The Society of Manufacturing Engineers (sme.org) is the lead professional society used in developing program criteria guiding program relevance and improvement directions. Students are encouraged to take the Certified Manufacturing Technologist (CMfgT) exam in the senior year and pursue other certifications as their experience broadens.

The primary goal of the MET program is to provide all graduates with the solid technical foundation necessary to insure their success in a wide variety of employment opportunities. To accomplish this goal, program outcomes and objectives are defined and assessed for continuous improvement. These are consistent with the mission of the university and college and reviewed by the Industrial Advisory Board on an annual basis. They are as follows:

**Program Outcomes.** Students at the time of graduation are prepared to:

1. **apply knowledge, problem solving techniques, and hands-on skills in the assessment, design, application, and continuous improvement of manufacturing systems, including automated manufacturing, processes, process controls, manufacturing operations, management, and systems integration.**
2. **specify and implement hard and soft technologies to solve manufacturing system problems using creativity in design.**
3. **demonstrate the application of their knowledge of mathematics, statistics, science, engineering and technology.**
4. **conduct, analyze and interpret experiments and apply results to improve processes and systems.**
5. **recognize the need and develop the skills for life-long learning.**
6. **communicate effectively across all design and management interface levels of an organization.**
7. **function effectively in a team and or leadership environment.**
8. **implement accepted professional standards of integrity and ethical conduct.**
9. **understand and engage in behavior which respects diversity and global cultures.**
10. **practice timeliness and quality with regard to work requirements.**

**Program Objectives.** Graduates two to three years into their careers should have the foundation to:

1. **deliver products, services, and support to both internal and external organizations by applying technical knowledge, problem solving techniques and hands-on skills in traditional and emerging areas of manufacturing.**
2. **actively participate in on-going professional development, professional growth and increasing professional responsibility.**
3. **effectively communicate ideas to technical and non-technical people.**
4. **perform, lead, and manage in cross-functional teams.**
5. **work within the accepted standards of professional integrity and conduct.**
6. **design, analyze, build, and test virtual or real models in product development and continuous improvement environments.**
7. **implement, and continuously improve cost, quality, time, and flexibility goals using world class management methodologies.**

**Accreditation.** The MET degree program is accredited by the Technology Accreditation Commission (TAC) of the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, Phone: 410-347-7700, Fax: 410-625-2238, e-mail: tac@abet.org, web: http://www.abet.org

**Application to the MET Major** is granted by the AMET Department. Admission to the major is required to register for 300-level courses. Minimum requirements for acceptance into the MET major include a cumulative GPA of 2.0 or higher and the completion of the following courses with a grade of “C” (2.0) or higher: CHEM 104, CMST 100 or CMAT 102, EET 133, ENG 101, MET 104, MET 142, MET 144, MET 177, MATH 121, MATH 127, STAT 154, PHYS 211, PHYS 212.
MANUFACTURING ENGINEERING TECHNOLOGY

MANUFACTURING ENGINEERING TECHNOLOGY MINOR

Required for Minor

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET 104</td>
<td>Introduction to Manufacturing Engineering Technology</td>
<td>(1)</td>
</tr>
<tr>
<td>MET 142</td>
<td>Computer Aided Design</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 177</td>
<td>Materials Processing I and Metallurgy</td>
<td>(4)</td>
</tr>
</tbody>
</table>

Additional electives required for minor (8 credits)

Required for Minor (Electives, 8 credits)

Choose 8 credits of MET/AET courses from major core courses.

COURSE DESCRIPTIONS

MET 104 (1) Introduction to Manufacturing Engineering Technology
An overview of careers, technology and requirements for individuals interested in Manufacturing Engineering Technology. Hands-on experience is gained in a variety of new technologies. Careers in engineering and technology are examined along with professional organizations and ethics. The course is intended as a first step toward a career in manufacturing.

MET 142 (3) Computer Aided Design
Computer Aided Designing covers a process of developing and analyzing solid parametric models for mechanical applications. Course includes solving technical design problems based on real-world applications as well as creation of technical documentation: working and assembly drawings. Introduction to the Finite Element Analysis is included in the course.

MET 177 (4) Materials Processing I and Metallurgy
Fundamentals of machine technology and metallurgy. Theory and step-by-step procedures are used to provide instruction on how to turn materials into products. Basics of metal processing, plastic molding, and other processes are discussed. Extra lab time is required.

MET 222 (3) Introduction to Statics and Mechanics of Materials
Course introduces the design theory and applied principles of force equilibrium, stress and strain, shear, bending moments, force diagrams, deformations of beams, and stress/stain analysis. Pre: PHYS 101, MATH 115
Fall, Spring

MET 277 (4) Materials Processing II
A study of the principles of manufacturing technologies, measurements and equipment used in processing of an end product. Advanced manufacturing processes including casting, forging, sheet metal forming, material removal, joining, and powder metals are discussed. Topics also include materials treatment, preparation, and design for manufacture. Extra lab time is required. Pre: MET 177

MET 323 (3) Statics
This course covers principles of statics, force equilibrium, analysis of structures, friction, centroid, centers of gravity, and moment of inertia. Pre: PHYS 211 and MATH 121
Fall, Spring, Summer

Policies/Information

GPA Policy. A minimum GPA of 2.0 is required.

Refer to the College regarding required advising for students on academic probation.

Department Grade Policy. All courses in the MET Major, and the required Communications, Basic Science, and Mathematics courses must be completed with a grade of "C" or better.

P/N Grading Policy. No more than 1/4 of all undergraduate credits may be P/N, except those courses offered P/N only.

Residency. A minimum of 50 percent of the credits for a major or minor in Manufacturing Engineering Technology must be taken at Minnesota State Mankato.

Prerequisites and co-requisites must be observed unless written permission is obtained from the instructor and the Department of AMET. A flow chart of prerequisites is available in the Department Office.

The scheduling of all department courses is done annually, based on enrollment and staffing. To obtain a current class schedule, contact the Department.

MANUFACTURING ENGINEERING TECHNOLOGY BS

Required General Education

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 104</td>
<td>Introduction to Chemistry</td>
<td>(3)</td>
</tr>
<tr>
<td>CMST 100</td>
<td>Fundamentals of Communication</td>
<td>(3)</td>
</tr>
<tr>
<td>CMST 102</td>
<td>Public Speaking</td>
<td>(3)</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Composition</td>
<td>(4)</td>
</tr>
<tr>
<td>MATH 115</td>
<td>Precalculus Mathematics</td>
<td>(4)</td>
</tr>
<tr>
<td>MATH 121</td>
<td>Calculus I (4)</td>
<td></td>
</tr>
<tr>
<td>PHYS 211</td>
<td>Principles of Physics I</td>
<td>(4)</td>
</tr>
<tr>
<td>STAT 154</td>
<td>Elementary Statistics</td>
<td>(3)</td>
</tr>
</tbody>
</table>

Please see advisor for additional General Education requirements.

Prerequisites to the Major

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 271</td>
<td>Technical Communication</td>
<td>(4)</td>
</tr>
<tr>
<td>EET 113</td>
<td>DC Circuits</td>
<td>(3)</td>
</tr>
<tr>
<td>MATH 127</td>
<td>Calculus II for Engineering Technology: Integration</td>
<td>(2)</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>Principles of Physics II</td>
<td>(4)</td>
</tr>
</tbody>
</table>

Major Common Core

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AET 334</td>
<td>Fluid Power</td>
<td>(3)</td>
</tr>
<tr>
<td>AET 378</td>
<td>Composite Materials</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 104</td>
<td>Introduction to Manufacturing Engineering Technology</td>
<td>(1)</td>
</tr>
<tr>
<td>MET 142</td>
<td>Computer Aided Design</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 144</td>
<td>Product Development and Design</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 177</td>
<td>Materials Processing I and Metallurgy</td>
<td>(4)</td>
</tr>
<tr>
<td>MET 277</td>
<td>Materials Processing II</td>
<td>(4)</td>
</tr>
<tr>
<td>MET 323</td>
<td>Statics</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 324</td>
<td>Strength of Materials and Dynamics</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 325</td>
<td>Project Management</td>
<td>(2)</td>
</tr>
<tr>
<td>MET 341</td>
<td>Advanced Computer Aided Design</td>
<td>(4)</td>
</tr>
<tr>
<td>MET 347</td>
<td>Manufacturing Automation</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 348</td>
<td>Computer Integrated Manufacturing</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 386</td>
<td>Metrology for Engineering Technologist</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 407</td>
<td>Manufacturing Resource Planning and Control</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 421</td>
<td>Project Valuation and Justification</td>
<td>(2)</td>
</tr>
<tr>
<td>MET 423</td>
<td>Ergonomics and Work Measurement</td>
<td>(4)</td>
</tr>
<tr>
<td>MET 424</td>
<td>Industrial Safety</td>
<td>(2)</td>
</tr>
<tr>
<td>MET 426</td>
<td>Logistics and Transportation</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 427</td>
<td>Quality Management Systems</td>
<td>(3)</td>
</tr>
<tr>
<td>MET 488</td>
<td>Senior Design Project I</td>
<td>(2)</td>
</tr>
<tr>
<td>MET 489</td>
<td>Senior Design Project II</td>
<td>(2)</td>
</tr>
</tbody>
</table>

Minor Required: None.
MET 324 (3) Strength of Materials and Dynamics
This course covers stress and strain, torsion, bending of beams, shearing stresses in beams, compound stresses, principal stresses, deflections of beams, columns, connections, and pressure vessels. Topics also include kinematics and kinetics of rigid bodies, work, energy and power.
Pre: MET 323
Fall, Spring, Summer

MET 325 (2) Project Management
Planning, organizing, directing, and reporting for industrial, team-based project management are studied in relationship to organizational factors of structure and culture.
Pre: ENG 271, MET 277, STAT 154
Spring

MET 341 (4) Advanced Computer Aided Design
This course emphasizes the use of CAD in design, analysis, and manufacturing. Topics include component design, mechanics, animation, finite element analysis, CNC machining and rapid prototyping using CAD.
Pre: MET 142, MET 323

MET 345 (1-2) CAD Projects
Advanced applications of computer aided design. Solid and parametric systems.

MET 347 (3) Manufacturing Automation
CNC programming, computer-aided manufacturing (CAM), flexible automations, machining centers, robotics, programmable logic controllers, tooling systems. Extra lab time is required.
Pre: AET 334, EET 113, MET 277, MET 341

MET 348 (3) Computer Integrated Manufacturing
This course covers the following topics: manufacturing systems integration techniques, Computer-Aided Design/Computer-Aided Manufacturing (CAD/ CAM), Computer-Aided Process Planning (CAPP), Direct Numerical Control (DNC), Flexible Machining Systems (FMS), Automated Storage and Retrieval Systems (ASRS), Automated Guided Vehicles (AGV) and Robotics.
Pre: MET 347, PHYS 212
Fall

MET 386 (3) Metrology for Engineering Technologist
Quality and its continuous improvement is supported by metrology, statistical process control, and geometric dimensioning and tolerancing. This course presents these topics and their integration into operations.
Pre: MATH 121, STAT 154. Admission to AET/MET major.
Fall

MET 407 (3) Manufacturing Resource Planning and Control
Strategic plant resource management for global manufacturing. Approaches examine and practice continuous improvements to the value stream related to design integration, production scheduling, staffing, facilities planning, and material flow.
Pre: MET 325, MET 347

MET 421 (2) Project Valuation and Justification
Principles of engineering economy are enhanced through spreadsheet modeling and proposal development of the justification of capital projects.
Pre: MET 325
Fall

MET 423 (4) Ergonomics & Work Measurement
Investigates work design and automated and manual operations. Measurement, and development of design-based solutions for reduction of environmental stresses to the human body through worker-machine systems analysis are applied. Regulatory, legal, and ethical issues are reviewed in the context of global manufacturing applications.
Pre: Junior status in program of discipline, or basic manufacturing and design knowledge in industry sector discipline and background in elementary statistics.

MET 424 (2) Industrial Safety
Techniques of developing safety practices in an industrial environment. Topics include OSHA, current legislation, cost analysis, personal protection, employee selection, psychological aspects, product safety, hazard materials and catastrophe control.

MET 426 (3) Logistics and Transportation
Fundamentals of logistics: control of materials, WIP, finished goods, costs of logistics. Theory and step-by-step procedures are used to analyze logistic systems, material handling, packaging, and transportation, including global logistics.
Pre: MET 407
Spring

MET 427 (3) Quality Management Systems
This course is focused on quality assurance systems, management philosophies, methodology, function and impact of quality systems in manufacturing operations. Development and application of statistical process control tools.
Pre: Basic manufacturing and design knowledge for industry sector discipline and elementary statistics.

MET 488 (2) Senior Design Project I
An examination of manufacturing design and research. Students refine their design proposal and begin their senior design projects. This course also prepares the student for MET 489, Senior Design Project II, where the design proposal, project, and final report are completed. This course should be taken in the fall semester of the senior year.
Pre: ENG 271, MET 144, MET 277, MET 325

MET 489 (2) Senior Design Project II
Completion of the capstone design project; a continuation of MET 488.
Pre: MET 347, MET 488

MET 492 (1-4) Seminar: Manufacturing
Selected manufacturing topics.

MET 497 (1-10) Internship: Manufacturing
Manufacturing work experience in an area pertinent to the student’s objective. Consent of internship coordinator required prior to the beginning of employment and registration. Typically done between the junior and senior year.
Pre: 50% of major

MET 499 (1-4) Individual Study