Manufacturing Engineering Technology
College of Science, Engineering & Technology
Department of Automotive & Manufacturing Engineering Technology
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Fax: 507-389-5002
Website: www.cset.mnsu.edu/met

Chair: Dr. Bruce E. Jones, Ph.D.
Faculty: Kuldeep Agarwal, Ph.D., Craig Evers, Ph.D., P.E., David Guerra-Zubia- 
ga, Ph.D., Gary Mead, Ph.D., Harry Petersen, Ph.D., P.E., Winston Sealy, Ph.D.

Accreditation. The Manufacturing Engineering Technology program is ac- 
ccredited by the Engineering Technology Accreditation Commission of ABET,
415 N. Charles Street, Baltimore, MD 21201, 410.347.7700, www.ABET.org

The mission of the Manufacturing Engineering Technology (MET) degree 
program at Minnesota State Mankato, is to provide a broad-based education to 
enable graduates to enter a variety of globally competitive manufacturing careers 
to serve the needs of the citizens of Minnesota, and the world by:
• providing the highest quality education to prepare application-oriented 
graduates for career opportunities in both traditional and computer-automated 
manufacturing environments;
• encouraging and supporting faculty, and students to engage in scholarly 
activities and research that support effective and ethical transfer of 
technology;
• providing access to state of the art equipment, facilities, and methodologies, 
along with faculty expertise to benefit MET students; and
• engaging in partnerships with area industry and other constituencies to 
broaden access to the program for traditional and diverse populations, while 
supporting K-12 pipeline development.

Program Description. Manufacturing Engineering Technology (MET) degree 
program awards a Bachelor of Science degree (BS) to successful students through 
a four-year curriculum.

“Engineering Technology” is the profession in which knowledge of the applied 
mathematical and natural sciences gained by higher education, practical experi-
ence, and competence developed in a specific field, is devoted to application of 
engineering principles and the implementation of technological advances for the 
benefit of humanity through its focus on product improvement, manufacturing, and 
automation of technological processes and operational functions. - Engineering 
Technology Council of the American Society of Engineering Education (ASEE).

“Modern manufacturing activities have become exceedingly complex because of 
rapidly increasing technology and expanded environmental involvement. This, 
coupled with increasing social, political, and economic pressures, has 
increased the demand for highly skilled manufacturing technologists, engi-
neers, and managers.” – Society of Manufacturing Engineers Fundamentals of 
Manufacturing 2005.

Students use major study areas of applied mathematics, engineering sciences and 
materials, product design, manufacturing processes, automated systems and 
controls, quality, manufacturing management and personal and professional 
effectiveness to perform in careers requiring the application of scientific and 
engineering knowledge and methods. Combined with technical skills in support of 
engineering activities; student careers often fit in the occupational spectrum 
between the craftsman and the engineer at the end of the spectrum closest to the 
engineer. Engineering technology is oriented less toward theory and more 
toward practical applications. (ASEE).

Manufacturing involves plans, materials, personnel, and equipment which 
are transformed in some way that adds value. Students acquire leadership and 
managerial skills necessary to enter careers in process and systems design, 
manufacturing operations, maintenance, technical sales or service functions. 
The curriculum concentrates on the study of individual subsystems and their 
overall optimization of cost, quality, speed, and flexibility goals for the success of 
a manufacturing enterprise. Students from the program are currently employed 
in a wide variety of industries including medical, electronics, power systems, 
defense, and automotive. A list of companies and industry sectors employing 
MET graduates may be obtained from the Department Chair.

The Society of Manufacturing Engineers (SME.org) is the lead professional 
society used in developing program criteria used for guiding program relevance 
and continuous improvement. Students are encouraged to take the Certified 
Manufacturing Technologist (CMT) exam in their 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 employ-
ment 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 orga-
nizations 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 develop-
ment and continuous improvement environments.
7. implement, and continuously improve cost, quality, time, and flexibility 
goals using world class management methodologies.

POLICIES/INFORMATION

Admission 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 CMST 102, EET 133, ENG 101, MET 104, MET 142, 
MET 144, MET 177, MATH 121, MATH 127, STAT 154, PHYS 211, PHYS 212.

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.

Pre-requisites and co-requisites must be observed unless written permission is obtained from the instructor and the Department of AMET. A flow chart of pre-requisites 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.

<table>
<thead>
<tr>
<th>COURSE DESCRIPTIONS</th>
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<tbody>
<tr>
<td><strong>MANUFACTURING ENGINEERING TECHNOLOGY BS</strong></td>
</tr>
<tr>
<td>Degree completion = 128 credits</td>
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**Required General Education**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENG 271W</td>
<td>3</td>
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<tr>
<td>MATH 115</td>
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**Pre-requisites to the Major**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 104</td>
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<tr>
<td>EET 113</td>
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<tr>
<td>ENG 101</td>
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<tr>
<td>MATH 121</td>
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<td>MET 104</td>
<td>3</td>
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<tr>
<td>MET 142</td>
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<td>MET 177</td>
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<td>PHYS 211</td>
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<td>STAT 154</td>
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(choose 3 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CMST 100</td>
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<tr>
<td>CMST 102</td>
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**Major Common Core**

<table>
<thead>
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<th>Course</th>
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<tbody>
<tr>
<td>AET 334</td>
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<tr>
<td>AET 378</td>
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<tr>
<td>MATH 122</td>
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<tr>
<td>MET 277</td>
<td>3</td>
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<td>MET 323</td>
<td>3</td>
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<td>MET 324</td>
<td>4</td>
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<td>MET 341</td>
<td>3</td>
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<td>MET 347</td>
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<tr>
<td>MET 386</td>
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<tr>
<td>MET 423</td>
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<td>MET 424</td>
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<td>MET 425</td>
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<td>MET 426</td>
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<td>MET 428</td>
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<tr>
<td>MET 488W</td>
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<tr>
<td>MET 489W</td>
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<td>PHYS 212</td>
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**Electives**

(choose 8 additional credits of MET courses)

**MANUFACTURING ENGINEERING TECHNOLOGY MINOR**

**Required for Minor**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MET 104</td>
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<tr>
<td>MET 142</td>
<td>3</td>
</tr>
<tr>
<td>MET 177</td>
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**Electives**

(choose 8 additional credits of MET courses)

<table>
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<tr>
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<tbody>
<tr>
<td>MET 104</td>
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</tr>
<tr>
<td>MET 142</td>
<td>3</td>
</tr>
<tr>
<td>MET 177</td>
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</table>

**MANUFACTURING ENGINEERING TECHNOLOGY CONTINUED**

**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.

Fall

**MET 142 (3) Introduction to Parametric Modeling**
The course 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 creating technical documentation: working and assembly drawings.

Fall, Spring

**MET 144 (3) Product Development and Design**
Analysis and application of key steps in the product realization process. External and internal factors affecting strategic product life-cycle management are emphasized along with the relationship of design to marketing and manufacturing activities and product development cost implications. Students work individually and in teams on competitive design projects assessing customer needs, product specifications, generation and selection of concepts, prototype development, test and product production planning. Concentrates on development of verbal, written and e-communication skills. Provides knowledge and practice in conducting effective project management.

Fall, Spring

**MET 177 (4) Materials Processing 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. Students learn to perform machining on a lathe, mill, and drill press, and also inspect the products. Basics of metal processing, plastic molding, and other processes are discussed. Extra lab time is required.

Pre: MATH 113 or MATH 115 or higher

Fall, Spring

**MET 277 (3) Manufacturing Processes**
A study of the principles of manufacturing technologies and equipment used in the processing of an end product. Advanced manufacturing processes including casting, forging, sheet metal forming, material removal, and powder metals are discussed. Topics also include materials treatment, preparation, and design for manufacture. Extra lab time is required.

Pre: MET 177

Fall

**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

**MET 324 (4) 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
MET 341 (3) Advanced Parametric Modeling
The course emphasizes the use of parametric modeling in design, analysis and manufacturing. Topics include component design, assembly, mechanism, animation, EFX and rapid prototyping using computer technology. Pre: MET 142 Fall, Spring

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: EET 113, MET 277, MET 341 Spring

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, MET 341, STAT 154. Admission to AET/MET major. Fall

MET 398 (0) CPT: Co-Operative Experience
Curricular Practical Training: Co-Operative Experience is a zero-credit full-time practical training experience for one summer and on adjacent fall or spring term. Special rules apply to preserve full-time student status. Please contact an advisor in your program for complete information. Pre: MET 104. At least 60 credits earned; in good standing; instructor permission; co-op contract; other prerequisites may also apply. Fall, Spring, Summer

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. Fall

MET 423 (3) 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: STAT 154 Spring

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. Fall, Spring

MET 425 (3) Project and Value Management
Planning, management, and economic justification of projects are supported by computer tools for scheduling, staffing, and economic analysis. Pre: STAT 154 Fall

MET 426 (3) Logistics and Transportation
Fundamentals of logistics and supply chain management: 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: STAT 154 Fall

MET 428 (3) Lean Manufacturing
Basics of Lean Manufacturing in industry, with emphasis on application of concepts. Students will learn the principles of Lean Manufacturing and how they can benefit a business. Pre: MET 427 or similar quality control course Spring

MET 448 (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 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, design project, and final report are completed. This course should be taken in the fall semester of the senior year. Pre: ENG 271W, MET 277, MET 425, 10 AET or MET 300/400 level credits

MET 488W (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, design project, and final report are completed. This course should be taken in the fall semester of the senior year. Pre: ENG 271W, MET 277, MET 425, 10 AET or MET 300/400 level credits

MET 489 (2) Senior Design Project II
Completion of the capstone design project; a continuation of MET 488. On-Demand Pre: MET 488, Permission Required

MET 489W (2) Senior Design Project II
Completion of the capstone design project; a continuation of MET 488. On-Demand Pre: MET 488, Permission Required

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
Pre: Permission Required

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