Industrial and Systems Engineering

Industrial engineers address the overall performance of systems, responsiveness of systems to customer and user needs, and the quality of products or services produced. Industrial engineers recognize how the design of machinery, tools, equipment, computers, software and automated systems affect the performance of people and work systems. They also evaluate and design the roles people play within work systems to ensure people can safely, effectively and efficiently perform their tasks while maximizing work quality.

Organizations from every sector of our economy—banking, food, energy, health care, commercial aviation, manufacturing, logistics, entertainment and government—turn to industrial engineers for help in improving an organization’s efficiency and productivity. Industrial engineers often work in teams with other types of engineers and business specialists to design and improve systems that produce and distribute goods and services. Industrial engineers guide and support organizational management and often become managers.

**Pursuing Industrial and Systems Engineering at Ohio State**

Students interested in studying industrial and systems engineering (ISE) should be strong in math, physics, chemistry, and written and verbal communication. Familiarity with word processing, presentation, graphing and spreadsheet software applications is an advantage.

Students may directly enroll as pre-engineering students; however, selection is competitive. Factors used to determine eligibility to directly enroll include ACT/SAT scores (emphasis on math), strong college prep curriculum (emphasis on math, science and rigorous courses), and class rank or GPA. Students not eligible to directly enroll in engineering may enroll in Science, Technology and Environment Exploration (see exploration.osu.edu).

Students may apply to the major during autumn and spring semesters and are evaluated based on the following:
- Eligibility point-hour ratio (EPHR) of pre-major courses: Math 1151 and 1172; Engineering 1181; English 1110; Physics 1250 and 1251; and CSE 1223
- Completion of Engineering 1182 (not included in EPHR)
- Completion of Math 2568 with a C or better
- Completion of Statistics 3470 (earn a C or better to be competitive)

The application review includes the following:
- Grades earned in pre-major classes
- Applicant’s full academic record (including transfer grades)
- A written narrative statement

Acceptance into the industrial and systems engineering major is competitive. Meeting the minimum specified point-hour ratios will not guarantee acceptance to the major; however, students with an EPHR of 3.5 or higher who apply to begin the ISE major in autumn 2016 or later and meet the minimum requirement of a C or better in CSE 1223, Math 2568 and Statistics 3470 will be guaranteed acceptance into the ISE major.

**Industrial and Systems Engineering Requirements**

The core curriculum in the major includes courses in applied operations research, manufacturing, human factors engineering, statistics and computer programming. By planning the selection of technical electives, each student achieves some depth of knowledge in an area of their choosing.

The capstone experience in the last semester is a major design project in which a team of students consults with a company to solve real problems that address the needs of the project’s sponsors.

In addition to the core curriculum, the industrial and systems major includes the following technical elective tracks:
- Data analytics and optimization
- Supply chain management and logistics
- Management systems and operations research
- Manufacturing
- Human systems integration and design

Students may also choose to pursue a variety of minors including, but not limited to the following:
- General business
- Interdisciplinary entrepreneurship
- Design
- Computer and information science

**Co-Curricular Opportunities**

Students may participate in Ohio State’s student chapter of the Institute of Industrial Engineers (IIE), the national professional organization for industrial engineers.

Other engineering-related student organizations include The American Society for Quality (ASQ), the Society of Manufacturing Engineers, the College of Engineering’s Engineers’ Council, Ohio State’s student chapter of the Human Factors and Ergonomics Society.
Ohio State’s industrial and systems engineering program is accredited by the Engineering Accreditation Commission of ABET, abet.org.

Curriculum Sample
This is a sample list of classes a student will take to pursue a Bachelor of Science in Industrial and Systems Engineering. Since university students need more than specific education in a narrow field, they also will take classes to complete General Education (GE) requirements. Because GE courses come from a variety of academic areas of study, this course work helps students develop fundamental skills essential to collegiate success and allows them to tailor these courses toward their interests. Note: This sample represents one of several possible paths to a degree in industrial and systems engineering. Visit ise.osu.edu for details.

Freshman Year:
Engineering survey 1
Calculus 10
Introduction to Engineering 4
Physics 10
Additional science 4
Programming 3
GE courses 6
Total hours 34

Sophomore Year:
Engineering Mathematics 6
Probability and Statistics 3
Statics and Strength of Materials 4
Additional science 4
MATLAB 3
Design of Work 2
Engineering Economics 2
Excel Modeling and Databases 3
GE courses 3
Total hours 30

Junior Year:
Introduction to Manufacturing Engineering 3
Linear and Integer Programming 3
Non-linear Programming 3
Production Planning and Facilities Design 4
Workplace Ergonomics 3
Project Management 3
Cognitive Systems Engineering 3
Quality Control and Improvement 3
GE courses 6
Total hours 31

Senior Year:
Stochastic Modeling and Simulation 3
Capstone Design 4
Technical elective ISE depth package 9
Technical electives 6
GE courses 9
Total hours 31

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Society, National Society of Black Engineers (NSBE), Big Data Analytics Association (BDAA), Society of Hispanic Professional Engineers (SHPE), Society of Women Engineers (SWE), and a chapter of the national industrial engineering honorary, Alpha Pi Mu (APM).

Engineering Career Services helps students find co-op or internship opportunities anytime after the end of their first year. Co-ops and internships help students gain work experience and decide which technical electives to take and whether to pursue graduate work. Students often receive job offers upon graduation from companies with which they co-oped or interned.

Undergraduates can assist faculty with their research or conduct an independent research thesis. Any student with a CPHR of 3.0 or higher may apply to complete a research thesis and graduate “with research distinction.” Students who plan to complete a research thesis can apply for funding through the College of Engineering Undergraduate Research Scholarship (URS) competition. Student researchers participate in the annual Denman Undergraduate Research Forum.

Honors & Scholars Programs
Industrial and systems engineering has an active Honors Program. To maintain Honors status, students must have a CPHR of at least 3.4 and fulfill an Honors contract through which students attain a required level of experience in three areas: honors and graduate course work, investigational studies, and leadership and service. Students who fulfill their Honors contract will graduate “with Honors research distinction.”

Honors students may choose to use the Senior Petition, which allows a student to receive graduate credit for up to 15 credit hours of course work taken while a senior which is not required as part of their undergraduate program. Some ISE Honors students choose to pursue a combined BS/MS degree program, which allows students with at least a 3.5 cumulative grade point average to be admitted to graduate school during the senior year and to count up to 15 hours of course work toward both graduate and undergraduate degrees, which then shortens the time required to obtain a master’s degree.

Career Prospects in Industrial and Systems Engineering
Graduates of the industrial systems engineering program develop strong technical, management and design skills that are valuable to many different industries. They pursue a variety of career paths, including jobs in manufacturing and production, health care, finance, energy systems, retail and distribution, aviation, information technology, marketing, and education.

For the past three years, 83 percent of industrial and systems engineering graduates have been placed in full-time employment within 3 months of graduation.

The future looks very promising for industrial engineers. According to the Bureau of Labor and Statistics, industrial engineers will make up 27 percent of new job growth by 2016—among the highest in growth for engineering occupations.

Beginning salaries for industrial engineers in the United States are reported to be about $62,245 (based on a survey by Employers Resource Association, published in 2013). The median salary for industrial engineers in 2010 was $76,100 (BLS Occupational Outlook Handbook, 2012–2013).

Revised July 2015. Information subject to change. For the most up-to-date information on the industrial and systems engineering program, visit ise.osu.edu.

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