

# INDUSTRIAL ENGINEERING

**Home Department:** Industrial and Manufacturing Engineering

**Interim Department Head:**

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## Program Overview

The Department of Industrial & Manufacturing Engineering offers a Bachelor of Science in Industrial Engineering (IE). The department emphasizes the development of the student's ability to analyze operational requirements and to design processes that systematically integrate customer needs, technology, and economic and social factors for industrial, service, and governmental organizations.

Industrial Engineering is a discipline known for its breadth of scope and application. The preparation received in industrial engineering is valuable to virtually all industrial, commercial and governmental entities that are engaged in manufacture of a product or provision of a service. Graduates typically are responsible for the design of integrated systems at one of two levels.

The first level may be described as the "human activity systems" level and is concerned with design of the physical workplace at which human activity occurs. The second level, the "management control system" level, is concerned with planning, measuring, and controlling the activities of the organization for optimal utilization of its resources. The use of computers and the development of the associated software are integral parts of both levels of systems design. Industrial Engineers are concerned with systematic design and integration of people, raw materials, facilities, information, and energy to produce safe and quality products and/or services at an affordable cost to the consumer.

The Industrial Engineering curriculum develops the engineering theory, the practical background, and the people skills necessary to design optimal productive work and management control systems for an organization. The Industrial Engineering curriculum is designed to provide the student with a sound theoretical background while being oriented toward applied problem-solving. Classroom instruction is backed by hands-on application in well-equipped laboratory facilities including Robotics, Additive Manufacturing, Applied Control Systems, Work Design, Human Factors (Ergonomics), Manufacturing Processes, Methods Analysis, and Simulation Modeling.

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

## Program Educational Objectives

Within a few years of graduation, Bachelor of Science in Industrial Engineering graduates will have attained:

- The ability to apply current principles of Industrial Engineering to solve complex, real-world problems and overcome challenges facing themselves, their organizations, and the community.
- Exemplary teamwork and leadership skills, growing professionally and increasing their level of responsibility and authority.
- The ability and motivation to expand their knowledge and technological skillset throughout their lives and careers.

## Dual Majors

Coordinated programs are available to earn both a Bachelor of Science in Industrial Engineering and a Bachelor of Science in other fields such as Management, Chemical Engineering, Computer Science, and Mechanical Engineering. Generally, completing such a program requires one or two additional academic terms at Kettering University. It is the student's responsibility to determine that all requirements are satisfied for both programs. The student must be advised by both programs each term.

## Minors

Many academic departments offer minors. For a list of minors see Academic Programs, Minors.

## 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.

## Industrial Engineering Program Curriculum Requirements

Code	Title	Credit Hours
<b>First Year Experience</b>		
CILE-101	First Year Foundations	1
<b>General Education</b>		
COMM-101	Rhetoric & Writing	4
ECON-201	Economic Principles	4
200-level Liberal Arts Electives		8
LA-489	Sr. Seminar: Leadership, Ethics	4
Advanced Humanities Electives <sup>1</sup>		4
Advanced Social Science Electives <sup>1</sup>		4
Advanced Humanities or Social Science Elective <sup>1</sup>		4
<b>Total Credit Hours</b>		<b>33</b>

<sup>1</sup> Humanities and Social Science advanced electives must be selected from approved 300 and 400 level courses.

Code	Title	Credit Hours
<b>Mathematics and Basic Sciences</b>		
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-102X	Calculus II	
MATH-203	Multivariate Calculus	4
or MATH-203X	Multivariate Calculus	
Select one of the following:		4
MATH-204	Differential Equations & Laplace Transforms	
MATH-307	Matrix Algebra	
MATH-258	Probability and Statistics	4
IME-332	Engineering Statistics	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
Science or Math Electives <sup>1</sup>		4
<i>Credit Hours Subtotal:</i>		40
<b>Engineering Topics</b>		
IME-100	Interdisciplinary Design and Manufacturing	4
IME-200	Introduction to Industrial Engineering	4
IME-211	Algorithms and Computer Programming	4
IME-300	Manufacturing Processes	4
IME-321	Operations Research - Deterministic Models	4
IME-351	Engineering Economics	4
IME-361	Lean Work Design	4
IME-422	Simulation	4
IME-452	Production System Design	4
IME-453	Supply Chain Design	4
IME-454	Senior Design Project	4
MECH-210	Statics	4
<i>Credit Hours Subtotal:</i>		48
<b>IE Program Electives</b>		
Select one of the following Human Factors requirements:		4
IME-462	Ergonomics	
IME-463	Safety and Human Factors	
IME-464	Cognitive Work	
or PSYC-350	Cognitive Psychology	
IME-465	Human-Computer Interaction and Interface Design	
Select one of the following Manufacturing requirements:		4
IME-403	Computer Numerical Control Machining	
IME-408	Industrial Robotics	
IME-412	Applied Control Systems Design	
IME-414	Design for Manufacturing and Assembly	
IME-416	Additive Manufacturing	
Select one of the following Quality & Statistics requirements:		4
IME-471	Quality Control	
IME-473	Design of Experiments	
IME-476	Lean Six Sigma	
IME Electives <sup>2</sup>		8
<i>Credit Hours Subtotal:</i>		20
<b>Electives</b>		
Technical Electives <sup>3</sup>		8
Free Electives		8
<i>Credit Hours Subtotal:</i>		16
<b>Culminating Undergraduate Experience</b>		
CILE-400 & CILE-401	Undergraduate Thesis Initiation and Undergraduate Thesis Completion <sup>4</sup>	4

*Credit Hours Subtotal:* 4

**Total Credit Hours** 128

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

<sup>1</sup> The Science or Math Elective may be any course with a MATH, CHEM, PHYS or BIOL prefix except MATH-100. Students taking CHEM-135 may not take CHEM-137 as a Science Elective.

<sup>2</sup> IME electives include any IME course not already used to satisfy degree requirements. IME 484-Engineering Ethics counts as an IME or technical elective.

<sup>3</sup> Technical electives include any CE, CHME, CS, ECE, EE, IME, MATH or MECH course not already used to satisfy degree requirements. One must be 200-level or higher and one must be 300-level or higher. Only one MATH course can be used as a technical elective.

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

## Representative Program

Course	Title	Credit Hours
<b>Freshman I</b>		
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
<b>Credit Hours</b>		17
<b>Freshman II</b>		
IME-200	Introduction to Industrial Engineering	4
IME-211	Algorithms and Computer Programming	4
MATH-102	Calculus II	4
PHYS-114	Newtonian Mechanics	3
PHYS-115	Newtonian Mechanics Laboratory	1
<b>Credit Hours</b>		16
<b>Sophomore I</b>		
ECON-201	Economic Principles	4
IME-300	Manufacturing Processes	4
MATH-203	Multivariate Calculus	4
MATH-258	Probability and Statistics	4
<b>Credit Hours</b>		16
<b>Sophomore II</b>		
IME-351	Engineering Economics	4
IME-361	Lean Work Design	4
200-level Liberal Arts Elective		4
MATH-204 or MATH-307	Differential Equations & Laplace Transforms or Matrix Algebra	4
<b>Credit Hours</b>		16
<b>Junior I</b>		
IME-321	Operations Research - Deterministic Models	4
IME-332	Engineering Statistics	4

200-level Liberal Arts Elective	4
MECH-210 Statics	4
PHYS-224 Electricity and Magnetism	3
PHYS-225 Electricity and Magnetism Laboratory	1
<b>Credit Hours</b>	<b>20</b>
<b>Junior II</b>	
Advanced Humanities or Social Science Elective	4
Technical Elective	4
IE Program Elective (Ergonomics, Manufacturing, or Quality & Statistics)	4
IME-452 Production System Design	4
<b>Credit Hours</b>	<b>16</b>
<b>Senior I</b>	
Math or Science Elective	4
Technical Elective	4
IME-422 Simulation	4
IME-453 Supply Chain Design	4
LA-489 Sr. Seminar: Leadership, Ethics	4
<b>Credit Hours</b>	<b>20</b>
<b>Senior II</b>	
Advanced Humanities or Social Science Elective	4
IE Program Elective (Ergonomics, Manufacturing, or Quality & Statistics)	4
IE Program Elective (Ergonomics, Manufacturing, or Quality & Statistics)	4
IME Elective	4
Free Elective	4
<b>Credit Hours</b>	<b>20</b>
<b>Senior III</b>	
Advanced Humanities or Social Science Elective	4
IME Elective	4
Free Elective	4
IME-454 Senior Design Project	4
<b>Credit Hours</b>	<b>16</b>
<b>Any Term</b>	
CILE-400 Undergraduate Thesis Initiation	4
& CILE-401 and Undergraduate Thesis Completion	
<b>Credit Hours</b>	<b>4</b>
<b>Total Credit Hours</b>	<b>161</b>

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