MANUFACTURING SYSTEMS ENGINEERING, M.S.

The Master of Science in Manufacturing Systems Engineering (MSE) is an on-campus, multidisciplinary degree, drawing courses and faculty from engineering, business, computer sciences, and statistics. As the first program of its kind in the United States, and among the first in the world, MSE has long been recognized as a leading provider of resourceful engineers for global and dynamic manufacturing firms. Hands-on projects, along with classes taught by internationally recognized experts and state-of-the-art technology, provide an ideal foundation for anyone entering today's advanced manufacturing environment.

MSE graduates leave the program skilled beyond narrow specialties and equipped to lead technical teams. Students are exposed to practical problems and cutting-edge concepts, resulting in engineers who combine management skills with advanced technical abilities. Courses cover a broad range of manufacturing issues, while reinforcing a systems approach. The variety of subjects allows students to tailor their studies to individual goals or interests. More than 400 MSE alumni currently work in industry.

The student body of the MSE program is predominantly composed of students returning from industry or working for their degrees while employed. The program also has a substantial number of international students. Prospective students find the midsized program an ideal learning environment.

Specifically, the program addresses solutions to problems in the design, development, implementation, operation, evaluation, and management of modern manufacturing systems. An named option in the MSE M.S. degree titled Engineering Management Specialization is also offered, ideal for engineering students with a special interest in management issues pertaining to manufacturing. For students seeking advanced training in management, the School of Business offers an MBA in operations and technology management. A maximum of 6 advanced credits of MSE course work can be used to satisfy some of the MBA degree requirements.

Students may also consider the named option Engineering Management Specialization (http://guide.wisc.edu/graduate/engineering-college-wide/manufacturing-systems-engineering-ms/manufacturing-systems-engineering-management-specialization-ms) in the manufacturing systems engineering M.S.

ADMISSIONS

MSE ADMISSIONS PROFILE (HTTPS://TOOLS.GRAD.WISC.EDU/MAS/DETAILS/VIEW/G624)

ADMISSION INFORMATION FOR THE ON-CAMPUS MANUFACTURING SYSTEMS ENGINEERING M.S.

To be admitted to the M.S. program, applicants must satisfy the Graduate School's minimum admission requirements as well as the following program requirements: undergraduate engineering degree from an ABET-accredited program or its equivalent (students with a physical sciences degree other than engineering and considerable industry experience are also eligible); an undergraduate grade point average of at least 3.0 on a 4.0 scale (exceptions may be made by the admissions committee in favor of applicants with industry experience); and at least two years of work experience in manufacturing.

The application deadline for entry in the fall semester is January 1. (Fall admissions only)

Admission to the master's program in manufacturing systems engineering (MSE) steps:

1. Please visit the UW–Madison Graduate School Admissions (https://grad.wisc.edu/admissions/requirements) to review requirements for admission. Frequently Asked Questions. (https://grad.wisc.edu/admissions/faq)
2. Apply at the UW–Madison Graduate School (http://www.grad.wisc.edu).
3. Please submit the required application materials to the MSE program uploaded to the online application system including a statement of purpose, 3 letters of recommendation, current vitae/resume’ and transcript information for all post high school education. (Students applying from non-U.S. universities must supply GRE and either TOEFL, MELAB, or IELTS scores).

After you have submitted all the application materials to the MSE program as well as the graduate school, we will review your qualifications and check if everything is complete. The MSE program will then recommend qualified candidates for admission to the graduate school.

For further information, please contact msaegradadmission@engr.wisc.edu.

Costs of Graduate School/ Tuition Information (https://grad.wisc.edu/admissions/cost)

International Applicant Financial Information

GRADUATE SCHOOL ADMISSIONS

Graduate admissions is a two-step process between academic degree programs and the Graduate School. Applicants must meet requirements of both the program(s) and the Graduate School. Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/admissions).

FUNDING

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad.wisc.edu/funding) is available from the Graduate School. Be sure to check with your program for individual policies and processes related to funding.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/ #policiesandrequirementstext), in addition to the program requirements listed below.
MAJOR REQUIREMENTS

MODE OF INSTRUCTION

<table>
<thead>
<tr>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Mode of Instruction Definitions

Evening/Weekend: These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.

Online: These programs are offered primarily online. Many available online programs can be completed almost entirely online with all online programs offering at least 50 percent or more of the program work online. Some online programs have an on-campus component that is often designed to accommodate working schedules.

Take advantage of the convenience of online learning while participating in a rich, interactive learning environment. For more information about the online nature of a specific program, contact the program.

Hybrid: These programs have innovative curricula that combine on-campus and online formats. Most hybrid programs are completed on-campus with a partial or completely online semester. For more information about the hybrid schedule of a specific program, contact the program.

Accelerated: These on-campus programs are offered in an accelerated format that allows you to complete your program in a condensed time-frame. Enjoy the advantages of on-campus courses with minimal disruption to your career. For more information about the accelerated nature of a specific program, contact the program.

CURRICULAR REQUIREMENTS

Minimum Credit Requirement

| Minimum Credit Requirement | 30 credits |

Minimum Residence Credit Requirement

| Minimum Graduate Coursework Requirement | 16 credits |

Half of degree coursework (15 credits out of 30 total credits) must be completed in graduate-level coursework in the College of Engineering, the School of Business, the Department of Statistics, the Department of Biological Systems Engineering, or the Department of Computer Sciences; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (https://registrar.wisc.edu/course-guide/).

Overall Graduate GPA Requirement

| Overall | 3.00 GPA required |

Other Grade Requirements

The Graduate School requires an average grade of B or better in all coursework (300 or above, not including research credits) taken as a graduate student unless conditions for probationary status require higher grades. Grades of Incomplete are considered to be unsatisfactory if they are not removed during the next enrolled semester.

Assessments and Examinations Requirements determined by the program.

Language No language requirements.

REQUIRED COURSES

The on-campus Manufacturing Systems Engineering M.S. program has three tracks: course only, industrial thesis, and research thesis. Students must take four courses from the core course areas with at least one course from each of the core course areas. All students are required to take the capstone course I SY E/M E 641 Design and Analysis of Manufacturing Systems. The remaining course requirements vary depending on the program track that is chosen and are described in the table below.

### Course Only Track

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SY E/M E 641</td>
<td>Design and Analysis of Manufacturing Systems (Offered in spring semester)</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses: 12

Industry Thesis (Optional for course only option): 3

**Total Credits:** 30

1. These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.
2. At least one course must be selected from each of the three core areas.
3. Up to one credit of Independent Study for an internship may count as elective credit toward the degree. A written report must be approved by the advisor. This credit cannot be used toward fulfillment of the Industry Thesis or Thesis Research requirements.

### Industry Thesis Track

<table>
<thead>
<tr>
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<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>I SY E/M E 641</td>
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Industry Thesis: 3

Elective Courses: 12

**Total Credits:** 30

1. These tracks are internal to the program and represent different pathways a student can follow to earn this degree. Track names do not appear in the Graduate School admissions application, and they will not appear on the transcript.
2. At least one course must be selected from each of the three core areas.
3. Up to one credit of Independent Study for an internship may count as elective credit toward the degree. A written report must be approved by the advisor. This credit cannot be used toward fulfillment of the Industry Thesis or Thesis Research requirements.

### Research Thesis Track

<table>
<thead>
<tr>
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<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SY E/M E 641</td>
<td>Design and Analysis of Manufacturing Systems (Offered in spring semester)</td>
<td>3</td>
</tr>
</tbody>
</table>
Core Course Areas

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M E 601</td>
<td>Special Topics in Mechanical Engineering (Material Selection)</td>
<td>1-3</td>
</tr>
<tr>
<td>M E 717</td>
<td>Advanced Polymer Processing</td>
<td>3</td>
</tr>
<tr>
<td>M E/C/E 739</td>
<td>Advanced Robotics</td>
<td>3</td>
</tr>
<tr>
<td>M E 747</td>
<td>Advanced Computer Control of Machines and Processes</td>
<td>3</td>
</tr>
<tr>
<td>M E/CBE 567</td>
<td>Solar Energy Technology</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 434</td>
<td>Introduction to Thin-Film Deposition Processes</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 461</td>
<td>Advanced Metal Casting</td>
<td>3</td>
</tr>
<tr>
<td>N E 405</td>
<td>Nuclear Reactor Theory</td>
<td>3</td>
</tr>
<tr>
<td>M S &amp; E 465</td>
<td>Fundamentals of Heat Treatment</td>
<td>3</td>
</tr>
<tr>
<td>N E 405</td>
<td>Nuclear Reactor Theory</td>
<td>3</td>
</tr>
</tbody>
</table>

Fundamentals of Systems Engineering and Design

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBE 430</td>
<td>Chemical Kinetics and Reactor Design</td>
<td>3</td>
</tr>
<tr>
<td>CIV ENGR 498</td>
<td>Construction Project Management</td>
<td>3</td>
</tr>
<tr>
<td>CIV ENGR 370</td>
<td>Transportation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CIV ENGR 498</td>
<td>Construction Project Management</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI/E C E 755</td>
<td>VLSI Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>COMP SCI/E C E 756</td>
<td>Computer-Aided Design for VLSI</td>
<td>3</td>
</tr>
<tr>
<td>E C 427</td>
<td>Electric Power Systems</td>
<td>3</td>
</tr>
<tr>
<td>M E 418</td>
<td>Engineering Design with Polymers</td>
<td>3</td>
</tr>
<tr>
<td>M E 444</td>
<td>Design Problems in Elasticity</td>
<td>3</td>
</tr>
<tr>
<td>M E 535</td>
<td>Computer-Aided Geometric Design</td>
<td>3</td>
</tr>
<tr>
<td>M E 549</td>
<td>Product Design</td>
<td>3</td>
</tr>
<tr>
<td>M E 601</td>
<td>Special Topics in Mechanical Engineering (Mechatronics in Control and Product Realization)</td>
<td>1-3</td>
</tr>
<tr>
<td>M E 601</td>
<td>Special Topics in Mechanical Engineering (Design of Computer Control Systems)</td>
<td>1-3</td>
</tr>
<tr>
<td>M E 601</td>
<td>Special Topics in Mechanical Engineering (Computer Aided Design and Analysis of Mechanical Systems)</td>
<td>1-3</td>
</tr>
<tr>
<td>M E 748</td>
<td>Optimum Design of Mechanical Elements and Systems</td>
<td>3</td>
</tr>
<tr>
<td>MARKETNG 427</td>
<td>Enterprise Systems and Supply Chain Management</td>
<td>3</td>
</tr>
<tr>
<td>MARKETNG 440</td>
<td>Emerging Issues in New Product Development</td>
<td>3</td>
</tr>
<tr>
<td>MARKETNG 740</td>
<td>Emerging Issues in New Product Development</td>
<td>3</td>
</tr>
<tr>
<td>OTM 860</td>
<td>Sustainable Design of Innovative Products, Services and Systems</td>
<td>3</td>
</tr>
<tr>
<td>I SY E/M 510</td>
<td>Facilities Planning</td>
<td>3</td>
</tr>
<tr>
<td>I SY E/M 512</td>
<td>Inspection, Quality Control and Reliability</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 515</td>
<td>Engineering Management of Continuous Process Improvement</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 520</td>
<td>Quality Assurance Systems</td>
<td>3</td>
</tr>
<tr>
<td>I SY E/B M E 564</td>
<td>Occupational Ergonomics and Biomechanics</td>
<td>3</td>
</tr>
<tr>
<td>I SY E 575</td>
<td>Introduction to Quality Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>
I SY E 612  Information Sensing and Analysis for Manufacturing Processes  3
I SY E 620  Simulation Modeling and Analysis  3
I SY E/M E 643  Performance Analysis of Manufacturing Systems  3
OTM 654  Production Planning and Control  3
OTM 770  Sustainable Approaches to System Improvement  4
OTM 875  Seminar in Operations and Technology Management  3
STAT/M E 424  Statistical Experimental Design  3

Fundamentals of Business and Management
ACCT I S 300  Accounting Principles  3
ACCT I S 301  Financial Reporting I  3
ACCT I S 710  Managerial Accounting  3
GEN BUS 765  Contemporary Topics  1-4
FINANCE/ECON 300  Introduction to Finance  3
FINANCE 757  Entrepreneurial Finance  1  3
I SY E/PSYCH 653  Organization and Job Design  3
M H R 700  Organizational Behavior  3
M H R 715  Strategic Management of Innovation  1  3
M H R 722  Entrepreneurial Management  1  3
M H R 765  Contemporary Topics  1  1-4
MARKETING/ OTM 421  Fundamentals of Supply Chain Management  3
MARKETING/ OTM 422  Logistics Management  3
MARKETING/ OTM 724  Strategic Global Sourcing  3
OTM 365  Contemporary Topics  2-7
& OTM 765  and Contemporary Topics
OTM 758  Managing Technological and Organizational Change  1  3
OTM 861  Strategic Systems and Sustainability  3

1 Most 700-level courses are only taught every three or four semesters. Please check with instructor about the next offering before completing study plan.
2 This course number is used for multiple seminar classes. Please check the Course Guide for correct listing.
3 Offered online through Sustainable Systems Engineering.

NAMED OPTIONS (SUB-MAJORS)
A named option is a formally documented sub-major within an academic major program. Named options appear on the transcript with degree conferral.


Policies

GRADUATE SCHOOL POLICIES
The Graduate School's Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

MAJOR-SPECIFIC POLICIES

GRADUATE PROGRAM HANDBOOK
A Graduate Program Handbook containing all of the program’s policies and requirements is forthcoming from the program.

PRIOR COURSEWORK

Graduate Work from Other Institutions
With program approval, students are allowed to count no more than 12 credits of graduate coursework from other institutions toward the minimum graduate degree requirement and toward the minimum graduate coursework (50%) requirement. No credits from other institutions can be counted toward the minimum graduate residence credit requirement. Coursework earned five or more years prior to admission is not allowed to satisfy requirements.

UW–Madison Undergraduate
With program approval, up to 7 credits from the UW–Madison Undergraduate career numbered 400 or above may be counted toward the minimum graduate degree credit requirement. No prior coursework from the UW–Madison undergraduate career may be counted toward the minimum graduate coursework (50%) requirement or the minimum graduate residence credit requirement. Coursework earned five or more years prior to admission is not allowed to satisfy requirements.

UW–Madison University Special
With program approval, students are allowed to count up to 15 credits of coursework numbered 400 or above taken as a UW–Madison Special student toward the minimum graduate residence credit requirement and the minimum graduate degree credit requirement; coursework numbered 700 or above may satisfy the minimum graduate coursework (50%) requirement. Coursework earned five or more years prior to admission is not allowed to satisfy requirements.

PROBATION
The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, or Incomplete in a graduate course (300 or above), or grade of U in research credits. This review could result in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

ADVISOR / COMMITTEE
Every graduate student is required to have an advisor. To ensure that students are making satisfactory progress toward a degree, the Graduate School expects them to meet with their advisor on a regular basis.
The director of the Manufacturing Systems Engineering Program is assigned as the advisor to incoming students. Students can be suspended from the Graduate School if they do not have an advisor. An advisor is a faculty member, or sometimes a committee, from the major department responsible for providing advice regarding graduate studies. (See People section of this Guide for possible MSE advisors).

CREDITS PER TERM ALLOWED
15 credits

TIME CONSTRAINTS
Master’s degree students who have been absent for five or more consecutive years lose all credits that they have earned before their absence.

OTHER

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES
Take advantage of the Graduate School’s professional development resources (https://grad.wisc.edu/pd) to build skills, thrive academically, and launch your career.

PROGRAM RESOURCES

THE INDIVIDUAL DEVELOPMENT PLAN (HTTPS://GRAD.WISC.EDU/PD/IDP)
An Individual Development Plan helps with self-assessment, planning, and communication:

- An IDP can help you communicate your professional development and career planning needs and intentions to others including your mentor, which can lead to helpful advice and resources.
- You can use the IDP to make sure you and your mentor’s expectations are clearly outlined and in agreement so that there are no big surprises, particularly at the end of your training.
- The current job market is challenging and research has shown that individuals who perform structured career planning achieve greater career success and satisfaction.

The onus to engage in the IDP process is your responsibility—although your mentor, PI, or others may encourage and support you in doing so. The IDP itself remains private to you, and you choose which parts to share with which mentors. Through the IDP process, you may decide to identify various mentors to whom you can go for expertise and advice.

ENGINEERING CAREER SERVICES (HTTPS://ECS.WISC.EDU)
Julie Rae, Assistant Director for Graduate Student Career Services, graduate students in all engineering programs

- Resumes and Cover Letters (https://ecs.wisc.edu/students/resumes-and-cover-letters)
- Job Search Strategies
- Job Offers and Negotiation (https://ecs.wisc.edu/students/offers-and-negotiation)
- CPT for Graduate Students (https://ecs.wisc.edu/students/co-op-and-internship)
- Student Appointments: Schedule Here (http://go.wisc.edu/ecs-grad-appt)

UW WRITING CENTER (HTTP://WRITING.WISC.EDU)
6171 Helen C. White Hall
608-263-1992
The UW Writing Center provides free of charge face-to-face and online consultations that focus on a number of different writing scenarios (i.e. drafts of course papers, resumes, reports, application essays, cover letters, theses, etc). Writing Center instructors will not edit or proofread papers. Instead, their goal is to teach students to edit and proofread on their own in order to become a better, more confident writers.

LEARNING OUTCOMES
1. Demonstrate a strong understanding of mathematical, scientific, and engineering principles in the field.
2. Demonstrate an ability to formulate, analyze, and solve advanced engineering problems.
3. Demonstrate creative, independent problem solving skills.
4. Apply the latest scientific and technological advancements, advanced techniques, and modern engineering tools to these problems.
5. Recognize and apply principles of ethical and professional conduct.

PEOPLE

PROFESSORS
- Frank Pfefferkorn (MSE Director; Mechanical Engineering) (https://directory.engr.wisc.edu/me/Faculty/Pfefferkorn_Frank)
- Gregory A. DeCroix (School of Business) Associate (https://directory.engr.wisc.edu/ie/Faculty/Decroix_Gregory)
- Neil Duffie (Mechanical Engineering) – Emeritus (https://directory.engr.wisc.edu/me/Faculty/Duffie_Neil)
- Mark Finster (School of Business) (https://bus.wisc.edu/faculty/mark-finster)
- Ananth Krishnamurthy (Industrial and Systems Engineering) (https://directory.engr.wisc.edu/ie/Faculty/Krishnamurthy_Ananth)
- Rafael Lazimy (School of Business) (https://bus.wisc.edu/faculty/rafi-lazimy)
- Jingshan Li (Industrial and Systems Engineering) (https://directory.engr.wisc.edu/ie/Faculty/Li_Jingshan)
• Miron Livny (Computer Science) (http://www.cs.wisc.edu/people/miron)

• Robert Lorenz (Mechanical Engineering) (https://directory.engr.wisc.edu/me/Faculty/Lorenz_Robert)

• Ella Mae Matusumura (School of Business) (https://bus.wisc.edu/faculty/ella-mae-matsumura)

• Sangkee Min (Mechanical Engineering) (https://directory.engr.wisc.edu/me/Faculty/Min_Sangkee)

• Tim Osswald (Mechanical Engineering) (https://directory.engr.wisc.edu/me/Faculty/Osswald_Tim)

• Robert Radwin (Industrial and Systems Engineering) (https://directory.engr.wisc.edu/ie/Faculty/Radwin_Robert)

• Bin Ran (Civil and Environmental Engineering) (https://directory.engr.wisc.edu/cee/faculty/ran_bin)

• Robert Rowlands (Mechanical Engineering) (https://directory.engr.wisc.edu/me/Faculty/Rowlands_Robert)

• Jeffrey S. Russell (Vice Provost for Lifelong Learning/ Dean of Continuing Studies) (https://continuingstudies.wisc.edu/bios/russell-jeffrey.html)

• Leyuan Shi (Industrial and Systems Engineering) (https://directory.engr.wisc.edu/ie/Faculty/Shi_Leyuan)

• Kumar Sridharan (Engineering Physics) (https://directory.engr.wisc.edu/ep/faculty/sridharan_kumar)

• Donald S. Stone (Material Science and Engineering) (https://directory.engr.wisc.edu/mse/Faculty/Stone_Donald)

• Krishnan Suresh (Mechanical Engineering) Associate (https://directory.engr.wisc.edu/me/faculty/suresh_krishnan)

• Lih-Sheng (Tom) Turng (Mechanical Engineering) (https://directory.engr.wisc.edu/me/Faculty/Turng_Lih-sheng)

• Raj Veeramani (Industrial and Systems Engineering) (https://directory.engr.wisc.edu/ie/Faculty/Veeramani_Raj)

• Xin Wang (Industrial and Systems Engineering) (https://directory.engr.wisc.edu/ie/Faculty/Wang_Xin)

• Urban Wemmerlov (School of Business) (https://bus.wisc.edu/faculty/urban-wemmerlov)

• Michael R. Zinn (Mechanical Engineering) (https://directory.engr.wisc.edu/me/Faculty/Zinn_Michael)

• Shiyu Zhou (Industrial and Systems Engineering) (https://directory.engr.wisc.edu/ie/Faculty/Zhou_Shiyu)