INDUSTRIAL ENGINEERING

Administered by the Department of Industrial and Manufacturing Systems Engineering

The undergraduate curriculum in Industrial Engineering leads to the degree Bachelor of Science.

The Industrial Engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Program Educational Objectives

The Industrial Engineering (IE) Program educates its future graduates to accomplish its program educational objectives (PEO's) in their early careers.

Specifically, the IE Program prepares its majors so that, within a few years after graduation, graduates' attainments are

1. Industrial engineering solutions that are effectively created and communicated and consider relevant stakeholders and ramifications.
2. Team goal accomplishment through productive and inclusive interactions and leadership.
3. New capabilities, skills, and knowledge that advance professional practice and enable career advancement.

Student Learning Outcomes

The IE Program currently has the following student outcomes describing what IE majors are expected to know and be able to do by the time of graduation.

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
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
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Details on Industrial Engineering program outcomes that foster the attainment of these objectives are available at appropriate sections of: www.imse.iastate.edu (http://www.imse.iastate.edu)

The Industrial Engineering undergraduate curriculum provides students with fundamental knowledge in mathematics and science, engineering science, social science, and humanities as well as professional industrial engineering course work. Management electives provide students with an opportunity to become familiar with modern business practices that they will encounter in their career. A senior capstone design course provides students with an opportunity to solve open-ended industrial problems with an industrial partner. The cooperative education program provides students with real world experience in the profession and a good perspective on career choices. Students are encouraged to participate in international experiences through exchange programs and industrial internships.

Qualified juniors and seniors interested in graduate studies may apply to the Graduate College to concurrently pursue both B.S. and M.S. or M.Eng. degrees in Industrial Engineering, or B.S. and M.B.A. degrees. For further information please refer to Concurrent Undergraduate and Graduate Programs tab.

Curriculum in Industrial Engineering

Administered by the Department of Industrial and Manufacturing Systems Engineering.

Leading to the degree Bachelor of Science.

Total credits required: 122 cr. See also Basic Program and Special Programs. Grades of C or better are required for any transfer credit course that is applied to the degree program but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA. Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements.
International Perspectives: 3 cr. [1]
U.S. Diversity: 3 cr. [1]
Communication Proficiency/Library requirements:

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1

Remaining Communication courses: 9 cr.

ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or Better in this course)	3
SP CM 212	Fundamentals of Public Speaking	3

ENGL 314	Technical Communication	3
Total Credits		**9**

Social Sciences and Humanities Electives: 12 cr. [2]

Six of twelve credits must be from 200-level or above courses. Six credits must be sequential or related courses.

Basic Program: 24 cr. [3]

A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.

CHEM 167	General Chemistry for Engineering Students	4
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
LIB 160	Introduction to College Level Research	1
I E 148	Information Engineering	3
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
Total Credits		**24**

Math and Physical Science: 17 cr.

MATH 265	Calculus III	4
MATH 267	Elementary Differential Equations and Laplace Transforms	4
STAT 231	Probability and Statistical Inference for Engineers	4
PHYS 232	Introduction to Classical Physics II	4
PHYS 232L	Introduction to Classical Physics II Laboratory	1
Total Credits		**17**

Industrial Engineering Core: 34 cr.

A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Core GPA):

I E 222	Design & Analysis Methods for System Improvements	3
I E 248	Engineering System Design, Manufacturing Processes and Specifications	3
I E 271	Applied Ergonomics and Work Design	3
I E 305	Engineering Economic Analysis	3
I E 312	Optimization	3
I E 341	Production Systems	3
I E 348	Solidification Processes	3
I E 361	Statistical Quality Assurance	3
I E 413	Stochastic Modeling, Analysis and Simulation	4
I E 441	Industrial Engineering Design	3
I E 448	Manufacturing Systems Engineering	3
Total Credits		**34**

Other Remaining Courses: 26 cr. [2]

MAT E 273	Principles of Materials Science and Engineering	3
E E 442	Introduction to Circuits and Instruments	2
C E 274	Engineering Statics	3
M E 231	Engineering Thermodynamics I	3
Focus Electives		6
Management Electives		3
Engineering Topic Electives		6
Total Credits		**26**

Seminar/Co-op/Internships:

I E 101	Industrial Engineering Profession	R
Optional co-op/internship courses		

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also allowed by the department to meet other course requirements within the degree program.
   U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.
2. For Social Sciences and Humanities, Focus, Management, and Engineering Topic Electives, choose from the department approved list. (http://www.imse.iastate.edu/wp-content/blogs.dir/16/files/2011/06/Elective-List-2013-2014-8-12-2013.pdf)
3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

See also the following grid showing course template by semester:

4-Year Plan of Study for Industrial Engineering

Industrial Engineering, B.S.

First Year

Fall	Credits	Spring	Credits
I E 148	3	SSH Elective	3
SSH Elective	3	MATH 166	4
MATH 165	4	ENGL 150	3
CHEM 167	4	I E 101	R
ENGR 101	R	LIB 160	1
		PHYS 231	4
		PHYS 231L	1
	14		**16**

Second Year

Fall	Credits	Spring	Credits
MATH 265	4	MATH 267	4
I E 248	3	STAT 231	4
MAT E 273	3	I E 222	3
PHYS 232	4	I E 271	3
PHYS 232L	1		
ENGL 250	3		
	18		**14**

Third Year

Fall	Credits	Spring	Credits
I E 305	3	ENGR Topic Elective	3
I E 341	3	SSH Elective	3
I E 312	3	I E 348	3
SP CM 212	3	I E 361	3
C E 274	3	E E 442	2
	15		**14**

Fourth Year

Fall	Credits	Spring	Credits
Focus Elective	3	Focus Elective	3
SSH Elective	3	Managment Elective	3
I E 413	4	ENGR Topic Elective	3
ENGL 314	3	I E 441	3
M E 231	3	I E 448	3
	16		**15**

Engineering Sales Minor

The Engineering Sales Minor is multidisciplinary and open to undergraduates in the College of Engineering. The minor requires 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

I E 450	Technical Sales for Engineers I	3
I E 451	Technical Sales for Engineers II	3
or I E 430	Entrepreneurial Product Engineering	
MKT 340	Principles of Marketing	3
MKT 442	Sales Management	3
or MKT 447	Consumer Behavior	
or MKT 450	Advanced Professional Selling	
And one of the following:		3
I E 305	Engineering Economic Analysis	
FIN 301	Principles of Finance	
C E 206	Engineering Economic Analysis and Professional Issues in Civil Engineering	
Total Credits		**15**

Concurrent B.S./Master's Industrial Engineering Degree

If you are considering going to graduate school, the concurrent B.S. IE/Master's program (either M.S. or M.Eng.) in industrial engineering is an excellent opportunity to obtain both degrees within 5 years. Up to 6 credits of graduate course work can be used to satisfy your program requirements for both degrees. After completing the B.S. program, you will be a full-time graduate student for the remainder of the Master's program.

Program Policies

1. Up to two semesters of concurrent enrollment are allowed.
2. Students can enroll in up to nine credits of coursework at the 500-level in Industrial Engineering for both the B.S. and M.S./M.Eng. degrees. Six credits will be shared with your undergraduate degree. The remaining three credits will be applied to your M.S. or M.Eng. degree.
3. Students must take at least three credits of 500-level courses each semester during concurrent enrollment and will be paying graduate tuition and fees.
4. Students participating in the concurrent program must adhere to the requirements for the graduate degree program in which they are enrolled.

Admission Requirements

Students must have a record of high academic achievement and should have a GPA of at least 3.40 on a 4.00 scale. Students must be within 30 credits of completing the requirements for the B.S. degree before applying to the concurrent program. Prospective students **must** speak with their undergraduate advisor prior to applying.

Concurrent B.S. in Industrial Engineering and MBA in the College of Business

Accelerate Your Career with an MBA

Today's successful engineers often need strong business management skills to complement their degree in engineering. These skills are especially important for engineers who are interested in working for technical companies, launching their own business ventures, or pursuing nontraditional jobs such as consulting. The MBA provides an opportunity for competitive advantage for advancement into management positions.

The Colleges of Business and Engineering offer an integrated, concurrent program leading to bachelor of science and master of business administration degrees.

The best part is that this program reduces by one year the normal time for completing both degrees separately.

The program is designed to be completed in a minimum of five academic years or ten semesters.

The actual time for completion may be longer depending upon semester course loads, internships, and course sequencing. Careful planning with an academic advisor is essential throughout the program. This program is slightly accelerated through the first six semesters to complete the general education requirements. The remaining four semesters integrate the B.S. in IE requirements and the MBA courses. Twelve credits will be shared in common and will fulfill the requirements for both the B.S. in IE and the MBA.

Summer study is possible, although students are strongly encouraged to complete at least two internships or co-ops in engineering and business for practical experience during their academic program.

Preparation for the B.S. IE/MBA

Students interested in pursuing the MBA need to demonstrate exemplary academic performance throughout their undergraduate program. Mastery of communications, economic theory, global and diversity perspectives, statistical data analysis, and the core professional curriculum is of particular importance.

The Selection Process

The program is demanding and admission is selective. Students are expected to exhibit superior intellectual ability, strong leadership attributes, and must be highly motivated and career-focused. Although not absolute minimums, admitted students typically will have earned a cumulative GPA of 3.00 or above and have scored 600 or higher on the Graduate Management Admissions Test (GMAT). All application materials, however, are taken into account collectively in the applicant review and student selection process.

GRADUATE STUDY

The department offers programs for the degrees Master of Engineering (M.Eng.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) with a major in industrial engineering. A minor is available to graduate students having a major in another department. The M.Eng. degree consists of coursework designed to improve professional expertise in industrial engineering. The M.S. and Ph.D. degrees are designed to improve the student's capability to conduct research as well as advancing their professional expertise. In conjunction with the Department of Mechanical Engineering, the department offers a certificate in advanced manufacturing.

The prerequisite to major graduate work is the completion of a curriculum similar to that required of undergraduate students in engineering at this institution. Because of the diversity of industrial engineering topics, it is possible for a student to qualify for graduate study even though undergraduate or prior graduate training has been in a discipline other than engineering; e.g., mathematics or physics. However, completion of a math sequence of calculus through differential equations is expected.

The graduate program offers advanced study in advanced manufacturing, ergonomics/human factors, operations research/analytics, systems engineering and engineering management.

Well-qualified juniors and seniors in industrial engineering who are interested in graduate study may apply for concurrent enrollment to simultaneously pursue both the industrial engineering bachelor's degree and an M.Eng or M.S. degree. Another attractive concurrent degree option is the industrial engineering bachelor's degree concurrent with a Master of Business Administration degree from the business college. For additional information about graduate degree programs, admission criteria, and procedures refer to https://www.imse.iastate.edu/graduate-program/.