



Department of Industrial  
and Systems Engineering  
UNIVERSITY OF WISCONSIN-MADISON

# Manufacturing & Production Systems

## Faculty

- Jingshan Li, 3222 ME
- Kaibo Liu, 3017 ME
- Ananth Krishnamurthy, 3258 ME
- Robert Radwin, 2106 ECB
- Leyuan Shi, 3250 ME
- Raj Veeramani, 4101 ME
- Xin Wang, 3258 ME
- Shiyu Zhou, 3254 ME

## PREREQUISITES

- BS Degree or equivalent
- Mathematical statistics (Ex. Stat 312)
- Computer programming (Ex. CS 302)
- Three courses in ISYE (Ex: 313, 315, 320, 323, 349, 415, 417)

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

## PROGRAM DESCRIPTION

The specialization in Manufacturing and Production Systems is intended to provide the skills and knowledge necessary to compete successfully in a manufacturing environment. These



skills include knowledge of the theory of manufacturing materials and processes and their control; knowledge of the essentials of manufacturing systems design and analysis; and knowledge of and hands-on experience with modern manufacturing technology.

## MS DEGREE REQUIREMENTS

### MS DEGREE REQUIREMENTS (30 CREDITS TOTAL)

All students need to have 30 credits with the following sub-requirements: 12 credits from broad core courses; 6 credits from track-specific core courses; and the rest from technical electives. Maximum 6 credits of independent study may be used. Please note if you earn a grade of C or below in a course you CANNOT count that course toward the 30-credit requirement.

## BROAD CORE COURSES (12 credits) Select one course from each category:

### 1) Optimization

- **ISyE 524:** Introduction to Optimization
- **ISyE 525:** Linear Programming Methods

### 2) Probability and Stochastic Modeling

- **ISyE 624:** Stochastic Modeling Techniques
- **ISyE 632:** Introduction to Stochastic Modeling
- **ISyE 643:** Performance Analysis of Manufacturing Systems

### 3) Simulation

- **ISyE 620:** Simulation Modeling and Analysis

### 4) Statistics and Decision Analysis

- **ISyE 512:** Inspection, Quality Control, and Reliability
- **ISyE 516:** Introduction to Decision Analysis
- **ISyE 575\*:** Introduction to Quality Engineering
- **Stat 424\*:** Statistical Experimental Design for Engineers

\*Only one of ISyE 575 and Stat 424 may count toward MS degree.

## TRACK CORE COURSES - 6 credits Select two courses from:

- ISyE 510:** Facilities Planning
- ISyE 605:** Computer Integrated Manufacturing
- ISyE 615:** Production Systems Control
- ISyE 645:** Engineering Models for Supply Chains

## TECHNICAL ELECTIVES - 12 credits A least 6 credits must be ISyE courses or cross-listed with ISyE

These courses are chosen to meet your interests and career goals. Courses need to be at the 400 level or above.

### Sample electives:

- Any of the courses listed as broad core courses or track core courses are acceptable as electives, provided that they are not used to fulfill other requirements.

### Courses in ISyE, such as:

- **ISyE 415:** Introduction to Manufacturing Systems, Design and Analysis
- **ISyE 425:** Intro to Combinatorial Optimization
- **ISyE 515:** Engineering Management of Continuous Process Improvement
- **ISyE 612:** Information Sensing and Analysis for Manufacturing Processes
- **ISyE 641:** Design and Analysis of Manufacturing Systems
- **ISyE 671:** E-Business: Technologies, Strategies and Applications

### Other ISyE courses could be elected:

- Courses in Engineering, Sciences, Mathematics, Statistics, Business, Computer Sciences, Economics, Population Health Sciences, or Psychology **if it is approved by your advisor.**

## PROGRAM OUTCOMES

Changes from the standard curriculum **MUST BE APPROVED (in writing)** by the student's advisor.

## EXIT REQUIREMENTS

In order to be eligible for graduation, a Master's student must:

- Have a GPA of 3.0 or higher.
- Meet all MS degree requirements for their focus area.
- Have all grades entered, except for the current semester. No I's or NR's can show on the student's transcript.
- Be enrolled in at least 2 credits the semester in which they graduate.
- Have their MS degree warrant signed and dated by the degree deadline.
- Please note if you earn a grade of C or below in a course you **CANNOT** count that course toward the 30-credit requirement.

## LABORATORIES & CENTERS

- **Flexible Manufacturing Cell Laboratory**
- **Manufacturing Enterprise Systems Optimization Lab**
- **Manufacturing Systems Analysis Laboratory**
- **Manufacturing System Realization and Quality Lab**
- **Manufacturing Process Analysis and Control Lab (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

In this laboratory, students and faculty members perform interdisciplinary research on new methodologies and tools for modeling, design, 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.

### 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.

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### 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.

## JOB PLACEMENT

### Engineering Career Services Office

1150 Engineering Hall  
1415 Engineering Drive  
Madison, WI 53706  
Tel: (608) 262-3471  
Email: [ecs@engr.wisc.edu](mailto:ecs@engr.wisc.edu)  
<https://ecs.wisc.edu>

## FURTHER INFORMATION

### ISyE Graduate Student Services

3182 Mechanical Engineering  
1513 University Avenue  
Madison, WI 53706  
Tel: (608) 263-4025  
Fax: (608) 890-2204  
Email: [iegradadmission@engr.wisc.edu](mailto:iegradadmission@engr.wisc.edu)  
<http://www.engr.wisc.edu/ie>