# GRADUATE HANDBOOK

# Industrial Engineering Program

## DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

## THE UNIVERSITY OF IOWA

**3131 Seamans Center for the Engineering Arts and Sciences**

**Iowa City, Iowa 52242-1527, USA**

**Tel: +1 319 335-5939 Fax: +1 319 335-5669**
**Internet: indeng@engineering.uiowa.edu**
**World Wide Web:** http://www.mie.engineering.uiowa.edu

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This handbook describes features of the Graduate Program in Industrial Engineering offered by The University of Iowa. There are two purposes served by this document. For those who are considering graduate studies, this booklet provides information for applicants whose interests and needs may be met by our program. For those who are already accepted in our program of studies, this booklet serves as a guide to procedures, policies, and regulations.

# TABLE OF CONTENTS

## GENERAL INFORMATION

The Industrial Engineering (IE) Program is housed within the Mechanical and Industrial Engineering Department (MIE) at the University of Iowa. The program occupies attractive quarters and benefits from modern human factors research and computer-based education laboratories, manufacturing laboratories, and an advanced teaching laboratory. Currently, there are approximately 170 undergraduate and 40 graduate students in the IE Program, of which around 35% are women. A large fraction of recent PhD's from the program have obtained teaching positions at major universities while others have obtained influential industrial positions.

The University of Iowa, a Big Ten University, enrolls about 28,000 students and has about l200 faculty members. The College of Engineering has 80 faculty members and a combined undergraduate and graduate enrollment of l,500 students. The Engineering College is comparable in size to the other nine colleges on campus, with the exception of the College of Liberal Arts which has an enrollment of 15,000 students. The other colleges include Tippie College of Business, Dentistry, Education, Law, Medicine, Nursing, Pharmacy, Public Health and the Graduate College. The Engineering 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 undergraduate and graduate curriculum offerings. The Liberal Arts College, which maintains strong programs in the Arts, Humanities, and the Sciences, provides extensive cultural opportunities as well as educational and research support for engineering students. The University of Iowa has one of the nation's largest university-owned teaching hospitals; biomedical engineering and health care research opportunities are available.

Iowa City, the home of The University of Iowa and the original capitol of the State of Iowa, is located in east-central Iowa, 25 miles south of Iowa's second largest city, Cedar Rapids, and 60 miles west on I-80 of the Quad Cities (Davenport and Bettendorf, Iowa and Moline and Rock Island, Illinois). Six air carriers service Cedar Rapids and the Quad Cities. Most of Iowa's industrial, historical and recreational areas are within a two-hour drive from Iowa City. Des Moines, the current State Capitol, is two hours driving time to the west, while Chicago, Minneapolis, St. Louis and Kansas City can all be reached by driving four to six hours. Iowa City, a city of about 50,000 people, is a cultural and medical center. The city's greatest asset, though, is the friendly midwestern people who make this city an ideal place in which to live and study.

## GRADUATE PROGRAMS AND DEGREES

Graduate programs leading to both the M.S. and PhD degrees in Industrial Engineering are tailored to meet the needs of the individual. Each student's course of study is based on his or her background, career objectives, and sound academic practice. The curriculum is highly flexible; the goal is academic excellence.

## MASTER OF SCIENCE DEGREE

### Admissions Criteria

Students from U.S. universities may be admitted 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 (minimum score of 650 Q and 4.5 W). 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 either regular or conditional admission. The student 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 or be dismissed. 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, VB), 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.

### M.S. Thesis and Non-Thesis Programs

Two M.S. programs are available: a thesis and a non-thesis option. Students considering eventual admission to a PhD 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 l00 or 200 level courses, including a maximum of six semester credit hours of research. The M.S. non-thesis option requires a minimum of 36 semester credits of course work in 100- or 200-level courses, and cannot include any credit hours of research. Both options require at least 21 graduate-level semester credits in Industrial Engineering, including research credits. All graduate students must register for 56:191, Industrial Engineering Graduate Seminar, each semester in which they are enrolled in the university. Seminar credit does not substitute for regular coursework or research semester credit hours.

All Master degree candidates 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, Operations Research, and Reliability and Systems Design. The courses in each focus area are shown on page 16. Beyond these specific distribution requirements, the other courses should be selected with consultation with his or her advisor and documented in the student's plan of study. If a student's degree objectives change, a new plan of study must be drafted and agreed upon by the student and advisor. M.S. thesis applicants who wish to pursue a PhD degree at The University of Iowa may wish to select two 200-level courses in each of the focus areas to complete their PhD breadth requirement before entering the PhD program.

In addition to the IE Graduate Program supported by the standard IE Curriculum, students may select the Wind Power Management in the IE Graduate Program, which is offered based on the Emerging Area Curriculum.

## Emerging Area in Wind Power Management

### Rationale

The wind power is an alternative source of intermittent energy generated from the wind. The wind power industry is to grow over the next decades. It is conceivable that as much as 20% of the national energy needs would be met by the wind generated power.

### Goals

The Wind Power Management aims at meeting the emerging needs for professionals prepare to design, effectively operate, and mange wind power farms deployed in massive numbers all over the country. The graduates will be able to fully understand the system and management of wind power facilities and their interactions with other alternative and conventional power generation systems.

### Prerequisites

The broad job opportunities in wind power industry call for graduates with different skill sets. To respond to the job market needs, students with diverse backgrounds and experience will be considered. Applicants for the Wind Power Management should have a baccalaureate degree in engineering, computer science, basic sciences, business, or a related area, and are expected to poses basic knowledge of calculus, analysis, and statistics.

### Course Requirements: M.S. Degree with a Focus on Wind Power Management

The basic requirements for MS Thesis and MS Non-Thesis degree for students in the Wind Power Management are the same as for the standard M.S. Programs in Industrial Engineering. However, the students in the Wind Power Management are required to take additional classes:

- MS Thesis Program: 3 classes (9 sh) from Table 1 (page 6)

- MS Non-Thesis Program: 4 classes (12 sh) from Table 1, and 1 class (3 sh) from Table 2 (page 7).

The classes selected from Table 1 and 2 need to be approved by the graduate advisor.

**Course Requirements: Doctoral Program**

Doctoral students enrolled in the Wind Power Management are expected to meet all IE Graduate Program requirements. In addition, each Ph.D. student is requited to gain sufficient breadth and depth of domain knowledge in her/his specific area of study by taking energy related classes.

Table 1. Recommended Courses for Wind Power Management.

| Course | sh |
|---|---|
| 56:xxx Wind Power Performance Management | 3 |
| 56:166 Stochastic Modeling | 3 |
| 56:171 Operations Research | 3 |
| 56:134 Process Engineering | 3 |
| 56:162 Quality Control | 3 |
| 56:178 Digital Systems Simulation | 3 |
| 53:107 Sustainable Systems | 3 |
| 53:117 Remote Sensing | 3 |
| 53:251 Environmental Systems Modeling | 3 |
| 58:1xx Advanced Energy Systems Design | 3 |
| 58:143 Computational Fluid and Thermal Engg | 3 |
| 58:147 Fuel Cells | 3 |
| 58:195 Aeropropulsion | 3 |
| 58:255 Multiscale Modeling | 3 |
| 58:268 Turbulent Flows | 3 |
| 55:164 Computer-Based Control Systems | 3 |
| 55:181 Formal Methods in Software Engineering | 3 |
| 55:160 Control Theory | 3 |

Table 2. Elective Courses for the Wind Power Management.

| Course | sh |
|---|---|
| 22C:144 Database Systems | 3 |
| 6K:176 Managerial Decision Models | 3 |
| 6K:234 Information Knowledge Management | 3 |
| 6K:226 Visual Basic Programming | 3 |
| 6K:228 Web and Multimedia | 3 |
| 175:192 Occupational Safety | 3 |
| 44:127 Environmental Quality: Sci. Tech. & Pol. | 3 |
| 44:135 Urban Geography | 3 |
| 12:114 Energy and the Environment | 3 |
| 56:176 Applied Linear Regression | 3 |

## Procedures for M.S. Students

### Advising

The MIE Department Chair or a faculty advisor designate provides entry advising. The MIE Department Chair or Graduate Program Coordinator will assign an advisor during the first regular semester of the student's residence.

### Plans of Study

The student and the advisor will prepare a plan of study during the semester of assignment of a regular advisor and will submit that plan to the MIE Department Chair for approval. It is the student's responsibility to assure that a plan of study is submitted to the MIE Department Chair. When approved by the MIE Chair, the plan of studies will be filed with the student's record.

### GPA and Comprehensive Examination Requirements

To be eligible for the M.S. degree, the student is required to maintain a grade point average of 3.00 (based on 4.00) on all graduate course work at The University of Iowa and to pass a final comprehensive examination as specified by the student's Examining Committee.

The Examining Committee shall consist of at least three members of the Graduate College faculty. The examination may be composed of both oral and written parts. The purpose of this examination is to assess the adequacy of the student's defense of thesis and/or course preparation. The final plan of study, approved by the Dean of the Graduate College, is a prerequisite to this

examination. It is the responsibility of the student to submit an application for degree to the Graduate College by the College deadline. The student should consult with his or her advisor on the composition of the Examining Committee, and the time and place for the examination.

### Combined B.S./M.S. Degree Program for IE Majors: Thesis and Non-Thesis Programs

A special combined Bachelor of Science/Master of Science (BS/MS) degree program for qualified Industrial Engineering undergraduate students is available to enable a student to complete a Master of Science degree in two or three semesters after completion of the Bachelor of Science degree. Students in the joint degree program are allowed to take up to 12 semester hours (sh) of 100- or 200-level graduate courses and attend one of the program's graduate seminars in place of the undergraduate seminar before the conferral of the Bachelor of Science degree. Of these courses, 6 sh may be counted towards both the B.S. and M.S. degrees. The requirements for admission to the program are: (a) completion of at least 80 sh of credits, (b) a cumulative grade point average (GPA) of 3.25 or higher, and (c) a letter of application submitted to the Department of Mechanical and Industrial Engineering Chairperson. A student in the combined program receives a B.S. degree when all requirements for that degree have been completed, and then becomes a regular M.S. level graduate student in the program. Students in the program may begin working with a faculty member on an M.S. thesis project during the senior year of undergraduate study.

### Combined B.S./M.S. Degree Program for Non-IE Majors: Thesis and Non-Thesis Programs

Undergraduate students in majors other than Industrial Engineering can be admitted for the combined BS/MS degree program. They need to follow the same admission process and criteria as IE majors. In some cases, student may be required to take additional courses to meet the prerequisite requirements for the upper level courses.

## DOCTOR OF PHILOSOPHY DEGREE

### Admissions Criteria

Students from U.S. universities may be admitted 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 (minimum score of 650 Q and 4.5 W). Those from outside the U.S. 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 PhD objective who enter with only a B.S. degree are typically first admitted to the M.S. Thesis Program. Other students with a PhD 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 PhD requirements.

## PhD Program

The Doctor of Philosophy (PhD) degree is given upon demonstration by the student of comprehensive knowledge and scholarly work at the highest level. A series of written and oral examinations is required, as well as written dissertation based upon the results of the original investigation. The PhD 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 Industrial Engineering (or closely allied area) M.S. degree will be expected to satisfy the requirements for the M.S. degree in Industrial Engineering prior to being admitted to the PhD program.

The main requirements for the PhD 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 towards a PhD 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 towards 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 minimum grade point average of 3.25 (based on 4.00) is required on all graduate work taken at The University of Iowa. All graduate students must register for 56:191, Industrial Engineering Graduate Seminar, each semester in which they are enrolled in the university. Seminar credit does not substitute for regular coursework or research semester credit hours.
2. **IE Breadth Requirement**. Each PhD student must pass at least two 200 level IE formal courses in each of three focus areas: Human Factors, Operations Research, and Reliability and Systems Design. The courses in each focus area are shown on page 12. 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 be at least two further 200 level formal IE courses in the focus area.
5. **Comprehensive Examination**. The student will then have to demonstrate their capability for creative individual research achievement by completing and defending his or her dissertation research proposal in a Comprehensive Examination conducted by an Examining Committee consisting of at least 5 members of the Graduate College faculty, with at least three faculty who are predominately IE faculty, and with a chair or co-chair of the Examining Committee who is a predominately IE faculty. This examination will only be scheduled after the Qualifying Examination requirement has been satisfied. 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 PhD degree.

6. **Final Examination.** The student then has to complete and defend his or her dissertation in a final examination conducted by the Examining Committee, with a composition as described in the section on the Comprehensive Examination.

## Procedures for Ph.D Students

### Advising

The MIE Department Chair or a faculty advisor designate provides entry advising. The MIE Department Chair or Graduate Program Coordinator will assign an advisor during the first regular semester of the student's residence. Students are expected to identify an IE faculty member willing to serve as their advisor by the end of the first regular semester of their enrollment.

### Plans of Study

The student and the advisor will prepare a plan of study during the semester of assignment of a regular advisor and will submit that plan to the MIE Department Chair for approval. The Graduate Plan of Study form is available in the MIE office. It is the student's responsibility to assure that a plan of study is submitted to the MIE Department Chair. When approved by the MIE Chair, the plan of study will be filed with the student's record. At the beginning of each academic year, the plan of study and students progress will be reviewed by the IE faculty, and students will be given feedback regarding their progress towards their degree objective. It is the student’s responsibility to make sure the plan of study is updated each semester.

### Requirements for Admission to PhD Degree Candidacy

There are three principal requirements for admission to PhD degree candidacy in addition to those of the Graduate College. The first is a minimum grade point average of 3.25 (based on 4.00) on all graduate work taken at The University of Iowa. A second requirement is an adequate demonstration of the capability for creative individual research achievement (typically a dissertation research proposal). The third requirement is successful completion of a comprehensive examination given by the Examining Committee. This examination will be scheduled with the approval of his or her advisor and the Chair of the IE Program or the Graduate Coordinator when the plan of study is essentially completed. The Examining Committee shall determine the composition of this examination, including both written and oral parts, and shall determine if the student is ready to commence the dissertation research at the current state of preparation.

**Publication expectations for PhD dissertation research**

An integral part of the PhD process is publication in peer reviewed journals. To support this aim, each candidate will work with his or her advisor to prepare a publication plan after the first semester and update this plan regularly. The publication plan should contain the title of each paper, a brief summary of each paper, a description of how each paper relates to the PhD dissertation, the expected completion date, and the journals to which the papers will be submitted.

A candidate is expected to work with his or her advisor to submit at least one paper to reputable peer-reviewed Engineering journals before the dissertation research proposal defense. These papers should form an integral part of the dissertation research proposal. A candidate should submit the papers and evidence of submission to members of the Examining Committee prior to the dissertation research proposal defense. A candidate is also encouraged to provide copies of all reviews received and communications from the editors of the journals.

At the time of the Final Examination of the PhD, it is expected that a candidate would work with his or her advisor to submit at least 3 papers to reputable peer-reviewed Engineering journals, with at least one of these papers accepted for publication. These papers should form an integral part of the dissertation research. The candidate should submit the papers and evidence of submission to members of the committee prior to the Final Examination. The candidate is encouraged to provide copies of reviews received and communications from the editors of the journals.

The *quality* of the papers is paramount in demonstrating satisfactory publication progress and the number of papers submitted and/or accepted is a secondary consideration. The number and timing of publications are *expectations* and the Committee may take other factors, such as unusual time delays in journal review processes, paper quality, and journal quality into account. However, it is the responsibility of each candidate to demonstrate overall compliance with these expectations.

To ensure that the student complies with these expectations, the Industrial Engineering faculty will review progress of each candidate at the beginning of each semester.

## FINANCIAL SUPPORT FOR GRADUATE STUDENTS

Awards and reappointments are highly competitive and are based upon the student's academic record, prior performance, the ability to serve, and upon an assessment of the candidate's 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. Stipends currently are approximately $21,000 (half time or 20 hours per week) for an academic year of graduate study. Other levels of support are also possible.

If an award is made, nonresident students usually also qualify for resident tuition fees, and this is worth approximately $8,300 per academic year.

Normally stipends are not immediately awarded to overseas applicants, but, after admission and enrollment, an application can be made. Preference for graduate student support is given to PhD students.

## ACADEMIC PROCEDURES

Students in the M.S. program shall be placed on academic probation if, after completing nine semester hours of graduate work, their cumulative GPA on graduate work done at The University of Iowa falls below 3.00. The corresponding minimum requirements on cumulative course work taken in the PhD program are 3.00 after the first 12 hours and 3.25 after 24 hours have been completed. Students who have not been removed from probation after one semester may be denied permission to reregister. Students in either the M.S. or PhD program who have not completed their program requirements within five years after admission to the program may also be denied re-registration. Each year the advisor shall certify that each student is making satisfactory progress towards degree objectives. If progress is deemed unsatisfactory the student shall be notified in writing by the program. The notification shall specify in what way(s) the student is failing make satisfactory progress towards degree objectives. The student shall be provided a reasonable amount of time to resolve the unsatisfactory performance before dismissal. If conditions such as conditional admission or probation are imposed, the program shall give, at the time of its imposition, a written explanation of this status and its time limits. A student who is denied re-registration shall be notified of this fact in writing with reasons for the action provided. The procedure for academic dismissal is described in Appendix I.

Since integrity is critical to graduate studies, students may also be denied reregistration or be dismissed directly for less than fully professional conduct. Reasons for such dismissal would typically include violation of University or Program rules, cheating on assignments or examinations, plagiarism, falsification of admission records, or other forms of dishonesty. The student is also subject to the more general provisions of the University's current Policies and Regulations Affecting Students document, a copy of which may be obtained at each registration. Should a student feel dismissal is unfair he or she may seek Program faculty review of this dismissal. The detailed procedure for academic dismissal is available from the Program office upon request.

## THESES, DISSERTATIONS AND THEIR DEFENSE

The student should consult with the Graduate College document “Requirements for Graduate Theses” and the advisor on matters pertaining to thesis format and detail. All committee members have the privilege of examining corrected drafts as well as earlier drafts before the thesis is accepted and submitted to the Graduate College. It is the student's responsibility to submit the thesis or dissertation to the Examining Committee at least two weeks prior to the final examination. In addition to Graduate College requirements, the student is required to prepare one bound copy of the approved thesis for the Industrial Engineering Program and other copies as required by the Examining Committee.

## FACULTY

**Linda Ng Boyle**, Assistant Professor; PhD, University of Washington, 1998. Areas of research interest include human factors, transportation, and behavioral risk models. Recent publications include "Impact of Traveler Advisory Systems on Driving Speed: Some New Evidence, An Approach to User Acceptance of a New Technology, and Survey Methodologies for Defining User Information Requirements".

**Dennis L. Bricker**, Emeritus Professor; PhD, Northwestern University, l975. Areas of research interest include optimization algorithms, particularly for geometric programming, decomposition techniques and optimization with economies of scale. Recent publications include "Maximum Likelihood Estimates with Order Restrictions on Probabilities and Odds Ratios: A Geometric Programming Approach", "An Algorithm for Posynomial Geometric Programming, Based on Generalized Geometric Programming", "A Multiperiod Planning Model for the Capacitated Minimal Spanning Tree Problem", and "Genetic algorithms for reliability design problems."

**Yong Chen**, Assistant Professor; PhD, University of Michigan, 2003. Areas of research interest include maintenance decision making; process monitoring and diagnosis; reliability modeling and analysis; manufacturing system design.. Recent publications include "Cost-Variability-Sensitive Preventive Maintenance Considering Management Risk"., "Diagnosability Study of Multistage Manufacturing Processes Based on Linear Mixed-Effects Models", "Root Cause Identification for Quality Improvement of Multistage Machining Processes", "Quality and Reliability Information Integration for Design Evaluation of Fixture System Reliability".

**Gary W. Fischer**, Emeritus Professor; PhD, The University of Iowa, 1969. Areas of research interest include manufacturing processes, process planning and optimization, industrial process controls, industrial robot applications, and concurrent engineering. Registered professional engineer. Representative publications include: "A Knowledge-Based System Concept for Process Planning and Programming of Industrial Robots," "Definition of an Object-Oriented Concept for a Mechanical System Data Structure to Support Concurrent Engineering," "Process-Controlled Machining of Gray Cast Iron," and "A Knowledge-Based Approach to Process Selection and Planning Estimator."

**Nagi Gebraeel**, Assistant Professor; PhD, Purdue University, 2003. Areas of research interest include reliability, maintenance management, condition monitoring, replacement decision systems. Recent publications include: "Life Distributions from Component Degradation Signals; A Neural Net Approach", "Life Distributions from Component Degradation Signals: A Bayesian Approach", "Deadlock Detection, Prevention, and Avoidance for Automated Tool Sharing Systems in Flexible Manufacturing".

**Pavlo Krokhmal,** Assistant Professor, Ph.D., University of Florida, 2003. Areas of research interest include operations research, risk theory, stochastic optimization, financial engineering, and combinatorial optimization. Recent publications include "Asymptotic behavior of the expected optimal value of multidimensional assignment problem", "A sample path approach to optimal position liquidation", "Modeling and implementation of risk-averse preferences in stochastic programs using risk measures".

**Andrew Kusiak**, Professor; PhD, Polish Academy of Sciences, 1979. Areas of research interest include data mining, computational intelligence, evolutionary computation, decision making, and their applications in technology, medicine, and pharmaceutics. Recent publications include: "Data Mining in Semiconductor Industry", "Data Mining in Lung Cancer Diagnosis", "Quality

Engineering: A Computational Intelligence Approach", "Hypoplastic Left Heart Syndrome: Knowledge Discovery with an Enhanced Data Mining Approach", "Evolutionary Computation for Improvement of Energy Generation", and "Predicting Drug Interactions".

**John D. Lee**, Associate Professor, PhD, University of Illinois, 1992. Research interests include human interaction with automation, interface design, and modeling of human behavior. Recent publications include" "Trust, self-confidence, and operators' adaptation to automation", "Classes of maritime automation and implications for system design and training", "Speech-based interaction with in-vehicle computers: The effect of speech-based e-mail on drivers' attention to the roadway", and "Perceptual and cognitive aspects of Intelligent Transportation Systems (ITS)".

**John M. Liittschwager**, Emeritus Professor; M.S., Northwestern University, 1961. Special fields of knowledge include engineering management, optimization, quality control and reliability, and legislative districting. Professor Liittschwager's paper "Iowa" which appeared in the book, Redistricting in the States, is a classic paper concerning the use of computers in legislative and other districting problems.

**Peter J. O'Grady**, Professor; PhD, University of Nottingham, 1981. Areas of research interest include supply chain management, information systems, rapid prototyping and concurrent engineering. Recent articles include: "An Extended Kalman Filter for Collaborative Supply Chains", "Analyzing Large-Scale Imprecise Concurrent Engineering Systems", "Integrated Enterprise Concurrent Engineering: A Framework and Implementation" and "A Constrained Evolutionary Search Formalism for Remote Design with Modules".

**Thomas Schnell**, Associate Professor, PhD, Ohio University, 1998. Areas of research are human factors and ergonomics. Visual performance, eye scanning, human performance assessment and measurement, aviation research, synthetic and enhanced vision, simulator based and airborne flight testing, accident analyses, human perception and information processing, human sensory capabilities and limitations, industrial hygiene, digital computer simulation (traffic engineering or manufacturing), statistical analysis and modeling, designed experiment, questionnaire design, software and database design, intelligent systems (expert systems and neural networks), image processing and vision systems.

**J. Richard Simon**, Emeritus Professor; PhD, University of Wisconsin, l955. Special fields of knowledge include human engineering, industrial psychology, applied experimental psychology, and information processing.

**Geb W. Thomas**, Associate Professor and IE Program Coordinator; PhD, The Pennsylvania State University, 1996. Areas of research interest include telerobotics, virtual reality and human-machine interface. Recent articles include: "Analysis of science team activities during the 1999 Marsokhod Rover Field Experiment: Implications for automated planetary surface exploration" and "Design and Evaluation of a Dental Simulator with a Force Feedback Joystick".

**Industrial Engineering Faculty have published in:**

Accident Analysis and Prevention, Acta Psychologica, Annals of Operations Research, Applied Discrete Mathematics, Computers and Chemical Engineering; Cortex; Control and Cybernetics, Drug Development and Industrial Pharmacy; Engineering Costs and Production Economics, The Engineering Economist; Engineering Optimization, European Journal of Operations Research, Human Factors, Human Factors Transportation Journal; Image and Vision Computing, Industrial Engineering; IEEE Systems, Man, and Cybernetics; IEEE Transactions of Robotics and

Automation, IEEE Transactions on Software Engineering, International Journal of Man Machine Studies; International Journal of Material Flow, International Journal of Production Research; Institute of Industrial Engineers Transactions, Journal of Applied Psychology; Journal of Experimental Psychology; Journal of Forecasting, Journal of Intelligent Manufacturing, Journal of Gerontology; Journal of Manufacturing Systems, Journal of Pharmaceutical Sciences; Journal of Motor Behavior; Journal of Safety Research, Management Science; Mathematical Programming; Memory and Cognition; Modern Health Care; Naval Research Logistics, Omega; Operations Research; Perception and Psychophysics; Planning, Journal of Quality Technology, and Technometrics, Revue Francaise d'Automatique, d'Informatique et de Recherche Operationnelle, Robotica, SCIMA; Simulation; Technometrics; Terotechnica, Transportation Research; And International Journal of Industrial Engineering, Research in Engineering Design, and Presence.

## COURSES IN SPECIALIZATION AREAS

| Course | Title | Semester Offering | Reliability & Production Systems. | Human Factors | Operations Research |
|---|---|---|---|---|---|
| 56:131 | Manufacturing Systems | Spring | X | | |
| 56:132 | Introduction to Industrial Robotics | TBD | X | | |
| 56:134 | Process Engineering | Fall | X | | |
| 56:138 | Knowledge Discovery and Management | TBD | X | | |
| 56:144 | Human Factors | Fall | | F | |
| 56:147 | Ergonomics | Spring | | X | |
| 56:150 | Information Systems Design | Spring | X | | |
| 56:153 | Engineering Administration I | Fall | | X | |
| 56:162 | Quality Control | Spring | X | X | |
| 56:166 | Production Systems | Spring | | | X |
| 56:171 | Operations Research | Fall | | | F |
| 56:176 | Applied Linear Regression | Fall | | | X |
| 56:178 | Digital Systems Simulation | Fall | F | | |
| 56:181 | Internet Systems Design | TBD | X | | |
| 56:186 | Health Informatics I | Fall | X | | |
| | **200-level courses (Instructor)** | | | | |
| 56:235 | Computational Intelligence (Kusiak) | Spr (08, 10) | X | | |
| 56:238 | Evolutionary Computation (Kusiak) | Spr (07, 09) | X | | |
| 56:23x | Decision Making in Supply Chain Management Engineering (O'Grady) | Fall (06, 08) | X | | |
| 56:23x | Operational Issues in Supply Chain Management Engineering (O'Grady) | Fall (07, 09) | X | | |
| 56:27x | Reliability Theory II (Chen) | Spr (08, 10) | X | | |
| 56:27x | Reliability Theory I: Degradation Systems (Gabraeel) | Spr (08, 10) | X | | |
| 56:240 | Human Performance in Engineering Systems (Boyle) | Spr (08, 10) | | X | |
| 56:241 | Research Methods in Human Factors Engineering (Lee) | Spr (08, '10) | | X | |
| 56:242 | Human Computer Interaction (Thomas) | Fall (07, 09) | | X | |
| 56:243 | Modeling Operator Performance (Lee) | Spr (07, 09) | | X | |
| 56:244 | Human Factors in Transportation (Schnell) | Fall (07, 09) | | X | |
| 56:245 | Human Factors in Aviation (Schnell) | Fall (06, 08) | | X | |
| 56:246 | The Design of Virtual Environments (Thomas) | Fall (06, 08) | | X | |
| 56:24x | Analytical Methods in Human Factors Engineering (Boyle) | Spr (07, 09) | | X | |
| 56:270 | Linear Programming (same as 06K:286; Business School) | Fall | | | X |
| 56:271 | Nonlinear Programming (Chen) | Spr (07, 09) | | | X |
| 56:272 | Integer Programming and Network Flows same as (06K:287: Discrete Optimization; Business School) | Spring | | | X |
| 56:273 | Stochastic Systems (Gabraeel) | Spr (07, 09) | | | X |
| 56:27x | Stochastic Optimization (Krokhmal) | Fall (07, 09) | | | X |
| 56:27x | Game theory (Krokhmal) | Fall (08, 10) | | | X |

F-Fundamental courses- these courses or their equivalent are required for all PhD and MS students. This requirement will typically be satisfied by an undergraduate degree in Industrial Engineering.
The plan of study of each student will be reviewed at the beginning of each semester to assess whether course requirements are being fulfilled. One course in each of the three focus areas for MS and two courses in each for PhD, with an additional two courses in the students focus area.

## TITLES OF RECENT THESES AND DISSERTATIONS

Examples of graduate thesis and dissertation topics can be noted in the following listing:

A Network Based Methodology to Model Supply Chain Systems
A Data Envelopment Analysis-Based Framework for Strategic Group Analysis: Empirical Investigation in the Hospital Industry
Remote Collaborative Product Development in a Product Development Chain
Perceived Urgency and Perceived Annoyance of In-Vehicle Auditory Warning Signals
CAD Based Optimization of Gas Metal Arc Welding Process Parameters for Sheetmetal Components
Stimergy-Based Control Systems for Multi-Robot Systems
Customer-Centric E-Optimization of a Supply Web
Evaluation of Traffic Flow Analysis Tools Applied to Work Zones Based on Flow Data Collected in the Field
Examining Sonification as a Means to Improve Supervisory Control in Multi-Agent Systems
Dynamic Simulator for Clinical Breast Examination Training
Incorporating Learning Classifier Systems to Improve Dispatching-Rule Selection for Production Scheduling
A Formulation for Product Development and Deployment Systems Design
Remote Collaborative Product Development in a Product Development Chain
Development and Evaluation of Two Paradigms for Position Estimation in Multi-Robot Teams
Force Patterns Applied During Dental Exams
Enhancing Nighttime Pavement Marking Visibility for Older Drivers
Internet-Based Data Exchange: Devise a Mapping Mechanism for Data Exchange Between Distributed Databases Over the Internet Using XML
Internet-Based Supply Chain Infrastructure for a Virtual Enterprise: Integrating Information Sharing and Decision Making
An Interval Analysis of Supply Chain Management for a Constraint-Based Genetic Algorithm
Use of Ergonomics Methods Application
Accuracy Analysis of Decision Processes
Motion Control Logic for Large Excursion Driving Simulators
An Application of DEA to Assess Performance of the Dominican Republic Public School Districts Use of Ergonomic Methods in an Engineering Environment
Design With Objects: An Approach to Object-Oriented Design
A Resource Consumption Model (RCM) for Process Design
Integrated Machining Cost Calculations for Process Planning in CAD/CAM.
Dependency Analysis in Constraint-Based Design
A Comparative Study of the Effects of Two Types of Intraocular Lens Implant on the Driving Abilities of Elderly Subjects
A Concurrent Engineering Evaluation and Optimization Process
Back-Propagation Neural Network for Machining Process Planning and Control
An Evaluation of Input Devices for Human-Computer Interaction: A Modification to Fitts' Law for Rapid-Aimed Movement
Determining Part Feature Sequencing in a Feature-Based Environment Using Genetic Algorithms.

A Hybrid Intelligent System for Process Modeling and Control Using a Neural Network and a Genetic Algorithm

Modularity in Design of Products and Testing

Proactive Driving Safety Evaluation: An Evaluation of an Automated Traveler Information System and Investigation of Hazard Analysis Data

Quantitative Analysis of Manufacturing, Product Development and Business Processes

Tool Wear and Surface Roughness Forecasting Using Neuro-Regression.

Unalerted Emergency Avoidance at an Intersection and Possible Implications for ABS Implementation.

Generation Expansion Planning Using Benders' Decomposition and Generalized Networks.

Districting with Parallel Processing.

Information Content and Format Recommendations for Automotive Head-Up Display.

Design of Components and Manufacturing Systems for Agility.

Freeway Incident Detection Using Artificial Neural Networks.

Resource Constrained Scheduling of Design Activities

Two Models for Workforce Scheduling Problems.

Design of Tolerances in Agile Manufacturing.

Assignment of Priorities to Machines of Multiple Repair Stages with A Single Service Facility.

Optimal Inspection Plans Satisfying Bounds on Misclassification Errors.

A Lagrangian Heuristic Algorithm for the Process Plan Selection Problem in Manufacturing.

Sequencing Conditions in a Human Factors Experiment to Control the Repetition Effect.

Integrated Approach for Solving the Layout Design Problem.

Infeasible Path-Following Algorithms for Convex Quadratic Programming.

Artificial Neural-Network-Based Feature Recognition and Grammar Based Feature Extraction to Integrate Design and Manufacturing.

Just-In-Time Manufacturing--A Metamodeling Approach.

Optimal Solution of Job Shop Scheduling Problems--A New Network Flow Approach.

Intelligent Manufacturing Process Design.

Investigation of Path-Following Algorithms for Signomial Geometric Programming Problems.

Intelligent GMAW Process Control System: An Application of Artificial Neural Network, Fuzzy Inference, and Expert System Technologies.

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**THE UNIVERSITY OF IOWA NONDISCRIMINATION STATEMENT**

The University of Iowa does not discriminate in its educational programs and activities on the basis of race, national origin, color, religion, sex, age, or disability. The University also affirms its commitment to providing equal opportunities and equal access to University facilities without reference to affectional or associational preference. For additional information on nondiscrimination policies, contact the Coordinator of Title IX and Section 504 in the Office of Affirmative Action, telephone (319) 335-0705, 202 Jessup Hall, The University of Iowa, Iowa City, Iowa 52242-1316.

## APPENDIX I: REVIEW PROCEDURES OF ACADEMIC DISMISSAL

This policy pertains to the review procedures which are to be followed in the event that a student dismissed from a graduate program for academic reasons other than academic misconduct requests a formal review of her/his dismissal. The procedure outlined below is in accordance with Section IV [paragraph D] of the Manual of Rules and Regulations of the Graduate College, [1983].

The procedure for academic dismissal review in all circumstances other than those resulting from academic misconduct is as follows:

1. Prior to the formal initiation of the academic dismissal review process a student should discuss her/his grievances with the Department Chair in an attempt to resolve such grievances informally.
2. If the student continues to feel her/his dismissal is unwarranted and cannot be resolved through the discussion provided for in 1 above, the student shall forward a written request for review of her/his dismissal to the Department Chair. The letter should outline the grievances in reasonable detail. In addition, the student should choose two graduate faculty members and one graduate student (from those eligible to serve on such committees; see item 3 below), to form a review committee.
3. Any faculty member in the Department of Mechanical and Industrial Engineering or any Industrial Engineering graduate student with at least 15 semester hours graduate credit earned at The University of Iowa may be requested to serve as a member of an academic dismissal review committee.
4. The Department Chair shall designate a chair of the review committee from those committee members identified by the student.
5. The review committee chair shall convene the committee as soon as possible. Normally it is expected that the review process will be completed within two weeks of its formal initiation by the student.
6. The student requesting the review shall have the opportunity to discuss the grievances directly with the committee and provide any supporting material relevant to the review.
7. The review committee shall then determine what additional information or consultation is necessary to complete their review.
8. Upon review of relevant information, the review committee shall communicate their findings and recommendations in writing to the student and the Department Chair. The committee's report should include the major considerations leading to the decision.
9. Final decision will be made by the Department Chair, after giving due consideration to the Committee's report.
10. If the student is dissatisfied with the decision by the Departmental Chair, he or she may elect to pursue further action through the Graduate College in accordance with the procedures of the Graduate College.