Edward P. Fitts Department of Industrial and Systems Engineering

Overview of Programs

https://youtu.be/yt8yx-wWOQw

Degree Programs

- Industrial and Systems Engineering
  - Master of Industrial Engineering (MIE)
  - Master of Science (MSIE)
  - Doctor of Philosophy (PhD-IE)
- Engineering Management
  - Master of Engineering Management (MEM)
- Integrated Manufacturing Systems
  - Master of Integrated Manufacturing Systems (MIMSE)
- Operations Research
  - Master of Operations Research (MOR)
  - Master of Science (MSOR)
  - Doctor of Philosophy (PhD-OR)

Student Population

Degree	ISE	OR	MEM	IMSEI	Total
Undergrad	307	-	-	-	307
Master (Non-Thesis)	70	8	140	31	249
Master (Thesis)	10	7	-	-	17
PhD	63	37	-	-	100
Total	450	52	140	31	673

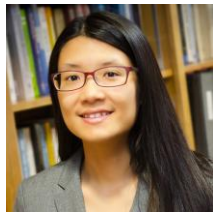
ISE Departmental Overview

- Research and Coursework Areas
  - Systems Analytics and Optimization
    - Data Analytics, Discrete Optimization, Stochastic Optimization, Simulation
  - Supply Chain and Logistics
    - Production, Inventory Control, Supply Chain Logistics Engineering, Sustainable Systems
  - Advanced Manufacturing
    - Additive Manufacturing, Bio Manufacturing, Nano-Manufacturing
  - Human Factors
    - Ergonomics, Virtual Reality, Occupational Safety, Biomechanics

Faculty

S. Ahiska King

K. Chen

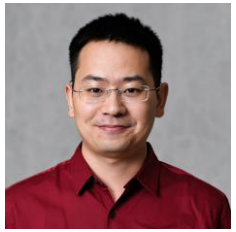


J. Dong

A. Escobedo

S.C Fang

X. Fang



Y. Fathi

L. Hajibabai

O. Harrysson

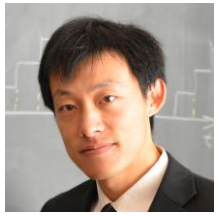
M. Kay

J. Kern

R. King

YS Lee

Y Liu



F. Livingston

L. Martin-Vega

M. Mayorga

B. McConnell

N. Ozaltin

O. Ozaltin

B. Rachunok

K. Reynolds

C. Rock

S. Shasshani

R. Shirwaiker

J. Swann

R. Uzsoy

H. Wan

H. West

X. Xu

Degree Requirements

MIE Degree Requirements

- A **minimum** of **30** credit hours, of which ≥21 hours must be in Industrial and Systems Engineering.
- At least **24** hours must be at the 500 level or above.
- At least one (1) 700 or 800 level ISE course
- Project work for the degree is optional; up to **three (3)** hours of credit for ISE 637 or 677 may be allowed toward the degree. Requires a faculty member approval.
- Breadth Requirement - 1 course from 4 of the 5 breadth requirement groups (Groups A – E) **plus** 1 course from Group F for a total of 15 credit hours.
- There is no minor. But you may elect a concentration from another department.

Masters Breadth Coursework

Group A – Economic & Decision Analysis

- Applied Engineering Economics
- Database Applications in ISE
- Python Programming for Industrial and Systems Engineers
- Financial Mathematics

Group B – Human Factors & Ergonomics

- Human Factors in Systems Design
- Occupational Safety Engineering
- Occupational Biomechanics
- Systems Safety Engineering
- Human Information Processing

Masters Breadth Coursework

Group C – Manufacturing Systems

- Manufacturing Process Engineering
- Fundamentals of AM
- BioMed Design and Mfg
- Automated Systems Engineering
- Micro/Nano-Scale Fabrication and Manufacturing
- Advanced Metal Additive Mfg

Group D – Supply Chain and Logistics

- Design and Control of Production and Logistics Systems
- Modeling and Analysis of Supply Chains
- Quality Engineering
- Logistics Engineering

Masters Breadth Coursework

Group E – Systems Analytics and Optimization

- Introduction to OR
- Introduction to Mathematical Programming
- Linear Programming
- Stat Models for Sys Analytics
- Stochastic Models in ISE
- Simulation Modeling
- Support Vector Machines
- Reinforcement Learning
- High Dimensional Data Analytics

Group F – Computer Science, Mathematics, and Statistics

- E-Commerce Technology
- Artificial Intelligence I
- Computer Networks
- Database Management Systems
- Linear Algebra
- Numerical Analysis I
- Experimental Statistics for Engineers I
- Experimental Statistics for Engineers II
- Design of Experiments

MSIE Degree Requirements

- A **minimum** of 30 credit hours is required (Duration Typically 4 semesters)
- At least 24 hours of the 30 must be coursework and at least 3 credit hours of thesis research (ISE 695) is required (6 hours maximum)
- At least one (1) 700 or 800 level ISE course, exclusive of thesis credit
- Breadth Requirement - 1 course from 3 of the 5 breadth requirement groups (Groups A – E) **plus** 1 course from Group F
- A minor
  - 3 courses from outside the department
  - May be constituted from a single area of concentration or carry a coherent, interdisciplinary theme
  - Must be supportive of your major area of specialization.
- Thesis
  - A research advisory committee of three faculty
  - Written (archival) document
  - Oral Defense

PhD Degree Requirements
Coursework and Credit Hours

- Minimum credit hours
  - With a related master's degree – 54 hours
  - Without a related master's degree – 72 hours
- A course from each PhD Breadth Area (Advanced Manufacturing, Human Factors, Supply Chain and Logistics, Systems Analytics and Optimization)
- A minor
  - 5 courses outside the department
  - May either be constituted from a single area of concentration or carry a coherent, interdisciplinary theme
  - Must be supportive of your major area of specialization.
- Your doctoral committee and the DGP must approve all coursework

PhD Degree Requirements
Events to Completion

Prequalifying

- Take coursework to prepare for Qualifying Exam and to fulfill (some of) the degree requirements
- Investigate research topics and identify faculty to work with
- Pass the PhD Qualifying Exam

PhD Qualifying Exam

- Area-based Exams
  - Manufacturing Systems
  - Human Systems
  - Supply Chain and Logistics
  - Systems Analytics and Optimization

Combined

- Sit for selected exam in August
- Two attempts to pass

Advanced Manufacturing Area Exam

- **Courses:** Take at least 1 approved course in 3 out of 4 sub-areas below:
  - Additive Mfg:
  - Biomedical Mfg:
  - Automation:
  - Micro-Nano Mfg:
- **Exam format:** 3-day take-home exam
  - Students will provide answers to multiple questions related to the above sub-areas. The questions will test the ability of students to: Conduct literature review on a state-of-the-art product/process/system/method; Develop a hypothesis and a testing plan; Analyze an advanced manufacturing problem and develop a systematic approach with the appropriate sets of tools to solve it; and Propose expected outcomes and describe implications.
  - Oral Exam based on take-home
- **Assessment:** Responses will be assessed first by the faculty that developed the specific questions, then collectively by the AM faculty group.

Human Factors and Ergonomics Area Exam

- **Courses:** The exam covers the following four topics/courses
  - Human Factors in Systems Design
  - Occupational Biomechanics
  - Advanced Topics in Human Systems
  - **Pick one** course (appropriate) Statistical Experimental Design
- **Exam format:** 5-day take-home exam and an oral exam.
  - The HFE faculty members each makes one essay question. The essay question is sent to the student at the beginning of the exam week, and the student has 5 days to respond. Each HSE faculty member assesses their respective essay question for quality.
  - Student does an oral presentation a within a week after submitting the essay answers.
- **Assessment:** Responses will be assessed first by the faculty that developed the questions, then collectively by the Human Factors and Ergonomics faculty group

SCL/SAO Area Exam

- **Courses:** There are five courses on which the content of the exam is based as follows:
  - All students are responsible for the content covered in **both**
    - Linear Programming
    - Applied Stochastic Models in Industrial Engineering
  - Each student must select to be examined on the content covered in **one** of the following:
    - Statistical Models for Systems Analytics in Industrial Engineering
    - Production Planning, Scheduling and Inventory Control
    - Logistics Engineering
- **Exam format:** The exam format in each content area is determined by the responsible faculty (typically the instructors of the most recent offering of each supporting course) and may be a 4-hour classroom exam or a take home exam with each exam being offered on separate days.
- **Assessment:** Responses will be assessed first by the faculty that develop the course exams, then collectively by the SAO/SCL faculty group.

PhD Degree Requirements: Events to Completion

Precandidacy

- **Officially** form a research advisory committee
  - At least 4 members with one representing your minor
  - File and have approved your POW by committee and DGP
- Pass the Preliminary Exam (Proposal)
  - Produce a proposal detailing your progress to-date and the specifics of your research plan. Distribute to your committee and apply to take the preliminary at least 2 weeks before the exam
  - Orally present and defend your research plan

PhD Degree Requirements: Events to Completion

Candidacy

- Complete your research
- Successfully defend your Dissertation
  - Produce a dissertation document. Distribute to your committee and apply for final exam at least 2 weeks before defense
  - Orally present and defend your dissertation
  - Complete any necessary changes to your dissertation document and Submit
- Get some new business cards!

Application Process

- Application form (online)
  http://www.ise.ncsu.edu/graduate/admissions.php
- Documents
  - Transcripts and Diploma
  - Reference letters (Academic primarily)
  - Statement of purpose
  - (INT'L Applicants) TOEFL, IELTS, or Duolingo scores
  - GRE scores
- Deadlines
  - Fall: June 25 (US) March 1 (Int'l)
  - Spring: Nov 25 July 15
- Priority Dates: by early January