INDUSTRIAL ENGINEERING, B.S.

The first bachelor of science in industrial engineering at the University of Wisconsin–Madison was awarded in 1972. Since that time the demand for industrial engineers has grown dramatically for one chief reason: the need for organizations to raise their level of productivity through thoughtful, systematic applications.

Becoming an industrial engineer (IE) places one in an exciting field of engineering that focuses on productivity improvement worldwide. It is a field that deals as much with human aspects of work as with today’s sophisticated tools of work.

What sets industrial engineering apart from other engineering disciplines is its broader scope. An IE deals with people as well as things. The industrial engineer applies problem-solving techniques in almost every kind of industry, business, or institution. There are IEs in banks, hospitals, government at all levels, transportation, construction, processing, social services, electronics, facilities design, manufacturing, and warehousing.

An IE looks at the "big picture" of what makes society perform best — the right combination of human resources, natural resources, and human-made structures and equipment. An IE bridges the gap between management and operations, dealing with and motivating people as well as determining what tools should be used and how they should be used. Industrial engineering is concerned with performance measures and standards, research of new products and product applications, ways to improve use of scarce resources, and many other problem-solving adventures.

Because industrial engineering serves a broad cross-section of business, industry and institutions, the IE’s work environment varies from office to plant to field. Choices can be made even after the IE begins his or her career. Few other vocations offer a graduating student such a wide selection of places to work or kind of work to perform. Need for industrial engineers makes this profession particularly attractive from the financial standpoint. Beginning salaries rank in the top group of high-paying engineers makes this profession particularly attractive from the financial standpoint. Beginning salaries rank in the top group of high-paying engineers makes this profession particularly attractive from the financial standpoint.

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In the industrial and systems engineering department at UW–Madison, the course curriculum is set up to provide a diversified background and at the same time allow choices according to individual interests. Specialized coursework might be categorized in five main areas:

- Decision Science and Operations Research
- Health Systems Engineering
- Human Factors and Ergonomics
- Manufacturing and Production Systems
- Quality Engineering

Although there is no sub major within IE, it is possible to achieve a degree of specialization through a judicious choice of IE technical electives. Courses focusing on teams and design projects prepare students to succeed in the workplace.

INDUSTRIAL ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES

1. Graduates will demonstrate competence in the professional practice of industrial engineering.
2. Graduates will demonstrate the skills needed to assume leadership in their workplaces and profession.
3. Graduates will act with professional and ethical responsibility, and appreciate the impact of proposed solutions in a global/societal context.

HOW TO GET IN

ADMISSION TO THE COLLEGE AS A FRESHMAN

Students applying to UW–Madison (https://www.admissions.wisc.edu/apply) need to indicate an engineering major (https://www.engr.wisc.edu/academics/undergraduate-academics/choosing-a-major) as their first choice in order to be considered for direct admission to the College of Engineering. Direct admission to a major means students will start in the program of their choice in the College of Engineering and will need to meet progression requirements (https://www.engr.wisc.edu/academics/student-services/academic-advising/first-year-undergraduate-students/progression-requirements) at the end of the first year to guarantee advancement in that program.

CROSS-CAMPUS TRANSFER TO ENGINEERING

UW–Madison students in other schools and colleges on campus must meet the course and credit requirements for admission to engineering degree granting classifications specified in the general college requirements (https://www.engr.wisc.edu/academics/student-services/academic-advising/cross-campus-students). The requirements are the minimum for admission consideration. Cross-campus admission is competitive and selective, and the grade point average expectations may increase as demand trends change. The student’s overall academic record at UW–Madison is also considered. Students apply to their intended engineering program by submitting the online application by stated deadlines for spring and fall. The College of Engineering offers group information sessions (https://www.engr.wisc.edu/academics/student-services/academic-advising/cross-campus-students) for students to learn about the cross-campus transfer process.

OFF-CAMPUS TRANSFER TO ENGINEERING

With careful planning, students at other accredited institutions can transfer coursework that will apply toward engineering degree requirements at UW–Madison. Off-campus transfer applicants are considered for direct admission to the College of Engineering by applying to the Office of Admissions with an engineering major listed as their first choice. Those who are admitted to their intended engineering program must meet progression requirements (https://www.engr.wisc.edu/academics/student-services/academic-advising/transfer-students) at the point of transfer or within their first two semesters at UW–Madison to guarantee advancement in that program. A minimum of 30 credits in residence in the College of Engineering is required after transferring, and all students must meet all requirements for their major in the college.

Transfer admission to the College of Engineering is competitive and selective, and students who have earned more than 80 transferable semester credits at the time of application are not eligible to apply.
The College of Engineering has dual degree programs with select four-year UW System campuses. Eligible dual degree applicants are not subject to the 80 credit limit.

Off-campus transfer students are encouraged to discuss their interests, academic background, and admission options with the Transfer Coordinator in the College of Engineering: ugtransfer@engr.wisc.edu or 608-262-2473.

SECOND BACHELOR'S DEGREE

The College of Engineering does not accept second undergraduate degree applications. Second degree students (https://www.engr.wisc.edu/admissions/undergraduate-admissions/returning-adults-second-degree-students) might explore the Biological Systems Engineering program at UW-Madison, an undergraduate engineering degree elsewhere, or a graduate program in the College of Engineering.

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (http://guide.wisc.edu/undergraduate/#requirementsforundergraduatetestudytext) section of the Guide.

General Education

- Breadth—Humanities/Literature/Arts: 6 credits
- Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits
- Breadth—Social Studies: 3 credits
- Communication Part A & Part B *
- Ethnic Studies *
- Quantitative Reasoning Part A & Part B *

* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

INDUSTRIAL ENGINEERING CURRICULUM

The following curriculum applies to students admitted to the industrial engineering degree program beginning in fall 2018 or later. Required courses are indicated. The Industrial Engineering Undergraduate Curriculum Guide (https://www.engr.wisc.edu/department/industrial-systems-engineering/academics/bachelor-of-science-in-industrial-and-systems-engineering) contains lists of courses that fulfill the requirements in the following categories: General Education Communication Elective, Mathematics, Science, Engineering and Science Electives, IE Required Courses, IE Technical Electives, Junior Design and Senior Design. For Liberal Studies Electives refer to the College of Engineering Liberal Studies Guidelines.

MATHEMATICS AND STATISTICS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH 221</td>
<td>Calculus and Analytic Geometry 1</td>
<td>5</td>
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<tr>
<td>MATH 222</td>
<td>Calculus and Analytic Geometry 2</td>
<td>4</td>
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<tr>
<td>MATH 234</td>
<td>Calculus--Functions of Several Variables</td>
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<tr>
<td>MATH 340</td>
<td>Elementary Matrix and Linear Algebra</td>
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<tr>
<td>STAT 311</td>
<td>Introduction to Theory and Methods of Mathematical Statistics I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 312</td>
<td>Introduction to Theory and Methods of Mathematical Statistics II</td>
<td>3</td>
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</table>

Total Credits 22

SCIENCE

<table>
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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>PHYSICS 201</td>
<td>General Physics (or)</td>
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<tr>
<td>E M A 201</td>
<td>Statics (and)</td>
<td></td>
</tr>
<tr>
<td>E M A 202</td>
<td>Dynamics (or)</td>
<td></td>
</tr>
<tr>
<td>M E 240</td>
<td>Dynamics</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 202</td>
<td>General Physics</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 109</td>
<td>Advanced General Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>COMP SCI 301</td>
<td>Introduction to Data Programming</td>
<td>3</td>
</tr>
<tr>
<td>or COMP SCI 200</td>
<td>Programming I</td>
<td></td>
</tr>
<tr>
<td>or COMP SCI 300</td>
<td>Programming II</td>
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</tbody>
</table>

Total Credits 18

1 E M A 202 or M E 240 will fulfill Engineering Science credit requirements.

ENGINEERING AND SCIENCE ELECTIVES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tr>
<td>Engineering Science (non I Sy E or E P D)</td>
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<tr>
<td>Statistics Elective</td>
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<td></td>
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<tr>
<td>Computer Science Elective</td>
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<tr>
<td>Math, Biology, Engineering Science, Statistics, or Computer Science additional electives</td>
<td>6</td>
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Total Credits 15

REQUIRED ISYE COURSES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ACCT I S 300</td>
<td>Accounting Principles</td>
<td>3</td>
</tr>
<tr>
<td>or ACCT I S 100</td>
<td>Introductory Financial Accounting</td>
<td></td>
</tr>
<tr>
<td>I SY E 313</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 315</td>
<td>Production Planning and Control</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 320</td>
<td>Simulation and Probabilistic Modeling</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 321</td>
<td>Simulation Modeling Laboratory</td>
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</tr>
<tr>
<td>I SY E 323</td>
<td>Operations Research-Deterministic Modeling</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 348</td>
<td>Introduction to Human Factors</td>
<td>1</td>
</tr>
<tr>
<td>Engineering Laboratory</td>
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</table>

Total Credits
Learning Outcomes

1. Apply knowledge of math, science, economics, and engineering principles to solve I SY E, social or business problems.

2. Recognize, describe, predict and analyze systems behavior.

3. Apply experimental design or data analytics.

4. Demonstrate ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

5. Design effective and efficient human and technical work systems.

6. Contribute to solving I SY E problems and cooperate with engineers to solve engineering and societal problems.

7. Identify, formulate, and solve engineering problems using appropriate information and approaches.

8. Understand physiological, cognitive, and sociotechnical aspects of humans as components in complex systems.

9. Identify opportunities and apply engineering solutions for evaluating productivity and quality improvement.

10. Demonstrate an understanding of professional and ethical responsibility.

11. Demonstrate an understanding of the impact of engineering solutions in a global, economic, environmental, and societal context.

12. Demonstrate knowledge of contemporary issues across various industries.

13. Show proficiency and effectiveness in technical communications.

14. Engage in continued learning and demonstrate an appreciation of the benefits of lifelong learning.

15. Apply the techniques, skills, and modern engineering tools necessary for engineering practice, such as quality engineering, optimization, simulation, and project management.

Four-Year Plan

Sample Four-Year Plan

First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH 221, 217, or 275</td>
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<td>MATH 222 or 276</td>
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<tr>
<td>CHEM 109</td>
<td>5</td>
<td>PHYSICS 201</td>
<td>5</td>
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<tr>
<td>ECON 101</td>
<td>4</td>
<td>Liberal Studies Elective</td>
<td>3</td>
</tr>
<tr>
<td>communications A</td>
<td></td>
<td>I SY E 191</td>
<td>1</td>
</tr>
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<td>16</td>
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</table>

Second Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH 234</td>
<td>4</td>
<td>STAT 311</td>
<td>3</td>
</tr>
<tr>
<td>PHYSICS 202</td>
<td>5</td>
<td>I SY E 313</td>
<td>3</td>
</tr>
</tbody>
</table>
COMP SCI 301  3  I SY E 315  3
Engineering Science Elective  3  MATH 340  3

Engineering and Science Elective (Stats)  3

15  15

Third Year
Fall  Credits  Spring  Credits
I SY E 323  3  I SY E 320  3
I SY E 348  1  I SY E 321  1
I SY E/PSYCH 349  3  I SY E 350  3
ACCT I S 300 or 100  3  E P D 397  3
STAT 312  3  Engineering and Science Elective (Comp Sci)  3
Liberal Studies Elective  3  I SY E Technical Elective  2
16  15

Fourth Year
Fall  Credits  Spring  Credits
I SY E 415  3  I SY E 450  3
I SY E Technical Elective (Human Factors)  3  I SY E Technical Elective (Quantitative Methods)  3
I SY E 417  3  I SY E Technical Elective (Quality)  3

Engineering Science Elective (ENGR)  3  Liberal Studies Elective  3
Liberal Studies Elective  3  Engineering Science Elective  3
15  15

Total Credits 121

ADVISING AND CAREERS

ADVISING
Each College of Engineering program has academic advisors dedicated to serving its students. Program advisors can help current College of Engineering students with questions about accessing courses, navigating degree requirements, resolving academic issues and more. Students can find their assigned advisor on the homepage of their student center.

ENGINEERING CAREER SERVICES
Engineering Career Services (ECS) assists students in identifying pre-professional work-based learning experiences such as co-ops and summer internships, considering and applying to graduate or professional school, and finding full-time professional employment during their graduation year.

ECS offers two major career fairs per year, assists with resume writing and interviewing skills, hosts workshops on the job search, and meets one-on-one with students to discuss offer negotiations.

Students are encouraged to utilize the ECS office early in their academic careers. For comprehensive information on ECS programs and workshops, see the ECS website or call 608-262-3471.

PROFESSORS
Alagöz
Bier
Krishnamurthy
Lee
Li
Linderoth (chair)
Radwin
Shi
Veeramani
Zhou

ASSOCIATE PROFESSORS
Albert
Luedtke
Wiegmann

ASSISTANT PROFESSORS
Del Pia
Liu
Michini
Wang
Werner
Zayas-Caban

See also Industrial and Systems Engineering Faculty Directory (http://directory.engr.wisc.edu/ie/faculty).

ACCREDITATION

Accreditation.


Note: Undergraduate Program Educational Objectives and Student Outcomes are made publicly available at the Departmental website. (In this Guide, the program's Student Outcomes are designated by our campus as "Learning Outcomes.")