INTRODUCTION TO INDUSTRIAL ENGINEEING

Industrial Engineering

Industrial Engineering is concerned with the design, improvement, and installation of integrated systems of people, materials, information, equipment and energy. It draws upon specialized knowledge and skill in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems.

Revised March 1985

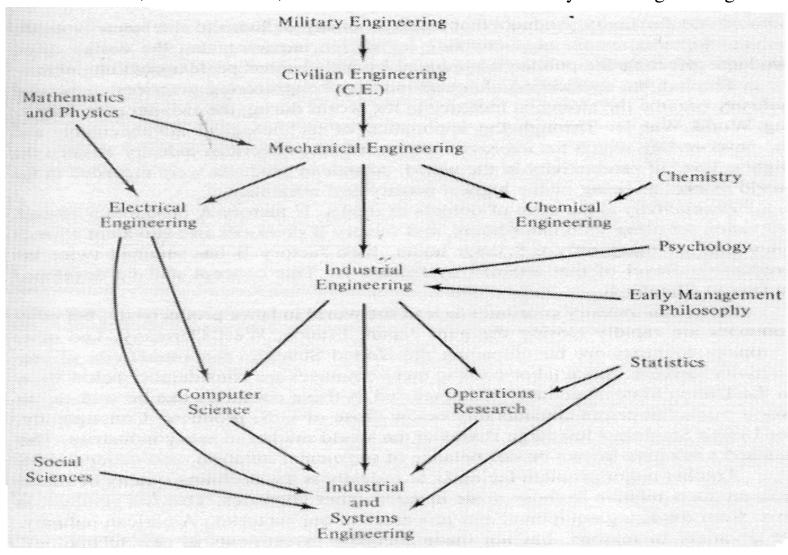


Industrial Engineering Definition

Industrial Engineers plan, design, implement and manage integrated production and service delivery systems that assure performance, reliability, maintainability, schedule adherence and cost control

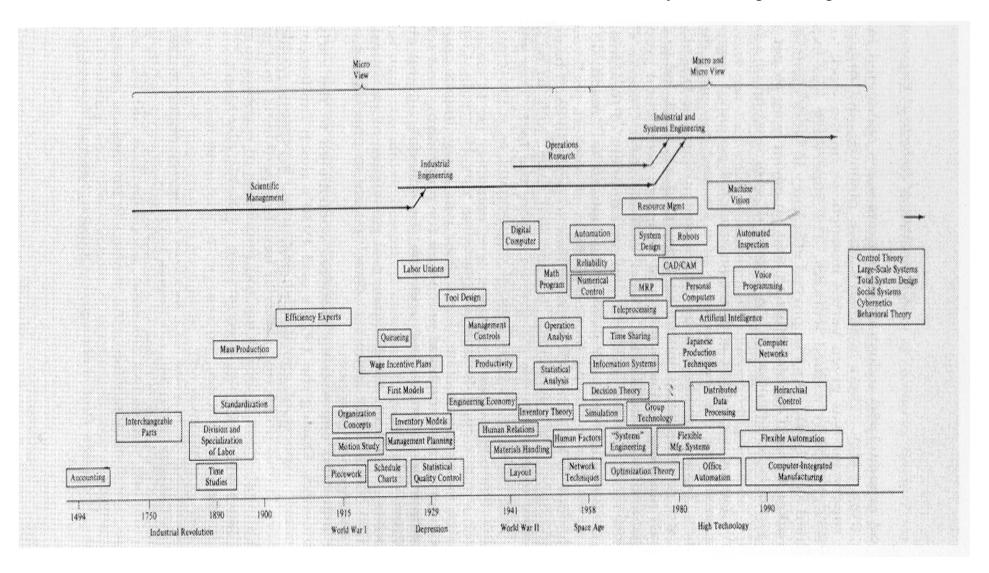
Development of I. E.

from Turner, Mize and Case, "Introduction to Industrial and Systems Engineering"



I. E. History

from Turner, Mize and Case, "Introduction to Industrial and Systems Engineering"



U.S. Engineering Jobs

from 2003 BLS

% of Eng. Jobs % Growth (2012)

•	Electrical	19.8%	3-9%
•	Civil and Environmental	18.6%	3-9%
•	Mechanical	14.5%	3-9%
•	Industrial	13.1%	10-20%
•	All Others	<5.0%	

IE Prospects

• Industrial engineers are expected to have employment growth of 14 percent over the projections decade, faster than the average for all occupations. As firms look for new ways to reduce costs and raise productivity, they increasingly will turn to industrial engineers to develop more efficient processes and reduce costs, delays, and waste. This focus should lead to job growth for these engineers, even in some manufacturing industries with declining employment overall. Because their work is similar to that done in management occupations, many industrial engineers leave the occupation to become managers. Numerous openings will be created by the need to replace industrial engineers who transfer to other occupations or leave the labor force.

US Engineering Employment 2008

Civil engineers	278,400
Mechanical engineers	238,700
Industrial engineers	214,800
Electrical engineers	157,800
Electronics engineers, except computer	143,700
Computer hardware engineers	74,700
Aerospace engineers	71,600
Environmental engineers	54,300
Chemical engineers	31,700
Health and safety engineers, except mining safety engineers and inspectors	25,700
Materials engineers	24,400
Petroleum engineers	21,900
Nuclear engineers	16,900
Biomedical engineers	16,000
Marine engineers and naval architects	8,500
Mining and geological engineers, including mining safety engineers	7,100
Agricultural engineers	2,700
Engineers, all other	183,200

Earnings distribution by engineering specialty, May 2008

Specialty	Lowest 10%	Lowest 25%	Median	Highest 25%	Highest 10%
Aerospace engineers	\$58,130	\$72,390	\$92,520	\$114,530	\$134,570
Agricultural engineers	43,150	55,430	68,730	86,400	108,470
Biomedical engineers	47,640	59,420	77,400	98,830	121,970
Chemical engineers	53,730	67,420	84,680	105,000	130,240
Civil engineers	48,140	58,960	74,600	94,470	115,630
Computer hardware engineers	59,170	76,250	97,400	122,750	148,590
Electrical engineers	52,990	64,910	82,160	102,520	125,810
Electronics engineers, except computer	55,330	68,400	86,370	106,870	129,920
Environmental engineers	45,310	56,980	74,020	94,280	115,430
Health and safety engineers, except mining safety engineers and inspectors	43,540	56,190	72,490	90,740	106,220
Industrial engineers	47,720	59,120	73,820	91,020	107,270
Marine engineers and naval architects	43,070	57,060	74,140	94,840	118,630
Materials engineers	51,420	63,830	81,820	102,040	124,470
Mechanical engineers	47,900	59,230	74,920	94,400	114,740
Mining and geological engineers, including mining safety engineers	45,020	57,970	75,960	96,030	122,750
Nuclear engineers	68,300	82,540	97,080	115,170	136,880
Petroleum engineers	57,820	80,040	108,020	148,700	>166,400
Engineers, all other	49,270	67,360	88,570	110,310	132,070

Manufacturing wages vs. other occupations

For Puget Sound Region, 1992.	2.24
Economic Sector	Avg. Wage
Construction	<u>* 29,600</u>
Manufacturing	38,400
Transportation, Communications & Utilities	33,800
Wholesale and Retail Trade	20,300
Finance, Insurance and Real Estate	32,700 -
Services	25,600
Government	29,800
Average wage - Total	28,300
Sourss: Washington Employment Security Department	

COLIN HAYES/P-I

UW Industrial Engineers Skills

- Engineering Fundamentals CEE, CSE, EE, ME, MSE
- Communications oral and written
- Mathematical Modeling
- Statistical Analysis
- Human Interface
- Teamwork

Industrial Engineering Topics

- Operations Research
- Production/Manufacturing Control and Management
- Statistical/Numerical Analysis
- Human Systems
- Design

Operations Research Topics

- Optimization
- Systems Engineering
- Decision Theory
- Simulation
- Markov Chains and Queuing Theory

Production/Manufacturing Control and Management

- Processes
- Work Measurement
- Plant Layout and Material Handling
- Inventory Control
- Scheduling
- CAD/CAM and CNC
- Human Factors/Ergonomics
- Engineering Economy
- Information Systems

Statistical/Numerical Analysis

- Design of Experiments
- Statistical Quality Control
- Reliability
- Safety
- Forecasting
- Computational Geometry

Industrial Engineers Professional Organizations

- Institute of Industrial Engineers (IIE)
- Institute for Operations Research and Management Sciences (INFORMS)
- American Society for Quality Control (ASQC)
- American Production and Inventory Control Society (APICS)
- Society of Manufacturing Engineers (SME)
- Society for Decision Sciences
- Society of American Value Engineers
- American Association of Cost Engineers

IND E 337 GOAL

- Introduce a variety of topics relating to how IE's are involved in manufacturing and service industries
- Teach a series of tools IE's apply in studying and improving manufacturing and service processes and companies

IND E 337 Skills to be Practiced

- Written Technical Communication
- Technical Reading Comprehension
- Analysis Mathematical and Organizational
- Observation/Data Collection

Why is Manufacturing Important?

paraphrased from Alexander Hamilton's "Report on the Subject of Manufactures" (1790)

- Allows more productive use of people
 - ...through division of labor
 - ...through mechanization
- Creates more jobs
- Provides a greater variety of jobs
- Provides more (and more stable) business opportunities