MANUFACTURING ENGINEERING

Manufacturing uses advanced technologies to transform materials into new products or parts of products. Today’s manufacturing industry includes (but is not limited to) aerospace, biotechnology, electronic equipment manufacturing, engineering in machining and equipment, food processing and supply, light metals, marine industries, etc.

Missouri S&T’s manufacturing engineering education program offers the interdisciplinary master of science (M.S.) and master of engineering (M.E.) degrees on campus or through distance learning via the internet. Both degree programs are intended for a student with a B.S. degree in engineering to learn about modern manufacturing technologies involving computers and automation.

Also offered are graduate manufacturing engineering certificate programs, including manufacturing systems and CAD/CAM and rapid product realization for working professionals who want to stay ahead of rapidly changing technology.

The M.S. program is a research-oriented degree where the courses supplement the thesis research. The M.E. program is designed such that the course selection is flexible and the student is allowed to take courses pertaining to his or her area of interest. A practice-orientated project is required by the M.E. program, which provides an opportunity for the student to participate in a practical project related to a manufacturing process. The M.E. program is structured so that individuals, such as working engineers, who wish to improve their knowledge and skills can complete their degree in one year.

The M.S. program requires 30 credit hours and a thesis:

- 12 credit hours from the manufacturing core areas
- 6 credit hours of 6000-level courses in manufacturing
- 6 to 9 credit hours for thesis research
- 3 to 6 credit hours of graduate courses in manufacturing as approved by the academic advisor

The M.E. program requires 30 credit hours and a practice-oriented project. The course requirements include 12 credit hours from the manufacturing core areas, 6 credit hours of 6000-level courses in manufacturing; 3 credit hours of approved mathematics/computer science or any suggested manufacturing courses, 3 credit hours for work related to the practice-oriented project, and 6 credit hours of graduate courses in manufacturing. The practice-orientated project is defined by the student and academic advisor. At the end of the project experience, the student should demonstrate not only the proficiency of operating certain manufacturing processes, but also the capability to improve the process. At the end of the M.E. program, a presentation and a report documenting the practice oriented projects are required. For both programs, at most 6 credit hours of two hundred level classes can be completed in the degree.

For both programs, each student must take at least one course from each of the core areas in manufacturing engineering during his or her first two semesters of graduate work. The core requirements may be deemed satisfied if a student has already taken a core course as a technical elective in his or her undergraduate program, thus allowing more freedom in the selection of other courses. The related courses in manufacturing core areas are selected and offered from various departments.

The manufacturing core areas include:

- Materials and Manufacturing Processes
- Process, Assembly and Product Engineering
- Manufacturing Competitiveness
- Manufacturing System Design

The graduate committee for each student in the interdisciplinary Master of Science degree program will consist of three faculty of which at least two must be from the Manufacturing Education Committee (MEC). The major advisor should also be a member of the Manufacturing Education Committee. The master of engineering student does not need a committee, but the advisor should be from MEC. MEC is formed by over 40 faculty members from various departments, such as ceramic engineering, chemical engineering, computer science, electrical and computer engineering, engineering management, mechanical and aerospace engineering, metallurgical engineering, mining engineering, and business administration. For details regarding the application, curriculum, courses in manufacturing core areas, and MEC faculty, you may also wish to explore the program’s web page at: http://mae.mst.edu.

Some examples of research areas in which you can specialize include:

- Design for Manufacturing/Assembly
- CAD/CAM/CIM
- Product/Process Development
- Manufacturing Management
- Manufacturing Processes
- Manufacturing Materials
- Lean Manufacturing
- Rapid Product Realization
- Programmable Controllers
- Assembly & Automation
- Manufacturing Plant Layout
- Jig, Fixture & Tool Design
- CNC machining
- Environmentally Friendly Manufacturing
- Product Quality Control

This is a truly interdisciplinary program, which will provide you with a variety of options in manufacturing. The existing laboratories which can be used in this proposed program include Computer Integrated Manufacturing Lab (CIM lab), Agile Manufacturing and Automated Inspection Lab (AMAIL), Rapid Prototyping Lab, Laser Aided Manufacturing Processes (LAMP) Lab, Augmented Reality Lab, High Pressure Waterjet Lab, Sustainable Design Lab, Laser Welding Lab, Composite Manufacturing Lab, Computer Vision Lab, Lab for Industrial Automation and Flexible Machining, Automated PC Board Milling Machine, Foundry to Melt and Cast Ferrous and Non-ferrous Alloys, Intelligent Control of Machining Lab and Digital Image and Signal Processing Lab.

The graduate certificate program consists of a four-course sequence from existing graduate-level courses. While the students admitted to the Certificate Program will have non-matriculated status, if they complete the four-course sequence with a grade of “B” or better in each of the courses taken, they will be admitted to the M.S. program if they so choose. The Certificate credits taken by students admitted to the M.S. program will count toward their master’s degree.

2015-2016
CAD/CAM & Rapid Product Realization Certificate
One each from the four core areas in the Manufacturing Engineering program as outlined below:

Course I
MECH ENG 576 Principles And Practice Of Computer Aided Design

Course II
Select one of the following:
- MECH ENG 570 Rapid Product Design And Optimization
- ENG MGT 5515 Integrated Product And Process Design
- MECH ENG 575

Course III
MECH ENG 665 Advanced Topics In Design And Manufacturing

Course IV
Select one of the following:
- AERO ENG 5760 Probabilistic Engineering Design
- MECH ENG 565 Design For Manufacture

Manufacturing Systems Certificate
For the Manufacturing Systems Graduate Certificate Program the students will need to take four course sequences, one each from the four course areas in the Manufacturing Engineering program as outlined below:

Course I-Materials and Manufacturing Processes
Select one of the following:
- MECH ENG 522 Advanced Mechanics of Materials
- MECH ENG 523 Fracture Mechanics
- MECH ENG 528 Introduction to Composite Materials & Structures
- MECH ENG 665 Advanced Topics In Design And Manufacturing

Course II-Process, Assembly and Product Engineering
Select one of the following:
- ENG MGT 5515 Integrated Product And Process Design
- MECH ENG 5757
- MECH ENG 570 Rapid Product Design And Optimization
- MECH ENG 576 Principles And Practice Of Computer Aided Design

Course III-Manufacturing Competitiveness
Select one of the following:
- ENG MGT 5710 Six Sigma
- ENG MGT 5613 Value Analysis
- ENG MGT 5615 Production Planning And Scheduling
- ENG MGT 5714 Statistical Process Control
- ENG MGT 6611 Lean Systems
- AERO ENG 5760 Probabilistic Engineering Design
- MECH ENG 5760
- ERP 5110 Enterprise Resource Planning Systems Design and Implementation

Course IV-Manufacturing Systems Design
Select one of the following:
- ENG MGT 5314 Computer Integrated Manufacturing Systems
- MECH ENG 565 Manufacturing Equipment Automation
- MECH ENG 565 Design For Manufacture
- MECH ENG 547 Mechatronics