Industrial Engineering, BS

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/#requirementsforundergraduatestudytext) 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
- 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.

Summary of Requirements

The following curriculum applies to students admitted to the Industrial Engineering, BS, degree program. Required courses and electives satisfying the Mathematics and Basic Science, Computer Sciences, IE Focus Area, and General Education Communication requirements are indicated. For Liberal Studies Electives refer to the College of Engineering Liberal Studies Guidelines.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 221</td>
<td>Calculus and Analytic Geometry 1</td>
<td>5</td>
</tr>
<tr>
<td>MATH 222</td>
<td>Calculus and Analytic Geometry 2</td>
<td>4</td>
</tr>
<tr>
<td>MATH 234</td>
<td>Calculus—Functions of Several Variables</td>
<td>4</td>
</tr>
<tr>
<td>MATH 340</td>
<td>Elementary Matrix and Linear Algebra</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one of the following:  
- PHYSICS 201 General Physics  
- PHYSICS 207 General Physics  
- E M A 201 & E M A 202 Statics and Dynamics

Choose 9 credits from the following list:  

**Basic Science**

- ANAT&PHY 335 Physiology
- BIOLOGY/BOTANY/ZOOLOGY 151 or ZOOLOGY 151 Introductory Biology
- BIOLOGY/BOTANY/ZOOLOGY 152 Introductory Biology
- CHEM 103 General Chemistry I  
  or CHEM 109 Advanced General Chemistry  
  or CHEM 115 Chemical Principles I
- CHEM 104 General Chemistry II
- CHEM 116 Chemical Principles II
- CHEM 311 Chemistry Across the Periodic Table
- CHEM 327 Fundamentals of Analytical Science  
  or CHEM 329 Fundamentals of Analytical Science
- CHEM 341 Elementary Organic Chemistry
- CHEM 342 Elementary Organic Chemistry Laboratory
- CHEM 343 Organic Chemistry I
- CHEM 344 Introductory Organic Chemistry Laboratory
- CHEM 345 Organic Chemistry II
- CHEM 346 Intermediate Organic Chemistry Laboratory
- MICROBIO 101 General Microbiology
- MICROBIO 102 General Microbiology Laboratory
- PHYSICS 202 General Physics  
  or PHYSICS 208 General Physics  
  or PHYSICS 248A Modern Introduction to Physics
- PHYSICS 205 Modern Physics for Engineers  
  or PHYSICS 241 Introduction to Modern Physics  
  or PHYSICS 249A Modern Introduction to Physics

**Mathematics**

- MATH/COMP SCI 240 Introduction to Discrete Mathematics

Free Electives: 4 credits

Total Credits: 120-122
MATH 319  Techniques in Ordinary Differential Equations
MATH 421  The Theory of Single Variable Calculus
MATH 441  Introduction to Modern Algebra
MATH 443  Applied Linear Algebra
MATH/COMP SCI/STAT 475  Introduction to Combinatorics
MATH 521  Analysis I
MATH 522  Analysis II

Total Credits 30-31

1 If EMA 201 and EMA 202 are used to fulfill the PHYSICS requirement, additional credits of math or basic science will be required
2 Credit will not be given for both CHEM 103 and CHEM 109 to fulfill Mathematics and Basic Science requirements.

PROBABILITY AND STATISTICS

Code   Title                      Credits
I SY E 210  Introduction to Industrial Statistics 3
or STAT/MATH 310  Introduction to Probability and Mathematical Statistics II 3
or STAT 312  Introduction to Theory and Methods of Mathematical Statistics II 3

STAT 311  Introduction to Theory and Methods of Mathematical Statistics I 3
or STAT/MATH 309  Introduction to Probability and Mathematical Statistics I 3

Total Credits 6

COMPUTER SCIENCES

Code   Title                      Credits
COMP SCI 220  Data Science Programming I 4

Select one of the following: 3-4
COMP SCI 200  Programming I
COMP SCI 300  Programming II
COMP SCI 320  Data Science Programming II
COMP SCI 400  Programming III
COMP SCI 412  Introduction to Numerical Methods

Total Credits 7-8

REQUIRED I SY E COURSES

Code   Title                      Credits
I SY E 191  The Practice of Industrial Engineering 2
I SY E 312  Data Management and Analysis for Industrial Engineers 3
I SY E 313  Engineering Economic Analysis 3
I SY E 315  Production Planning and Control 3
I SY E 320  Simulation and Probabilistic Modeling 3
I SY E 321  Simulation Modeling Laboratory 1
I SY E 323  Operations Research-Deterministic Modeling 3
I SY E 348  Introduction to Human Factors Engineering Laboratory 1
I SY E/PSYCH 349  Introduction to Human Factors 3
I SY E 350  Industrial Engineering Design I 3
I SY E 450  Industrial Engineering Design II 3

Total Credits 28

I SY E FOCUS AREA TECHNICAL ELECTIVES

Choose 1 of the following 6 focus areas.

Industrial Data Analytics

Code   Title                      Credits
Choose at least 3: 9
I SY E 412  Fundamentals of Industrial Data Analytics
I SY E 512  Inspection, Quality Control and Reliability
I SY E 521  Machine Learning in Action for Industrial Engineers
I SY E 562  Human Factors of Data Science and Machine Learning
I SY E/ECE 570  Ethics of Data for Engineers
I SY E 603  Special Topics in Engineering Analytics and Operations Research
I SY E 612  Information Sensing and Analysis for Manufacturing Processes
I SY E 649  Interactive Data Analytics

One elective I SY E course other than those listed in the Industrial Data Analytics area 3
Additional elective I SY E courses in any area 6

Total Credits 18

Applications of Industrial Engineering

Code   Title                      Credits
Choose at least 3 courses from the following applications: 9
Manufacturing
I SY E 415  Introduction to Manufacturing Systems, Design and Analysis
I SY E/M E 510  Facilities Planning
I SY E 515  Engineering Management of Continuous Process Improvement
I SY E 604  Special Topics in Manufacturing and Supply Chain Management
I SY E 605  Computer Integrated Manufacturing
I SY E/M E 641  Design and Analysis of Manufacturing Systems
I SY E 645  Engineering Models for Supply Chains

Health Systems
I SY E 417  Health Systems Engineering
I SY E 517  Decision Making in Health Care
I SY E 606  Special Topics in Healthcare Systems Engineering

Quality Engineering
I SY E 520  Quality Assurance Systems
I SY E 575  Introduction to Quality Engineering
One elective I SYE course other than those listed in the Applications of Industrial Engineering area  
Additional elective I SYE courses in any area  
Total Credits  

Human Factors and Ergonomics  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SYE/COMP SCI/ DS 518</td>
<td>Wearable Technology</td>
<td></td>
</tr>
<tr>
<td>I SYE/PSYCH 549</td>
<td>Human Factors Engineering</td>
<td></td>
</tr>
<tr>
<td>I SYE 555</td>
<td>Human Performance and Accident Causation</td>
<td></td>
</tr>
<tr>
<td>I SYE 562</td>
<td>Human Factors of Data Science and Machine Learning</td>
<td></td>
</tr>
<tr>
<td>I SYE/BME 564</td>
<td>Occupational Ergonomics and Biomechanics</td>
<td></td>
</tr>
<tr>
<td>I SYE 602</td>
<td>Special Topics in Human Factors</td>
<td></td>
</tr>
<tr>
<td>I SYE/BME 662</td>
<td>Design and Human Disability and Aging</td>
<td></td>
</tr>
</tbody>
</table>

One elective I SYE course other than those listed in the Human Factors and Ergonomics area  
Additional elective I SYE courses in any area  
Total Credits  

Optimization and Operations Research  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SYE/COMP SCI/ MATH 425</td>
<td>Introduction to Combinatorial Optimization</td>
<td></td>
</tr>
<tr>
<td>I SYE 516</td>
<td>Introduction to Decision Analysis</td>
<td></td>
</tr>
<tr>
<td>I SYE/COMP SCI/ ECE 524</td>
<td>Introduction to Optimization</td>
<td></td>
</tr>
<tr>
<td>I SYE/COMP SCI/ MATH/STAT 525</td>
<td>Linear Optimization</td>
<td></td>
</tr>
<tr>
<td>I SYE 603</td>
<td>Special Topics in Engineering Analytics and Operations Research 1</td>
<td></td>
</tr>
<tr>
<td>I SYE 620</td>
<td>Simulation Modeling and Analysis</td>
<td></td>
</tr>
<tr>
<td>I SYE 624</td>
<td>Stochastic Modeling Techniques</td>
<td></td>
</tr>
<tr>
<td>I SYE/MATH/OTM/STAT 632</td>
<td>Introduction to Stochastic Processes</td>
<td></td>
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</tbody>
</table>

One elective I SYE course other than those listed in the Optimization and Operations Research area  
Additional elective I SYE courses in any area  
Total Credits  

Distributed Focus Area  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
</table>

Total credits in Distributed Focus Area:  

Choose 6 courses in at least 3 of the 4 areas listed above (Industrial Data Analytics, Applications of Industrial Engineering, Human Factors and Ergonomics, and Optimization and Operations Research)  

Honors in Research Focus Area  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SYE 468</td>
<td>Introduction to Industrial Engineering Research</td>
<td></td>
</tr>
<tr>
<td>I SYE 478</td>
<td>Research and Beyond in Industrial Engineering</td>
<td></td>
</tr>
<tr>
<td>I SYE 489</td>
<td>Honors in Research</td>
<td></td>
</tr>
</tbody>
</table>

Choose 5 courses in at least 2 of the 4 areas listed above (Industrial Data Analytics, Applications of Industrial Engineering, Human Factors and Ergonomics, and Optimization and Operations Research)  

The area to which I SYE 603 Special Topics in Engineering Analytics and Operations Research will count is dependent on course topic. Please consult your advisor for details.  

PROFESSIONAL ELECTIVES, COMMUNICATION SKILLS, AND LIBERAL STUDIES  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional Electives</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Professional Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication Skills</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>ENGL 100</td>
<td>Introduction to College Composition</td>
<td></td>
</tr>
<tr>
<td>or COM ARTS 100</td>
<td>Introduction to Speech Composition</td>
<td></td>
</tr>
<tr>
<td>or LSC 100</td>
<td>Science and Storytelling</td>
<td></td>
</tr>
<tr>
<td>or ESL 118</td>
<td>Academic Writing II</td>
<td></td>
</tr>
<tr>
<td>INTEREGR 397</td>
<td>Engineering Communication</td>
<td></td>
</tr>
<tr>
<td>Liberal Studies</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Liberal Studies Electives</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>ECON 101</td>
<td>Principles of Microeconomics</td>
<td></td>
</tr>
<tr>
<td>Total Credits</td>
<td></td>
<td>27</td>
</tr>
</tbody>
</table>

1 Professional electives may not include STAT 301 Introduction to Statistical Methods or transfer/test math elective credits for calculus.  

FREE ELECTIVES  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 credits of Free Electives</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Total Credits</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>
MINIMUM REQUIRED CREDITS: 120

UNIVERSITY DEGREE REQUIREMENTS

Total Degree
To receive a bachelor’s degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.

Residency
Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. "In residence" credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.

Quality of Work
Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.