Industrial and Systems Engineering

Industrial and Systems Engineering

B.S., M.S., Ph.D. in Industrial Engineering

B.S., M.S. in Information and Systems Engineering

M.S. in Quality Engineering

M.S. in Management Science

M.S. in Analytical Finance (with finance and math)

All engineers solve problems…..

but what exactly do IEs and I&SEs do?

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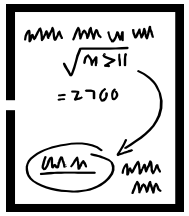
but what exactly do IEs and I&SEs do?

The real question is what types of problems don't we work on….

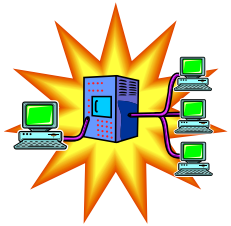
ISE has Evolved with Industry

- Started with Manufacturing
  - Continuous improvements in efficiency
  - Shop Floor → Automation → Supply Chain
- Migrated to the Service Industry
  - Hospitals, airlines, financial institutions, government, logistics and transportation
- Information Technology has moved to the center of industrial systems
  - Enterprise information systems, eCommerce

IEs and ISEs build a toolbox



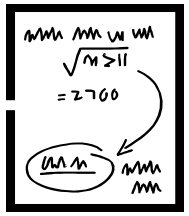
Quantitative Methods



Computing

Project Mgmt, Finance & Communication Skills

To solve a variety of problems



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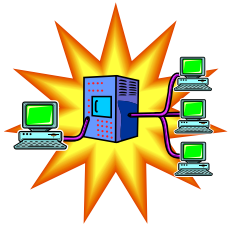

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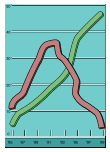
Finance



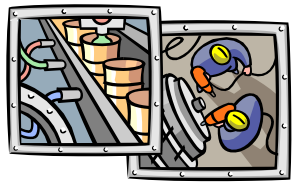
Telecom

Biomedical/ Health Care

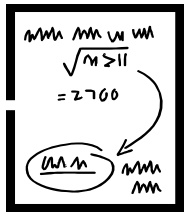
Supply Chain Mgmt

Transportation

Manufacturing



Better decision making…I&SEs



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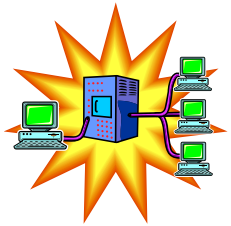

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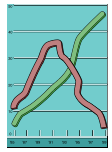

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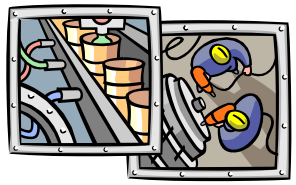

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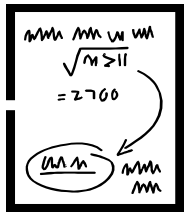

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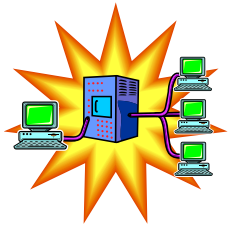

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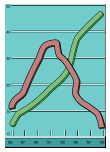

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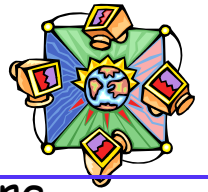

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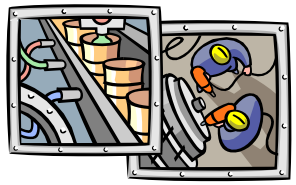
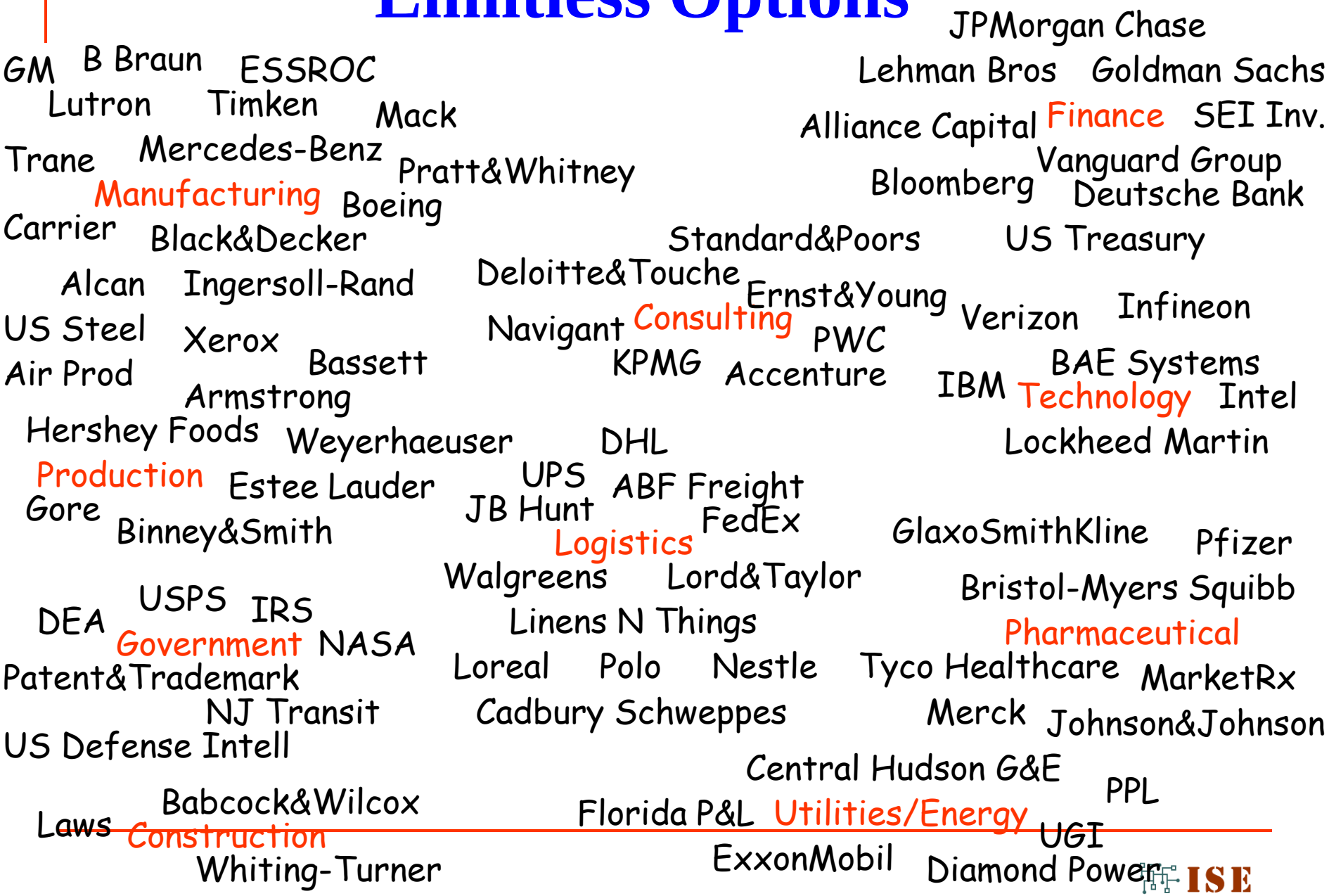


Limitless Options



ISE

Sources: Current LUCIE listings, ISE Postings, and 2005-08 Hirings

What problems do IEs solve?

- Supply Chain Management
  - Where to locate a facility.
  - Determining where/how much inventory to maintain.
  - Coordinating all plants, manufacturers and supplies.

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  - Routing trucks through a network.
  - Determining the optimal fleet size.

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- Manufacturing
  - Determining when/how much to expand a facility.
  - Determining optimal number of workers and scheduling shifts.
  - Determining the order in which jobs should be processed.
  - Specifying/implementing automated systems.

What problems do I&SEs solve?

- Finance
  - Building robust investment portfolios.
  - Evaluating risk levels of investments/customers.
  - Designing warranty contracts.
  - Determining which capital projects should be funded.
  - Developing models to determine who is cheating on their taxes

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- Telecom
  - Choosing between technologies.
  - Locating hubs/designing networks.
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- Telecom
  - Choosing between technologies.
  - Locating hubs/designing networks.
  - Developing protocol for routing information/packets.
- Biomedical
  - Writing algorithms to aid in DNA sequencing.
  - Allocating R&D funding among projects.
  - Determining number of hospital beds, nurses, doctors, etc.

Industrial Engineering Curriculum

- Engineering
  - Analytical skills (probability, statistics, math modeling, engineering methods, etc.) to comprehend large-scale systems.
- General Business
  - Knowledge to appreciate complexity of non-technical issues and broader problem context. Flexibility for Business Minor.
- Industry Specific Knowledge
  - Manufacturing, production, logistics and process control.
- Distinction from Mechanical Engineering
  - ME is about how to design a product/machine.
  - IE is about how to create a system to produce and market the product.

Information and Systems Engineering Curriculum

- Engineering
  - Analytical skills (probability, statistics, math modeling, computing, etc.) to comprehend large-scale systems.
- General Business
  - Knowledge to appreciate complexity of non-technical issues and broader problem context. Flexibility for Business Minor.
- Industry Specific Knowledge
  - Financial, communications, supply chain, biomedical…
- Distinction from Computer Science & Engineering
  - CSE is about how to design hardware and software.
  - I&SE is about how to develop and use information to make better decisions.

Where you start

Applications Engineer

Continuous Improvement Engineer

Production Engineer

System Developer

Operations Research Analyst

Business Analyst

Technical Leader

Process Control Specialist

Data Modeler

Production Supervisor

Management Trainee

Supply Chain Consultant

Industrial Engineer

Sales Engineer

Process Integration Specialist

Engineer

Corporate Value Consultant

Systems Analyst

Systems Engineer

Finance Analyst

Program Analyst

IT Specialist

Consultant

Logistics Engineer

Operations Engineer

Regulatory Supervisor

Risk Advisor

Financial Modeling Analyst

SAP Consultant

Manufacturing Engineer

Information Mgmt Analyst

Marketing Analyst

Manufacturing Supervisor

Associate Engineer

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What IEs and ISEs Earn

Materials Science	$62,800
Computer Science	$62,250
Chemical Engineering	$62,100
Information & Sys Eng	$61,250
Electrical Engineering	$61,144
Computer Engineering	$60,400
Industrial Engineering	$58,583
Mechanical Engineering	$56,633
Bioengineering	$55,250
Civil Engineering	$49,063

Source: 2007 Undergraduate Placement Report, Career Services, Lehigh Univ.

ISE

Minimum Starting Salaries

Computer Engineering	$55,000
Chemical Engineering	$55,000
Computer Science	$54,000
Electrical Engineering	$54,000
Info and Systems Eng	$52,500
Materials Science	$51,000
Industrial Engineering	$50,000
Bioengineering	$48,000
Mechanical Engineering	$46,000
Civil Engineering	$42,000

Source: 2007 Undergraduate Placement Report, Career Services, Lehigh Univ.

ISE

….Sky is the Limit….

Senior Analyst

Portfolio Manager

Senior Manager

Senior Consultant

Plant Manager

Executive Director

Executive Vice President

Chief Financial Officer

VP Operations

Chief Technical Officer

Head of Operations

Chief Information Officer

Partner

Entrepreneur

Senior Research Scientist

VP Strategic Planning

Director Business Planning

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Portfolio Manager

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Plant Manager

Executive Director

Executive Vice President

Chief Financial Officer

VP Operations

President/CEO

Chief Technical Officer

Head of Operations

Chief Information Officer

Partner

Entrepreneur

Senior Research Scientist

VP Strategic Planning

Director Business Planning

ISE

Successful Industrial & Systems Eng.

Howard L. Lance
Chair Harris Corp

David Kovacevich
CEO Wells Fargo

Mark Pigott
CEO PACCAR Financial

Andrew Patti
Former Pres Dial

Edward Whitacre, Jr.
CEO SBC/AT&T

Joe Forehand
Former CEO Accenture

W. George Hairston III
Chair, Nuclear Energy Inst.

Robert Coury
CEO Mylan Labs

Lee Iacocca
Former CEO Chrysler

Susan Story
CEO Gulf Power

David Kyle
CEO Oneok

Mel Hall, Jr.
CEO Comp Health

John McGlade
CEO Air Products & Chemicals

Charles O. Holliday, Jr.
CEO DuPont

Harold Mohler
Former Chair Hershey

Jim McCaslin
Pres Harley-Davidson

Michael Eskew
CEO UPS

William Swanson
CEO Raytheon

Paul Torgerson
14th President VaTech

Michael Johnson
CEO Visteon

John Dasburg
Former CEO Northwest

Yun Jong Yong
CEO Samsung

Tom Usher
Former CEO US Steel

Myron Ulman III
CEO JC Penny

David Perdue
CEO Dollar General

Richard Snead
CEO Carlson Restaurants

Jose Maria Alapont
CEO Federal-Mogul

John Edwardson
CEO CDW Computer Centers

Mike Duke
Former CEO Wal-Mart

ISE

Some Non-Traditional Industrial & Systems Engineers

Roger Corman
Film Director

Vance Wilkins, Jr.
VA, Speaker of House

Michael Massimino
NASA Astronaut

Homer Hickman Jr.
NASA Engineer
Author *Rocket Boy*
(movie *October Sky*)

Larry Davis
General, Pacific Ocean Division
U.S. Army Corps of Engineers

Joe Girardi
Former Manager
Florida Marlins

Edwin Moses
400M Hurdles
World Record Setter

Tom Landry
Former Coach
Dallas Cowboys

Dave Johnson
Former Manger
Baltimore Orioles

Jack Guynn
President Federal Reserve
Bank of Atlanta

Charles Armstrong
Pres Seattle Mariners

Our Department

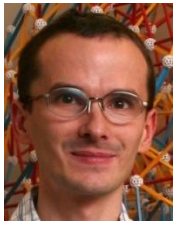
Industrial and Systems Engineering

- Fifteen Faculty Members
- 138 Undergraduate Students
- 120 Graduate Students (42 Ph.D.)
- Academic Programs
  - B.S., M.S., Ph.D. Industrial Engineering
    - Ph.D. program ranked 15th in country (US News)
  - B.S., M.S. Information and Systems Engineering
  - M.S. Quality Engineering
  - M.S. Management Science
  - M.S. Analytical Finance

ISE a Major Lehigh Investment

Tamás Terlaky
- Professor and Chair;
- Convex Conic Optimization, Interior Point Methods

Pietro Belotti
- Ph.D. Politecnico di Milan; Post Doctorate: CMU
- Mixed Integer Nonlinear Programming (MINLP); Network Flow



Imre Pólik
- Ph.D. McMaster; Post Doctorate: McMaster
- Conic Optimization; High Performance Comptuing

Jitamitra Desai
- Ph.D. Virginia Tech; Post Doctorate: University of Arizona
- Computational Optimization;

Eugene Perevalov
- Ph.D. UT Austin; Post Doctorate: Harvard, MIT
- Wireless Networks; Financial Engineering

Larry Snyder
- Ph.D. Northwestern; Logistics Industry
- Supply Chain Optimization; Inventory Control

Aurélie Thiele
- Ph.D. MIT
- Robust Optimization; Revenue Management

ISE

Balanced with Seasoned Professors

Keith Gardiner
- Ph.D Manchester
- Manufacturing Systems, Engineering Mgt

Mike Groover
- Ph.D Lehigh
- Manufacturing Process, Work Measurement

Nicholas Odrey
- Ph.D. Penn State
- Automation and Control; Petri Nets

Robert Storer
- Ph.D. Georgia Tech
- Heuristic Optimization; Statistics

S. David Wu, Dean
- Ph.D. Penn State
- Optimization; Supply Chain Management

Emory Zimmers, Jr.
- Ph.D. Lehigh
- Enterprise Systems; Management

John Adams
- Ph.D. North Carolina
- Quality Control; Statistics

Louis Plebani
- Ph.D. Lehigh
- Computational OR; Dynamic Programming

Ted Ralphs
- Ph.D Cornell; Post Doctorate: Rice
- Parallel Computing; Large-Scale Optimization

Gregory Tonkay
- Ph.D. Penn State; Logistics Industry
- Manufacturing Systems, Telecommunications

George Wilson
- Ph.D. Penn State
- Logistics; Large-Scale Optimization