Fall '08 Engineering Major Info-Sessions

Mondays at 5pm

http://engle.berkeley.edu/infosessions

Date	Major
September 15	Engineering Physics
September 22	Materials Science
September 29	IEOR
October 6	Chemical Eng.
October 13	Nuclear Engineering
October 20	EECS
October 27	Mechanical Eng.
November 3	Civil Engineering
November 10	Bioengineering
November 17	Environmental Eng.

Industrial Engineering and Operations Research

What is Industrial Engineering?

Industrial engineering is a branch of engineering that concerns the development, improvement, implementation and evaluation of integrated systems of people, money, knowledge, information, equipment, energy, material and process. It draws upon the principles and methods of engineering analysis and design, as well as math, physics and social sciences, to specify, predict and evaluate the results to be obtained from such systems. In lean manufacturing systems, IEs work to eliminate wastes of time, money, materials, energy, and other resources.

While most engineering disciplines apply skills to very specific areas, *industrial engineering can be applied to virtually every industry.* Examples of where industrial engineering might be used include shortening lines at a theme park, streamlining an operating room, distributing products worldwide (aka supply chain management), and manufacturing cheaper and more reliable automobiles. Industrial engineers typically use statistics and computer simulation for system analysis and evaluation.

The name "industrial engineer" can be misleading. While the term originally applied to manufacturing, it has grown to encompass services and other industries as well.

What is Operations Research?

Operations research is an interdisciplinary branch of applied math which uses methods like mathematical modeling, statistics, and algorithms to help make optimal decisions in complex problems. These problems typically are concerned with optimizing the maxima (profit, assembly line capacity, crop yield) or minima (production costs, risk) of an objective function. The goal of using operations research is to elicit a best possible solution to a problem mathematically, which improves or optimizes the performance of the system.

Operations research is very closely related to industrial engineering. Industrial engineers take more of an engineering perspective on solving problems, but typically consider OR techniques to be a major part of their toolset. Some of the primary tools used by operations researchers are statistics, optimization, stochastics, queuing theory, game theory, graph theory, decision analysis, and simulation. Because of the computational nature of these fields, OR also has ties to computer science, and operations researchers regularly use custom-written or off-the-shelf software. *Operations research is distinguished by its ability to look at and improve an entire system, rather than concentrating only on specific elements*.

Additional Resources

- IEOR Department [*http://ieor.berkeley.edu*]
- Institute of Industrial Engineers (IIE) at Cal [*http://ieor.org*]
- Alpha Pi Mu (APM, the IEOR honor society) at Cal [*http://apm.berkeley.edu*]
- Institute of Industrial Engineers (National IIE) [*http://iienet.org*]

Contacts

- Brian Loo, IIE @ Cal President [*dreamscometrue@berkeley.edu*]
- Michelle Lew, IIE @ Cal VP [*michellelew@berkeley.edu*]

Program in Industrial Engineering and Operations Research		118-126 Units*
Freshman Year	*Fall*	*Spring*
Math 1A-1B, Calculus	4	4
Chemistry 1A or 4A, General Chemistry	4	-
Physics 7A, Physics for Scientists and Engineers	-	4
E 10, Engineering Design and Analysis	3	-
E 7, Introduction to Applied Computing	-	4
Reading and Composition[1]	4	-
Electives: Humanities/Social Studies[1]	-	3-4
<Optional> Freshman Seminar or E 92 (Survey Course)	<1>	-
Total	**15-16**	**15-16**
Sophomore Year		
Math 53-54, Multivariable Calculus, Linear Algebra and Differential Equations	4	4
Physics 7B, Physics for Scientists and Engineers	4	-
Engineering Breadth[2]	4	4
E 120, Engineering Economics	-	3
Self Pace Programming Course (see note #1)	-	1
Electives: Humanities/Social Studies[1]	3-4	3-4
Total	**15-16**	**15-16**
Junior Year		
IEOR 131, Computer Simulation of Industrial Engineering Systems	-	3
IEOR 160, Operations Research I	3	-
IEOR 161, Operations Research II	-	3
IEOR 162, Linear Programming	3	-
IEOR 165, Engineering Statistics, Quality Control and Forecasting	-	3
IEOR 172, Probability and Risk Analysis for Engineering, or Statistics 134, Concepts of Probability	3	-
IEOR Electives[3]	3	3
Electives: Humanities/Social Studies[1]	3-4	3-4
Total	**15-16**	**15-16**
Senior Year		
E 190, Technical Communication	3	-
IEOR 180, Senior Project	-	4
IEOR Electives[3]	6	6
Unrestricted Electives (9 units minimum)	6	3-5
Total	**15**	**13-15**

[1]Humanities/Social Studies Electives include six courses of at least 3 units each in humanities and social studies selected from an approved list of courses. Two of these courses must fulfill the College of Engineering Reading and Composition requirement. **Note:** It is strongly recommended that the first half of the Reading and Composition requirement be completed within the first year (as described in the sample program). The second half must be completed before graduation. Refer to the handout at www.coe.berkeley.edu/hssreq.pdf or 308 McLaughlin Hall for details and the list of approved courses.

[2]Engineering Breadth: 8 units of Engineering Breadth must be completed; 6 of which must be from the approved list below. (Cannot include BioE 100; E 110, C111, 140, 124 or 195. IEOR courses are permitted.)

CE 70, Engineering Geology
CE 155, Transportation Systems Engineering
EE 40 or 42, Introduction to Microelectronic Circuits or Digital Electronics
CE 11, Engineered Systems and Sustainability
E 28, Basic Engineering Design Graphics
E 36, Engineering Mechanics
E 45, Properties of Materials
ME 105 Thermodynamics
ME 132, Dynamic Systems and Feedback

The other units may consist of any courses in the College of Engineering taken for a grade, except 1-unit courses, 1-unit seminars, or CS 3.

[3]Students must take a minimum of six courses chosen from the categories listed below, including a minimum of three courses from Category A and a minimum of one course from Category B:

Category A
IEOR 130, Methods of Manufacturing Improvement
IEOR 166, Decision Analysis
IEOR 150, Production Systems Analysis
IEOR 151, Service Operations Design and Analysis
IEOR 153, Facilities Planning and Design

Category B
IEOR 115, Industrial and Commercial Data Systems
IEOR 140, Industrial Production and Design
(**Note:** The prerequisite is a course in Java programming.)
IEOR 170, Human Factors for Engineering Design
IEOR 171, Introduction to Design of Human Work Systems and Organization

Additional requirements/Notes:
1. A course in Computer Programming must be completed by the end of your sophomore year: CS 9C, 9F, 9G, or any equivalent course work (with evaluation and approved petition) is acceptable.
2. No course can be used to satisfy simultaneously two requirements.

***A minimum of 120 units is required for graduation.**