction to Finite Element Analysis with Structural Applications	4
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MECH-582	Mechanics and Design Simulation of Fiber-Reinforced Composite Materials	4
MECH-512 or MECH-572	Mechanical Systems Design Project CAD/CAM and Rapid Prototyping Project	4
Two MDAM Specialty Related Electives		8

Course	Title	Credit Hours
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**Freshman I**

FYE-101	First Year Foundations	1
CHEM-135	Principles of Chemistry	3
CHEM-136	Principles of Chemistry Lab	1
COMM-101	Written & Oral Communication I	4
MATH-101	Calculus I	4
MECH-100	Engineering Graphical Communication <sup>1</sup>	4
Credit Hours		17

**Freshman II**

IME-100	Interdisciplinary Design and Manufacturing <sup>1</sup>	4
MATH-102	Calculus II	4
PHYS-114	Newtonian Mechanics	3
PHYS-115	Newtonian Mechanics Laboratory	1
HUMN-201 or SSCI-201	Introduction to Humanities or Introduction to the Social Sciences	4
Credit Hours		16

**Sophomore I**

ECON-201	Economic Principles	4
MATH-203	Multivariate Calculus	4
MECH-210	Statics	4
PHYS-224	Electricity and Magnetism	3
PHYS-225	Electricity and Magnetism Laboratory	1
Credit Hours		16

**Sophomore II**

EE-212	Applied Electrical Circuits	3
MECH-231L	Signals for Mechanical Systems Lab	1
MATH-204	Differential Equations & Laplace Transforms	4
MECH-212	Mechanics of Materials	4
Math/Science Elective		4
Credit Hours		16

**Junior I**

CUE-495	Culminating Undergraduate Experience Introductory Course	0
Select one of the following:		4
IME-301 or EP-342	Engineering Materials <sup>(EP-342 only if dual degree ME/EP)</sup> or Materials Science and Nanotechnology	
MATH-305	Numerical Methods and Matrices	4
MECH-312	Mechanical Component Design I	4
MECH-311	Introduction to Mechanical System Design	4

HUMN-201 or SSCI-201	Introduction to Humanities or Introduction to the Social Sciences	4
Credit Hours		20

**Junior II**

COMM-301	Written & Oral Communication II	4
MATH-408	Probability and Statistics	4
MECH-300	Computer Aided Engineering <sup>2</sup>	4
MECH-310	Dynamics	4
MECH-320	Thermodynamics	4
Credit Hours		20

**Senior I**

MECH-322	Fluid Mechanics	4
MECH-330	Dynamic Systems with Vibrations	4
Advanced Humanities or Advanced Social Science Elective		4
Free Elective		4
ME Elective <sup>3</sup>		4
Credit Hours		20

**Senior II**

MECH-420	Heat Transfer	4
MECH-430	Dynamic Systems with Controls	4
Advanced Humanities or Advanced Social Science Elective		4
ME Elective <sup>3</sup>		4
Credit Hours		16

**Senior III**

LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
MECH-422	Energy Systems Laboratory	4
Free Elective		4
ME Senior Design Project <sup>4</sup>		4
Credit Hours		16

**Any Term**

CUE -495C/E/P/R	Culminating Undergraduate Experience	4
Credit Hours		4

Total Credit Hours 161

<sup>1</sup> Approximately one-half of the students take MECH-100 Freshman I and IME-100 Freshman II, the other one-half take IME-100 Freshman I and MECH-100 Freshman II.

<sup>2</sup> Approximately one-half of students take MECH-300 Junior II and MECH-311 Junior I, the other one-half take MECH-311 Junior II and MECH-300 Senior I.

<sup>3</sup> Elective courses may vary in lecture and/or laboratory credits and terms from those shown. Math/Science electives are any level MATH, BIOL, CHEM, or PHYS course that is not used to complete core degree requirements.

<sup>4</sup> ME Senior Design Projects may vary in lecture and/or laboratory credits and terms from those shown.

## Bachelor of Science in Mechanical Engineering Curriculum by Specialty

### Alternative Energy Specialty

Freshman I through Junior II Representative Program Credit Total: 105

Course	Title	Credit Hours
<b>Senior I</b>		
MECH-322	Fluid Mechanics	4
MECH-330	Dynamic Systems with Vibrations	4
MECH-420	Heat Transfer	4
Advanced Humanities or Advanced Social Science Elective		4
Credit Hours		16
<b>Senior II</b>		
MECH-430	Dynamic Systems with Controls	4
MECH-527	Energy and the Environment	4
MECH-528	Bio and Renewable Energy Lab	4
MECH-545	Hybrid Electric Vehicle Propulsion	4
Advanced Humanities or Advanced Social Science Elective		4
Credit Hours		20
<b>Senior III</b>		
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
MECH-422	Energy Systems Laboratory	4
MECH-526	Fuel Cell Science & Engineering	4
MECH-521	Energy and Environmental Systems Design	4
Credit Hours		16
<b>Any Term</b>		
CUE -495C/E/P/R Culminating Undergraduate Experience		4
Credit Hours		4
Total Credit Hours		56

**(Minimum) Total Credits Required for Program: 161**

### Automotive Engineering Design Specialty

Freshman I through Junior II Rep. Program Credit Total: 105

Course	Title	Credit Hours
<b>Senior I</b>		
MECH-322	Fluid Mechanics	4
MECH-330	Dynamic Systems with Vibrations	4
Advanced Humanities or Advanced Social Science Elective		4
Automotive Specialty Electives <sup>1,2</sup>		8
Credit Hours		20
<b>Senior II</b>		
MECH-420	Heat Transfer	4
MECH-430	Dynamic Systems with Controls	4
Advanced Humanities or Advanced Social Science Elective		4
Automotive Specialty Elective		4
Credit Hours		16
<b>Senior III</b>		
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
MECH-422	Energy Systems Laboratory	4
MECH-548	Vehicle Design Project	4
Automotive Specialty Elective		4
Credit Hours		16

<b>Any Term</b>	
CUE -495C/E/P/R Culminating Undergraduate Experience	4
Credit Hours	
Total Credit Hours	
	56

**(Minimum) Total Credits Required for Program: 161**

<sup>1</sup> Elective courses may vary in lecture and/or laboratory credits and terms from those shown.

<sup>2</sup> Students select a Specialty Related Elective or Specialty Related ME Elective with approval of their ME Specialty Advisor.

### Bioengineering Application Specialty

Freshman I through Junior I Representative Program Credit Total: 85

Course	Title	Credit Hours
<b>Junior II</b>		
COMM-301	Written & Oral Communication II	4
MECH-300	Computer Aided Engineering	4
MECH-310	Dynamics	4
MECH-320	Thermodynamics	4
MECH-350	Introduction to Bioengineering Applications	4
Credit Hours		20
<b>Senior I</b>		
MATH-408	Probability and Statistics	4
MECH-322	Fluid Mechanics	4
MECH-330	Dynamic Systems with Vibrations	4
Advanced Humanities or Advanced Social Science Elective		4
Bioengineering Specialty Related Elective <sup>1,2</sup>		4
Credit Hours		20
<b>Senior II</b>		
MECH-420	Heat Transfer	4
MECH-430	Dynamic Systems with Controls	4
Advanced Humanities or Advanced Social Science Elective		4
Bioengineering Specialty Related Elective <sup>1,2</sup>		4
Credit Hours		16
<b>Senior III</b>		
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
MECH-422	Energy Systems Laboratory	4
MECH-554	Bioengineering Applications Project	4
Bioengineering Specialty Related Elective <sup>1,2</sup>		4
Credit Hours		16
<b>Any Term</b>		
CUE -495C/E/P/R Culminating Undergraduate Experience		4
Credit Hours		4
Total Credit Hours		76

**(Minimum) Total Credits Required for Program: 161**

<sup>1</sup> Elective courses may vary in lecture and/or laboratory credits and terms from those shown.

<sup>2</sup> Students select a Specialty Related Elective or Specialty Related ME Elective with approval of their ME Specialty Advisor.

## Machine Design & Advanced Materials Specialty

Freshman I through Junior II Representative Program Credit Total: **105**

Course	Title	Credit Hours
<b>Senior I</b>		
MECH-322	Fluid Mechanics	4
MECH-330	Dynamic Systems with Vibrations	4
MECH-516	Introduction to Finite Element Analysis with Structural Applications	4
MECH-582	Mechanics and Design Simulation of Fiber-Reinforced Composite Materials	4
Advanced Humanities or Advanced Social Science Elective		4
Credit Hours		20
<b>Senior II</b>		
MECH-420	Heat Transfer	4
MECH-430	Dynamic Systems with Controls	4
Advanced Humanities or Advanced Social Science Elective		4
Machine Design Specialty Elective <sup>1,2</sup>		4
Credit Hours		16
<b>Senior III</b>		
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
MECH-422	Energy Systems Laboratory	4
Select one of the following:		
MECH-512 or MECH-572	Mechanical Systems Design Project or CAD/CAM and Rapid Prototyping Project	4
Machine Design Specialty Elective <sup>1,2</sup>		4
Credit Hours		16
<b>Any Term</b>		
CUE -495C/E/P/R Culminating Undergraduate Experience		4
Credit Hours		4
Total Credit Hours		56

**(Minimum) Total Credits Required for Program: 161**

<sup>1</sup> Elective courses may vary in lecture and/or laboratory credits and terms from those shown.

<sup>2</sup> Students select a Specialty Related Elective or Specialty Related ME Elective with approval of their ME Specialty Advisor.