Industrial and Manufacturing Systems Engineering
Collection Development Policy
Iowa State University Library

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I. General Purpose

This policy provides a general and detailed description of the educational and research programs of the department of Industrial and Manufacturing Systems Engineering. Within this context, the document describes the overall as well as the short and long-term efforts to support the library material and resource needs of the department and its programs.

In general, a systematic effort has been made to acquire major monograph works, relevant proceedings, and core journals that support the primary and secondary research needs of the department and its instructional programs. Among the factors that influence the selection of monographic works are their overall relevance to department programs, potential usage, and state, regional, and national availability. Potential usage is determined by a title-by-title systematic review of record data in the staff-side or Horizon for publications with similar subject coverage. Availability is determined by reviewing the holdings of candidate publications by our state and regional interlibrary loan partners in the OCLC WorldCat database. In addition, ISU interlibrary loan reports are systematically reviewed on a semi-annual basis to identify the current and emerging needs and interests of faculty and staff associated with the department.
The general short and long-term goal is to investigate the availability of electronic forms of key journals that support the research interests of the departmental faculty.

II. Profession

“Industrial engineering is a branch of engineering dealing with the optimization of complex processes or systems. It is concerned with the development, improvement, implementation and evaluation of integrated systems of people, money, knowledge, information, equipment, energy, materials, analysis and synthesis, as well as the mathematical, physical and social sciences together with the principles and methods of engineering design to specify, predict, and evaluate the results to be obtained from such systems or processes. Its underlying concepts overlap considerably with certain business-oriented disciplines such as operations management.

Depending on the subspecialties involved, industrial engineering may also be known as, or overlap with, operations management, management science, operations research, systems engineering, manufacturing engineering, ergonomics or human factors engineering, safety engineering, or others, depending on the viewpoint or motives of the user”

(http://en.wikipedia.org/wiki/Industrial_engineering)


Careers in Industrial Engineering

Industrial engineers help people get more out of life by improving their work environments, providing better service, and reducing their cost of living. We are working to improve the environment by conserving energy, reducing industrial waste, and recycling materials.

Examples of Job Titles and Descriptions:

Supply Chain & Logistics Optimization Analyst

- Develop and maintain short and long term global supply chain strategies
- Complete tactical and strategic supply chain studies
- Identify and support implementation of regional and global enhancements to improve supply chain efficiency
- Assess and analyze performance to support key business decisions
- Identify and investigate potential supply chain and logistics opportunities
- Initiate, analyze and develop cost reduction and performance improvement initiatives

Operations Research Engineer

- Develop and maintain short and long term global supply chain strategies
- Complete tactical and strategic supply chain studies
- Identify and support implementation of regional and global enhancements to improve supply chain efficiency
• Assess and analyze performance to support key business decisions
• Identify and investigate potential supply chain and logistics opportunities
• Initiate, analyze and develop cost reduction and performance improvement initiatives

**Manufacturing Engineer**

• Utilize and enhance existing models to improve operations and reduce company operating cost
• Create, validate and implement new tools/models to monitor and improve field performance and operations
• Strong knowledge of SAS, ACCESS, EXCEL, Visual Basic and GUI systems are required
• Strong written, oral and presentation communication skills are required
• Knowledge of transportation, optimization, simulation and statistical analyses are definite pluses

**Modeling and Simulation Specialist**

• Develop and maintain short and long term global supply chain strategies
• Complete tactical and strategic supply chain studies
• Identify and support implementation of regional and global enhancements to improve supply chain efficiency
• Assess and analyze performance to support key business decisions
• Identify and investigate potential supply chain and logistics opportunities
• Initiate, analyze and develop cost reduction and performance improvement initiatives

**Management Engineer**

• Manage and coordinate diverse projects and activities
• Complete assigned analyses and reports concerning operations
• Data analysis
• Work process redesign
• Project implementation support
• Benchmarking data resources
• Software technology administration
• Database design and maintenance
• Web development

**Director of Warehousing & Distribution**

• Recruit, manage and develop warehouse and clerical personnel
• Maintain budgets and cost containment
• Define and design processes
• Design warehouse layouts
• Implement warehouse systems
- Interface with customers
- Negotiate contracts

**Process Engineer**

- Implement Lean Manufacturing techniques to reduce costs, improve quality, and reduce cycle times
- Develop, qualify, and implement new manufacturing processes
- Identify equipment needs and product design changes to improve cost, quality, and manufacturability
- Identify root cause of manufacturing problems and implement corrective actions

(https://www.imse.iastate.edu/undergraduate-program/careers-in-imse/)

**IV. Iowa State University Program**

**A. History**

The department first offered an industrial engineering degree in 1956, but the core curriculum started way back in 1919. That’s the year an industrial engineering option became available for mechanical engineers. J. O. Keller, who graduated from Penn State in 1914, came to Iowa State to direct the new program. Keller was one of the first students in the country to earn an IE degree.

In 1926 a general engineering (GE) curriculum was started, and in 1929 the Department of General Engineering (the predecessor to industrial engineering) was established with offices in Engineering Hall (now Marston Hall).

The GE curriculum consisted primarily of classes in electrical, mechanical, and civil engineering, as well as many classes in economics. There were only two GE courses (both personnel related) in the original curriculum.

Frank Paine was the first department chair, serving in that position from 1929 until he died of a heart attack in 1942. Joseph Walkup was appointed the new department chair in 1942, staying until 1973. During his tenure, many changes were made, including moving the general engineering department closer to the IE concept. Accordingly, an IE option was prepared and eventually offered in 1946. By 1955, the ECPD Accrediting Committee recommended that the department change its name to industrial engineering. The Board of Regents accepted the recommendation, and the change was made on July 1, 1956.

At that time, the department had 197 undergraduate students and three labs in Marston Hall. The curriculum was equally split between engineering and management through most of the 1960s, 70s, and 80s. In 1989, IE became the Department of Industrial and Manufacturing Systems Engineering (IMSE), with more emphasis in the curriculum on manufacturing. Also that year, IMSE moved into the Engineering Annex, which allowed the department to increase the number of labs from three to six.
In 1999, engineering management was introduced as a new focus area to provide students with an opportunity to learn management principles. Also in 1999, IMSE moved again—this time to Black Engineering. That move increased the number of laboratory facilities available for students and faculty in the department to 16. In 2004, the department in collaboration with the College of Business introduced a new combined B.S. in IE and MBA program (
http://www.imse.iastate.edu/the-department/department-history/).

B. Department

In 2011/12, the department awarded the 29th highest number of bachelor’s degrees in the U.S. (http://www.asee.org/papers-and-publications/publications/11-47.pdf). In 2013, it was ranked as 31st in Industrial Engineering (24th among publics) by U.S. News & World Report (http://www.news.iastate.edu/news/2013/03/12/gradrankings13).

In Fall 2012, there were 344 undergraduate students enrolled in the Industrial and Manufacturing Systems Engineering program with an additional 72 full-time graduate students, and had approximately 15 faculty members, with a total head count of 16 (http://www.ir.iastate.edu/DeptData/DDat2012FB.pdf).

The Industrial Engineering Program is accredited by the Engineering Accreditation Commission of ABET (http://www.abet.org) (http://www.imse.iastate.edu/undergraduate-program/)

C. Facilities

Research Laboratories

Operations Research

0022 Black Engineering – Enterprise Informatics Laboratory

0074 Black Engineering – Operations Research and Production Systems Research Laboratory

Advanced Manufacturing

Industrial Assessment Center - 0068 Black Engineering

Metalcasting Systems Laboratory - 0086 Black Engineering

Welding and Materials Testing Laboratory - 1092 Black Engineering

Polymer Processing and Heat Treatment Laboratory - 1095 Black Engineering

Rapid Manufacturing and Prototyping Laboratory (RMPL) - 1210 Sweeney

Wind Energy Manufacturing Laboratory - 1310 Sweeney
**Ergonomics and Human Factors**

Ergo Lab – The Ergonomics Laboratory

Human Performance and Cognitive Engineering Laboratory - 0066 Black Engineering

Physical Ergonomics Laboratory - 0076 Black Engineering

([http://www.imse.iastate.edu/research/research-laboratories/](http://www.imse.iastate.edu/research/research-laboratories/))

**Center for e-Design**

([http://www.center4edesign.org/](http://www.center4edesign.org/))

**Instructional Laboratories**

Operations Research and Production Systems Computing Laboratory - 0010 Black Engineering

Industrial Design Laboratory - 0020 Black Engineering –

Computing Laboratory - 0028 Black Engineering

Metrology Laboratory - 0036 Black Engineering –

Machining Processes Laboratory - 1070 Black Engineering –

Metalcasting Laboratory - 1098 Black Engineering –

([http://www.imse.iastate.edu/research/instructional-laboratories/](http://www.imse.iastate.edu/research/instructional-laboratories/)).

**D. Research**

The Department of Industrial and Manufacturing Systems Engineering (IMSE) has research programs in operations research, advanced manufacturing, ergonomics, and information engineering.

**Operations Research**

Operations research is concerned with the development of quantitative models that can provide new insights into the behavior of complex systems, identify areas where significant improvements can be made in system performance, and provide a basis for effective decision making. Quantitative models include mathematical and computer models based on principles of simulation, optimization, probability, and statistics.

**Advanced Manufacturing Research**

Advanced manufacturing research includes the investigation of new production methods for advanced products, studying process parameters of new processes, and understanding the
interaction of processes in advanced manufacturing systems. Current IMSE efforts in this area include rapid manufacturing systems, advanced metrology and inspection, control and automation systems, and industrial energy efficiency.

**Ergonomics and Human Factors**

Ergonomics and human factors research is the application of our understanding of the capabilities and limitations of human beings in the design of the workplace and consumer items. Current emphasis areas in IMSE include 1) physical ergonomics with a particular focus on spine biomechanics, prevention of low back injury and hand/wrist disorders such as tendinitis and carpal tunnel syndrome and 2) cognitive engineering with a focus on augmented human performance and human computer interaction.

**Information Engineering**

Information Engineering research is focused on enhancing the decision making process through knowledge discovery methods and information modeling that helps us understand how information is used within an enterprise. Faculty working in this area conduct research related to data mining, experimental design, decision theory, and statistical analysis

([http://www.imse.iastate.edu/research/focus-areas/](http://www.imse.iastate.edu/research/focus-areas/)).

**E. Instruction**

**Select Courses (ISU Catalog 2013-2014)**

- IE 148. Information Engineering
- IE 248. Engineering System Design, Manufacturing Processes and Specifications
- IE 271. Applied Ergonomics and Work Design
- IE 312. Optimization
- IE 341. Production Systems
- IE 361. Statistical Quality Assurance
- IE 413. Stochastic Modeling, Analysis and Simulation
- IE 419/448 Manufacturing Systems Modeling
- IE 441. Industrial Engineering Design.
- IE 481/581. e-Commerce Systems Engineering
- IE 483/583. Knowledge Discovery and Data Mining.
- IE 508. Design and Analysis of Allocation Mechanisms
- IE 510. Network Analysis.
- IE 514. Production Scheduling
- IE 519. Simulation Modeling and Analysis
- IE 531. Quality Control and Engineering Statistics.
- IE 534. Linear Programming
I E 537. Reliability and Safety Engineering
I E 541. Inventory Control and Production Planning
I E 545. Rapid Prototyping and Manufacturing
I E 546. Geometric Variability in Manufacturing
I E 549. Computer Aided Design and Manufacturing
I E 561. Continuous Quality Improvement of Process
I E 566. Applied Systems Engineering
I E 570. Systems Engineering and Project Management.
I E 572. Design and Evaluation of Human-Computer Interaction
I E 582. Enterprise Modeling and Integration
I E 585. Requirements Engineering
I E 588. Information Systems for Manufacturing
I E 613. Stochastic Production Systems
I E 631. Nonlinear Programming
I E 634. Computational Optimization.
I E 642. Simultaneous Engineering in Manufacturing Systems

(http://catalog.iastate.edu/azcourses/i_e/).

V. Subject Boundaries

The research interests of some departmental faculty are more the focus of other ISU departments or programs. A conscious effort is made to purchase publications that support these other research efforts from other appropriate funds or to refer these candidates to the appropriate bibliographer. The major overlapping programs or subject areas and their respective bibliographer are:

- Computer Science / Gerry McKiernan
- Economics / Jeff Kushkowski
- Management / Jeff Kushkowski
- Material Science and Engineering / Heather Lewin
- Mathematics / Kris Stacy-Bates
- Mechanical Engineering / Gerry McKiernan
- Statistics / Kris Stacy-Bates
- Supply Chain Management / Jeff Kushkowski

Representative textbooks are considered and selectively acquired, particularly those that are a latter edition of titles owned by the ISU library and that have documented use. Proceedings are selectively acquired.

VI. General Collection Guidelines

A. Linguistic

English is the primary collection language.
B. Geographical Areas

Nearly all selected material is published in United States or Europe. As with the linguistic parameter, the content of the publication is the basis for considering its selection rather than its geographical origin.

C. Types of Materials Collected

Monographs and serials form the core of the collections that support this program. Significant national and international conference proceedings are also selectively acquired.

D. Format of Materials Collected

The collection is almost entirely paper. A select number of relevant journals are available in electronic form. Several major World Wide Web-based abstract and index database are available.

VII. Specific Collection Guidelines

In general, a conscious effort is made to acquire the monographic and serial literature that supports the broad and specific research interest of departmental faculty.

VII. Other Resources Available

Core databases:

- ABI/Inform
- ACM Digital Library
- Business Source Elite
- Computer and Information Systems Abstracts
- Compendex
- Current Index to Statistics (CIS) (Statistics)
- Engineering Research Database
- MathSciNet
- ScienceDirect
- Web of Science

Core e-journals and ebooks:

- BCC Research
- Encyclopedia of Statistical Sciences
- ENGnetBASE
- Knovel e-book collection
Among the factors that influence the selection of monographic works are state, regional, and national availability. Availability is determined by reviewing the holdings of candidate publications by our state and regional interlibrary loan partners in the OCLC WorldCat database.

VIII. Cross-references to Collection Policies

The following subject areas or programs overlap part of the research focus of the Industrial and Manufacturing Systems Engineering department:

- Computer Science / Kris Stacy-Bates
- Economics / Jeff Kushkowski
- Management / Jeff Kushkowski
- Material Science and Engineering / Heather Lewin
- Mechanical Engineering / Gerry McKiernan
- Production and Operations Management / Jeff Kushkowski
- Statistics / Kris Stacy-Bates

IX. Creation date

August 17, 2001

X. Revision History

December 31, 2013

January 30, 2008

XI. LC Class(es), if applicable.

- T 55.4 – T 60.8
- TS 155- TS 194

XII. Bibliographer name

Gerry McKiernan