Industrial Engineering, PhD

Requirements

The Doctor of Philosophy (PhD) in industrial engineering requires a minimum of 72 s.h. of graduate credit. Students must maintain a minimum Graduate College program grade-point average of 3.50 to earn the degree.

Students are typically expected to completed three academic years of PhD study at the University of Iowa. For students who earned an MS at the University of Iowa, no more than 36 s.h. from the MS may be counted toward the PhD. For students who earned an MS from another institution, a maximum of 30 s.h. may be transferred toward the doctoral program. The director of graduate studies reviews the transcripts of new students to determine which requirements have been met from previous coursework.

Excellence in research is the principal requirement for the degree. It is expected that the PhD dissertation research project represents an original and significant contribution to the body of knowledge in the field. At least one accepted research article in a peer-reviewed journal as first author with the research advisor as a co-author, in addition to the presentation of the research in a departmental seminar, are requirements. Submission of three first-authored papers and at least one research presentation at a national conference is typical. In addition, students must fulfill the qualifying requirement, pass the comprehensive examination, submit the Final Examination: Advanced Degree form, complete a Report of Thesis Approval, and submit a copy of their thesis to the Graduate College by following the published guidelines and deadlines.

Engineering Ethics and Graduate Seminar

Students must complete ENGR:7270 Engineering Ethics (1 s.h.), typically in the first or second fall semester of enrollment. Students must enroll in ISE:5000 Graduate Seminar: Industrial Engineering (1 s.h.) in the first two consecutive semesters of enrollment and once per year (either fall or spring semester) in each subsequent academic year. Credit from ENGR:7270 and ISE:5000 may count as elective courswork.

Required Coursework

All students complete a minimum of 36 s.h. in industrial and systems engineering (prefix ISE) courses numbered 3000 or above, excluding ISE:5000 and ISE:5999. A minimum of 24 s.h. of this coursework must be numbered 5001 or above and cannot include ISE:7999. All required coursework must be taken on an A–F graded basis except for ISE:7999 Research: Industrial Engineering PhD Dissertation.

Breadth Areas Requirement Coursework

As a part of the required ISE coursework, students must complete at least two courses in each of the three breadth requirement areas: analytics, human factors, and systems. The academic advisor and/or examining committee may decide that a student must complete other requirements such as additional coursework or the acquisition of specific skills. The actual amount of coursework required is determined with the advice and consent of the academic advisor. Students who earned an MS at the University of Iowa may have satisfied this requirement. Students with a relevant academic background in these areas may be excused from the breadth requirement with the approval of the director of graduate studies.

Analytics

Course #	Title	Hours
Two of these:		
ISE:5380	Deep Learning	3
ISE:5730	Digital Industry	3
ISE:5740	Design and Analysis of Computer Experiments	3
ISE:6300	Innovation Science and Studies	3
ISE:6760	Pattern Recognition for Financial Data	3
ISE:6780	Financial Engineering and Optimization	3
ISE:6790	Advanced Data Analytics and Informatics	3

Human Factors

Course #	Title	Hours
Two of these:		
ISE:6211	Human Factors in Healthcare Systems	3
ISE:6220	Cognitive Engineering	3
ISE:6420	Human/Computer Interaction	3
ISE:6450	Human Factors in Aviation	3
ISE:6480	Unmanned Aircraft Systems	3

Systems

Course #	Title	Hours
Two of these:		
ISE:5310	Advanced Computational Design and Manufacturing	3
ISE:5350	Logistics Engineering and Management	3
ISE:5520	Renewable Energy	3
ISE:5620	Design of Experiments	3
ISE:5650	Mechatronics Engineering for Smart Device Design	3
ISE:5810	Advanced Additive Manufacturing	3
ISE:6350	Computational Intelligence	3

Thesis and Electives

Students complete additional credits as needed to bring the total credit for the PhD to a minimum of 72 s.h. For many students, this will primarily consist of enrollment in ISE:7999 Research: Industrial Engineering PhD Dissertation.

Students may select other elective courses as needed from industrial and systems engineering (prefix ISE) courses numbered 3000 or above. Students who have previously taken ISE:5998 and ISE:5999 in pursuit of their industrial engineering MS may count these courses toward their PhD electives; however, once students have completed the MS, they are expected to enroll in ISE:7998 and ISE:7999 and

are not permitted additional enrollments in ISE:5998 and ISE:5999.

Students may also select electives from courses numbered 3000 or above in the following engineering and engineering-related areas: biomedical engineering (prefix BME), chemical and biochemical engineering (prefix CBE), civil and environmental engineering (prefix CEE), core engineering courses (prefix ENGR), electrical and computer engineering (prefix ECE), mechanical engineering (prefix ME), and statistics (prefix STAT).

Additional Information

Qualifying Exam

Students interested in pursuing a PhD are initially admitted as MS nonthesis students until they have completed the qualifying examination. This is typically achieved within their first three semesters if beginning the program without an MS, or within the first two semesters if beginning the program with an MS. Once the exam is passed, students are formally admitted to the PhD program. The purpose of this qualifier is to determine a student's proficiency in research and scholarship.

Comprehensive Examination

The general rules for the administration of the PhD comprehensive examination are contained in the policies and procedures of the Graduate College. The tradition in the department is for the comprehensive examination to consist of a written and oral component. Students write and submit a comprehensive examination document, usually called the dissertation research proposal, to each member of the examination committee two weeks before the examination date. During the examination, students make a roughly 30-minute presentation on the content of the research proposal. Committee members may ask questions regarding the proposal before, during, or after the oral presentation. Having satisfactorily completed the comprehensive examination, students are accepted as candidates for the PhD.

Final Examination (Dissertation Defense)

Each student must defend the completed dissertation in the final examination, which is conducted by the examining committee.

En Passant Option

Students admitted to the PhD program may elect to earn their MS through the *en passant* option, with the permission of their PhD committee. This option allows students to write an English-language manuscript as the first author and submit it to a peer-reviewed research journal in lieu of writing the MS thesis. With this option, students, in conjunction with their academic advisor, author a paper that serves as the foundation for the PhD research. The decision to select this option must be made before the qualifying examination. The committee may determine, based on the published or submitted scholarship to peer-reviewed journals, that the presentation of a separate research thesis is not necessary. In this case, up to 9 s.h. in ISE:5999 Research: Industrial Engineering MS Thesis may be counted toward the nonthesis option of the MS. Students choosing the *en passant* option generally receive an MS without the thesis designation.

For more detailed information about program requirements, see Graduate Student Handbook on the Department of Industrial and Systems Engineering Graduate Program website.