

# INDUSTRIAL AND ENTERPRISE SYSTEMS ENGINEERING

<http://ise.illinois.edu>

Head of Department: Rakesh Nagi  
Associate Head for Graduate Studies: Ramavarapu S. Sreenivas  
117 Transportation Building  
104 South Mathews Avenue  
Urbana, IL 61801  
(217) 333-2731  
E-mail: [ise-grad@illinois.edu](mailto:ise-grad@illinois.edu)

Major: Industrial Engineering  
Degrees Offered: M.S., Ph.D.

Concentrations: Advanced Analytics (available to M.S. only),  
Computational Science and Engineering (M.S. and Ph.D.)

Major: Systems and Entrepreneurial Engineering  
Degrees Offered: M.S., Ph.D.

Concentrations: Computational Science and Engineering (M.S. and Ph.D.)

Joint Degree Program: Master of Science in Industrial Engineering  
or Systems and Entrepreneurial Engineering and Master of Business  
Administration ([http://catalog.illinois.edu/graduate/graduate-majors/  
bus-admin-mba](http://catalog.illinois.edu/graduate/graduate-majors/bus-admin-mba))  
Degrees Offered: M.S. and M.B.A.

Medical Scholars Program: Doctor of Philosophy (Ph.D.) in Industrial  
Engineering or Systems and Entrepreneurial Engineering and Doctor  
of Medicine (M.D.) through the Medical Scholars Program ([https://  
www.med.illinois.edu/mdphd](https://www.med.illinois.edu/mdphd))

## Graduate Degree Programs

The Department of Industrial and Enterprise Systems Engineering (ISE) offers graduate study leading to master's and doctoral degrees in Industrial Engineering (IE) and Systems and Entrepreneurial Engineering (SEE). The program offers an approach to industrial engineering and systems engineering, engineering design, and entrepreneurial engineering that crosses disciplinary lines. The IE program is based in advanced studies that focus on operations research, optimization, supply chain management, financial engineering, quality and reliability engineering and production management, with the aim to advance modeling, simulation, analysis and decision making for complex engineering and economic systems. The SEE program is founded on the premise of dual competency in both traditional engineering and systems integration. The SEE program offers flexibility by permitting the student to select from a menu of advanced courses and take a wide range of electives to meet individual career goals. Graduates of these programs are prepared to enter academic and professional engineering positions in universities, industry, government, and private practice. Opportunity also exists for students to complete a(n):

1. Computational Science and Engineering (CSE) Concentration (M.S. and Ph.D.)
2. Energy and Sustainability Engineering (EaSE) Certificate

3. Advanced Analytics in Industrial & Enterprise Systems Engineering Concentration (M.S. students in I.E.).

The Medical Scholars Program (<https://www.med.illinois.edu/mdphd>) permits highly qualified students to integrate the study of medicine with study for a graduate degree in a second discipline, including Industrial Engineering or Systems and Entrepreneurial Engineering.

The Department is a joint sponsor with the Department of Finance for the M.S. degree in Financial Engineering ([http://catalog.illinois.edu/  
graduate/graduate-majors/financial-eng](http://catalog.illinois.edu/graduate/graduate-majors/financial-eng)).

## Admission

Applicants who have completed degree requirements in an accredited engineering program or its equivalent are eligible to apply for admission. A minimum grade point average of 3.25 (A = 4.00) for the last two years of undergraduate study is required.

Scores on the Graduate Record Examination (GRE) (<http://www.ets.org>) general test are required of all applicants. Based upon the previous preparation of the student for either program, prerequisite courses may be specified by the advisor, but the credit may not be applied toward a degree.

All applicants whose native language is not English must submit a minimum TOEFL (<http://www.ets.org/toefl>) score of 103 (iBT), or 613 (PBT); or minimum International English Language Testing System (IELTS) (<http://www.ielts.org>) academic exam scores of 7.0 overall and 6.0 in all subsections. Applicants may be exempt from the TOEFL if certain criteria (<http://grad.illinois.edu/admissions/instructions/04c>) are met. Full admission status is granted for those meeting the minimum requirements and having taken the TOEFL or IELTS since the scores required for admission to ISE are above the minimum scores demonstrating an acceptable level of English language proficiency.

Applicants to the joint M.B.A. degree program must meet the admissions standards for both programs and be accepted by both programs.

Students may apply to the Medical Scholars Program prior to beginning graduate school or while in the graduate program. Applicants to the Medical Scholars Program must meet the admissions standards for and be accepted into both Industrial and Enterprise Systems Engineering and the College of Medicine. The application to the Medical Scholars Program will also serve as the application to the Industrial and Enterprise Systems Engineering graduate program. Further information on this program is available by contacting the Medical Scholars Program (125 Medical Sciences Building, (217)-333-8146, [mospo@illinois.edu](mailto:mospo@illinois.edu)).

## Medical Scholars Program

Students in the Medical Scholars program must meet the specific requirements for both the medical (<https://www.med.illinois.edu/mdphd>) and graduate degrees. On average, students take eight years to complete both degrees. The first year of the combined program is typically spent meeting requirements of the Industrial or Systems and Entrepreneurial Engineering graduate degree.

## Faculty Research Interests

Faculty research by ISE faculty is pursued in the following fields:

- computer-aided design
- data analytics
- optimization

- design systems
- manufacturing systems
- nondestructive testing and evaluation
- system dynamics and simulation
- control
- robotics
- real-time decision making
- reliability
- financial engineering
- operations research/management science
- biomechanics

In ISE, research is conducted in operations research, production engineering, quality and reliability engineering, supply chain and logistics, transportation, financial engineering, and business analytics. Study in the areas of cognitive engineering, computer-aided manufacturing, ergonomics, facilities planning, human-machine interaction, large-scale systems analysis, machine tool systems design, mathematical programming and optimization, production planning and control, and project management is aimed at improving the design and implementation of integrated systems of persons, materials, planning, and equipment.

## Facilities and Resources

Members of the ISE Department have access to a wide range of excellent research facilities. These laboratories support a wide range of activity and are described at the department's research laboratories Web site (<http://ise.illinois.edu/research/ise-labs>).

## Financial Aid

Qualified students may compete for financial assistance in the form of teaching/graduate/research assistantships, fellowships, grants, and tuition waiver scholarships. Under certain conditions, fellowships may be augmented by part-time assistantships. All applicants, regardless of U.S. citizenship, whose native language is not English and who wish to be considered for teaching assistantships must demonstrate spoken English language proficiency (<http://grad.illinois.edu/admissions/taengprof.htm>) by achieving a minimum score of 24 on the speaking subsection of the TOEFL iBT or 8 on the speaking subsection of the IELTS. For students who are unable to take the iBT or IELTS, a minimum score of 4CP is required on the English Proficiency Interview ([http://cte.illinois.edu/testing/oral\\_eng/epi\\_overview.html](http://cte.illinois.edu/testing/oral_eng/epi_overview.html)) (EPI), offered on campus. All new teaching assistants are required to participate in the Graduate Academy for College Teaching (<http://citl.illinois.edu/professional-development/ta-orientation>) conducted prior to the start of the semester.

- Master of Science in Industrial Engineering (<http://catalog.illinois.edu/graduate/graduate-majors/iese/ms-indust-eng>)
- Master of Science in Systems and Entrepreneurial Engineering (<http://catalog.illinois.edu/graduate/graduate-majors/iese/ms-systems-entre-eng>)
- Doctor of Philosophy in Industrial Engineering (<http://catalog.illinois.edu/graduate/graduate-majors/iese/dr-philo-indust-eng>)
- Doctor of Philosophy in Systems and Entrepreneurial Engineering (<http://catalog.illinois.edu/graduate/graduate-majors/iese/dr-philo-entre-eng>)

## Joint M.B.A. Program

Students in this unit may choose to earn their major degree and simultaneously complete an M.B.A., with 12 fewer required hours than when pursuing both degrees independently. Students must be enrolled in the M.B.A. program for three terms and complete all the requirements of their primary degree. Interested students should see the joint program requirements (<http://catalog.illinois.edu/graduate/graduate-majors/bus-admin-mba/master-ba-fulltime>) and contact the M.B.A. program and their major department office for more information.

## Advanced Analytics in Industrial & Enterprise Systems Engineering

The Advanced Analytics in Industrial & Enterprise Systems Engineering Concentration prepares students to relate the application of engineering approaches and methods to the analysis and management of engineering and business processes which are data-oriented. Students will be able to provide companies and organizations with the ability to convert the massive amounts of data received into useful information that can help shape the decisions companies and organizations make. Students must be enrolled in the Industrial Engineering MS (thesis or non-thesis) degree program.

This concentration requires students to earn a B or better in each concentration course and complete a minimum of 12 credit hours in topics of advanced analytics. The 12 hours may be used toward the major degree requirements. Students in the Advanced Analytics in Industrial & Enterprise Systems Engineering Concentration must complete 8 hours from the Advanced Analytics Core Course List and 4 hours from the Advanced Analytics Secondary Course List or may choose an additional 4 hours from the Core Course List.

### Current course options:

<b>Advanced Analytics Core:</b>		<b>8</b>
IE 528	Computing for Data Analytics	
IE 529	Stats of Big Data & Clustering	
IE 530	Optimization for Data Analytics	
IE 531	Algorithms for Data Analytics	
IE 532	Analysis of Network Data	
IE 533	Big Graphs and Social Networks	
<b>Advanced Analytics Secondary:<sup>1</sup></b>		<b>4</b>
IE 400	Design & Anlys of Experiments	
IE 410	Stochastic Processes & Applic	
IE 411	Optimization of Large Systems	
IE 510	Applied Nonlinear Programming	
IE 511	Integer Programming	
IE 521	Convex Optimization	

<sup>1</sup> Complete 4 hours from the Advanced Analytics Secondary Course List or choose an additional 4 hours from the Advanced Analytics Core Course List.