



Proposal to the Senate Educational Policy Committee

PROPOSAL TITLE: Change course requirements in the undergraduate Industrial Engineering curriculum in the Department of Industrial and Enterprise Systems Engineering; (i) include IE 370 as a requirement; (ii) change IE 360 from an elective option to a requirement; (iii) change IE 361 from an elective option to a requirement; (iv) change IE 400 from an elective option to a requirement; (v) increase the credit hours for SE 261 from 1 to 2 hours; (vi) remove IE 410 from a requirement to an elective option which is appropriate for students preparing for graduate school; (vii) remove 3 hours of Technical Elective from required coursework; (viii) remove Engineering Science Elective from required coursework; (ix) remove IE 311 from required coursework. These changes were approved by the ISE Courses and Curriculum Committee on 2016-11-03 and approved by vote in faculty meeting on 2016-12-02

SPONSOR: Professor Rakesh Nagi, ISE Department Head, (217) 244-3848, nagi@illinois.edu

COLLEGE CONTACT: Umberto Ravaioli, Interim Associate Dean for Undergraduate Programs and Professor in Electrical and Computer Engineering, College of Engineering (217) 333-2280, ravaioli@illinois.edu.

BRIEF DESCRIPTION:

IE 370 **Stochastic Processes and Applications (3 credits):** Industrial Engineering students in the Industrial and Enterprise Systems Engineering Department previously took IE 410 (3cr) as a required, stochastics course. The IE 410 course is an advanced stochastics course, which is more appropriate for graduate students and undergraduates preparing for graduate school. The IE 370 course is more appropriate for undergraduate students.

IE 360 **Facilities Planning and Design (3 credits):** Industrial Engineering students in the Department of Industrial and Enterprise Systems Engineering Department have the option to take this as an elective. ISE proposes to explicitly require Industrial Engineering students to take this course instead of using it as an elective option as it meets industry standards and expectations.

IE 361 **Production Planning & Control (3 credits):** Industrial Engineering students in the Department of Industrial and Enterprise Systems Engineering Department have the option to take this as an elective. ISE proposes to explicitly require Industrial Engineering students to take this course instead of using it as an elective option as it meets industry standards and expectations.

IE 400 **Design & Anlys of Experiments (3 credits)**: Industrial Engineering students in the Department of Industrial and Enterprise Systems Engineering Department have the option to take this as an elective. ISE proposes to explicitly require Industrial Engineering students to take this course instead of using it as an elective option as it meets industry standards and expectations.

SE 261 **Business Side of Engineering (2 credits for IE students proposed)**: Industrial Engineering students in the Department of Industrial and Enterprise Systems Engineering Department have to take IE 430 (3cr) as a required course. ISE proposes to increase the hours in SE 261, which will replace IE 430. By increasing contact hours, the SE 261 course can cover the required topics currently taught in IE 430.

IE 410 **Stochastic Processes & Applic (3 credits for undergraduates)**: Industrial Engineering students in the Department of Industrial and Enterprise Systems Engineering Department currently take IE 410 (3cr) as a requirement. ISE proposes that undergraduate students interested in advanced topics and preparing for graduate studies will enroll in the course.

Technical Elective (3 credits each): Industrial Engineering students in the Department of Industrial and Enterprise Systems Engineering Department currently take two, technical elective courses totaling 6 hours. ISE proposes to remove one technical elective course to allow students to take IE 360.

Engineering Science Elective (3 credits): Industrial Engineering students in the Department of Industrial and Enterprise Systems Engineering Department currently take one Engineering Science course elective. ISE proposes to remove the engineering science elective course to allow students to take IE 361.

IE 311 **Operations Research Lab (1 credit)**: Industrial Engineering students in the Department of Industrial and Enterprise Systems Engineering Department currently take IE 311 (1cr). ISE proposes to remove the 1-hour requirement in order to teach more content within SE 261. The IE 311 course duplicates material already covered within the IE 310 course.

JUSTIFICATION: The Department of Industrial and Enterprise Systems Engineering is not currently in step with modern engineering practice and industry expectations. This curriculum change proposal will allow ISE to meet industry standards and better prepare its students. This curricular change will allow ISE to rely more on its own teaching capacity rather than depending upon other departments.

The proposed curriculum changes will cause us to be more aligned to our peer institutions that the Department of Industrial and Enterprise Systems Engineering is compared to when students are making their college selections. By comparison, the Industrial Engineering curriculum in the Department of Industrial and Enterprise Systems Engineering offers an average of 15 fewer Industrial Engineering core courses than five peer institutions

BUDGETARY AND STAFF IMPLICATIONS: *(Please respond to each of the following questions.)*

1) Resources

a. How does the unit intend to financially support this proposal?

ISE already offers these courses to the Industrial Engineering students and does not anticipate any increase in required support for the increase in enrollment.

- b. How will the unit create capacity or surplus to appropriately resource this program? If applicable, what functions or programs will the unit no longer support to create capacity?

First, a number of these elective courses are already being offered, so making them required is not going to demand additional teaching capacity.

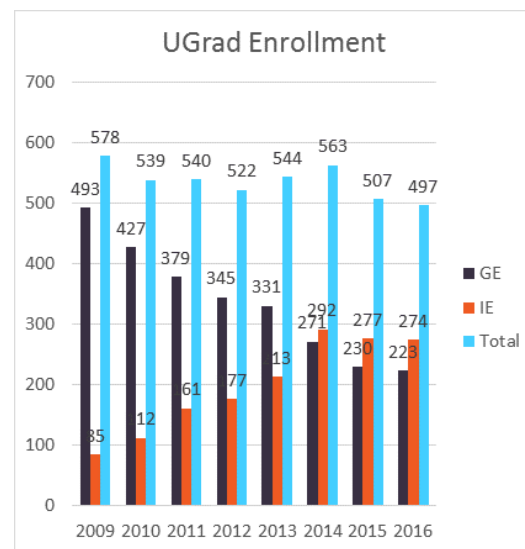
Furthermore, ISE faculty size is scheduled to grow to 35 (from a current size of 27). Between the increased teaching capacity and slightly larger courses, we should be able to accommodate the expected enrollment (see Figure below).

- c. Will the unit need to seek campus or other external resources? If so, please provide a summary of the sources and an indication of the approved support.

ISE does not need additional campus or other external resources to make the present changes.

- d. Please provide a letter of acknowledgment from the college that outlines the financial arrangements for the proposed program.

No financial arrangements are required.



2) Resource Implications

- a. Please address the impact on faculty resources including the changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc.

These changes pose no additional impact on the faculty resources.

- b. Please address the impact on course enrollment in other units and provide an explanation of discussions with representatives of those units. (A letter of acknowledgment from units impacted should be included.)

IE students will not need to take engineering science elective courses in other departments. The majority of IE students were taking courses within the ISE

Department to fulfill this requirement so other departments should notice very little change.

- c. Please address the impact on the University Library

There is no foreseen impact to the University Library.

- d. Please address the impact on technology and space (e.g. computer use, laboratory use, equipment, etc.)

The proposed changes would not impact technology but the courses may require a larger space due to higher enrollments.

For new degree programs only:

- 3) Briefly describe how this program will support the University's mission, focus, and/or current priorities. Include specific objectives and measurable outcomes that demonstrate the program's consistency with and centrality to that mission.
- 4) Please provide an analysis of the market demand for this degree program. What market indicators are driving this proposal? What type of employment outlook should these graduates expect? What resources will be provided to assist students with job placement?
- 5) If this is a proposed graduate program, please discuss the programs intended use of waivers. If the program is dependent on waivers, how will the unit compensate for lost tuition revenue?

DESIRED EFFECTIVE DATE: Fall 2018

STATEMENT FOR PROGRAMS OF STUDY CATALOG:

For the Degree of Bachelor of Science in Industrial Engineering

Industrial Engineering is a discipline that encompasses the analysis, development, improvement, implementation, and evaluation of integrated systems and their components, including materials, information, energy, people, money, time, equipment, and associated processes. Industrial Engineering draws upon a variety of disciplines, from mathematics to psychology, from communications to computer science, and from production management to process control. Industrial engineers design efficient, productive systems in a wide range of business, industrial, and governmental settings.

The technical portion of the Industrial Engineering curriculum is designed as a sequence of increasingly specialized experiences. The entering student's first year is spent mastering the basics of science: math, chemistry, and physics. Second-year students begin to take fundamental engineering courses such as statics, dynamics, statistics, and

strength of materials. Third-year students take a core of Industrial Engineering courses and begin their chosen area of specialization in one of five tracks, including: Operations Research; Quality Engineering; Supply Chain, Manufacturing, and Logistics; Economics and Finance; and Industrial Engineering Fundamentals. Finally, all students participate in the practice of engineering through the capstone Senior Design course in which they work in teams to solve problems submitted by industry partnering companies, and present their solutions in reports and presentations supported by complete economic analyses. Engineering design, communication, teamwork, and laboratory experiences are integrated throughout all four years of the curriculum.

A combined B.S.-M.S. Industrial Engineering degree program is available. Its admission and course requirements are described in the [College of Engineering program information section](#).

Overview of Curricular Requirements

The curriculum requires 128 hours for graduation and is organized as shown below. Technical grade point average requirements for graduation and advanced-level course registration apply to students in this curriculum. These rules are summarized at the College of Engineering's [Undergraduate Advising Website](#).

Note: the TGPA rules for this curriculum are under review and if changed, will be reflected as the Website indicated.

Orientation and Professional Development

These courses introduce the opportunities and resources your college, department, and curriculum can offer you as you work to achieve your career goals. They also provide the skills to work effectively and successfully in the engineering profession.

Course List		
Code	Title	Hours
ENG 100	Engineering Orientation ¹	0
SE 100	Introduction to ISE ¹	1
SE 390	General Engineering Seminar	0
Total Hours		1

¹ External transfer students take [ENG 300](#) instead.

Foundational Mathematics and Science

These courses stress the basic mathematical and scientific principles upon which the engineering discipline is based.

Course List		
Code	Title	Hours
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
MATH 221	Calculus I ¹	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 285	Intro Differential Equations	3
MATH 415	Applied Linear Algebra	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
Total Hours		31

¹ [MATH 220](#) may be substituted, with four of the five credit hours applying toward the degree. [MATH 220](#) is appropriate for students with no background in calculus.

Industrial Engineering Technical Core

These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of Industrial Engineering.

Course List		
Code	Title	Hours
CS 101	Intro Computing: Engrg & Sci	3
ECE 110	Introduction to Electronics	3
SE 101	Engineering Graphics & Design	3
SE 261	Business Side of Engineering	2
SE 494	Senior Engineering Project I	3
SE 495	Senior Engineering Project II	2
IE 300	Analysis of Data	3
IE 310	Operations Research	3
IE 360	Facilities Planning and Design	3
IE 361	Production Planning & Control	3
IE 370	Stochastic Processes & Applic	3
IE 400	Design & Anlys of Experiments	3
IE 413	Simulation	3
ME 330	Engineering Materials	4
TAM 211	Statics	3
TAM 212	Introductory Dynamics	3

Course List		
Code	Title	Hours
TAM 251	Introductory Solid Mechanics	3
Total Hours		50

Track Option Electives

These courses enable the student to tailor his or her studies to one's interests and career goals in the major sub-disciplines of Industrial Engineering.

Course List		
Code	Title	Hours
Track option electives. Courses selected from departmentally approved lists of Track Option Electives or by petition to the department. The current Track options include:		12
Industrial Engineering Fundamentals (IEF)		
Operations Research (OR)		
Quality Engineering (QE)		
Supply Chain, Manufacturing and Logistics (SC&L)		
Economics and Finance (E&F)		

Technical Electives

These courses augment and strengthen the rigorous analysis and design principles practiced in the major sub-disciplines of Industrial Engineering.

Course List		
Code	Title	Hours
Computer Science elective selected from the departmentally approved list of Computer Science Electives.		3
IE Technical Elective selected from the departmentally approved list of IE Technical Electives.		3
Total Hours		6

Liberal Education

The [liberal education courses](#) develop students' understanding of human culture and society, build skills of inquiry and critical thinking, and lay a foundation for civic engagement and lifelong learning.

Course List

Code	Title	Hours
ECON 102	Microeconomic Principles	3
or ECON 103	Macroeconomic Principles	
Electives from the campus General Education Social and Behavioral Sciences list.		3
Electives from the campus General Education Humanities and the Arts list.		6
Electives either from a list approved by the college, or from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts.		6
Total Hours		18

Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course and (ii) one non-western/U.S. minority culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy these cultural studies requirements. Courses from the western and non-western lists that fall into free electives or other categories may also be used satisfy the cultural studies requirements.

Composition

These courses teach fundamentals of expository writing.

Course List

Code	Title	Hours
RHET 105	Writing and Research	4
Advanced Composition (satisfied by completing the combination SE 494 + SE 495 in the Industrial Engineering Technical Core)		
Total Hours		4

Free Electives

These unrestricted electives, subject to certain exceptions as noted at the [College of Engineering Advising Website](#), give the student the opportunity to explore any intellectual area of unique interest. This freedom plays a critical role in helping students to define research specialties or to complete minors.

Course List

Code	Title	Hours
Free electives. Additional unrestricted course work, subject to certain exceptions as noted at the College of Engineering advising Web site, so that there are at least 6 128 credit hours earned toward the degree.		

Suggested Sequence

The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course credit already earned and who intends to graduate in four years. Each individual's case may vary, but the position of required named courses is generally indicative of the order in which they should be taken.

First Year		
	First Semester	Hours
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
SE 101 or RHET 105 ¹	Engineering Graphics Design	3-4
MATH 221 ²	Calculus I	4
	Liberal education elective ³	3
ENG 100	Engineering Orientation	0
SE 100	Introduction to ISE	1
	Semester Hours	15-16
Second Semester		
PHYS 211	University Physics: Mechanics	4
CS 101	Intro Computing: Engrg Sci	3
MATH 231	Calculus II	3
ECE 110	Introduction to Electronics	3
RHET 105 or SE 101 ¹	Writing and Research	4-3
	Semester Hours	17-16
Second Year		
First Semester		
PHYS 212	University Physics: Elec Mag	4
TAM 211	Statics	3
SE 261	Business Side of Engineering	2
MATH 241	Calculus III	4
	Liberal education elective ³	3
	Semester Hours	16
Second Semester		
IE 300	Analysis of Data	3
MATH 285	Intro Differential Equations	3
PHYS 213	Univ Physics: Thermal Physics	2
TAM 212	Introductory Dynamics	3
TAM 251	Introductory Solid Mechanics	3
SE 390	General Engineering Seminar	0

Liberal education elective ³		3
	Semester Hours	17
Third Year		
First Semester		
IE 310	Operations Research	3
IE 361	Production Planning & Control	3
MATH 415	Applied Linear Algebra	3
ME 330	Engineering Materials	4
Liberal education elective ³		3
	Semester Hours	16
Second Semester		
IE technical elective ⁶		3
IE 360	Facilities Planning & Design	3
IE 370	Stochastic Processes & Applic	3
Track option electives ⁴		6
	Semester Hours	15
Fourth Year		
First Semester		
IE 400	Design & Anlys of Experiments	3
SE 494 & SE 495 ⁸	Senior Engineering Project I	5-6
OR		
Free electives		
Computer Science elective		3
Track option elective ⁴		3
Liberal education elective ³		3
	Semester Hours	17-15
Second Semester		
IE 413	Simulation	3
SE 494 & SE 495 ^{7,8}	Senior Engineering Project I	5-6
OR		
Free electives		
Track option elective ⁴		3
Liberal education elective ³		3
	Semester Hours	15-17
	Total Hours:	128

¹ [RHET 105](#) may be taken in the first or second semester of the first year as authorized. The alternative is [SE 101](#).

- ² [MATH 220](#) may be substituted, with four of the five credit hours applying toward the degree. [MATH 220](#) is appropriate for students with no background in calculus.
- ³ [Liberal education electives](#) must include 6 hours of social & behavioral sciences and 6 hours of humanities & the arts course work from the campus General Education lists. [ECON 102](#) or [ECON 103](#) must be one of the social & behavioral sciences courses, highly recommended before the fourth semester. The remaining 6 hours may be selected from a list maintained by the college, or additional course work from the campus General Education lists for social & behavioral sciences or humanities & the arts. Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course and (ii) one non-western/U.S. minority culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy these cultural studies requirements. Courses from the western and non-western lists that fall into free electives or other categories may also be used satisfy the cultural studies requirements.
- ⁴ Selected from the departmentally approved [lists of Track Option Electives](#) or by petition to the department.
- ⁵ Selected from the departmentally approved [list of Computer Science Electives](#)
- ⁶ Selected from the departmentally approved [list of IE Technical Electives](#)
- ⁷ [SE 494](#) and [SE 495](#) may be taken in the first or second semester of the fourth year as authorized. The alternative is a liberal education elective.
- ⁸ Combination satisfies the General Education Advanced Composition requirement.

CLEARANCES: (Clearances should include signatures and dates of approval. *These signatures must appear on a separate sheet. If multiple departments or colleges are sponsoring the proposal, please add the appropriate signature lines below.*)

Signatures:



September 19, 2017

Rakesh Nagi
Unit Representative:

Date:



9-19-2017

College Representative:

Date:

Graduate College Representative:

Date:

Council on Teacher Education Representative:

Date:

Appendix A:
(Proposed Curriculum Revisions)
(Replace the following material with your appendix, if any.)

For example only, formats may vary.

Current Requirements:		Current Hours	Revised Requirements:		Revised Hours
<i>Major Requirement</i>	<i>Core</i>		<i>Major Requirement</i>	<i>Core</i>	
XXXX 100 – Intro to XXXX		4 Hours	XXXX 100 – Intro to XXXX		4 Hours
XXXX 120 – Contemporary XXXX		3 Hours	XXXX 220 – Modern XXXX		4 Hours
Total Core Required Hours		7 Hours	Total Core Required Hours		8 Hours
<i>Elective Requirement</i>		12 Hours	<i>Elective Requirement</i>		11 Hours

September 20, 2017

Gay Miller, Chair
Senate Committee on Educational Policy
Office of the Senate
228 English Building, MC-461

Dear Professor Miller:

Enclosed is a copy of a proposal from the College of Engineering to revise the Bachelor of Science in Industrial Engineering.

Sincerely,

Kathryn A. Martensen
Assistant Provost

Enclosures

c: U. Ravaioli
R. Nagi
R. Willoughby
M. Hirschi
D. Lange
H. Reis
B. Newell

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

College of Engineering
Executive Committee
306 Engineering Hall, MC-266
1308 West Green Street
Urbana, IL 61801



September 19, 2017

Kathryn Martensen
Assistant Provost
207 Swanlund, MC 304

Via: Andreas Cangellaris, Engineering College

Dear Provost Martensen:

The College of Engineering Executive Committee has reviewed and approved the following:

“Course Proposal “Change course requirements in the undergraduate Industrial Engineering IE 370 as a requirement; (ii) change IE 360 from an elective option to a requirement; (iii) change IE 361 from an elective option to a requirement; (iv) change IE 400 from an elective option to a requirement; (v) increase the credit hours for SE 261 from 1 to 2 hours (vi) remove IE 410 from a requirement to an elective option which is appropriate for students preparing for graduate school; (vii) remove 3 hours of Technical Elective from required coursework; (viii) remove Engineering Science Elective from required coursework; (ix) remove IE 311 from required coursework. These changes were approved by the ISE Courses and Curriculum Committee on 11-3-2016 and approved by vote in faculty meeting in 12-2-2016.”

Attached is a copy of the request.

Sincerely yours,

David Lange, Vice Chair
Executive Committee

Approval Recommended:

9-19-2017

Andreas Cangellaris, Dean
College of Engineering

Date