

IOWA STATE UNIVERSITY

Department of Industrial and Manufacturing Systems Engineering

IMSE Graduate Student Handbook (2021-22)



Graduate Student Services
3011 Black Engineering
<http://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 Coordinator is the primary point of contact for all current students and is located in the Graduate Student Services Office (3011 Black Engineering).

Forms requiring the signature of the Director of Graduate Education (DOGE) should be submitted to the Graduate Coordinator.

Abbreviations Used in this Handbook

B.S. – Bachelor of Science degree

DOGE – Director of Graduate Education

GR ST – 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

POS – Program of Study

POSC – Program of Study and Committee

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 earned a master's degree.

External (to IMSE at ISU) Ph.D. and M.S. applicants must provide GRE scores. External (to IMSE at ISU) M.Eng. applicants do not have to submit GRE scores. If an applicant is a current B.S. IE student at Iowa State University and has a cumulative GPA of 3.0 or greater, the requirement of supplying GRE scores is waived. Likewise for a recent (within the last six years) B.S. IE graduate from Iowa State University with a GPA of 3.0 or greater, the requirement of supplying GRE scores is waived. Applicants who have been granted this waiver 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 one major within ISU to an IE graduate degree program must follow the same application process as students applying from outside of the University. Although it is not required, we highly encourage the potential transfer student to update all application materials. These materials must be emailed to the Graduate Coordinator by the deadline for the semester that the transfer will begin.

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 545—Rapid prototyping and manufacturing
- IE 546—Geometric variability in manufacturing
- IE 549—Computer aided Design and Manufacturing
- IE 543—Wind Energy Manufacturing
- IE 642—Simultaneous Engineering in Manufacturing Systems
- ME 520—Material and Manufacturing Considerations in Design
- ME 521—Mechanical Behavior and Manufacturing of Polymers and Composites
- ME 527—Mechanics of Machining and Finishing Processes
- ME 528—Micro/Nano Manufacturing

Design Innovation courses

- ME 517—Advanced Machine Design
- ME 523—Creativity and Imagination for Engineering and Design
- ME 525—Optimization methods for Complex design
- ME 557—Computer Graphics and Geometric Modeling
- ME 564—Fracture and Fatigue
- ME 625—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 500-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 500-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 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. Please refer to the following [link](#) for application requirements and deadlines.

Application Documents

The following items must be emailed to the Graduate Coordinator:

1. [Concurrent Enrollment Request Form](#)
2. Statement of Purpose
3. One Letter of Recommendation (LOR) (from an IMSE faculty member)**
4. Résumé/C.V.
5. Transcript (obtained from your undergraduate academic adviser)
6. Undergraduate grad plan (from your undergraduate academic adviser)

****** If a hardcopy LOR is in a sealed envelope, the student must hand-deliver the document and it must remain unopened. If the LOR is submitted via email, the faculty member must email it to the Graduate Coordinator directly. If an LOR is submitted contrary to these instructions, it will not be marked as having been received and the application may be marked as “Incomplete.”

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. Human Factors IE 537—Reliability and Safety Engineering IE 571—Occupational Biomechanics IE 572 – Design and Evaluation of Human-Computer Interaction IE 576—Human Factors in Product Design IE 577—Human Factors Manufacturing and Operations IE 514—Production Scheduling IE 541—Inventory Control and Production Planning IE 544—Micro-Nano Scale Additive Printing IE 545—Rapid Prototyping and Manufacturing IE 546—Geometric Variability in Manufacturing IE 547—Bioedical Design and Manufacturing IE 549—Computer Aided Design and Manufacturing IE 581—e-Commerce Systems Engineering Operations Research IE 508—Design and Analysis of Allocation Mechanisms IE 510—Network Analysis IE 513—Analysis of Stochastic Systems IE 514—Production Scheduling IE 519—Simulation Modeling and Analysis IE 520—Engineering Problem Solving with R IE 534—Linear Programming IE 541—Inventory Control and Production Planning IE 583—Data Mining	9
2. Additional graduate-level courses in industrial engineering	12
3. Continuous registration in IE 501 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 POS 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 500-level, but with the approval of the major professor, up to six credits from 300- and 400-level non-IE courses may be used on a plan of study with a limit of three credits at the 300 level.

M.Eng. Program Timeline

Action	Completion Date	<u>Forms</u>
Satisfy Graduate College English Requirement (International Students)	Beginning of student's first semester	Graduate College policy
Submit Program of Study and Committee Form	By the end of the second month of the second academic semester	Program of Study and Committee Form via AccessPlus > Grad Stdnt Status tab > My POSC Form button
Submit Application for Graduation	Typically within three weeks of the start of the semester of graduation (See ISU Graduation Deadlines)	"Graduation" tab in AccessPlus
Coursework Only Final Check	Typically within three weeks of the start of the semester of graduation (review ISU Graduation Deadlines)	Complete the eForm . Must be fully approved by the deadline

M.Eng. Program of Study Form (POSC)

The POSC is an electronic form that lists all the courses that will be taken to complete the M.Eng. degree program and also lists the POS committee. This form is completed via [AccessPlus](#) and it must be completed by the end of the second month of the student's second semester.

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

To file a POSC a student logs into [AccessPlus](#) and navigates to the "Grad Student Status" tab. On the right-hand side of the screen the student will see a button labeled "My POSC Form." The student clicks on that button and a blank POSC will be displayed. 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 POSC. If the DOGE is not the major professor, the student's major professor must approve the POSC prior to the DOGE receiving it electronically. After the form is routed to the DOGE it is then sent to the ISU Graduate College for final approval. If the POSC is rejected it will be routed back to the student.

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 500- or 600-level IE courses – including experimental courses but excluding independent study courses¹. 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. 500- and 600-level industrial engineering courses	14
2. Courses outside of industrial engineering ³	6
3. IE 699: Research ⁴	9
4. Continuous registration in IE 501 throughout graduate program ⁵	R
5. GR ST 565 Responsible Conduct of Research ⁶	1
Total	30

OR

M.S. with Creative Component Course Requirements

Courses	Credits ^{1,2}
1. 500- and 600-level industrial engineering courses	18
2. Courses outside of industrial engineering ³	6
3. IE 599: Creative Component ⁴	2
4. Continuous registration in IE 501 throughout graduate program ⁵	R
5. GR ST 565 Responsible Conduct of Research ⁶	1
6. Three grad credits from IE or outside of IE	3
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 POS 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 500-level, but with the approval of the student's plan of study committee, up to six credits from 300- and 400-level non-IE courses may be used on a plan of study with a limit of three credits at the 300 level.

⁴ During the semester of a scheduled final oral exam thesis-based students must be registered for at least one credit of IE 699 // creative component-based students must be registered for at least one credit of IE 599.

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	Forms
Satisfy Graduate College English Requirement (International Students)	Beginning of student’s first semester	Graduate College policy
Submit Program of Study and Committee Form	By the end of the second month of the second academic semester	Program of Study and Committee Form via AccessPlus > Grad Stdnt Status tab > My POSC Form button
Submit Application for Graduation	Typically within three weeks of the start of the semester of graduation (review ISU Graduation Deadlines)	“Graduation” tab in AccessPlus
Submit Request for Final Oral Examination	At least three weeks <i>before</i> the intended date of the student’s final oral examination	Complete the eForm . Must be <i>received</i> by the Graduate College by the deadline
Submit Thesis to Members of the POS Committee	Two week prior to the final oral examination	None
Take Final Oral Examination	Within two years of entry	None

M.S. Program of Study and Committee Form (POSC)

The POSC is an electronic form that lists all the courses that will be taken to complete the M.S. degree program and also lists the POS committee. This form is completed via [AccessPlus](#) and it must be completed by the end of the second month of the student’s second semester.

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

To file a POSC a student logs into [AccessPlus](#) and navigates to the “Grad Student Status” tab. On the right-hand side of the screen the student will see a button labeled “My POSC Form.” The student clicks on that button and a blank POSC will be displayed. 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 and POS committee prior to filing the POSC. After the form is approved by the POS committee, it is routed to the DOGE and then on to the ISU Graduate College. If the POSC is rejected it will be routed back to the student. All POS committee members must approve any changes to the POSC.

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 POS 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 POS 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 699 (thesis-based M.S.) or IE 599 (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 POS committee must be present throughout the entire scheduled period of the exam.

The [Request for Final Oral Examination eForm](#) is available on the Graduate College's website and must be received by the Graduate College at least three weeks prior to the intended date of the exam, per the deadline established by the Graduate College. The student is responsible for contacting the Graduate Coordinator to reserve a conference room. The student must provide to the POS committee the "Final Oral Exam paperwork packet" which will be available thirty minutes before the start of their exam. The Graduate Coordinator will provide this paperwork to the student.

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 500- or 600-level IE courses – including experimental courses but excluding independent study courses². The POS 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. 500- and 600-level courses	41
a. at least 9 credits of IE courses at ISU	
b. at least two of these courses must be at the 600 level ³	
c. up to 27 credits from a master's degree <u>may</u> (with approval from the Plan of Study Committee) be applied	
2. Courses outside of industrial engineering ⁴	6
3. IE 699: Research ⁵	24
4. Continuous registration in IE 501 throughout graduate program ⁶	R
5. GR ST 565 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 POS 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 600-level IE courses, students may take 600-level courses from other departments or IE 690 (Independent Study). All proposed 690 projects must be approved by the IMSE Graduate Committee.

⁴ These courses are typically at the 500- or 600 level, but with the approval of the student's plan of study committee, up to nine credits from 300- and 400-level non-IE courses may be used on a plan of study with a limit of three credits at the 300 level.

⁵ During the semester of a scheduled final oral exam students must register for at least one credit of IE 699.

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	Required Forms (ISU, Graduate College, IMSE)
Satisfy Graduate College English Requirement (International Students)	Beginning of student’s first semester	Graduate College policy
Declare Major Professor	Within two months of entry	<u>IMSE</u> : Form available from the IE Graduate Coordinator
Take IMSE Qualifying Examination	Before the beginning of the student’s fourth semester (not including summer semesters)	<u>IMSE</u> : Please see “PHD Qualifying Examination” > “Requirements for EVERY Ph.D. Classification”
Submit Program of Study and Committee Form	Within three months of passing the Qualifying Examination	<u>Graduate College & IMSE</u> : Program of Study and Committee Form via AccessPlus > Grad Stdnt Status tab > My POSC Form button
Submit Request for Preliminary Oral Examination	At least two weeks <i>prior</i> to proposed preliminary oral examination date	<u>Graduate College</u> : Complete the eForm . Must be <i>received</i> by the Graduate College by the deadline
Submit Dissertation Proposal to Committee	At least two weeks <i>prior</i> to the preliminary oral examination	None
Take Preliminary Oral Examination	At least six months <i>prior</i> to final oral examination	None
Submit Application for Graduation	Typically within three weeks of the start of the semester of graduation (review ISU Graduation Deadlines)	<u>Graduate College</u> : “Graduation” tab in AccessPlus
Submit Request for Final Oral Examination	At least three weeks <i>before</i> the intended date of the student’s final oral examination	<u>Graduate College</u> : Complete the eForm . Must be <i>received</i> by the Graduate College by the deadline
Submit Dissertation to Members of the POS Committee	Two weeks prior to the final oral examination	None
Take Final Oral Examination	At least six months <i>after</i> the preliminary oral examination	None

Ph.D. Program of Study and Committee Form (POSC)

The POSC is an electronic form that lists POS committee members and 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 [AccessPlus](#) and it must be completed within three months of passing the Qualifying Exam.

The POSC shall list at least five members of the Graduate Faculty as the POS committee. 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.

To file a POSC a student logs into [AccessPlus](#) and navigates to the "Grad Student Status" tab. On the right-hand side of the screen the student will see a button labeled "My POSC Form." The student clicks on that button and a blank POSC will be displayed. 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 and committee prior to filing the POSC. After the form is approved by the committee, it is routed to the DOGE and then on to the ISU Graduate College. If the POSC is rejected it will be routed back to student. All committee members must approve any changes to the POSC.

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. 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 two months of beginning the Ph.D. program, each student and their major professor must complete a Major Professor Declaration Form available from the Graduate Coordinator. 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 501, IE 697, and IE 699) 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 501, IE 697, and IE 699) 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 501, IE 697, and IE 699). 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 to take an early qualifying exam (this approval must be received from the student's major professor).

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). Once the specific date of the oral examination has been determined, the Graduate Coordinator will email all QE candidates and begin scheduling exams. Ten days prior to the scheduled oral exam, students must supply: 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]. These items are to be emailed to the Graduate Coordinator.
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. 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.

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 POS 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 POS 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 Preliminary Oral Examination eForm](#) must be submitted. 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 699.

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 dissertation must be distributed to members of the POSC 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 699 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.

The [Request for Final Oral Examination eForm](#) is available on the Graduate College's website and must be received by the Graduate College at least three weeks prior to the intended date of the exam, per the deadline established by the Graduate College. The student is responsible for contacting the Graduate Coordinator to reserve a conference room. The student must provide their POS committee the "Final Oral Exam paperwork packet" which will be available thirty minutes before the start of their exam. The Graduate Coordinator will provide this paperwork to the student.

Attendance at Ph.D. Final Oral Examinations

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

A. Attending examinations within the IMSE Department

One week prior to a scheduled examination, the Graduate Coordinator will email all IMSE students with a seminar flier containing the Ph.D. candidate's abstract, biographical information, and exam date/time/location information. All interested students should inform the Graduate Coordinator of their planned attendance.

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.

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 500- or 600-level IE courses – including experimental courses but excluding independent study courses³. The POS 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

IMSE department and the ISU Graduate College will monitor each student's progress toward their degree. If the GPA falls below a 3.00, 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.

Information about Satisfactory/Fail Coursework

A. IE 501 – Graduate Seminar

IE 501 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 590/690—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 POSC. Normally a maximum of three credits of 590/690 courses are permitted on the student's POSC. The proposal must include detailed time commitments, outcomes, and assessment methods. This course is graded as Satisfactory/Fail.

C. IE 697—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 697 is permitted only with instructor 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 697, please read the [IMSE Graduate Student Engineering Internship](#) instruction page. This course is graded as Satisfactory/Fail.

D. IE 699—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. degree a minimum of nine credit hours must be completed. 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). Credits received for research cannot be used in computing the student's GPA. 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 POSC; 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 masters 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 POSC.

Severance of Major Professor

Under normal conditions, major professors who leave Iowa State University through retirement or transfer to another position may not serve as the major professor or as a committee member. When a new POS committee is formed, retired professors cannot be chosen as committee members. However, under special circumstances, the student may petition the IMSE Graduate Committee to retain the major professor or committee member.

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 classes for the semester employment begins (for example, if the assistantship begins in the fall you must register for that semester during the previous spring semester)
 - 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 one week prior to the start of the semester and check-in with the Graduate Coordinator to sign a Letter of Intent (LOI). Should the student neglect to check-in on the required date the LOI will not be processed resulting in a hold being placed on the student's stipend and tuition scholarship.
 - **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: <http://cce.grad-college.iastate.edu/ita>
 - b. OECT Exam Information: <http://cce.grad-college.iastate.edu/ita/oect>
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 POSC 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.