THE DEPARTMENT OF Mechanical & Industrial Engineering’s graduate programs educate students utilizing advanced contemporary methods to prepare them for professional careers in engineering research, design and teaching. Students’ plans of study are based on their backgrounds and career objectives. Department faculty members have expertise in areas related to applied statistics, design and manufacturing, energy conversion, ergonomics, fluid mechanics, heat transfer, human factors, information technology, mechanical systems, operations research, reliability and production control, and solid mechanics.

Many Mechanical and Industrial Engineering faculty members conduct research in affiliation with various College of Engineering and University of Iowa centers and institutes, including the Center for Computer-Aided Design (CCAD), IIHR–Hydroscience and Engineering (IIHR), and The National Advanced Driving Simulator (NADS). Department faculty also collaborate with researchers at The University of Iowa Medical School, which manages one of the largest and most distinguished teaching hospitals in the country.

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THE UNIVERSITY OF IOWA

The University of Iowa, a Big Ten University, enrolls approximately 28,000 students and has about 1,200 faculty members.

The College of Engineering has approximately 87 tenured and tenure-track faculty members and a combined undergraduate and graduate enrollment of 2,000 students. The College is well integrated into the university community and capitalizes on its special environment through a multitude of interdisciplinary research efforts and by using the academic richness of the University to enhance curriculum offerings.

Industrial Engineering areas of specialization include applied statistics, design and manufacturing, engineering management, human factors (ergonomics), information systems, operations research and quality and production control.

INDUSTRIAL ENGINEERING

The Industrial Engineering graduate program comprises three major areas of academic specialization:
1) Human Factors and Ergonomics
2) Operations Research/Production Systems
3) Systems in Design and Manufacturing.

Within these specialization areas, graduate students can pursue focus areas in Cognitive Engineering and Ergonomics, Design and Manufacturing Engineering, Engineering Management, Information Systems, Operations Research and Applied Statistics, Quality and Production Control, and Reliability.

Industrial Engineering faculty include:
• Analysis of science operations for Mars exploration
• Collaborative systems for design and manufacturing
• Concurrent engineering
• Commercial vehicle operations and transportation safety
• Data mining
• Design and development of medical simulators
• Dynamic programming logistics
• Evolutionary computation
• Human-computer interaction
• Image processing in vision systems
• In-vehicle display and algorithm issues associated with adaptive cruise control and rear-end collision warning systems
• Lane-keeping and road departure alerting strategies for vehicle drivers
• Linear and nonlinear optimization
• Online fault diagnosis and variation reduction in manufacturing processes
• Sensory capabilities and limitations
• Supply chain design and management
• System reliability modeling and design of manufacturing processes
• Virtual reality in robot simulation and
control

- User acceptance of new technology
- Using sonification to calibrate trust in automation

Many M.S. graduate students concentrate on one area of study whereas others, particularly those without undergraduate industrial engineering backgrounds, follow a more general program of study with only moderate specialization. Ph.D. students are expected to have a breadth of background as well as a strong research specialization. Supportive areas of theory and application to the Industrial Engineering Program include Mathematics, Statistics, Psychology, Computer Science, Materials Science, Business, Medicine, and Transportation Planning.

GENERAL INFORMATION ON DEGREES GRANTED

Master of Science (M.S.) in Industrial Engineering

Two M.S. programs are available: a thesis and a non-thesis option. Students considering eventual admission to a Ph.D. program are strongly advised to select the thesis option. Those students receiving research or teaching assistantship support may be required to take the thesis option. The M.S. thesis option requires a minimum of 30 semester credits of coursework in 100 or 200 level courses, including a maximum of six semester credits of research. The M.S. non-thesis option requires a minimum of 36 semester credits of course work in 100 or 200 level courses. Both options require at least 21 graduate-level semester credits in Industrial Engineering, including research credits. All M.S. students must take at least nine semester credits at the 200 level from the Industrial Engineering curriculum. Also, both M.S. options require at least one 100 or 200 level course from each of three focus areas: Human Factors and Engineering, Operations Research/Production Systems, and Systems in Design and Manufacturing. M.S. thesis applicants who wish to pursue a Ph.D. degree at The University of Iowa may wish to select two 200-level courses in each of the focus areas to complete their Ph.D. breadth requirement before entering the Ph.D. program.

Doctor of Philosophy Degree

Current Industrial Engineering research focuses include modeling driver behavior, data mining, supply chain management, reliability, robotics, and simulator-based human factors.

(Ph.D.) in Industrial Engineering

For Industrial Engineering Ph.D. students, a series of written and oral examinations is required, as well as written dissertations based upon the results of the original investigations.

The Ph.D. degree recognizes a broad academic background with considerable depth in at least one area of specialization and that clearly demonstrates the capability of the student to do high level research. Students without an M.S. degree in Industrial Engineering (or a closely allied area) will be expected to satisfy the requirements for the M.S. degree in Industrial Engineering prior to being admitted to the Ph.D. program. The main requirements for the Ph.D. degree in Industrial Engineering are as follows (these requirements are in addition to those of the Graduate College):

1. General Course Work. The graduate work toward a Ph.D. must include at least two semesters of residence and include a minimum of 72 hours of total graduate study including research for the dissertation. Graduate studies toward a M.S. degree are included in the minimum requirements, with a maximum of 36 hours transferred in from a M.S. program in Industrial Engineering (or closely allied area) at a recognized institution. A grade point average of at least 3.25 (based on 4.00) is required on all graduate work taken at The University of Iowa.

2. IE Breadth Requirement. Each Ph.D. student must pass at least two 200 level IE formal courses in each of three focus areas: Human Factors and Ergonomics, Operations Research/Production Systems, and Systems in Design and Manufacturing. Continuing M.S. students may already satisfy this requirement in full or in part.

3. Qualifying Exam. Each student has to satisfy the Qualifying Exam in two of the three focus areas. The requirement can be satisfied for a focus area by:
   a) Passing a written Qualifying Exam in that focus area. The Qualifying Exam will be held in the first week of the Fall semester each year, or by
   b) Achieving a grade of A or better in each of two 200 level IE formal courses in that focus area.

4. Focus Area Study. The student will then select a focus area and take further course work in that area to at least the minimum required for that focus area. This will require at least two further 200 level IE courses in the focus area.

5. Comprehensive Examination. Doctoral students then demonstrate their capability for creative individual research achievement by completing and defending dissertation research proposals in a
Comprehensive Examination conducted by an Examining Committee. The Examining Committee shall determine if the student is ready to commence the dissertation research at the current state of preparation. Having satisfactorily completed this examination, the student is accepted as a candidate for the Ph.D. degree.

6. Final Examination. Ph.D. candidates must complete and defend their dissertations in a final examination conducted by the Examining Committee.

ADMISSION TO GRADUATE PROGRAMS

M.S. Admission

Students from U.S. universities may be admitted to Industrial Engineering from an ABET accredited baccalaureate curricula in any engineering discipline or the mathematical, physical, or computer science disciplines with a minimum undergraduate grade point average of 3.00 (based on 4.00) and/or an acceptable score on the Graduate Record Examination. Mathematical background should be essentially equivalent to that of a B.S. in engineering. Applicants from non-U.S. institutions must meet equivalent conditions for consideration for regular admission. Students with lesser qualifications may be considered for conditional admission. Students from business or social science programs with mathematical preparation similar to the engineering student are considered for both regular or conditional admission. Students on conditional status must achieve regular status within two sessions of initial registration by attaining an acceptable grade point average and/or other specified conditions. Available resources may limit admission. Entering students need strong verbal and written skills in the English language and a background in computer programming (e.g., C++, C, Pascal or Fortran), probability, statistics, and mathematics equivalent to that required in an accredited undergraduate engineering program. Other background requirements are helpful depending upon the emphasis of the individual’s program of study. Students with insufficient background are expected to take additional courses beyond those normally required in a plan of study.

Ph.D. Admission

Students from U.S. universities may be admitted to Industrial Engineering from an ABET accredited program in any engineering discipline or curricula from mathematical, physical, or computer sciences with a minimum undergraduate grade point average of 3.25 (based on 4.00) and/or an acceptable score on the Graduate Record Examination. Those from outside the U.S.A. must have an equivalent basis as determined by this University. Reference letters, student research interests, previous graduate study grade point average, and other factors such as faculty availability will be considered in making the admission decision. Students may also be admitted from business or social science programs as determined on an individual basis. Students with a Ph.D. objective who enter with only a B.S. degree are typically first admitted to the M.S. thesis program. Other students with a Ph.D. objective who enter with a higher degree but without evidence of independent research capability (e.g., a thesis) may also be admitted to a M.S. thesis program to first complete that requirement. An accepted thesis becomes credited as meeting part of the Ph.D. requirements.
GRADUATE SUPPORT

Awards and reappointments are highly competitive, and are based upon the students’ academic records, prior performance, and upon an assessment of the candidates’ potential contribution to the research and teaching goals of the program. Financial support is available through research and teaching assistantships on either a semester or academic year basis. If an award is made, nonresident students usually also qualify for resident tuition fees.

INDUSTRIAL ENGINEERING
GRADUATE COURSES

Systems in Design and Manufacturing
IE:3300 (56:131) Manufacturing Systems
IE:3350 (56:134) Process Engineering
IE:4550 (056:155) Wind Power Management
IE:6350 (56:235) Computational Intelligence
IE:6370 (56:237) Operational Issues in Supply Chain Management Engineering

Human Factors and Ergonomics
IE:3400 (56:144) Human Factors
IE:3450 (56:147) Ergonomics
IE:6410 (56:241) Research Methods in Human Factors Engineering
IE:6420 (56:242) Human/Computer Interaction
IE:6440 (56:244) Airborne Design of Experiments
IE:6450 (56:245) Human Factors in Aviation
IE:6460 (56:246) The Design of Virtual Environments

Operations Research/Production Systems
IE:3500 (56:150) Information Systems Design
IE:4600 (56:160) Operational Systems Design
IE:4610 (56:161) Enhanced Design Experience
IE:3600 (56:162) Quality Control
IE:3640 (56:164) Six Sigma Operations and Quality Control
IE:3650 (56:165) Advanced Six Sigma and Quality Improvement
IE:3610 (56:166) Stochastic Modeling
IE:3700 (56:171) Operations Research
IE:3760 (56:176) Applied Linear Regression
IE:3750 (56:178) Digital Systems Simulation
IE:5860 (56:186) Health Informatics I
IE:6300 (56:230) Innovation Science and Studies
IE:6360 (56:236) Decision Making in Supply Chain Management Engineering
IE:5610 (56:268) Reliability Theory and Applications
IE:6600 (56:270) Linear Programming
IE:6720 (56:271) Nonlinear Optimization
IE:6750 (56:274): Stochastic Optimization
IE:6760 (56:275) Statistical Pattern Recognition
IE:6770 (56:276) Game Theory
IE:6780 (56:277) Financial Engineering and Optimization
IE:5870 (56:287) Health Informatics II

THE UNIVERSITY OF IOWA

The information provided in this brochure is only a brief overview of the Industrial Engineering program. Students are responsible for taking care of all details for graduation prescribed by their departments, and for meeting requirements and deadlines described in the gold leaflet published by The University of Iowa Graduate College and Registrar.

Helpful links for prospective and current graduate students:

Manual of Rules and Regulations of the Graduate College
http://registrar.uiowa.edu/registrar/catalog/graduatecollege/manualofrulesandregulationsofthegraduatecollege/

Industrial Engineering Graduate Student Handbook
www.mie.engineering.uiowa.edu/IEProgram/assets/IEGradHndb_2010-11_Rev_Dec_18_09.pdf

Industrial Engineering Graduate Program Website
www.mie.engineering.uiowa.edu/IEProgram/IEGrads.php

visit us on the web @ www.mie.engineering.uiowa.edu
Industrial Engineering

Yong Chen, 
Associate Professor

• Ph.D., Industrial and Operations Engineering, University of Michigan, 2003
• M.A., Statistics, University of Michigan, 2003
• B.S., Computer Science and Engineering, Tsinghua University, Beijing, China, 1998

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Professor Chen teaches courses in operations research, statistical pattern recognition and simulation model analysis. His research interests include maintenance decision making; process monitoring and diagnosis; reliability modeling and analysis; and manufacturing system design.

Pavlo Krokhmal, 
Associate Professor

• Ph.D., Operations Research, University of Florida, 2003
• Ph.D., Mechanics of Solids and Applied Mathematics, Kiev National University, 1999
• M.S. Applied Mathematics and Mechanics, Kiev National University, 1996

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Professor Krokhmal teaches courses in stochastic modeling and optimization, financial engineering and optimization, and engineering economy. His research is in the area of stochastic optimization, risk analysis, probabilistic combinatorial optimization, cooperative control, optimal trading strategies and pricing of derivatives.

Andrew Kusiak, 
Professor

• Ph.D., Operations Research, Polish Academy of Sciences 1979
• M.S., Mechanical Engineering, Warsaw University of Technology 1974
• B.S., Precision Engineering, Warsaw University of Technology 1972

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Professor Kusiak teaches courses in computational intelligence, manufacturing, innovation, wind power management, process engineering, and quality control. His research interests are data mining; evolutionary computation, healthcare systems, medical technology, reengineering, engineering design, manufacturing, process modeling.

Peter J. O’Grady, 
Professor

• Ph.D., University of Nottingham, 1981
• M.A., University of Cambridge, 1977

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Professor O’Grady teaches courses in information systems design, op
erational issues, quality control, engineering problem solving and manufacturing. His research interests include intelligent systems, supply chain design; large-scale networks; and collaborative systems for design manufacturing.

Thomas Schnell, Associate Professor

• Ph.D., Industrial Engineering, Ohio University, 1998
• M.S., Industrial Engineering, Ohio University, 1994
• B.S., Electrical Engineering, Bern Institute of Technology, 1992

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Professor Schnell teaches courses in operational systems, human factors, ergonomics and design. His research interests are human factors, cognitive technology, flight deck and cockpit design, flight simulation and flight testing, neural imaging, and workload assessment.

Geb Thomas, Associate Professor

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• M.S., Industrial Engineering, Penn State University, 1995
• B.S., Physics, State University of New York, 1991
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Professor Thomas teaches courses in human/computer interfaces, information systems, and human factors. His research interests include human-computer interaction; haptics; design of medical simulators and robotic control.

Ibrahim Ozbolat, Assistant Professor

• Ph.D., Industrial and Systems Engineering, University at Buffalo, 2011
• B.S., Mechanical Engineering, Middle East Technical University, Ankara, Turkey, 2007
• B.S., Industrial Engineering, Middle East Technical University, Ankara, Turkey, 2006
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Professor Ozbolat teaches courses in Design for Manufacturing and Advanced CAD and Manufacturing. His research interests include Computer-Aided Design and Manufacturing (CAD/CAM), computational geometry, tissue engineering, rapid prototyping, and heterogeneous object modeling.

Photo taken by Dean Harken

Visit us on the web @ www.mie.engineering.uiowa.edu
Mission and Vision of the College of Engineering

Our Mission
The College of Engineering serves the state, the nation, and the world by producing talented, broadly educated engineers, conducting high quality research, developing breakthrough technologies, and disseminating and preserving technical knowledge.

Our Vision
To be recognized internationally for engineering education and research, and for leadership to the profession.

The following strategic characteristics and aspirations will enable the College to realize its vision:

- Small-college atmosphere that facilitates personal commitment to the educational success of students in a comprehensive university
- Undergraduate curricula that emphasize breadth and depth of education, which link to areas contiguous to engineering
- Graduate education that prepares students for research and advanced problem solving needed to address complex engineering problems
- Internationally recognized research programs in each department with strong support from professional constituencies
- Demonstrable leadership and service in advancing engineering professionalism to meet society’s needs
- Educational and research partnerships with health sciences, business, and other UI colleges, and with select agencies, universities, and industries
- Highly successful alumni who contribute to the profession in the global society

DESTINATIONS
Where are our graduates working?

Industrial Engineering graduates have gone on to hold prestigious positions at widely recognized institutions and companies, both public and private, throughout the world.

Here are just a few destinations from recent graduates:

- Arizona State University
- Boeing Corporation
- Bradley University
- Florida State University
- Korea Electric Power Corporation
- Louisiana State University
- North Carolina State University
- Oregon State University
- Penn State University
- Rockwell-Collins
- Rockwell International
- Tuskegee University
- Univ. of Illinois at Chicago
- Virginia Tech Transportation Institute

THE UNIVERSITY OF IOWA prohibits discrimination in employment and in its educational programs and activities on the basis of race, national origin, color, creed, religion, sex, age, disability, veteran status, sexual orientation, gender identity, or associational preference. The University also affirms its commitment to providing equal opportunities and equal access to University facilities. For additional information on nondiscrimination policies, contact the Coordinator of Title IX, Section 504, and the ADA in the Office of Affirmative Action, (319) 335-0705 (voice) or (319) 335-0697 (text), 202 Jessup Hall, The University of Iowa, Iowa City, Iowa, 52242-1316.