

Automotive Engineering Technology

College of Science, Engineering & Technology

Department of Automotive & Manufacturing

Engineering Technology

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The mission of the Automotive Engineering Technology (AET) degree program at Minnesota State University, Mankato, is to provide a broad-based education for graduates to enter globally competitive automotive careers to serve the citizens of Minnesota, and the world by:

- providing the highest quality education to prepare application-oriented graduates for a broad range of career opportunities in product research, design, development, and technical sales environments;
- encouraging and supporting faculty and students to engage in scholarly research and activities through partnerships with government, industry, and other constituencies that support effective and ethical transfer of technology;
- equipping or developing access to state of the art equipment, facilities, and methodologies, along with faculty expertise to benefit AET students; and
- broadening access to the program for diverse populations and support of K-12 pipeline development.

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

Engineering technology has been defined as the part of the technological field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies 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. - American Society of Engineering Education (ASEE)

The Automotive Engineering Technology degree program prepares graduates for careers in product research, design and development, manufacturing, and technical sales in the original equipment and aftermarket industries. Fields include passenger cars, trucks, motorcycles, recreational vehicles, vehicle emissions, safety, fuels and lubricants, construction, industrial, and agricultural equipment. Graduates from the program are currently working for original equipment manufacturers (OEMs), such as General Motors, Polaris, John Deere, AGCO, and Ford along with aftermarket companies such as Competition Cams, OTC, and S&S Cycle. A more complete reference to companies employing AET graduates may be obtained from the Department Chair.

The Society of Automotive Engineers (sae.org) and National Institute of Automotive Service Excellence (ase.com) are the lead professional societies used in developing program criteria, guiding program relevance, and continuous improvement.

The primary goal of the AET 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. They are as follows:

Program Outcomes. AET students at the time of graduation are prepared to:

1. apply knowledge of science, math, statistics, and engineering technology to solve problems encountered in a professional career in the automotive industry.
2. design, analyze and build virtual and real models, and conduct testing in product development environments through applied computer technologies.
3. define and analyze a set of requirements for a system, component or process and develop solutions to satisfy these criteria in an optimal fashion.
4. function effectively as a manager, leader, or member of a team.
5. understand and practice professional, ethical, environmental, and global responsibilities.
6. communicate effectively.
7. recognize the need and develop the skills for life long learning.

Program Objectives. AET 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 technologies.
2. actively participate in ongoing professional development, professional growth, and increasing professional responsibility.
3. effectively communicate ideas to technical and non-technical people.
4. perform in or manage 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 goals using world class management methodologies.

Accreditation: The AET 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>

Admission to Major is granted by the department. Minimum university admission requirements are:

- a minimum of 32 earned semester credit hours;
- a minimum cumulative GPA of 2.00 ("C").

Contact the department for application procedures.

AUTOMOTIVE ENGINEERING TECHNOLOGY BS

Required General Education (25 credits):

ENG 101	Composition (4)
SPEE 100	Fund. of Speech Communication (3) OR
SPEE 102	Public Speaking (3)
MATH 115	Precalculus Mathematics (4)
MATH 121	Calculus I (4)
PHYS 211	Principles of Physics I (4)
CHEM 104	Introduction to Chemistry (3)
STAT 154	Elementary Statistics (3)

plus additional B.S. General Education as required by the university.

Required Support Courses (12 credits):

ENG 271	Technical Communication (4)
MATH 127	Calculus II for Engineering Technology: Integration (2)
PHYS 212	Principles of Physics II (4)
CS 171	Introduction to C++ Programming (2)

Required for Major (Core, 60 credits):

AET 102	Introduction to Automotive Engineering Technology (1)
EET 113	DC Circuits (3)
MET 142	Computer Aided Drafting (3)
MET 144	Product Development & Design (3)
AET 160	Automotive Technology & Systems (4)
MET 177	Materials Processing I and Metallurgy (4)

AET 261	Automotive Driveability & Diagnosis (4)
AET 262	Automotive Computers and Electronics (4)
MET 322	Statics, Dynamics, and Mechanics of Materials (5)
AET 334	Fluid Power (3)
MET 341	Advanced Computer Aided Design (4)
AET 364	Chassis Design & Emission/Performance Testing (4)
AET 366	Automotive Thermodynamics and Engine Design (3)
AET 378	Composite Materials (3)
AET 387	Junior Design Project (1)
MET 424	Industrial Safety (2)
AET 465	Automotive Laboratory Experience (2)
AET 468	Automotive Research Methods & Design of Experiments (4)
AET 488	Senior Design Project I (1)
AET 489	Senior Design Project II (2)

Required Minor: None

AUTOMOTIVE ENGINEERING TECHNOLOGY MINOR (16 Credits)

Required for Minor (9 credits):

AET 102	Introduction to Automotive Engineering Technology (1)
AET 160	Automotive Technology & Systems (4)
AET 261	Automotive Driveability and Diagnosis (4)

Additional Electives Required for Minor (7 credits):

Choose 7 credits of AET/MET courses from major core courses.

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 AET 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 Automotive 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 at the Department Office.

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

COURSE DESCRIPTIONS

AET 102 (1) Introduction to Automotive Engineering Technology

An overview of careers, technology and requirements for individuals interested in Automotive Engineering Technology. Hands-on experience is gained in a variety of new technologies. Careers in engineering technology are examined along with professional organizations and ethics. This course is intended as the first step toward an automotive career. It is not an auto maintenance class.

AET 160 (4) Automotive Technology & Systems

This course is centered on the theory, operation and service of the systems found in modern automobiles. Basic diagnosis and repair procedures are covered. Various aspects of the automotive industry are explored, including issues relating to conventional and innovative energy and transportation systems. Lectures and demonstrations cover the course topics and open lab sessions allow students time to complete assignments and gain hands-on experience in maintenance, diagnosis and repair procedures.
Coreq: MATH 112 or higher.

AET 261 (4) Automotive Driveability and Diagnosis

The diagnosis of automotive engine problems using a systems approach along with detailed troubleshooting procedures and specific test equipment will be the focus of this course. The engine's mechanical, ignition, fuel and emission systems are covered. Lectures and demonstrations cover the course topics and laboratory assignments allow students to gain hands-on experience in automotive diagnosis. Test equipment used in the course includes: Exhaust Gas Analyzers; Compression, Vacuum and Leakage Testers; Ignition Oscilloscopes, Timing Lights, Engine Analyzers; Crack Detection Equipment; Measuring Tools.
Pre: AET 160; Coreq: Math 115

AET 262 (4) Automotive Computers and Electronics

Theory and diagnostic procedures related to modern automobile electrical and electronic management systems. Major emphasis involves the computer as used in today's cars to control the ignition, fuel, emission control, body, and chassis system. Programmable engine management systems are introduced. Hands-on experience on diagnosis is provided.
Pre: AET 261, EET 113 Coreq: CS 171

AET 334 (3) Fluid Power

Course provides a fundamental understanding of the physical principles of fluid power, along with a practical working knowledge of the components utilized in designing, installing, operating, and maintaining hydraulic and pneumatic power systems.
Pre: MATH 121, PHYS 211

AET 364 (4) Chassis Design and Emission/Performance Testing

The theory and design of chassis systems in addition to the evaluation of such designs. The chassis dynamometer as a research and certification tool. Determination of load, road load testing, and power testing. Emissions and fuel economy measurement. Emphasis placed on Federal Emission Testing, IM 240, OBD II, and State I/M programs.
Pre: AET 262

AET 366 (3) Automotive Thermodynamics and Engine Design

The study of thermodynamics and engine theory. Static and dynamic engine measurements along with a technical study of the engine's mechanical, ignition, fuel, cooling and lubrication systems.
Pre: AET 261 Coreq: MATH 121, CHEM 104

AET 378 (3) Composite Materials

Fiber reinforced plastic composite materials used in the manufacturing and transportation industries are the focus of this course. Matrix and reinforcement materials are examined and their properties identified. Manufacturing methods, fabrication, assembly techniques, testing, repair, and design of composite products are covered.
Coreq: MET 177, MET 322

AET 387 (1) Junior Design Project

An examination of automotive design and research along with a review of topics such as ethics, professionalism, measurement, statistics, and career development/placement. This course prepares the student for AET 488, Senior Design Project I, where the design proposal, design project and final report are completed.
Pre: AET 102; Coreq: STAT 154

AET 435 (1-4) Automotive Design and Construction

Involves designing and building of prototype vehicles. Topics include: vehicle design decisions, rules, budgets, chassis design, body and aerodynamics, drivetrain choices, construction techniques, and test procedures. An actual experimental car will be built in this class. May be repeated.

AET 465 (2) Automotive Laboratory Experience

Designed to provide experience in lab organization, supervision, instruction and maintenance. Emphasis is also placed on obtaining service experience on a variety of makes of domestic and import vehicles. Enrollment is limited; students need to sign up at least two semesters in advance.

AUTOMOTIVE ENGINEERING TECHNOLOGY

Laboratory.
Pre: AET 364

AET 468 (4) Automotive Research Methods and Design of Experiments

Automotive research techniques and equipment form the basis for this course. Environmental measurement, air flow testing, engine dynamometer testing, and vehicle performance measurement are covered. Emphasis is placed on research procedures, data acquisition and interpretation. Current research projects from the automotive industry are also examined.

Pre: AET 364, AET 366

AET 488 (1) Senior Design Project I

An examination of automotive design and research. Students refine their design proposal and begin their senior design project. This course also prepares the student for AET 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 during the senior year.

Coreq: STAT 154

AET 489 (2) Senior Design Project II

A continuation of AET 488.

Pre: AET 468, AET 488, ENG 271

AET 492 (1-4) Automotive Seminar

Selected automotive topics.

AET 497 (1-10) Internship: Automotive

Automotive 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

AET 499 (1-4) Individual Study