INDUSTRIAL ENGINEERING, PH.D.

The Department of Industrial and Systems Engineering offers opportunities for graduate study leading to the master of science and the doctor of philosophy degrees in industrial and systems engineering.

In the Ph.D. program, four areas of specialization are available, each designed to produce graduates capable of leading new and developing areas within industrial and systems engineering. The four areas are: decision science/operations research, health systems, human factors and ergonomics, and manufacturing and production systems.

The specialization in decision science/operations research trains students in analytical methodologies useful for solving decision problems, especially problems that involve the allocation of scarce resources, and the design, planning and operation of complex systems. Graduate study focuses on optimization modeling and algorithms, applied probability and stochastic modeling, and decision analysis.

The health systems specialization seeks to train students to look at broad issues in health care, including long-term care, prevention, quality improvement, health care financing, and system evaluation. Understanding how people solve problems is a basic requirement for health systems engineers, who must apply scientific methods in a value-laden setting.

The specialization in human factors and ergonomics is concerned with the quality of work lives, ergonomics, and occupational safety and health for both workers and management. By examining, designing, testing, and evaluating the workplace and how people interact within it, human systems engineers can create productive, safe, and satisfying work environments.

The specialization in manufacturing and production systems is intended to provide the skills and knowledge necessary to compete successfully in a manufacturing environment. These skills include knowledge of the theory of manufacturing materials and processes and their control; knowledge of the essentials of manufacturing systems design and analysis; and knowledge of and hands-on experience with modern manufacturing technology.

The department also offers three distinct master of science programs. The Master of Science in Industrial Engineering (http://guide.wisc.edu/graduate/industrial-systems-engineering/industrial-engineering-ms/) with no named option is a research program designed for students wishing to conduct research during their program. The two course-based named option programs in the MS-IE, Human Factors and Systems Engineering M.S. (http://guide.wisc.edu/graduate/industrial-systems-engineering/industrial-engineering-ms/industrial-engineering-human-factors-health-systems-engineering-ms/) and Systems Engineering and Analytics M.S. (http://guide.wisc.edu/graduate/industrial-systems-engineering/industrial-engineering-ms/industrial-engineering-systems-engineering-analytics-ms/), are accelerated programs that can be completed in one full year of study and are designed for students wishing to pursue a career in industry or government.

The department also offers a graduate/professional certificate in Patient Safety (http://guide.wisc.edu/graduate/industrial-systems-engineering/patient-safety-graduate-professional-certificate/). This certificate is an interdisciplinary effort between the Department of Industrial and Systems Engineering, School of Nursing, School of Pharmacy, Department of Medical Physics, and Department of Population Health Sciences.

ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. Applicants must meet the minimum requirements (https://grad.wisc.edu/apply/requirements/) of the Graduate School as well as the program(s).

Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/apply/).

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Deadline</td>
<td>December 15</td>
</tr>
<tr>
<td>Spring Deadline</td>
<td>October 1</td>
</tr>
<tr>
<td>Summer Deadline</td>
<td>December 15</td>
</tr>
<tr>
<td>GRE (Graduate Examinations)</td>
<td>Required</td>
</tr>
<tr>
<td>English Proficiency Test</td>
<td>Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements (<a href="https://grad.wisc.edu/apply/requirements/#english-proficiency">https://grad.wisc.edu/apply/requirements/#english-proficiency</a>).</td>
</tr>
<tr>
<td>Other Test(s) (e.g., GMAT, MCAT)</td>
<td>n/a</td>
</tr>
<tr>
<td>Letters of Recommendation Required</td>
<td>3</td>
</tr>
</tbody>
</table>

Students from any discipline that provides foundations for research in ISyE topics are encouraged to apply. For example, applicants may come from industrial, electrical, or mechanical engineering, or mathematics, statistics, computer science, psychology, or economics. Applicants are strongly advised to review the prerequisites for each area of specialization at the department website (https://www.engr.wisc.edu/academics/graduate-academics/).

Each application is judged on the basis of previous academic record, Graduate Record Exam (GRE) scores for the general test, three letters of recommendation, and the statement of purpose. Admission is very competitive and application deadlines are extremely important.

APPLICATION DEADLINES:

- **Fall**: Dec. 15th
- **Spring**: Oct. 1st
- **Summer**: Dec. 15th

Reentry applicants: July 15 (fall), December 1 (spring), and must notify an academic advisor.

Additional reentry information (https://grad.wisc.edu/admissions/previouslyenrolled/)
APPLICATION REQUIREMENTS

Application deadlines are strictly enforced and ALL application materials including transcripts, GRE and TOEFL scores MUST be included and submitted by the application deadline.

*Please note our office does not provide feedback to applicants as to their potential for admission - please review both the ISyE department and Graduate School requirements for admission and if you feel you meet the necessary criteria for applying, please do so.

1. Applicants must first meet all of the requirements of the Graduate School. Click here for more information about these requirements (http://grad.wisc.edu/admissions/requirements/).
2. Applicants must also meet department specific requirements as outlined below:
   - B.S. degree or equivalent

APPLICATION STEPS

1. Fill out an online application (https://grad.wisc.edu/apply/) through the Graduate School website and pay the application fee. (https://grad.wisc.edu/admissions/faq/)
2. List three recommenders and their contact information as part of the online application. An email will be sent to the recommender, asking that they submit their letter online using the Graduate School’s recommendation form. Applicants can log back into their online application to re-send the email request if the recommender loses the email. Letters of recommendation must be submitted electronically.
3. Submit a Statement of Purpose (https://grad.wisc.edu/prospective/prepare/statement/) with your online application.
4. TOEFL Exam Information: Ask ETS (https://www.ets.org/) to submit your GRE and/or TOEFL scores to the UW-Madison Graduate School (Institution Number 1846). If you have your scores sent to UW-Madison, they will be available online to all departments to which you have applied. The institution code, therefore, is the only number needed. For more information please visit the Graduate School Requirements (https://grad.wisc.edu/admissions/requirements/) page. Please note: Exam information must be valid at start date of the semester that you are applying for (nonexpired).
5. GRE Exam Information: (https://www.ets.org/gre/) The IE graduate program requires the GRE exam be taken by prospective students as part of the application. Note there are no specific scoring guidelines for the exam as the GRE is only one part of consideration for admission into the program. Please note: Exam information must be valid at start date of the semester that you are applying for (nonexpired).
6. Electronically submit one copy of your official transcript with your application. Unofficial copies of transcripts will be accepted for review but official copies are required for admitted students.

NOTE: PLEASE DO NOT SEND MATERIALS/DOCUMENTS TO THE ISyE DEPARTMENT OR GRADUATE SCHOOL UNTIL YOU ARE RECOMMENDED FOR ADMISSIONS. ALL DOCUMENTS SHOULD BE UPLOADED WITH YOUR APPLICATION.

QUESTIONS?

Check out the Admissions FAQ or contact us at iegradadmission@engr.wisc.edu.

FUNDING

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad.wisc.edu/funding/) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

PROGRAM RESOURCES

All ISyE PhD students are provided funding and tuition remission, provided they are making satisfactory academic progress. This funding may be in the form of a teaching assistant, research assistant, or project assistant position, or as an external fellowship. The type position providing the funding support may change from semester to semester and is determined based on a combination of factors including the availability of research funds by the student’s faculty advisor and the need for teaching assistants in ISyE courses.

REQUIREMENTS FOR STUDENTS ASSIGNED TEACHING ASSISTANT POSITIONS

Students hired into a TA position are required to attend the New Educator Orientation (NEO) training in late August. For more details, please see this website.

All international students assigned to a teaching assistant position must meet the UW-Madison Graduate School’s requirement for spoken English. This requirement can be fulfilled in two ways:

- Pass the SPEAK—you can register for the SPEAK test through Aaron Webster in Room 3107 ME, aaron.webster@wisc.edu.
- Receive a 26 or higher on the speaking portion of the TOEFL test (or equivalent). Provide a copy of your score to Aaron Webster in Room 3107 ME, aaron.webster@wisc.edu

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/#policiesandrequirementstext), in addition to the program requirements listed below.
MAJOR REQUIREMENTS

MODE OF INSTRUCTION

<table>
<thead>
<tr>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Mode of Instruction Definitions

**Evening/Weekend:** These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.

**Online:** These programs are offered primarily online. Many available online programs can be completed almost entirely online with all online programs offering at least 50 percent or more of the program work online. Some online programs have an on-campus component that is often designed to accommodate working schedules.

Take advantage of the convenience of online learning while participating in a rich, interactive learning environment. For more information about the online nature of a specific program, contact the program.

**Hybrid:** These programs have innovative curricula that combine on-campus and online formats. Most hybrid programs are completed on-campus with a partial or completely online semester. For more information about the hybrid schedule of a specific program, contact the program.

**Accelerated:** These on-campus programs are offered in an accelerated format that allows you to complete your program in a condensed time-frame. Enjoy the advantages of on-campus courses with minimal disruption to your career. For more information about the accelerated nature of a specific program, contact the program.

CURRICULAR REQUIREMENTS

**Requirements Detail**

- **Minimum Credit Requirement:** 51 credits
- **Minimum Residence Credit Requirement:** 32 credits
- **Minimum Graduate Coursework Requirement:** Half of degree coursework (26 credits out of 51 total credits) must be completed graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university’s Course Guide.
- **Overall Graduate GPA Requirement:** 3.00 GPA required.
- **Other Grade Requirements:** Grades of C and D received by a candidate in any graduate course will not be counted as credit toward the degree. These grades will be counted in the graduate GPA.
- **Assessments and Examinations:** Qualifying exams, preliminary exams, and a final dissertation defense are required of all students. Details may be found in the program handbook.
- **Language Requirements:** No language requirements.

**Required Courses**

Students choose one of the following research areas (https://www.engr.wisc.edu/department/industrial-systems-engineering/research-in-industrial-systems-and-engineering/). Work with your faculty advisors to answer any questions and to form a plan of study.

**Decision Science/Operations Research Area**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SY E COMP SCI/ E C E 524</td>
<td>Introduction to Optimization</td>
<td>3</td>
</tr>
<tr>
<td>I SY E COMP SCI/ MATH/STAT 525</td>
<td>Linear Optimization</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 620</td>
<td>Simulation Modeling and Analysis</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 624</td>
<td>Stochastic Modeling Techniques</td>
<td>3</td>
</tr>
<tr>
<td>I SY E MATH/OTM/ STAT 632</td>
<td>Introduction to Stochastic Processes</td>
<td>3</td>
</tr>
<tr>
<td>I SY E COMP SCI/ MATH 728</td>
<td>Integer Optimization</td>
<td>3</td>
</tr>
</tbody>
</table>

**Courses Recommended for DS/OR Qualifying Exam:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SY E COMP SCI/ E C E 524</td>
<td>Introduction to Optimization</td>
<td>3</td>
</tr>
<tr>
<td>I SY E COMP SCI/ MATH/STAT 525</td>
<td>Linear Optimization</td>
<td>3</td>
</tr>
<tr>
<td>I SY E COMP SCI/ MATH/STAT 726</td>
<td>Nonlinear Optimization I</td>
<td>3</td>
</tr>
<tr>
<td>I SY E COMP SCI/ MATH 728</td>
<td>Integer Optimization</td>
<td>3</td>
</tr>
<tr>
<td>I SY E COMP SCI/ MATH 730</td>
<td>Nonlinear Optimization II</td>
<td>3</td>
</tr>
</tbody>
</table>

**Other Suggested Courses:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SY E 412</td>
<td>Fundamentals of Industrial Data Analytics</td>
<td>3</td>
</tr>
<tr>
<td>I SY E COMP SCI/ MATH 425</td>
<td>Introduction to Combinatorial Optimization</td>
<td>3</td>
</tr>
<tr>
<td>I SY E M 512</td>
<td>Inspection, Quality Control and Reliability</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 516</td>
<td>Introduction to Decision Analysis</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 517</td>
<td>Decision Making in Health Care</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 575</td>
<td>Introduction to Quality Engineering</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 603</td>
<td>Special Topics in Engineering Analytics and Operations Research</td>
<td>1-3</td>
</tr>
<tr>
<td>I SY E 604</td>
<td>Special Topics in Manufacturing and Supply Chain Management</td>
<td>1-3</td>
</tr>
<tr>
<td>I SY E 612</td>
<td>Information Sensing and Analysis for Manufacturing Processes</td>
<td>3</td>
</tr>
<tr>
<td>I SY E MATH/OTM/ STAT 632</td>
<td>Introduction to Stochastic Processes</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 645</td>
<td>Engineering Models for Supply Chains</td>
<td>3</td>
</tr>
<tr>
<td>I SY E COMP SCI 719</td>
<td>Stochastic Programming</td>
<td>3</td>
</tr>
</tbody>
</table>
Health Systems Engineering Research Area

**Highly Recommended Courses:**
- I SY E 417 Health Systems Engineering 3
- I SY E 415 Decision Making in Health Care 3
- I SY E 555 Human Performance and Accident Causation 3
- I SY E 575 Introduction to Quality Engineering 3
- I SY E 601 Special Topics in Industrial Engineering 1-3
- I SY E 412 Fundamentals of Industrial Data Analytics 3
- I SY E 415 Introduction to Manufacturing Systems, Design and Analysis 3
- I SY E 555 Human Performance and Accident Causation 3
- I SY E 575 Introduction to Quality Engineering 3
- I SY E 601 Special Topics in Industrial Engineering 1-3
- I SY E 602 Quality of Health Care: Evaluation and Assurance 1-3
- I SY E/PHARMACY 608 Safety and Quality in the Medication Use System 3
- I SY E 615 Production Systems Control 3
- I SY E 620 Simulation Modeling and Analysis 3
- I SY E 624 Stochastic Modeling Techniques 3
- I SY E/M E 643 Performance Analysis of Manufacturing Systems 3
- I SY E/PSYCH 652 Sociotechnical Systems 3
- I SY E/PSYCH 653 Organization and Job Design 3
- I SY E/M H R 729 Behavioral Analysis of Management Decision Making 3
- I SY E/POP HLTH 875 Cost Effectiveness Analysis in Health and Healthcare 3
- B M I/COMP SCI 576 Introduction to Bioinformatics 3
- B M I 779 Clinical Research Informatics 3
- B M I/COMP SCI 776 Advanced Bioinformatics 3

**Other Suggested Courses:**
- I SY E 517 Decision Making in Health Care 3
- I SY E/PHARMACY 608 Safety and Quality in the Medication Use System 3
- I SY E/M E 643 Performance Analysis of Manufacturing Systems 3
- I SY E/M H R 729 Behavioral Analysis of Management Decision Making 3
- I SY E/POP HLTH 875 Cost Effectiveness Analysis in Health and Healthcare 3
- B M I/COMP SCI 576 Introduction to Bioinformatics 3
- B M I 779 Clinical Research Informatics 3
- B M I/COMP SCI 776 Advanced Bioinformatics 3

1. These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

2. Topics vary for this course. Obtain advance approval from your faculty advisor.

Manufacturing and Production Systems Research Area

**Possible Courses:**
- I SY E 412 Fundamentals of Industrial Data Analytics 3
- I SY E 415 Introduction to Manufacturing Systems, Design and Analysis 3
- I SY E/M E 510 Facilities Planning 3
- I SY E/M E 512 Inspection, Quality Control and Reliability 3
- I SY E/M E 513 Analysis of Capital Investments 3
- I SY E 515 Engineering Management of Continuous Process Improvement 3
- I SY E 575 Introduction to Quality Engineering 3
- I SY E 601 Special Topics in Industrial Engineering 1-3
- I SY E 603 Special Topics in Engineering Analytics and Operations Research 1-3
- I SY E 604 Special Topics in Manufacturing and Supply Chain Management 1-3
- I SY E 605 Computer Integrated Manufacturing 3
- I SY E 612 Information Sensing and Analysis for Manufacturing Processes 3
- I SY E 615 Production Systems Control 3
- I SY E/M E 641 Design and Analysis of Manufacturing Systems 3
- I SY E/M E 643 Performance Analysis of Manufacturing Systems 3
- I SY E 645 Engineering Models for Supply Chains 3
- STAT/M E 424 Statistical Experimental Design 3
- I SY E 816 Special Topics in Systems Design 1-3
- I SY E 823 Special Topics in Operations Research 1-3

1. These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

2. Topics vary for this course. Obtain advance approval from your faculty advisor.

Quality Engineering Research Area

**Possible Courses:**
- I SY E 412 Fundamentals of Industrial Data Analytics 3
- I SY E 415 Health Systems Engineering 3
- I SY E/M E 512 Inspection, Quality Control and Reliability 3
- I SY E/M E 513 Analysis of Capital Investments 3
- I SY E 515 Engineering Management of Continuous Process Improvement 3
- I SY E 520 Quality Assurance Systems 3
- I SY E 575 Introduction to Quality Engineering 3
### Human Factors and Ergonomics Research Area

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SY E/COMP SCI/</td>
<td>Wearable Technology</td>
<td>3</td>
</tr>
<tr>
<td>DS 518</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I SY E 552</td>
<td>Human Factors Engineering Design and Evaluation</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 555</td>
<td>Human Performance and Accident Causation</td>
<td>3</td>
</tr>
<tr>
<td>I SY E/MED PHYS 559</td>
<td>Patient Safety and Error Reduction</td>
<td>2</td>
</tr>
<tr>
<td>559</td>
<td>in Healthcare</td>
<td></td>
</tr>
<tr>
<td>I SY E/B M E 564</td>
<td>Occupational Ergonomics and Biomechanics</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 601</td>
<td>Special Topics in Industrial Engineering²</td>
<td>1-3</td>
</tr>
<tr>
<td>I SY E 602</td>
<td>Special Topics in Human Factors</td>
<td>3</td>
</tr>
<tr>
<td>I SY E/PSYCH 652</td>
<td>Sociotechnical Systems</td>
<td>3</td>
</tr>
<tr>
<td>I SY E/PSYCH 653</td>
<td>Organization and Job Design</td>
<td>3</td>
</tr>
<tr>
<td>I SY E/B M E 662</td>
<td>Design and Human Disability and Aging</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 699</td>
<td>Advanced Independent Study²</td>
<td>1-5</td>
</tr>
</tbody>
</table>

1. These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.
2. Topics vary for this course. Obtain advance approval from your faculty advisor.

### HFE Course Requirement

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SY E 555</td>
<td>Human Performance and Accident Causation</td>
<td>3</td>
</tr>
<tr>
<td>I SY E/</td>
<td>Patient Safety and Error Reduction</td>
<td>2</td>
</tr>
<tr>
<td>MED PHYS 559</td>
<td>in Healthcare</td>
<td></td>
</tr>
<tr>
<td>I SY E/PSYCH 653</td>
<td>Organization and Job Design</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 601</td>
<td>Special Topics in Industrial Engineering²</td>
<td>1-3</td>
</tr>
<tr>
<td>I SY E 602</td>
<td>Special Topics in Human Factors</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 699</td>
<td>Advanced Independent Study²</td>
<td>1-5</td>
</tr>
<tr>
<td>I SY E/PSYCH 854</td>
<td>Special Topics in Organization Design²</td>
<td>1-3</td>
</tr>
</tbody>
</table>

To take the qualifying exam, a student will have to have received a grade of AB or better in at least 3 credits in each of the three areas below. Courses taken during undergraduate studies can be used to satisfy this requirement:

#### Cognitive Ergonomics:

- I SY E 555: Human Performance and Accident Causation
- I SY E/MED PHYS 559: Patient Safety and Error Reduction in Healthcare
- I SY E 601: Special Topics in Industrial Engineering²
- I SY E 602: Special Topics in Human Factors²
- I SY E 699: Advanced Independent Study²
- I SY E/PSYCH 859: Special Topics in Human Factors Engineering²

#### Sociotechnical Systems / Macroergonomics:

- I SY E 555: Human Performance and Accident Causation
- I SY E/PSYCH 653: Organization and Job Design²
- I SY E 601: Special Topics in Industrial Engineering²
- I SY E 602: Special Topics in Human Factors²
- I SY E 699: Advanced Independent Study²
- I SY E/PSYCH 854: Special Topics in Organization Design²

#### Physical Ergonomics:

- I SY E 555: Human Performance and Accident Causation
- I SY E/B M E 564: Occupational Ergonomics and Biomechanics
- I SY E/B M E 662: Design and Human Disability and Aging
- I SY E 601: Special Topics in Industrial Engineering²
- I SY E 602: Special Topics in Human Factors²
- I SY E 699: Advanced Independent Study²
1 These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.

2 Topics vary for this course. Obtain advance approval from your faculty advisor.

3 Various courses in the categories of Research Methods, Statistics, Qualitative Research, Biomechanics Methods, and Psychology count as 'Tools and Methods.' The Human Factors and Ergonomics faculty group updates the list of ‘Tools and Methods’ courses, and advisors decide which set of courses are appropriate for each student. Work with your faculty advisor regarding non-ISyE course work.

Prior to defending their dissertation, HFE Ph.D. students must complete at least six seminar/special topics courses at the 700 level or above totaling a minimum of 12 credits; at least 6 credits of these must be in the Human Factors and Ergonomics area. Seminar credits outside the Human Factors and Ergonomics area may be used to satisfy the Industrial Engineering Breadth requirement. Other courses may qualify. Students may submit courses to the HFE Area group for consideration. Transfer students should submit a course syllabus or description and transcript for any courses from other institutions that they would like to have considered for satisfaction of this requirement. The HFE Area group will make this decision.

Additional Breadth Requirements for all ISyE PhD Students
- Colloquium/Lecture Series: For at least two semesters, students must regularly attend a colloquium series. The appropriate colloquium series must be approved by the student’s faculty adviser. It is not required to meet this requirement by registering for a course (indeed some colloquium series have no associate course). Instead, attendance at the approved colloquium series must be confirmed by the student’s faculty adviser when the student submits their PhD Plan of Study prior to their preliminary examination. Example of colloquium series that can be used to meet this requirement include the ISyE Colloquia and the Systems, Information, Learning and Optimization (SILO) seminars.
- Industrial Engineering Breadth Requirement: The breadth requirement is to make sure the Ph.D. student achieves minimum competence in multiple areas of industrial and systems engineering. It consists of taking at least two courses (6 credits) in two different areas outside of the student's focus area. Students can choose from a select set of courses and must attain a grade of B or above in both courses. The courses selected by the student must be approved by the student's adviser. These courses must be completed before a Ph.D. student can request their Preliminary Warrant. Courses the student has taken before entering the Ph.D. program can be counted toward this breadth requirement, including courses taken as an undergraduate. Students should submit the course title and syllabus to the student services coordinator who will then seek approval from the chair of graduate affairs.

POLICIES

GRADUATE SCHOOL POLICIES
The Graduate School’s Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy/) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

MAJOR-SPECIFIC POLICIES

PRIOR COURSEWORK

Graduate Work from Other Institutions
Not allowed for graduate residence credit requirement but allowed for graduate degree credit requirement and graduate coursework (50%) requirement. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

UW–Madison Undergraduate
Not allowed for graduate residence credit requirement for master’s thesis option or the Ph.D. track but allowed up to 6 credits numbered 300 level or above toward the graduate degree credit requirement for master’s course option tracks but not toward the 50% graduate coursework except for 700 level or above courses. Coursework earned five or more years prior to admission to a master’s degree is not allowed to satisfy requirements.

UW–Madison University Special
Allowed up to 15 credits numbered 300 or above toward graduate residence credit requirement and graduate degree credit requirement. If the courses were numbered 700 or above they may count toward the minimum graduate coursework (50%) requirement. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

PROBATION

Students who are admitted with deficiencies but do not complete these courses within the first year are subject to probation.

ADVISOR / COMMITTEE

Every graduate student is required to have an advisor. A faculty advisor provides the graduate student with academic guidance regarding their course selection and research oversight in their dissertation. Graduate students should always seek advice from their advisor prior to enrolling for courses.

Many PhD students are assigned a faculty advisor when they are admitted to the program, based on a match between their research interests and those of the assigned advisor. Some PhD students are not initially matched to a faculty advisor for their research when admitted. Such students are advised by the associate chair for graduate studies in their first year. During their first year, these students explore research possibilities with different faculty in the department and choose a faculty advisor by the end of the first year.

Changing advisors during the graduate program may be necessary due to changes in a student's interests or changes in the funding sources for their support. Students should discuss an advisor change with the faculty in their interest area and request a change of advisor with the ISyE Student Services in Room 3182 in Mechanical Engineering Building.

Ph.D. Committee

Attainment of a Ph.D. degree requires the preparation of a thesis on a research topic selected by the student and their advisor. Once a research project is selected, the student must choose his or her thesis committee*. The ISyE Graduate Program requires the thesis committee shall consist
of at least four members for the Preliminary Exam Committee and at least five members for the Final Ph.D. Defense Committee including:

- The Committee Chair (the student’s primary advisor). The Committee Chair must be an ISyE faculty. Emeritus faculty cannot serve as the Committee Chair.
- Three other graduate faculty members or former UW-Madison graduate faculty up to one year after resignation or retirement with two faculty members having their tenure home in ISyE.
- All Committee members are required to be readers.
- The dissertation committee must consist of at least 5 members (4 members for prelim exam) and meet the requirements set forth by the Graduate School, including for example, at least one of the members of the committee must be from a UW-Madison program outside the Industrial and Systems Engineering Department.
- The fifth member of the committee, as well as any additional members, may be from any of the following categories: graduate faculty, faculty from a department without a graduate program, academic staff (including emeritus faculty), visiting faculty, faculty from other institutions, scientists, research associates, and other individuals deemed qualified by the executive committee (or its equivalent).

CREDITS PER TERM ALLOWED
Enrollment of 12 credits or less recommended. (Full time status considered 8-12 credits).

TIME CONSTRAINTS
The qualifying examination requirement must be satisfied by the end of the fifth semester of enrollment after entering the ISyE graduate program.

The preliminary exam must be completed within 4 years of joining the ISyE graduate program, and within 3 years of passing the qualifying exam.

The dissertation defense must be completed either within two years after passing the preliminary exam or by the end of the 6th year in the graduate program, whichever is later.

Exceptions to these time limits may be granted by the Academic Affairs Cluster through a petition process.

GRIEVANCES AND APPEALS
These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (https://doso.students.wisc.edu/bias-or-hate-reporting/)
- Graduate Assistantship Policies and Procedures (https://hr.wisc.edu/policies/gapp/#grievance-procedure)
- Hostile and Intimidating Behavior Policies and Procedures (https://hr.wisc.edu/hib/)
  - Office of the Provost for Faculty and Staff Affairs (https://facstaff.provost.wisc.edu/)
- Dean of Students Office (https://doso.students.wisc.edu/) (for all students to seek grievance assistance and support)
- Employee Assistance (http://www.eao.wisc.edu/) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (https://employee.disabilities.wisc.edu/) (for qualified employees or applicants with disabilities to have equal employment opportunities)
- Graduate School (https://grad.wisc.edu/) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (https://compliance.wisc.edu/) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office of Student Conduct and Community Standards (https://conduct.students.wisc.edu/) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (http://www.ombuds.wisc.edu/) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (https://compliance.wisc.edu/titleix/) (for concerns about discrimination)

Grievance Procedures: Industrial and Systems Engineering
If a graduate student feels unfairly treated or aggrieved by faculty, staff, or another student, the University offers several avenues to resolve the grievance. Student’s concerns about unfair treatment are best handled directly with the person responsible for the objectionable action. If the student is uncomfortable making direct contact with the individual(s) involved, they should contact the advisor or the person in charge of the unit where the action occurred (program or department chair, section chair, lab manager, etc). Many departments and schools/colleges have established specific procedures for handling such situations; check their web pages and published handbooks for information. If such procedures exist at the local level, these should be investigated first. For more information, see the College of Engineering Policies and Procedures (https://www.engr.wisc.edu/academics/student-services/academic-advising/policies-and-procedures/). The Assistant Dean for Graduate Affairs (engr-dean-graduateaffairs@engr.wisc.edu) provides overall leadership for graduate education in the College of Engineering (CoE), and is a point of contact for graduate students who have concerns about education, mentoring, research, or other difficulties.

Procedures for handling graduate student grievances against ISyE faculty, staff, or students:

1. The student is encouraged to speak first with the person toward whom the grievance is directed to see if a situation can be resolved at this level.

2. Should a satisfactory resolution not be achieved, the student should contact the Associate Chair for Graduate Affairs, to discuss the grievance. The Associate Chair will facilitate problem resolution through informal channels and facilitate any complaints or issues of students. The first attempt is to help students informally address the grievance prior to any formal complaint. Students are also encouraged to talk with their faculty advisors regarding concerns or difficulties, if necessary. University resources for sexual harassment, discrimination, disability accommodations, and other related concerns can be found on the UW Office of Compliance website (https://compliance.wisc.edu/).

3. If the issue is not resolved to the student’s satisfaction, the student can submit the grievance to the Department Chair. The grievance should be submitted in writing, within 60 calendar days of the alleged unfair treatment.
4. On receipt of a written complaint, the Department Chair will form a faculty committee that will review the complaint and gather further information as necessary from the filer of the complaint and other parties involved (including the party toward whom the complaint is directed).

5. The faculty committee will determine a decision regarding the grievance. The Department Chair will report on the action taken by the committee in writing to both the student and the party toward whom the complaint was directed within 15 working days from the date the complaint was received.

6. At this point, if either party (the student or the person toward whom the grievance is directed) is unsatisfied with the decision of the faculty committee, the party may file a written appeal to the College of Engineering Assistant Dean for Graduate Affairs (engr-dean-graduateaffairs@engr.wisc.edu). Either party has 10 working days to file a written appeal to the School/College.

7. Documentation of the grievance will be stored for at least 7 years. Significant grievances that set a precedent will be stored indefinitely.

8. The Graduate School has procedures for students wishing to appeal a grievance decision made at the school/college level. These policies are described in the Graduate School Academic Policies and Procedures - Grievances & Appeals (https://grad.wisc.edu/documents/grievances-and-appeals/).

OTHER
n/a

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES
Take advantage of the Graduate School's professional development resources (https://grad.wisc.edu/pd/) to build skills, thrive academically, and launch your career.

PROGRAM RESOURCES

THE INDIVIDUAL DEVELOPMENT PLAN (HTTPS://GRAD.WISC.EDU/PD/IDP/)

An Individual Development Plan helps with self-assessment, planning, and communication:

- An IDP can help you communicate your professional development and career planning needs and intentions to others including your mentor, which can lead to helpful advice and resources.
- You can use the IDP to make sure you and your mentor’s expectations are clearly outlined and in agreement so that there are no big surprises, particularly at the end of your training.
- The current job market is challenging and research has shown that individuals who perform structured career planning achieve greater career success and satisfaction.

The onus to engage in the IDP process is on you – although your mentor, PI, or others may encourage and support you in doing so. The IDP itself remains private to you, and you choose which parts to share with which mentors. Through the IDP process, you may decide to identify various mentors to whom you can go for expertise and advice.

ENGINEERING CAREER SERVICES (HTTPS://ECS.WISC.EDU/)

Julie Rae, Assistant Director for Graduate Student Career Services

GRADUATE students in all Engineering programs

- Resumes & Cover Letters https://ecs.wisc.edu/students/resumes-and-cover-letters/
- Job Search Strategies
- Job Offers & Negotiation https://ecs.wisc.edu/students/offers-and-negotiation/
- CPT for Graduate Students https://ecs.wisc.edu/students/co-op-and-internship/
- Student appointments: Click Here (http://go.wisc.edu/ecs-grad-appt/) to schedule an appointment with ECS.


UW WRITING CENTER (HTTPS://WRITING.WISC.EDU/)

Location: 6171 Helen C. White Hall

Tel: (608) 263-1992

The UW Writing Center provides free of charge face-to-face and online consultations that focus on a number of different writing scenarios (i.e. drafts of course papers, resumes, reports, application essays, cover letters, theses, etc). Writing Center instructors will not edit or proofread papers. Instead, their goal is to teach students to edit and proofread on their own in order to become a better, more confident writer.

LEARNING OUTCOMES

1. Articulates research problems, potentials, and limits with respect to theory, knowledge, or practice within industrial and systems engineering.
2. Formulates ideas, concepts, designs, and/or techniques beyond the current boundaries of knowledge within the industrial and systems engineering.
3. Creates research, scholarship, or performance that makes a substantive contribution to the industrial and systems engineering field.
4. Demonstrates breadth within their learning experiences.
5. Advances contributions of the field of industrial and systems engineering to society.
6. Communicates complex ideas in a clear and understandable manner to variety of audience.
7. Fosters ethical and professional conduct.

PEOPLE

Faculty Directory (https://directory.engr.wisc.edu/display.php?faculty?search=faculty)

PROFESSORS

- Oguzhan Alagöz (https://directory.engr.wisc.edu/ie/Faculty/Alagöz_Oguzhan/)
• Laura Albert (https://directory.engr.wisc.edu/ie/Faculty/Albert-mclay_Laura/)
• Vicki Bier (https://directory.engr.wisc.edu/ie/Faculty/Bier_Vicki/)
• Justin Boutilier (https://directory.engr.wisc.edu/ie/Faculty/Boutilier_Justin/)
• Carla Michini (https://directory.engr.wisc.edu/ie/Faculty/Michini_Carla/)
• Bilge Mutlu (https://directory.engr.wisc.edu/ie/Faculty/Mutlu_Bilge/)
• Shiyu Zhou (https://directory.engr.wisc.edu/ie/Faculty/Zhou_Shiyu/)
• John Lee (https://directory.engr.wisc.edu/ie/Faculty/Lee_John/)
• Jingshan Li (https://directory.engr.wisc.edu/ie/Faculty/Li_Jingshan/)
• Jeff Linderoth (https://directory.engr.wisc.edu/ie/Faculty/Linderoth_Jeffrey/)
• Kaibo Liu (https://directory.engr.wisc.edu/ie/Faculty/Liu_Kaibo/)
• Jim Luedtke (https://directory.engr.wisc.edu/ie/Faculty/Luedtke_James/)
• Carla Michini (https://directory.engr.wisc.edu/ie/Faculty/Michini_Carla/)
• Yonotan Mintz (https://directory.engr.wisc.edu/ie/Faculty/Mintz_Yonotan/)
• Robert Radwin (https://directory.engr.wisc.edu/ie/Faculty/Radwin_Robert/)
• Leyuan Shi (https://directory.engr.wisc.edu/ie/Faculty/Shi_Leyuan/)
• Raj Veeramani (https://directory.engr.wisc.edu/ie/Faculty/Veeramani_Raj/)
• Xin Wang (https://directory.engr.wisc.edu/ie/Faculty/Wang_Xin/)
• Nicole Werner (https://directory.engr.wisc.edu/ie/Faculty/Werner_Nicole/)
• Doug Wiegmann (https://directory.engr.wisc.edu/ie/Faculty/Wiegmann_Douglass/)
• Gabriel Zayas-Caban (https://directory.engr.wisc.edu/ie/Faculty/Zayas-caban_Gabriel/)
• Shiyu Zhou (https://directory.engr.wisc.edu/ie/Faculty/Zhou_Shiyu/)

AFFILIATE FACULTY
• Barbara Bowers (https://directory.engr.wisc.edu/ie/Faculty/Bowers_Barbara/)
• Elizabeth S. Burnside (https://directory.engr.wisc.edu/ie/Faculty/Burnside_Elisabeth/)
• Molly Carnes (https://directory.engr.wisc.edu/ie/Faculty/Carnes_Mary/)
• Peter Chien (https://directory.engr.wisc.edu/ie/Faculty/Chien_Peter/)
• Gregory DeCroix (https://directory.engr.wisc.edu/ie/Faculty/DeCroix_Gregory/)
• Michael Ferris (https://directory.engr.wisc.edu/ie/Faculty/Ferris_Michael/)
• Caprice Greenberg (https://directory.engr.wisc.edu/ie/Faculty/Greenberg_Caprice/)
• Po-ling Loh (https://directory.engr.wisc.edu/ce/Faculty/Loh_Poling/)
• Eneida Mendonca (https://directory.engr.wisc.edu/ie/Faculty/Mendonca_Eneida/)
• Bilge Mutlu (https://directory.engr.wisc.edu/ie/Faculty/Mutlu_Bilge/)
• David Noyce (https://directory.engr.wisc.edu/ce/Faculty/Noyce_David/)
• Kevin Ponto (https://directory.engr.wisc.edu/ie/Faculty/Ponto_Kevin/)
• Carla Pugh (https://directory.engr.wisc.edu/ie/Faculty/Pugh_Carla/)
• Andrew Quanbeck (https://directory.engr.wisc.edu/ie/Faculty/Quanbeck_Antoine/)
• Thomas Rutherford (https://directory.engr.wisc.edu/ie/Faculty/Rutherford_Thomas/)
• Nasia Safdar (https://directory.engr.wisc.edu/ie/Faculty/Safdar_Nasia/)
• Mary Elizabeth Sesto (https://directory.engr.wisc.edu/bme/Faculty/Sesto_Mary/)
• Dhavan V. Shah (https://directory.engr.wisc.edu/ie/Faculty/Shah_Dhavan/)
• Maureen A. Smith (https://directory.engr.wisc.edu/ie/Faculty/Smith_Maureen/)
• Linsey Steege (https://directory.engr.wisc.edu/ie/Faculty/Steege_Linsey/)
• Bruce R. Thomadsen (https://directory.engr.wisc.edu/ece/Faculty/Thomadsen_Bruce/)
• David J. Vanness (https://directory.engr.wisc.edu/ie/Faculty/Vanness_David/)
• Rebecca Willett (https://directory.engr.wisc.edu/ece/Faculty/Willett_Rebecca/)
• Stephen J. Wright (https://directory.engr.wisc.edu/ie/Faculty/Wright_Stephen/)
• Victor Zavala (https://directory.engr.wisc.edu/che/Faculty/Zavala_Victor/)

EMERITUS PROFESSORS
• John Bollinger (https://directory.engr.wisc.edu/ie/Faculty/Bollinger_John/)
• Patricia Brennan (https://directory.engr.wisc.edu/ie/Faculty/Brennan_Patricia/)
• Dennis G. Fryback (https://directory.engr.wisc.edu/ie/Faculty/Fryback_Dennis/)
• David Gustafson (https://directory.engr.wisc.edu/ie/Faculty/Gustafson_David/)
• William G. Reddan (https://directory.engr.wisc.edu/ie/Faculty/Reddan_William/)
• Stephen M. Robinson (https://directory.engr.wisc.edu/ie/Faculty/Robinson_Stephen/)
• Jerry L. Sanders (https://directory.engr.wisc.edu/ie/Faculty/Sanders_Jerry/)
• Michael J. Smith (https://directory.engr.wisc.edu/ie/Faculty/Smith_Michael/)
• Harold J. Steudel (https://directory.engr.wisc.edu/ie/Faculty/Steudel_Harold/)
• Rajan Suri (https://directory.engr.wisc.edu/ie/Faculty/Suri_Rajan/)
• Arne Thesen (https://directory.engr.wisc.edu/ie/Faculty/Thesen_Arne/)
• Gregg Vanderheiden (https://directory.engr.wisc.edu/ie/Faculty/Vanderheiden_Gregg/)
• David R. Zimmerman (https://directory.engr.wisc.edu/ie/Faculty/Zimmerman_David/)