MANUFACTURING & PRODUCTION SYSTEMS

FACULTY

L. Shi, 3250 ME, 265-5969
A. Krishnamurthy, 3258 ME, 608-890-2236
D. Veeramani, 4101 ME, 262-0861
S. Zhou, 3254 ME, 262-9534

PREREQUISITES

- BS degree or equivalent
- Mathematical statistics course (Ex: Stat312)
- Computer programming course (Ex: CS302)
- 3 courses in ISyE (Ex: 313, 315, 320, 323, 349, 415, 417)

The Associate Chair of Graduate Affairs is responsible for evaluating equivalencies.

MS DEGREE REQUIREMENTS

30 credits total with the following sub-requirements:

- 6 cr of Core Courses + 18 cr Focus Courses
- 3 cr of Breadth Course + 3 cr Free Elective
- Minimum of 15 cr in ISyE courses
- Maximum of 6 cr of Independent Study may be used

CORE COURSES (6 cr min):

ISyE/ME 510 Facilities Planning
ISyE 605 Computer Integrated Manufacturing
ISyE 615 Production Systems Control

FOCUS COURSES (18 cr Total)

- Elective courses grouped into 4 categories
- Must select 2 categories & take 6 cr in each
- Remaining 6 cr to be chosen with prior approval of student’s advisor
- With advisor approval a maximum of 6 cr of ISyE 699 or ISYE 790 may be used as elective courses. Students intending to continue for a PhD are strongly encouraged to take this option.

Manufacturing System Modeling & Analysis

ISyE/ME 510 Facilities Planning
ISyE/OTM 578 Facilities Location Models
ISyE 615 Production Systems Control
ISyE/OTM 620 Simulation Model & Analysis
ISyE/Math 632 Intro to Stochastic Processes
ISyE/ME 641 Design & Analysis of Mfg. Systems
ISyE/ME 643 Performance Analysis of Mfg. Systems
ISyE 816 Topic: Supply Chain Optimization
OTM 640 Business Logistics Analysis
OTM 722 Logistics Management

Computer Integrated Mfg. Processes and Technology

ISyE 415 Intro to Mfg. Systems, Design & Analysis
ISyE 605 Computer Integrated Manufacturing
ISyE 612 Information Sensing and Technology
ISyE 655 Advanced CAD/CAM
ISyE 691 Special Topics in ISyE (Advisor consent required)
ME 417 Introduction to Polymer Processing
ME 418 Engineering Design with Polymers
ME 419 Fundamentals of Injection Molding
ME/EE 439 Introduction to Robotics
ME 447 Computer Control of Machines & Processes
ME 601 Topic: Rapid Prototyping Technologies and Advanced Manufacturing
ME/EE 739 Advanced Automation and Robotics

Manufacturing System Management

ISyE 513 Analysis of Capital Investments
ISyE 515 Engr Mgmt-Continuous Process Improvement
ISyE 658/ OTM 758 Managing Tech Change in Manufacturing Systems
OTM 654 Production Planning & Control
OTM 700 Operations Management

Information & Decision Technology

CS 367 Introduction to Data Structures
CS 540 Introduction to Artificial Intelligence
CS 564 Database Mgmt System, Design & Implementation

ISyE 516 Introduction to Decision Analysis
ISyE/OTM 671 E-Business: Technologies, Strategies & Applications
OTM 765 Database Concepts for Operations Management
MARK 765 Enterprise Systems and Supply Chain

BREADTH COURSE (3 cr min)

Human Factors & Ergonomics in Manufacturing

ISyE 555 Human Performance and Accident Causation
ISyE/BME 564 Ergonomics in Manufacturing Industry
ISyE 653 Organization & Job Design
ISyE 764 Occupational Biomechanics

Quality in Manufacturing

ISyE/ME 512 Inspection, Quality Control & Reliability
ISyE 520 Quality Assurance Systems
ISyE 575 Introduction to Quality Engineering
OTM 770 Introduction to Quality & Productivity Improvement

FREE ELECTIVE (3 cr)

Any graduate level course that is consistent with the student’s plan of study may be chosen upon approval by the advisor. Students interested in project and research experience are encouraged to take an Independent Study.
and optimization of manufacturing systems. Research conducted in this laboratory utilizes many interesting mathematical models and techniques from computer science, control theory, and operations research. Resources available include personal computers, and a variety of software tools.

**Laboratory for Manufacturing System Analysis Laboratory**
In this laboratory, students and faculty members perform research on new techniques for modeling and analysis of manufacturing systems, and application of these techniques to enable time-based competitive manufacturing. The laboratory consists of several computers equipped with state-of-the-art system analysis tools.

**Laboratory for Manufacturing System Realization and Quality (MSR&Q)**
The goal of this laboratory is to develop a science base for a new manufacturing system realization and quality improvement. It will bring together research on manufacturing system CAD/CAM models and statistics-based methods for design, control, and diagnostics of multistage manufacturing processes behavior/quality. In doing so it addresses the following areas: (i) system decomposition and analysis using the concept of product/process key characteristics and their causalities; (ii) developing statistical methods driven by engineering models to achieve quality improvement, i.e., integrating models of data sets with efficient CAD/CAM models of manufacturing systems instead of identifying model(s) of data set alone as in the traditional SPC, and (iii) application of the developed models towards: root cause diagnosis of manufacturing variability; distributed sensing system/networks; and manufacturing system design evaluation and optimization in early design phases. Information generated is further applied to study reusable/reconfigurable multistage manufacturing systems convertibility, scalability and diagnosability. Resources available include: PCs, laser tracker, various software (CAM, VSA,…).

**Laboratory for Manufacturing Process Analysis and Control (MPAC)**
In this laboratory, we focus on interdisciplinary research on new methodologies of data analysis, knowledge discovery, and control of manufacturing processes for quality and productivity improvement. The research is based on the fusion of the diverse information sources, such as the in-process sensing information of the machine conditions, and the final product quality information, and the discrete event signals from the logic controller of the process. The research utilizes theories of engineering field knowledge, signal processing, advanced statistical analysis, and system and control.

---

**LABORATORIES & CENTERS**

- Flexible Manufacturing Cell Laboratory
- Manufacturing Enterprise Systems Optimization Laboratory
- Manufacturing Systems Analysis Laboratory
- Laboratory for Manufacturing System Realization and Quality
- Laboratory for Manufacturing Process Analysis and Control (MPAC)

**Flexible Manufacturing Cell Laboratory**
This laboratory enables integrated design, manufacturing, inspection, and assembly. It includes CAD/CAM systems, CNC milling and turning centers, an automated storage and retrieval system, a material-handling conveyor and robots, a CMM integrated with a computer-aided inspection system, and an assembly robot having tactile- and vision-sensing capabilities.

**Manufacturing Enterprise Systems Optimization Laboratory**
In this laboratory, students and faculty members perform interdisciplinary research on new methodologies and tools for modeling, design,