MECHANICAL ENGINEERING

Home Department: Mechanical Engineering

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Program Overview

The Bachelor of Science in 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 mechatronics, heat transfer, fluid mechanics, engines, vibrations, instrumentation, fuel cells, and automotive driving 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 concentration within the Mechanical Engineering program or by pursuing a Minor with non-Mechanical Engineering programs. For more details see Mechanical Engineering Program Concentrations (p. 2) or Minors.

The Mechanical Engineering program is accredited by the Engineering Accreditation Commission (EAC) of ABET.

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.

BS/MASTERS PATHWAY

Undergraduate students also have an opportunity to get their bachelor's and master's degrees in five years with the BS/MASTERS Pathway.

Program Curriculum Requirements

Code	Title	Credit Hours
First Year Experience		
CILE-101	First Year Foundations	1
General Education		
COMM-101	Rhetoric & Writing	4
ECON-201	Economic Principles	4
LA-201	Sophomore Seminar: Exploring the Human Condition	4
LA-489	Sr. Seminar:Leadership, Ethics	4
Advanced Humanities Electives [1]		8
Advanced Social Science Electives [1]		8
Total Credit Hours		**33**

[1] Humanities and Social Science advanced electives must be selected from approved 300 and 400 level courses.

Code	Title	Credit Hours
Mathematics and Basic Science		
CHEM-135 & CHEM-136	Principles of Chemistry and Principles of Chemistry Lab	4
MATH-101	Calculus I	4
or MATH-101X	Calculus I	
MATH-102	Calculus II	4
or MATH-102H	Calculus II - Honors	
or MATH-102X	Calculus II	
MATH-203	Multivariate Calculus	4
or MATH-203H	Multivariate Calculus - Honors	
or MATH-203X	Multivariate Calculus	
MATH-204	Differential Equations & Laplace Transforms	4
or MATH-204H	Differential Equations and Laplace Transforms - Honors	
MATH-258	Probability and Statistics	4
MATH-305	Numerical Methods and Matrices	4
PHYS-114 & PHYS-115	Newtonian Mechanics and Newtonian Mechanics Laboratory	4
PHYS-224 & PHYS-225	Electricity and Magnetism and Electricity and Magnetism Laboratory	4
Math/Science Elective [1]		4
	Credit Hours Subtotal:	*40*
Engineering Topics		
IME-100	Interdisciplinary Design and Manufacturing	4
MECH-111	Computer Programming for MEs	4
MECH-210	Statics	4
MECH-211	Circuits and Mechatronics	4
MECH-212	Mechanics of Materials	4
MECH-300	Computer Aided Engineering	4
MECH-307	Materials Engineering	4
MECH-310	Dynamics	4
MECH-311	Mechatronics Systems Design	4
MECH-312	Mechanical Component Design I	4
MECH-320	Thermodynamics	4
MECH-322	Fluid Mechanics	4
MECH-330 & MECH-331	Dynamic Systems with Vibrations and Dynamic Sys w Vibrations Lab	4
MECH-420	Heat Transfer	4
MECH-430 & MECH-431	Dynamic Systems with Controls and Dynamic Systems with Controls Lab	4
MECH-493	Senior Design 1	4
	Credit Hours Subtotal:	*64*

Electives		
Two Free Electives		8
Two Mechanical Engineering Electives [3]		8
Mechanical Engineering Senior Design Project		4
	Credit Hours Subtotal:	*20*
Culminating Undergraduate Experience		
CILE-400 & CILE-401	Undergraduate Thesis Initiation and Undergraduate Thesis Completion [4]	4
Total Credit Hours		**128**

(Minimum) Total Credits Required for the Program: 161

1 Math/Science elective is described as: Any level BIOL, CHEM, MATH or PHYS that is not used to complete core degree requirements.

2 Students pursuing an Electrical Engineering minor take EE-210/EE-211 in lieu of MECH-231L/EE-212.

3 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-303, BUSN-304 and MGMT-419 also qualify as M.E. Electives.

4 Students are automatically registered for CILE-400 in a co-op term when they reach Junior II status.

Mechanical Engineering Concentrations

Students majoring in Mechanical Engineering may select a concentration consisting of 20 credit hours of courses focused in a particular area. Concentrations may include both required and elective courses. The first six terms are common to all Mechanical Engineering students. Senior I through Senior III representative programs are given for each concentration.

A Mechanical Engineering concentration 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 concentration 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 Concentration

Code	Title	Credit Hours
MECH-495	Senior Design Project	4
MECH-426	Fuel Cell Science and Engineering	4
MECH-427	Energy and the Environment	4
MECH-428	Bio and Renewable Energy	4
MECH-445	Hybrid Electric Vehicle Propulsion	4
	Credit Hours Subtotal:	*20*

Automotive Engineering Design Concentration

Code	Title	Credit Hours
MECH-448	Vehicle Design Project	4
Select four of the following:		16
MECH-416	Introduction to Finite Element Analysis with Structural Applications	
MECH-426	Fuel Cell Science and Engineering	
MECH-440	Introduction to Internal Combustion Engines	
MECH-441	Advanced Automotive Power Systems	
MECH-442	Chassis Systems	
MECH-444	Introduction to Automotive Powertrains	
MECH-445	Hybrid Electric Vehicle Propulsion	
MECH-446	Vehicle Systems Dynamics	
MECH-450	Automotive Bioengineering: Occupant Protection and Safety	
MECH-451	Vehicular Crash Dynamics and Accident Reconstruction	
	Credit Hours Subtotal:	*20*
Other courses with the approval of the automotive faculty		

Bioengineering Applications Concentration

Code	Title	Credit Hours
Required Courses		
MECH-350	Introduction to Bioengineering Applications	4
MECH-495	Senior Design 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-450	Automotive Bioengineering: Occupant Protection and Safety	
MECH-451	Vehicular Crash Dynamics and Accident Reconstruction	
PHYS-354	Medical Physics Principles	
	Credit Hours Subtotal:	*20*

Machine Design & Advanced Materials Concentration

Code	Title	Credit Hours
MECH-416	Introduction to Finite Element Analysis with Structural Applications	4
MECH-482	Mechanics and Design Simulation of Fiber-Reinforced Composite Materials	4
MECH-495	Senior Design Project	4
Two MDAM Concentration Related Electives		8

Course	Title	Credit Hours
Freshman I		
CILE-101	First Year Foundations	1
CHEM-135	Principles of Chemistry	3
CHEM-136	Principles of Chemistry Lab	1
COMM-101	Rhetoric & Writing	4

IME-100	Interdisciplinary Design and Manufacturing	4
MATH-101	Calculus I	4
	Credit Hours	**17**
Freshman II		
LA-201	Sophomore Seminar: Exploring the Human Condition	4
MATH-102	Calculus II	4
MECH-111	Computer Programming for MEs	4
PHYS-114	Newtonian Mechanics	3
PHYS-115	Newtonian Mechanics Laboratory	1
	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		
MATH-204	Differential Equations & Laplace Transforms	4
MECH-307	Materials Engineering	4
MECH-211	Circuits and Mechatronics	4
MECH-212	Mechanics of Materials	4
	Credit Hours	**16**
Junior I		
MATH-305	Numerical Methods and Matrices	4
MECH-312	Mechanical Component Design I	4
Advanced Humanities or Social Science Elective		4
Math/Science Elective		4
	Credit Hours	**16**
Junior II		
MATH-258	Probability and Statistics	4
MECH-300	Computer Aided Engineering [2]	4
MECH-310	Dynamics	4
MECH-320	Thermodynamics	4
Advanced Humanities or Social Science Elective		4
	Credit Hours	**20**
Senior I		
LA-489	Sr. Seminar:Leadership, Ethics	4
MECH-311	Mechatronics Systems Design	4
MECH-322	Fluid Mechanics	4
MECH-330 & MECH-331	Dynamic Systems with Vibrations and Dynamic Sys w Vibrations Lab	4
Advanced Humanities or Social Science Elective		4
	Credit Hours	**20**
Senior II		
MECH-420	Heat Transfer	4
MECH-430 & MECH-431	Dynamic Systems with Controls and Dynamic Systems with Controls Lab	4
MECH-493	Senior Design 1	4
Free Elective		4
ME Elective		4
	Credit Hours	**20**
Senior III		
MECH-495 or MECH-448	Senior Design Project or Vehicle Design Project	4
Free Elective		4
ME Elective		4
Advanced Humanities or Social Science Elective		4
	Credit Hours	**16**
Any Term		
CILE-400 & CILE-401	Undergraduate Thesis Initiation and Undergraduate Thesis Completion [5]	4
	Credit Hours	**4**
	Total Credit Hours	**161**

1. Approximately one-half of the students take MECH-111 Freshman I and IME-100 Freshman II, the other one-half take IME-100 Freshman I and MECH-111 Freshman II.
2. 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.
3. 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.
4. ME Senior Design Projects may vary in lecture and/or laboratory credits and terms from those shown.
5. Students are automatically registered for CILE-400 in a co-op term when they reach Junior II status.

Bachelor of Science in Mechanical Engineering Curriculum by Concentration

Alternative Energy Concentration

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

Course	Title	Credit Hours
Senior I		
MECH-322	Fluid Mechanics	4
MECH-330 & MECH-331	Dynamic Systems with Vibrations and Dynamic Sys w Vibrations Lab	4
MECH-427	Energy and the Environment	4
Advanced Humanities or Social Science Elective		4
	Credit Hours	**16**
Senior II		
LA-489	Sr. Seminar:Leadership, Ethics	4
MECH-420	Heat Transfer	4
MECH-430 & MECH-431	Dynamic Systems with Controls and Dynamic Systems with Controls Lab	4
MECH-428	Bio and Renewable Energy	4
MECH-493	Senior Design 1	4
	Credit Hours	**20**

Senior III		
MECH-426	Fuel Cell Science and Engineering	4
MECH-445	Hybrid Electric Vehicle Propulsion	4
MECH-495	Senior Design Project	4
Advanced Humanities or Social Science Elective		4
	Credit Hours	**16**
Any Term		
CILE-400 & CILE-401	Undergraduate Thesis Initiation and Undergraduate Thesis Completion [1]	4
	Credit Hours	**4**
	Total Credit Hours	**56**

(Minimum) Total Credits Required for Program: 161

[1] Students are automatically registered for CILE-400 in a co-op term when they reach Junior II status.

Automotive Engineering Design Concentration

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

Course	Title	Credit Hours
Senior I		
MECH-322	Fluid Mechanics	4
MECH-330 & MECH-331	Dynamic Systems with Vibrations and Dynamic Sys w Vibrations Lab	4
Advanced Humanities or Social Science Elective		4
Automotive Concentration Electives [1,2]		8
	Credit Hours	**20**
Senior II		
LA-489	Sr. Seminar:Leadership, Ethics	4
MECH-420	Heat Transfer	4
MECH-430 & MECH-431	Dynamic Systems with Controls and Dynamic Systems with Controls Lab	4
MECH-493	Senior Design 1	4
	Credit Hours	**16**
Senior III		
MECH-448	Vehicle Design Project	4
Advanced Humanities or Social Science Elective		4
Automotive Concentration Elective		4
Automotive Concentration Elective		4
	Credit Hours	**16**
Any Term		
CILE-400 & CILE-401	Undergraduate Thesis Initiation and Undergraduate Thesis Completion [3]	4
	Credit Hours	**4**
	Total Credit Hours	**56**

(Minimum) Total Credits Required for Program: 161

[1] Elective courses may vary in lecture and/or laboratory credits and terms from those shown.

[2] Students select a Concentration related elective or Concentration related ME elective with approval of their ME Concentration Advisor.

[3] Students are automatically registered for CILE-400 in a co-op term when they reach Junior II status.

Bioengineering Applications Concentration

Freshman I through Junior I Representative Program Credit Total: **85**

Course	Title	Credit Hours
Junior II		
MECH-300	Computer Aided Engineering	4
MECH-310	Dynamics	4
MECH-320	Thermodynamics	4
MECH-350	Introduction to Bioengineering Applications	4
Advanced Humanities or Social Science Elective		4
	Credit Hours	**20**
Senior I		
MATH-258	Probability and Statistics	4
MECH-322	Fluid Mechanics	4
MECH-330 & MECH-331	Dynamic Systems with Vibrations and Dynamic Sys w Vibrations Lab	4
Advanced Humanities or Social Science Elective		4
Bioengineering Concentration Related Elective [1,2]		4
	Credit Hours	**20**
Senior II		
LA-489	Sr. Seminar:Leadership, Ethics	4
MECH-420	Heat Transfer	4
MECH-430 & MECH-431	Dynamic Systems with Controls and Dynamic Systems with Controls Lab	4
MECH-493	Senior Design 1	4
	Credit Hours	**16**
Senior III		
MECH-495	Senior Design Project	4
Advanced Humanities or Social Science Elective		4
Bioengineering Concentration Related Elective [1,2]		4
Bioengineering Concentration Related Elective		4
	Credit Hours	**16**
Any Term		
CILE-400 & CILE-401	Undergraduate Thesis Initiation and Undergraduate Thesis Completion [3]	4
	Credit Hours	**4**
	Total Credit Hours	**76**

(Minimum) Total Credits Required for Program: 161

[1] Elective courses may vary in lecture and/or laboratory credits and terms from those shown.

[2] Students select a Concentration related elective or Concentration related ME elective with approval of their ME Concentration Advisor.

[3] Students are automatically registered for CILE-400 in a co-op term when they reach Junior II status.

Machine Design & Advanced Materials Concentration

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

Course	Title	Credit Hours
Senior I		
MECH-322	Fluid Mechanics	4
MECH-330 & MECH-331	Dynamic Systems with Vibrations and Dynamic Sys w Vibrations Lab	4
MECH-416	Introduction to Finite Element Analysis with Structural Applications	4
MECH-482	Mechanics and Design Simulation of Fiber-Reinforced Composite Materials	4
Advanced Humanities or Social Science Elective		4
	Credit Hours	**20**
Senior II		
LA-489	Sr. Seminar:Leadership, Ethics	4
MECH-420	Heat Transfer	4
MECH-430 & MECH-431	Dynamic Systems with Controls and Dynamic Systems with Controls Lab	4
MECH-493	Senior Design 1	4
	Credit Hours	**16**
Senior III		
MECH-495	Senior Design Project	4
Advanced Humanities or Social Science Elective		4
Machine Design Concentration Electives [1,2]		8
	Credit Hours	**16**
Any Term		
CILE-400 & CILE-401	Undergraduate Thesis Initiation and Undergraduate Thesis Completion [3]	4
	Credit Hours	**4**
	Total Credit Hours	**56**

(Minimum) Total Credits Required for Program: 161

[1] Elective courses may vary in lecture and/or laboratory credits and terms from those shown.

[2] Students select a Concentration related elective or Concentration related ME elective with approval of their ME Concentration Advisor.

[3] Students are automatically registered for CILE-400 in a co-op term when they reach Junior II status.