

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

## **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. History**

**“In 1926 a general engineering 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), and the curriculum focus changed from engineering and management courses to manufacturing and operations research courses. 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, with input from the Industrial Advisory Council, engineering students, and companies that historically hired IMSE engineering students, the department moved to reinstate management concepts as a significant part of the curriculum. 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.”

[\[http://www.imse.iastate.edu/fileadmin/www.imse.iastate.edu/pdf/Newsletter.pdf\]](http://www.imse.iastate.edu/fileadmin/www.imse.iastate.edu/pdf/Newsletter.pdf)

“In 2004, the department in collaboration with the College of Business introduced a new combined B.S. in IE and MBA program.”

[\[http://www.imse.iastate.edu/who-we-are/history.html\]](http://www.imse.iastate.edu/who-we-are/history.html)

### III. Iowa State University Program

#### Profession

“Industrial engineers design, build, analyze, and operate these kinds of systems for telecommunications, healthcare, consumer products, defense, automotive, electronics, and transportation companies. Industrial engineers use principles of engineering and management to integrate systems that include people, materials, information, equipment and energy.

“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.”

[\[http://www.imse.iastate.edu/who-we-are/its-a-fact.html\]](http://www.imse.iastate.edu/who-we-are/its-a-fact.html)

#### Department

... [T]he primary goals of the IMSE Department [are]:

- to develop technically qualified industrial engineers equipped with the necessary analytical,
- data-based decision making, computing, communication, teamwork and leadership skills for the design, analysis, implementation, and management of production, information, and service systems;
- to expand the field of knowledge in industrial and manufacturing systems engineering with emphases on manufacturing systems, information engineering, human factors, and applied operations research; and
- to provide continuing education and outreach activities in our professional areas.”

[\[http://www.imse.iastate.edu/fileadmin/www.imse.iastate.edu/pdf/handbook.pdf\]](http://www.imse.iastate.edu/fileadmin/www.imse.iastate.edu/pdf/handbook.pdf)

Currently, approximately 240 undergraduate students are enrolled in Industrial and Manufacturing Systems Engineering programs at ISU, including about 46 full-time graduate students (ISU 2006-2007 Fact Book: 103). The department current has 13 faculty members (ISU 2006-2007 Fact Book: 103) [\[http://www.public.iastate.edu/~inst\\_res\\_info/FB07files/pdf07/FB07all.pdf\]](http://www.public.iastate.edu/~inst_res_info/FB07files/pdf07/FB07all.pdf)

#### Laboratories

- Applied Ergonomics Laboratory 0016 Black
- Enterprise Computing Laboratory 0074 Black
- Industrial Design Laboratory 0020 Black
- Machining Processing Laboratory 1070/1072 Black
- Metrology Laboratory 0036 Black
- Operations Research and Production Systems Laboratory 0010 Black
- Polymer Processing Laboratory 1095 Black
- Heat Treatment Laboratory 1095 Black
- Metalcasting Laboratory 1098 Black
- Welding and Materials Testing 1092 Black
- Rapid Manufacturing and Prototyping Laboratory 1210 Sweeney

[\[http://www.imse.iastate.edu/research/facilities.html\]](http://www.imse.iastate.edu/research/facilities.html)

## **Research**

**“The Department of Industrial and Manufacturing Systems Engineering has research programs in applied operations research, information engineering, advanced manufacturing systems and ergonomics.**

**Faculty in applied operations research conduct research on 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.**

**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.**

**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 an 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 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 in IMSE is in the area of physical ergonomics with a particular focus on prevention of low back injury and hand/wrist disorders such as tendonitis and carpal tunnel syndrome.”**

[ <http://www.imse.iastate.edu/research.html>]

**A list of recent departmental research projects and publications is available**

[<http://www.imse.iastate.edu/research/research-projects.html>]

## **Instruction**

- **Undergraduate Program**

### **--- B.S. in Industrial Engineering**

The ABET accredited curriculum provides a basic preparation in science and engineering along with a core of industrial engineering courses. Students can choose a focus area for a set of electives including management, operations research, manufacturing, enterprise computing and information engineering, and human factors.

## **Focus Areas**

- **Engineering Management**  
Learn strategies necessary for solving internal and external problems of a company in areas such as production, quality, project management, sales, and marketing strategies.
- **Human Factors**  
Learn about the relationships between people and their work tasks, machines, information, and environment.
- **Operations Research**  
Learn how to make good engineering decisions using quantitative models and methods for production and service systems such as, inventory control, scheduling, transportation, and logistics.
- **Manufacturing Systems**  
Learn how to design, analyze, operate, and control manufacturing processes and systems.
- **Enterprise Computing**  
Learn how to integrate and use information from the functional units of an enterprise as well as between multiple enterprises.
- **Problem based learning and hands-on laboratory experience are major components of the program.**

**[<http://www.imse.iastate.edu/academics/undergraduate-program.html>]**

### **---Combined B.S. Industrial Engineering /Master of Business Administration**

The Colleges of Business and Engineering offer an integrated, concurrent program leading to bachelor of science and master of business administration degrees.

[[http://www.imse.iastate.edu/academics\\_new/majors-and-programs/combined-bs-iemba.html](http://www.imse.iastate.edu/academics_new/majors-and-programs/combined-bs-iemba.html)]

- **Graduate Program**

--- **M.S. in Industrial Engineering**

The M.S. in Industrial Engineering program prepares students for more challenging career assignments, more complex engineering problems, and Ph.D. studies. It provides an opportunity to gain more in-depth knowledge of industrial engineering and introduces students to the research process.

--- **Ph.D. in Industrial Engineering**

The Ph.D. in IE program prepares students for careers in consulting, industry research, and academia. It provides an opportunity to explore challenging research problems and make a research contribution to the field of industrial engineering.

[<http://www.imse.iastate.edu/academics/graduate-program.html>]

--- **Interdisciplinary Masters Programs**

- **Master of Engineering in Systems Engineering (MEng SysEng)**
- **Master of Science in Information Assurance (M.S. IA)**

**Select Courses (ISU Catalog 2005-2007)**

- **I E 148. Information Engineering**
- **I E 248. Engineering System Design, Manufacturing Processes and Specifications**
- **I E 271. Applied Ergonomics and Work Design**
- **I E 312. Optimization**
- **I E 341. Production Systems**
- **I E 361. Statistical Quality Assurance**
- **I E 413. Stochastic Modeling, Analysis and Simulation**
- **I E 419/448 Manufacturing Systems Modeling**
- **I E 441. Industrial Engineering Design.**
- **I E 449. Computer Aided Design and Manufacturing.**

- **I E 481/581. e-Commerce Systems Engineering**
- **I E 483/583. Knowledge Discovery and Data Mining.**
- **I E 508. Design and Analysis of Allocation Mechanisms**
- **I E 510. Network Analysis.**
- **I E 514. Production Scheduling**
- **I E 519. Simulation Modeling and Analysis**
- **I E 531. Quality Control and Engineering Statistics.**
- **I E 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**

## **Careers**

**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 analyse performance to support key business decisions**
- **Identify and investigate potential supply chain and logistics opportunities**
- **Initiate, analyse and develop cost reduction and performance improvement initiatives**

### **Operations Research 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**

### **Manufacturing Engineer**

- **Plan, direct, and coordinate manufacturing processes in industrial plant(s)**
- **Train operators to perform assigned duties**
- **Develop, evaluate, and improve manufacturing methods based on the “Toyota Production System” continuous improvement process**
- **Analyze/plan work force utilization, space requirements, and workflow**
- **Design layout of equipment and workspace**
- **Confer with planning and design staff concerning product design and tooling**
- **Confer with vendors to determine product specifications and arrange for purchase of equipment, materials, or parts**
- **Estimate production times, staffing requirements, and related costs**
- **Confer with management, engineering, and other staff regarding manufacturing capabilities, production schedules, and other considerations**
- **Apply statistical methods (Six Sigma, SPC, Shainin, etc.) to continually improve the manufacturing processes**

### **Modeling and Simulation Specialist**

- **Make recommendations concerning the availability and suitability of models, simulations and tools to support operations**
- **Evaluate models, simulations and tools for application to company operations**

- **Develop concepts, white papers or other decision documents in sufficient detail to support decision making**
- **Support decision making and integrate products into operations**
- **Assist with the developmental efforts to modify models, simulations and tools for use**
- **Analyze and define requirements for models, simulations, and analytical tools**
- **Responsible for project execution, including planning, requirements analysis, modeling, data collection, software development, presentations, and final reports**

#### **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**

**<http://www.imse.iastate.edu/jobs/careers.html>**

## **IV. 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 / Steve McMinn**
- **Mechanical Engineering / Gerry McKiernan**
- **Statistics / Kris Stacy-Bates**
- **Logistics, Operations & Management Information Systems / 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.

## **V. 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

## **VI. 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.

## **VI. Other Resources Available**

Databases: ABI/Inform; ACM Digital Library; Business and Company ASP; Computer and Information Systems Abstracts; EiVillage2: Compendex; Engineering Materials Abstracts; IEEE Xplore (IEL); MathSciNet; Mechanical Engineering Abstracts; NTIS (National Technical Information Service; Current Index to Statistics (CIS) (Statistics). Electronic Journals: ScienceDirect.

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.

## **VII. 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 / Steve McMinn
- Mechanical Engineering / Gerry McKiernan
- Production and Operations Management / Jeff Kushkowski
- Statistics / Kris Stacy-Bates
- Logistics, Operations & Management Information Systems / Jeff Kushkowski

**VIII. Creation date**

**August 17, 2001**

**IX. Revision History**

**January 30, 2008**

**X. LC Class(es), if applicable.**

**T 55.4 – T 60.8 ; TS 155- TS 194**

**XIII. Bibliographer name**

**Gerry McKiernan**