IOWA STATE UNIVERSITY
Department of Industrial and Manufacturing Systems Engineering

# IMSE Graduate Student Handbook (2025-26)








Graduate Student Services
2205E Therkildsen IE Building
https://www.imse.iastate.edu

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# Industrial Engineering Graduate Program Contact Information

Prospective Industrial Engineering Graduate Students

For all inquiries related to the IE Graduate Program, please email imsegradprogram@iastate.edu.

Current Industrial Engineering Graduate Students

The Industrial Engineering Graduate Program Coordinator is the primary point of contact for all current students. Their office is located in the SPARK Advising Center, 2205E Therkildsen IE Building.

# Abbreviations Used in this Handbook

APC – Academic Plan and Committee
B.S. – Bachelor of Science degree
DOGE – Director of Graduate Education
GRST – Graduate Studies (course designator)
IE – Industrial Engineering (course designator)
IMSE – Department of Industrial and Manufacturing Systems Engineering
ISSO – International Students and Scholars Office
ISU – Iowa State University
LOI – Letter of Intent
LOR – Letter of Recommendation
ME – Mechanical Engineering (course designator)
M.Eng. – Master of Engineering degree (coursework-only master's degree)
M.S. – Master of Science degree
Ph.D. – Doctor of Philosophy degree
QE – Qualifying Exam
RA – Research Assistant
TA – Teaching Assistant

# Graduate Studies in Industrial Engineering

The Department of Industrial & Manufacturing Systems Engineering (IMSE) in the College of Engineering at Iowa State University offers a Master of Engineering (M.Eng.), a Master of Science (M.S.) and a Doctor of Philosophy (Ph.D.) degree program in Industrial Engineering (IE). Graduate coursework and research activities are focused on Advanced Manufacturing; Human Factors & Ergonomics; Operations Research & Analytics; and Systems Engineering & Engineering Management.

# Research Areas in Industrial Engineering

Advanced Manufacturing

Advanced manufacturing research in the department focuses on advanced manufacturing technologies and processes, digital manufacturing, advanced sensing and control, and advanced materials manufacturing. Students are engaged in research projects that involve multiple manufacturing research labs including the Interdisciplinary Manufacturing Engineering and Design Laboratory (electrospinning, ball mill grinding, cryomilling, compression molding, microscopy, thermal analysis, fatigue testing, and spectroscopy), the Rapid Manufacturing and Prototyping Laboratory (additive manufacturing, hybrid manufacturing, geometric modeling), and the Wind Energy Manufacturing Laboratory (advanced composite manufacturing processes, laser tracking, laser scanning).

Human Factors & Ergonomics

Human factors and ergonomics research in the department helps people work more efficiently, effectively, and safely with the technologies and work systems around them. Students are engaged in research that advances our understanding of the capabilities and limitations of human beings and then seeks to apply that knowledge to the design of the equipment, the work environment, and the jobs that they perform for safe, comfortable, and effective performance. Current research areas are physical ergonomics and cognitive engineering. In physical ergonomics, the particular focus is on injury prevention, spine biomechanics, upper extremity biomechanics and ergonomic intervention effectiveness research. In cognitive engineering, the research focus is on human performance engineering, human computer interaction, and system design that enhances performance, reduces errors, and increases safety of the overall joint human-machine system. Courses include occupational biomechanics, human factors, human factors in product design, human-computer interaction, cognitive engineering, applied ergonomics and work design, and research methods.

Operations Research & Analytics

Operations research and analytics research is focused on the development and application of mathematical tools and models to solve problems of a quantitative nature. The main research areas include the design and analysis of quantitative models to support effective decision making in industrial, commercial, and governmental systems. Specific areas of course work and research include: mathematical optimization (linear programming, nonlinear programming, integer programming, etc.), data analytics, stochastic processes, queuing, simulation, inventory and scheduling, and network analysis.

Systems Engineering & Engineering Management

Systems engineering is focused on the design and management of large, complex, and interdisciplinary technological systems. Engineering management is the art and science of planning, organizing, allocating resources, and directing and controlling activities that have a technological component, thereby bridging the gap between engineering and management. Research in this area is focused on decision and risk analysis, quantitative modeling (e.g., optimization, simulation), and analysis of complexity and emergent phenomena in large-scale systems. Courses are offered in decision analysis, risk analysis, requirements engineering, project management, and engineering management theory.

## ISU and Graduate College Policies

No part of this manual supersedes policies or requirements of either the Iowa State University Graduate College or Iowa State University. Students are responsible for knowing and complying with all policies in the Graduate College Handbook and with Thesis/Dissertation guidelines and Graduation deadlines.

## Admissions Information

To be successful in the program, students should have a strong background in engineering, mathematics, or physical sciences and exhibit good working skills and high ethical standards.

Admission into the Industrial Engineering Major for the M.Eng., M.S., or Ph.D. Programs

To be considered for admission to the graduate program, the applicant should have a bachelor's degree in industrial engineering or related field from a college, university, or technical school of recognized standing. Other educational backgrounds will be considered on an individual basis. High academic achievement or other persuasive evidence of professional accomplishments is expected for admission to the program. An applicant may apply as a direct-entry Ph.D. applicant when they have not yet earned a master's degree.

GRE scores are no longer required for admission to graduate programs in Industrial Engineering. Applicants can, however, submit GRE scores if they wish.

As a guideline for prospective students, typical GRE scores for new students are 155 Quantitative, 145 Verbal, and 3.0 for Analytical. A GPA of 3.00 for the M.Eng. or M.S. program and 3.40 for the Ph.D. program are recommended. These represent typical student qualifications and should not be interpreted as a guarantee of admission to the program.

An English proficiency test is required for students whose native language is not English. This requirement can be waived for applicants who hold a post-secondary degree from a U.S. institution. Please follow this link for complete application instructions and requirements.

English Placement Test (EPT) for International Students

Graduate students whose native language is not English and who do not have a bachelor's or advanced degree from ISU or a U.S. institution, or who do not meet the TOEFL or IELTS exemption score range, must take the English Placement Test at the beginning of their first semester of enrollment. Please review the ISU Graduate College policy and the Department of English's EPT webpage for further information and guidance.

Transfer Applications from within Iowa State University

Students seeking a transfer from another graduate major at ISU to an IE graduate degree program must reapply through the Admissions system.

Admission to the Graduate Certificate in Advanced Manufacturing

These requirements are based on the same requirements as an M.S. applicant. Students may take up to nine credits before admission into a degree or certificate program.

# Requirements for the Graduate Certificate in Advanced Manufacturing

The graduate certificate in advanced manufacturing provides students who have strong science, technology, mathematics and/or engineering backgrounds with additional graduate education in advanced manufacturing. The students are required to take four courses with emphasis on advanced manufacturing and design innovation concepts. Three courses must be selected from the list of courses in advanced manufacturing and one must be selected from the design innovation list.

Advanced Manufacturing courses

- IE 5450—Rapid prototyping and manufacturing
- IE 5460—Geometric variability in manufacturing
- IE 5490—Computer aided Design and Manufacturing
- IE 5430—Wind Energy Manufacturing
- IE 6420—Simultaneous Engineering in Manufacturing Systems
- ME 5200—Material and Manufacturing Considerations in Design
- ME 5210—Mechanical Behavior and Manufacturing of Polymers and Composites
- ME 5270—Mechanics of Machining and Finishing Processes
- ME 5280—Micro/Nano Manufacturing

Design Innovation courses

- ME 5170—Advanced Machine Design
- ME 5230—Creativity and Imagination for Engineering and Design
- ME 5250—Optimization methods for Complex design
- ME 5570—Computer Graphics and Geometric Modeling
- ME 5640—Fracture and Fatigue
- ME 6250—Surface Modeling

# Requirements for the Concurrent B.S./M.S. IE and B.S./M.Eng. IE Degrees

Up to six credits of graduate 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 M.S./M.Eng. 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 5000-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 5000-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. Students must be within 30 credits of completing the requirements for the B.S. degree to enroll in the concurrent program. Prospective students must speak with their undergraduate advisor prior to applying.

Application Procedure

You will need to submit your application and documents prior to the start of your last two semesters or last semester of your B.S. degree program. The application and documents must be submitted by the deadline of your intended semester of entry. You will need to submit a Concurrent Graduate Student Application through the ISU Admissions website.

Application Documents

***The following items must be uploaded to the Admissions system:***

1. Statement of Purpose
2. One Letter of Recommendation (LOR) (from an IMSE faculty member)
3. Résumé/C.V.
4. Transcript

# Requirements for the Master of Engineering in Industrial Engineering Degree

**Master of Engineering – Non-thesis (M.Eng. IE) - 30 credits minimum**

**M.Eng. Course Requirements**

| Courses | Credits [1,2] |
|---|---|
| **1. One course from each of the following areas is required.** | **9** |
| Human Factors | |
| IE 5370—Reliability and Safety Engineering | |
| IE 5710—Occupational Biomechanics | |
| IE 5720—Design and Evaluation of HCI | |
| IE 5760—Human Factors in Product Design | |
| IE 5770—Human Factors | |
| Manufacturing and Operations | |
| IE 5140—Production Scheduling | |
| IE 5410—Inventory Control and Production Planning | |
| IE 5440—Micro/Nano Scale Additive Printing | |
| IE 5450—Rapid Prototyping and Manufacturing | |
| IE 5460—Geometric Variability in Manufacturing | |
| IE 5470—Biomedical Design and Manufacturing | |
| IE 5490—Computer Aided Design and Manufacturing | |
| IE 5810—e-Commerce Systems Engineering | |
| Operations Research | |
| IE 5080—Design and Analysis of Allocation Mechanisms | |
| IE 5100—Network Analysis | |
| IE 5130—Analysis of Stochastic Systems | |
| IE 5140—Production Scheduling | |
| IE 5190—Simulation Modeling and Analysis | |
| IE 5200—Engineering Problem Solving with R | |
| IE 5340—Linear Programming | |
| IE 5410—Inventory Control and Production Planning | |
| IE 5830—Data Mining | |
| IE 5870—Big Data Analytics and Optimization | |
| **2. Additional graduate-level courses in industrial engineering** | **12** |
| **3. Continuous registration in IE 5010 throughout graduate program [3]** | **R** |
| **4. Courses outside of industrial engineering [4]** | **9** |
| **Total** | **30** |

[1] Credits listed are the minimum for each category.

[2] For the M.Eng. degree a maximum of six credits of coursework may be transferred from another school. Any transfer of credits from another institution must be approved by the student's committee and the DOGE. Graduate credit will be approved for transfer only if the student received a "B" or better and the institution from which the course(s) originate(s) must confirm that the transfer credits are from graduate courses.

[3] If student is off campus in a given semester, they are exempt from this requirement for that semester.

[4] These courses are typically at the 5000-level, but with the approval of the major professor, up to six credits from 3000- and 4000-level non-IE courses may be used on a plan of study with a limit of three credits at the 3000 level.

M.Eng. Program Timeline

| Action | Completion Date | More Information |
|---|---|---|
| **Satisfy Graduate College English Requirement (International Students)** | Beginning of student's first semester | Graduate College policy |
| **Submit Committee and Academic Plan** | By the end of the second month of the second academic semester | Committee Membership must be approved before completing the Academic Plan in Workday. |
| **Submit Application for Graduation** | Typically within three weeks of the start of the semester of graduation (See ISU Graduation Deadlines) | Apply for Program Completion |
| **Coursework Only Final Check** | Typically within three weeks of the start of the semester of graduation (review ISU Graduation Deadlines) | Coursework Only Final Check |

M.Eng. Academic Plan and Committee

The Academic Plan and Committee are electronic forms that list all the courses that will be taken to complete the M.Eng. degree program and also lists the student's committee. These forms are completed via Workday and must be completed by the end of the second month of the student's second semester.

The Academic Plan for the M.Eng. degree typically lists just one individual as the committee. The default individual is the DOGE, but any member of the IMSE graduate faculty may be selected.

The committee must be filed and approved before the Academic Plan can be submitted for approval. If you are transferring any courses from a previous or concurrent degree/certificate at ISU, you must also complete the Internal Transfer of Courses process before filing your plan. Instructions on filing the committee can be found here. For instructions on completing the Academic Plan, click here.

For further instructions, the student is directed to the help page of the ISU Graduate College.

Requirements for the M.Eng. Minor in Industrial Engineering

A student pursuing an M.Eng. degree in another major at Iowa State University may be eligible to pursue a minor in Industrial Engineering. The student must select at least three 5000- or 6000-level IE courses – including experimental courses but excluding independent study courses[1]. The student wishing a minor in Industrial Engineering should consult with the DOGE of the IE program.

[1] Cross-listed courses must be taken as IE courses. It is the student's responsibility to check with their academic home department to ensure that cross-listed courses taken for the minor will satisfy the requirements for their major.

# Requirements for the Master of Science in Industrial Engineering Degree

**Master of Science - (M.S. IE) - 30 credits minimum**

**M.S. with Thesis Course Requirements**

| Courses | Credits [1,2] |
|---|---|
| 1. 5000- and 6000-level industrial engineering courses | 14 |
| 2. Courses outside of industrial engineering [3] | 6 |
| 3. IE 6990: Research [4] | 9 |
| 4. Continuous registration in IE 5010 throughout graduate program [5] | R |
| 5. GR ST 5650 Responsible Conduct of Research [6] | 1 |
| Total | 30 |

***OR***

**M.S. with Creative Component Course Requirements**

| Courses | Credits [1,2] |
|---|---|
| 1. 5000- and 6000-level industrial engineering courses | 21 |
| 2. Courses outside of industrial engineering [3] | 6 |
| 3. IE 5990: Creative Component [4] | 2 |
| 4. Continuous registration in IE 5010 throughout graduate program [5] | R |
| 5. GR ST 5650 Responsible Conduct of Research [6] | 1 |
| Total | 30 |

[1] Credits listed are the minimum for each category.

[2] For the M.S. degree a maximum of six credits of coursework may be transferred from another school. Research credits do not transfer. Any transfer of credits from another institution must be approved by the student's committee and the DOGE. Graduate credit will be approved for transfer only if the student received a "B" or better and the institution from which the course(s) originate(s) must confirm that the transfer credits are from graduate courses.

[3] These courses are typically at the 5000-level, but with the approval of the student's plan of study committee, up to six credits from 3000- and 4000-level non-IE courses may be used on a plan of study with a limit of three credits at the 3000 level.

[4] During the semester of a scheduled final oral exam thesis-based students must be registered for at least one credit of IE 6990 // creative component-based students must be registered for at least one credit of IE 5990.

[5] If student is off campus in a given semester, they are exempt from this requirement for that semester.

[6] Typically taken the second or third semester.

M.S. Program Timeline

*To review policies regarding specific items click on the "Action" item to advance to the appropriate page.*

| Action | Completion Date | More Information |
|---|---|---|
| **Satisfy Graduate College English Requirement (International Students)** | Beginning of student's first semester | Graduate College policy |
| **Submit Committee/Academic Plan** | By the end of the second month of the second academic semester | Committee Membership must be approved before completing the Academic Plan in Workday. |
| **Submit Application for Graduation** | Typically within three weeks of the start of the semester of graduation (review ISU Graduation Deadlines) | Apply for Program Completion |
| **Submit Request for Final Oral Examination** | At least three weeks *before* the intended date of the student's final oral examination | Request for Final Oral Exam |
| **Submit Thesis to Members of the POS Committee** | Two week prior to the final oral examination | N/A |
| **Pass Final Oral Examination & Submit Graduate Approval Form** | Within two years of entry | Submit Graduate Approval Form |

M.S. Academic Plan and Committee (formerly known as POSC)

The Academic Plan and Committee are electronic forms that list all the courses that will be taken to complete the M.Eng. degree program and also lists the student's committee. This form is completed via Workday and it must be completed by the end of the second month of the student's second semester.

The Academic Plan for the M.S. degree typically lists three faculty members (major professor and two additional committee members) forming the committee. The major professor serves as chairperson of the committee. The student and the major professor with work together to determine the second and third members of the committee. One member of the committee must have an appointment outside of the IMSE department.

The Graduate Committee must be filed and approved before the Academic Plan can be submitted for approval. Instructions on filing the committee can be found here. If you are transferring any courses from a previous or concurrent degree/certificate at ISU, you must also complete the Internal Transfer of Courses process before filing your plan. For instructions on completing the Academic Plan, click here.

For further instructions, the student is directed to the help page of the ISU Graduate College. The student is advised to consult with the major professor prior to filing the academic plan. If the DOGE is not the major professor, the student's committee must approve the Academic Plan prior to the DOGE receiving it electronically. If the Academic Plan is rejected for any reason, it will be routed back to the student.

M.S. Thesis & M.S Creative Component

The M.S. thesis is the result of a focused research effort by the student and must be prepared according to the Graduate College requirements. Per Department policy, the final copy of the M.S. thesis must be emailed to the Graduate Coordinator when the student uploads the document to ProQuest. Per Department policy, the final copy of the M.S. creative component must be emailed to the Graduate Coordinator when the student uploads the document to the ISU Digital Repository.

M.S. Final Oral Examination

The thesis must be distributed to members of the student's committee at least two weeks prior to the final oral examination. It is the responsibility of the student to arrange a meeting time and place in agreement to all committee members. The exam is a defense of the thesis or creative component; however, questions may be asked on specific coursework or areas of concentration. The student must be registered for a minimum of one credit hour of IE 6990 (thesis-based M.S.) or IE 5990 (creative component-based M.S.) during the semester in which the final oral examination is taken. For examinations to be valid, all members of the student's committee must be present throughout the entire scheduled period of the exam. The exam may be conducted in-person, remotely over video conferencing, or a hybrid of these options.

For more information and instructions for requesting your final oral examination, please click here.

Requirements for the M.S. Minor in Industrial Engineering

A student pursuing an M.S. degree in another major at Iowa State University may be eligible to pursue a minor in Industrial Engineering. The student must select at least three 5000- or 6000-level IE courses – including experimental courses but excluding independent study courses[2]. The committee must include a faculty member from the IMSE Department. The student wishing a minor in Industrial Engineering should consult with the DOGE of the IE program.

[2] Cross-listed courses must be taken as IE courses. It is the student's responsibility to check with their academic home department to ensure that cross-listed courses taken for the minor will satisfy the requirements for their major.

# Requirements for the Doctor of Philosophy in Industrial Engineering Degree

**Doctor of Philosophy (Ph.D.) - 72 credit minimum**

**Ph.D. Course Requirements**

| Courses | Credits [1,2] |
|---|---|
| **1. 5000- and 6000-level courses**<br>**a. at least 12 credits of IE courses at ISU**<br>**b. at least two of these courses must be at the 6000 level [3]**<br>**c. up to 27 credits from a master's degree may (with approval from the Plan of Study Committee) be applied** | **41** |
| **2. Courses outside of industrial engineering [4]** | **6** |
| **3. IE 6990: Research [5]** | **24** |
| **4. Continuous registration in IE 5010 throughout graduate program [6]** | **R** |
| **5. GR ST 5650 Responsible Conduct of Research [7]** | **1** |
| **Total** | **72** |

[1] Credits listed are the minimum for each category.

[2] For the Ph.D. degree a maximum of 27 credits of coursework may be transferred from another school. Research credits do not transfer. Any transfer of credits from another institution must be approved by the student's committee and the DOGE. Graduate credit will be approved for transfer only if the student received a "B" or better and the institution from which the course(s) originate(s) must confirm that the transfer credits are from graduate courses.

[3] For the 6000-level IE courses, students may take 6000-level courses from other departments or IE 6900 (Independent Study). All proposed 6900 projects must be approved by the IMSE Graduate Committee.

[4] These courses are typically at the 5000- or 6000 level, but with the approval of the student's plan of study committee, up to nine credits from 3000- and 4000-level non-IE courses may be used on a plan of study with a limit of three credits at the 3000 level.

[5] During the semester of a scheduled final oral exam students must register for at least one credit of IE 6990.

[6] If student is off campus in a given semester, they are exempt from this requirement for that semester.

[7] Typically taken the second or third semester.

Ph.D. Program Timeline

*To review policies regarding specific items click on the "Action" item to advance to the appropriate page.*

| Action | Completion Date | More Information |
|---|---|---|
| **Satisfy Graduate College English Requirement (International Students)** | Beginning of student's first semester | Graduate College policy |
| **Declare Major Professor** | Within four months of entry | IMSE: E-mail to Graduate Program Coordinator |
| **Take IMSE Qualifying Examination** | Before the beginning of the student's fourth semester (not including summer semesters) | IMSE: Please see "PHD Qualifying Examination" > "Requirements for EVERY Ph.D. Classification" |
| **Submit Committee/Academic Plan** | Within three months of passing the Qualifying Examination | Committee Membership must be approved before completing the Academic Plan in Workday. |
| **Submit Request for Preliminary Oral Examination** | At least two weeks *prior* to proposed preliminary oral examination date but no sooner than 3 months after filing APC | Request Preliminary Oral Exam |
| **Submit Dissertation Proposal to Committee** | At least two weeks *prior* to the preliminary oral examination | N/A |
| **Take Preliminary Oral Examination** | At least six months *prior* to final oral examination | N/A |
| **Submit Application for Graduation** | Typically within three weeks of the start of the semester of graduation (review ISU Graduation Deadlines) | Apply for Program Completion |
| **Submit Request for Final Oral Examination** | At least three weeks *before* the intended date of the student's final oral examination | Request Final Oral Exam |
| **Submit Dissertation to Members of the Committee** | At least two weeks *before* the final oral examination | N/A |
| **Pass Final Oral Examination & Submit Graduate Approval Form** | At least six months *after* the preliminary oral examination | Submit Graduate Approval Form |

Ph.D. Academic Plan and Committee (formerly known as POSC)

The Academic Plan lists all of the courses that will be taken to complete the Ph.D. degree program, including courses transferred from a master's degree. This form is completed via Workday and it must be completed within three months of passing the Qualifying Exam.

The committee must be filed and approved before the Academic Plan can be submitted for approval. Instructions on filing the committee can be found here. For instructions on completing the Academic Plan, click here.

The Committee shall include at least five members of the Graduate Faculty. It must include at least three members, including the major professor, from within the student's major or program. A term member of the graduate faculty may participate in the direction of a student's dissertation research as a co-major professor if a full member of the graduate faculty serves as a co-major professor and jointly accepts responsibility for direction of the dissertation. The major professor serves as chairperson of the committee. A faculty member holding a joint or courtesy (non-salaried) appointment may not serve as an "outside the department" member on a committee if the student's major is in either of the departments represented by the joint or courtesy appointment. For examinations to be valid, all members of the committee must be present throughout the entire scheduled period of the exam. Exceptions need to be approved by the ISU Graduate College.

For further instructions, the student is directed to the help page of the ISU Graduate College. The student is advised to consult with the major professor prior to filing the academic plan. If the DOGE is not the major professor, the student's committee must approve the Academic Plan prior to the DOGE receiving it electronically. If the Academic Plan is rejected for any reason, it will be routed back to the student.

Ph.D. Qualifying Examination (QE)

The Qualifying Examination is required for all students in Ph.D. program; for all students seeking minor in Industrial Engineering while pursuing a Ph.D. in another program; and all students seeking a co-major in Industrial Engineering. The QE is an assessment of a student's ability to conduct research in the student's focus area in industrial engineering. There are three components for the IMSE QE: academic performance in coursework, journal article submission, and oral exam. Each student must pass all components of the IMSE QE to continue in the Ph.D. program.

Within the first four months of beginning the Ph.D. program, each student and their major professor must declare their Major Professor to the Graduate Program Coordinator, either verbally or by e-mail. This requirement is noted here as it is critically important for the incoming Ph.D. student to quickly establish a working relationship with an IMSE faculty member to meet the journal article submission requirement of the IMSE QE. Timelines for the IMSE Ph.D. Qualifying Exam can vary depending on the "type" of Ph.D. student:

A. QE Timing and Coursework Requirements by Ph.D. Classification

*i. Traditional Ph.D.*

Students who hold a master's degree from another institution are considered Traditional Ph.D. students. These students must take at least four (12 credit minimum) graduate level industrial engineering courses (excluding IE 5010, IE 6970, and IE 6990) in the first three semesters of attendance and achieve a GPA of at least 3.40 in this coursework. The deadline of the IMSE Qualifying Exam (journal article submission deadline and oral exam) for traditional Ph.D. students is before the fourth semester of attendance.

*ii. Direct Entry Ph.D.*

Students who begin the Ph.D. program without having already achieved a master's degree are considered Direct Entry Ph.D. students. The coursework performance assessment will be based on all graduate coursework in industrial engineering courses completed at Iowa State University (excluding IE 5010, IE 6970, and IE 6990) at the time of the oral exam. Students must achieve a GPA of at least 3.40 in this coursework. The deadline of the IMSE Qualifying Exam (journal article submission deadline and oral exam) for direct entry Ph.D. students is before the sixth semester of attendance.

*iii. Masters to Ph.D.*

Students who begin their program having completed a master's degree in Industrial Engineering at ISU in the IMSE department are considered Masters to Ph.D. students. The coursework performance assessment will be based on all graduate coursework in industrial engineering courses completed at Iowa State University (excluding IE 5010, IE 6970, and IE 6990). Students must achieve a GPA of at least 3.40 in this coursework. The deadline for the IMSE Qualifying Exam (journal article submission deadline and oral exam) for masters to Ph.D. students is before the fourth semester as a Ph.D. student.

Every student, regardless of classification, may elect to take an "Early Qualifying Exam" providing the following conditions are met: 1) complete all coursework and achieve a GPA of 3.40 in coursework, as outlined by their classification and, 2) obtain approval from their major professor and the DOGE to take an early qualifying exam.

B. Requirements for EVERY Ph.D. Classification

1. Satisfactory performance in the graduate-level industrial engineering coursework as outlined in the classification-specific requirements above.

2. Submission of a technical paper to a refereed journal. The student must complete an IMSE submission form and the major professor must complete an IMSE evaluation form. These forms are obtained from the Graduate Coordinator. The deadline for submission and completion of these two forms is ten days prior to the date of the oral examination.

3. The oral exam date will be either the Thursday or Friday preceding the start of classes each semester (Fall and Spring semesters only). Ten days prior to the scheduled oral exam, students must supply these items to the graduate coordinator: 1) the submitted journal article, 2) technical paper confirmation page/email from refereed journal, 3) QE-Submission Form [Student], and 4) QE-Evaluation Form [Major Professor].

4. The format for the oral exam is a 20-minute technical presentation with an additional ten minutes for questioning. The IMSE Graduate Committee will oversee this oral examination, and it is expected that this presentation will provide strong evidence of the capability of the student to perform PhD-level research. The review committee will consist of the Graduate Committee plus one additional faculty member in the student's research area. If the student's major professor is on the IMSE Graduate Committee, the major professor will recuse him/herself from the proceedings and two faculty members from the student's research area will be recruited to participate in the oral examination. This oral exam will provide the student the opportunity to demonstrate their ability to conduct PhD-level research. A word of caution: literature review papers (while an important component to a PhD dissertation) are not typically sufficient for the review committee to establish that a student is capable of PhD-level research and should not be the sole deliverable for both the journal article and the oral presentation. Questions can be directed to the DOGE.

C. QE Results

"Pass," "Conditional Fail," and "Fail" are the three possible results of the IMSE QE. Decisions will be made based on evaluation of the student's performance during the examination, proof of journal article submission, and academic performance. Students will receive a decision letter from the Graduate Coordinator within one week of the oral exam. If a student earns a Conditional Fail rating, the decision letter will specify the appropriate course of action. The student will have one more opportunity to take the exam in order to obtain a Pass. Upon the second QE attempt the student must demonstrate they have met all conditions established in the decision letter. If the IMSE Graduate Committee determines the conditions have not been met, the student will receive a Fail. If a student earns a Fail rating they may, at the discretion of the IMSE Graduate Committee, be given another chance.

Ph.D. Preliminary Examination

The Preliminary Oral Examination is composed of two parts: (A) a written dissertation proposal and (B) a preliminary oral examination.

A. Dissertation Proposal

Two weeks prior to the preliminary oral examination, a dissertation proposal should be distributed to the student's committee. At a minimum, the proposal should consist of the following components:

I. Description of the research problem
II. Review of related literature and current research on the topic
III. Detailed description of the methodology that will be used
IV. Preliminary results
V. Schedule

B. Preliminary Oral Examination

The major professor and the student's committee examine the student's dissertation proposal in depth. This exam also covers the coursework taken up to this point. Once a date and time has been confirmed by the student's major professor and committee, a conference room must be reserved through the Graduate Coordinator, and the corresponding Request for a Graduate Oral Exam must be submitted through Workday. This form must be completed at least two weeks prior to the anticipated date of the preliminary oral examination. The preliminary oral examination must be passed at least six months prior to the expected date of the final oral examination. During the semester of a scheduled exam the student must be registered for a minimum of one credit hour of IE 6990.

Ph.D. Dissertation

Dissertations must be prepared according to the Graduate College requirements. Per Department policy, the final copy of the thesis must be emailed to the Graduate Coordinator when the student uploads the document to ProQuest.

Ph.D. Final Oral Examination

The student must request their final oral exam through Workday at least three weeks prior to the exam date. The dissertation must be distributed to members of the student's committee at least two weeks prior to the final oral examination. It is the responsibility of the student to arrange a meeting time and place in agreement to all committee members. The examination is generally a defense of the dissertation; however, questions may be asked on specific coursework or areas of concentration. The student must be registered for a minimum of one credit hour of IE 6990 during the semester in which the final oral examination is taken. For examinations to be valid, all members of the committee must be present throughout the entire scheduled period of the exam, whether online or in person.

Attendance at Ph.D. Final Oral Examinations

Ph.D. students must attend a minimum of two Ph.D. final oral examinations prior to scheduling their own final oral examination.

A. Attending examinations within the IMSE Department

Approximately one week prior to a scheduled examination, the Graduate Coordinator will email all IMSE students with a seminar flyer containing the Ph.D. candidate's abstract, biographical information, and exam date/time/location information. You will be prompted to fill out an RSVP survey in the email you receive, and that survey will be used to take attendance at the defense.

B. Attending examinations outside of the IMSE Department

Students may attend final oral examinations outside of the IMSE Department if there aren't any IMSE Ph.D. final oral examinations scheduled. Prior to attending an examination in a different department the student **must** speak with the **IMSE** Graduate Coordinator, otherwise the examination will not be counted towards their total.

Ph.D. Annual Reviews

Annual Reviews will be conducted in a two-part series: the student completes Part A and the major professor completes Part B. Both parts are due by the first working day in October. The survey will be conducted using the IMSE eForm system and the Graduate Coordinator will email each party the appropriate survey link on September 1st (or first working day thereafter). If the surveys remain incomplete, the Graduate Coordinator will send out reminder emails to both the major professor and the student. If either Part A or Part B are not received by October 1st (or the first working day in October), an "Adviser Hold" will be placed on the student's academic records preventing them from registering for further coursework.

Residency Requirement

Ph.D. students must earn at least 24 semester credits during two consecutive semesters or during a continuous period including two semesters and a summer session. Of the 72 graduate credits required for a Ph.D., at least 36 credits, including all dissertation research credits, must be earned from Iowa State University under the supervision of the student's committee.

Requirements for the Ph.D. Minor in Industrial Engineering

A student pursuing a Ph.D. degree in another major at Iowa State University may be eligible to pursue a minor in Industrial Engineering. The student must select at least four 5000- or 6000-level IE courses – including experimental courses but excluding independent study courses[3]. The committee must include a faculty member from the IMSE Department. The student must take the IMSE QE, on its regular offering. If the student has already taken and passed the preliminary oral examination in the primary major, they are not permitted to add a minor. The student wishing to pursue a minor in Industrial Engineering should consult with the DOGE of the IE program.

[3] Cross-listed courses must be taken as IE courses. It is the student's responsibility to check with their academic home department to ensure that cross-listed courses taken for the minor will satisfy the requirements for their major.

# Additional Information

Registration Requirements

The student must be registered for all semesters in residence. This includes semesters in which they are (a) developing a thesis/dissertation, (b) scheduling the preliminary/final oral examination, or (c) receiving support from the IMSE Department.

Progress Evaluations

The IMSE Department and the ISU Graduate College will monitor each student's progress toward their degree. If the GPA falls below a 3.00 after the first semester, the student will be given the opportunity to achieve a 3.00 in coursework the following semester. Failure to do so will result in a HOLD being placed on registration. To request hold removal, please contact the Graduate Coordinator.

Information about Satisfactory/Fail Coursework

A. IE 5010 – Graduate Seminar

IE 5010 is required for all M.Eng., M.S., and Ph.D. students every semester. It introduces students to the research process and exposes them to state-of- the-art research presented by seminar speakers. Regular attendance is required for a "Satisfactory" grade. This course is graded as Satisfactory/Fail.

B. IE 5900/6900—Independent Study

Instructor and student together determine a study scope and student time expectations for an independent study course. Once the arrangement of the course has been established between the instructor and the student, the proposal is submitted to the Graduate Coordinator who will forward the document to the IMSE Graduate Committee. The IMSE Graduate Committee evaluates and determines acceptance of the course for the student's Academic Plan. Normally a maximum of three credits of 5900/6900 courses are permitted on the student's Academic Plan. The proposal must include detailed time commitments, outcomes, and assessment methods. This course is graded as Satisfactory/Fail.

C. IE 6970—Engineering Internship

A maximum of one Fall OR Spring semester combined with one summer is permitted. This means that neither a Spring-Summer-Fall combination nor a Fall-Spring combination is permitted. Registration for IE 6970 is allowed only with DOGE permission. The aim of this course is for students to gain professional experience in an industrial setting to supplement the industrial engineering concepts learned in academic courses. This R-credit course does not carry numerical credit toward a student's degree, and it is not a requirement of the curriculum/major. For explicit instructions regarding IMSE policies and procedures related to IE 6970, please read the IMSE Graduate Student Engineering Internship instruction page. This course is graded as Satisfactory/Fail.

D. IE 6990—Research

The number of credit hours taken in any particular semester is arranged in advance between the student and the instructor. The credits to be earned depends on the amount of work expected of the student, in accordance with the policy that some combination of teacher-student contact and outside work by the student involving at least three hours per week for the semester is required for each credit. For an M.S. thesis degree a minimum of nine credit hours must be completed. (M.S. Creative Component students must register for two credits of IE 5990 instead.) For a Ph.D. degree a minimum of 24 credit hours must be completed. Expectations (including time commitment), outcomes, and assessment methods are discussed between the student and the research advisor. The final outcome of this course is development, submission, and oral defense of a thesis (M.S. student) or dissertation (Ph.D. candidate). This course is graded as Satisfactory/Fail.

Audit or Pass/Not Pass

**Audit:** Students planning to attend courses without a grade must register for the course and designate it as an "Audit."

**Pass (P)/Not Pass (NP):** Students planning to attend courses and receive a P/NP must register for the course as a "Pass/Not Pass."

Neither Audit nor P/NP courses may be used on a student's Academic Plan; however, if a student receives a grade of NP it is considered an "F." If a grade of "NP" is earned in a P/NP course the student is not eligible to graduate until the course is completed with a "P" grade.

Dual-Listed Courses in Industrial Engineering

**M.Eng./M.S.:** No more than two dual-listed courses can be used to satisfy the M.Eng. or M.S. program requirements (concurrent master's degrees not included).

**Ph.D.:** No more than two dual-listed courses can be used to satisfy the Ph.D. degree program requirements. However, if the master's degree was received at Iowa State University, up to two additional dual-listed courses beyond the master's degree (for a total of four dual-listed courses) can be used on the student's academic plan.

Severance of Major Professor

Under normal conditions, major professors who leave Iowa State University through retirement or transfer to another position may no longer serve as the major professor, and a second major professor must be designated if they were serving on a committee that had previously been approved. When a new committee is formed, retired or resigned professors cannot be chosen as committee members.

# Student Employment at Iowa State University

Current law states that employers can hire only American citizens and aliens who are authorized to work in the United States. Under the Immigration Reform and Control Act of 1986, Iowa State University **must** verify the employment eligibility of **every** employee hired. Form I-9 (Employment Eligibility Verification) must be completed to document legally employable status. Individuals who are neither United States citizens nor U.S. permanent residents must report to International Students and Scholars Office (ISSO), 3248 Memorial Union, on or before their first day of work to complete Form I-9 (and submit such to Human Resource Services) to register for payroll and fringe benefits. The International Students and Scholars Office must endorse and United States Citizenship and Immigration Services must approve off-campus employment requests by F-1 visa-holders before they may legally work off-campus.

IMSE Teaching and Research Assistantships

1. Graduate assistants are expected to provide the following levels of effort:
   - ¼ time appointment - 10 hours per week
   - ½ time appointment - 20 hours per week

   Assistantship offers will be made based on student performance and availability of funds.

2. The following criteria must be satisfied before you can be employed by the IMSE department as a Teaching Assistant (TA) or Research Assistant (RA):
   - You must be registered for credits in the semester employment begins, or you cannot be paid.
   - Graduate assistants must be enrolled full-time (minimum: 9 credit hours; maximum: 15 credit hours). International students in their last semester must maintain full-time status.
   - Per IMSE Department policy, ALL graduate assistants must begin their assistantship duties on the appointment starting date as noted on the electronic LOI, and ALL new students must check-in (in person) with the Graduate Coordinator by that date.
   - TAs ONLY: Attendance at the Center for Learning Excellence and Teaching (CELT) Teaching Symposium is required. If the student does not attend this training session, the TA offer may be rescinded. Registration for this event is required and the event takes place prior to the start of the semester.

3. New TAs whose native language is not English are evaluated for their ability to communicate effectively in English and must take the Oral English Certification Test (OECT). The TA appointment is contingent upon satisfactory results on the OECT. Please review the following links as they relate to the OECT exam:
   a. International Teaching Assistant Program
   b. OECT Exam Information

4. Continuing Appointment
   a. Satisfactory Academic Progress:
      - Students holding assistantships must maintain a GPA of at least 3.00.
      - Graduate assistants must maintain full-time status (9-15 credit hours).
      - The student's Academic Plan must be submitted by the end of the second month of the second academic semester (or within three months of passing the QE for Ph.D. students).
   b. Satisfactory Performance of Duties:
      - Continued appointment is contingent on satisfactory performance as determined by the student's supervisor.
      - Students who are given an unacceptable rating will meet with a member of the IMSE Graduate Committee to discuss the shortcoming and may be dismissed.