Automotive Engineering Technology

College of Science, Engineering & Technology
Department of Automotive & Manufacturing Engineering Technology
205 Trafton Science Center E
Phone: 507-389-6383
Fax: 507-389-5002
Website: www.cset.mnsu.edu/aet

Chair: Dr. Bruce E. Jones, Ph.D.

Faculty: Kuldeep Agarwal, Ph.D., Craig Evers, Ph.D., P.E., Shaheen Ahmed, Ph.D., Gary Mead, Ph.D., Harry Petersen, Ph.D., P.E., Winston Sealy, Ph.D.

Accreditation. The Automotive Engineering Technology program is accredited 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 Automotive Engineering Technology (AET) degree program at Minnesota State 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;
- providing 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 making 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. 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 communicate a set of requirements for a system, component or process and develop solutions to satisfy given criteria in an optimal fashion using creativity in design.
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 across all design and management interface levels of an organization.
7. recognize the need for, and then develop, the skills for life-long learning.
8. understand and engage in behavior which respects diversity and global cultures
9. practice timeliness and quality with regard to work requirements

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 on-going 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.

Academic Map/Degree Plan at www.mnsu.edu/programs/#All

POLICIES/INFORMATION

Admission to the AET. Major is granted by the Department of AMET. Admission to the major is required to register for 300-level courses. Minimum requirements for acceptance into the AET major include a cumulative GPA of 2.0 or higher and the completion of the courses listed in the Prerequisites to the Major in the AET section of this bulletin with a grade of "C" (2.0) or higher.

GPA Policy. A GPA of 2.5 or higher in courses required for the major or minor in Automotive Engineering Technology in order to proceed in the program sequence and graduate. This GPA calculation is based on the following areas: Required Communications; Required Basic Science and Mathematics; Required Major and Required Elective Courses. Refer to the College of Science Engineering and Technology Student Advising Center 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 except for AET 387, AET 488, and AET 489.

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.

AUTOMOTIVE ENGINEERING TECHNOLOGY BS

Degree completion = 128 credits

Required General Education

CHEM	104	Introduction to Chemistry (3)
ECON	202	Principles of Microeconomics (3)
ENG	271W	Technical Communication (4)
STAT	154	Elementary Statistics (4)

Prerequisites to the Major

AET	102	Introduction to Automotive Engineering Technology (1)
AET	160	Automotive Technology & Systems (4)
AET	261	Automotive Driveability and Diagnosis (4)
AET	262	Automotive Computers and Electronics (4)
EET	113	DC Circuits (3)
ENG	101	Composition (4)
MATH	121	Calculus I (4)
MET	142	Computer Aided Design (3)
MET	275	Manufacturing Processes I (4)
PHYS	211	Principles of Physics I (4)

Speech (choose 3 credits)

CMST	100	Fundamentals of Speech Communication (3)
CMST	102	Public Speaking (3)

Major Common Core

AET	334	Fluid Power (3)
AET	364	Chassis Design and Performance Testing (4)
AET	366	Automotive Thermodynamics and Engine Design (3)
AET	387	Junior Design Project (3)
AET	465	Automotive Laboratory Experience (2)
AET	468	Automotive Research Methods (4)
AET	488W	Senior Design Project I (3)
AET	489W	Senior Design Project II (3)
MATH	122	Calculus II (4)
MET	323	Statics (3)
MET	324	Strength of Materials and Dynamics (4)
MET	341	Advanced Computer Aided Design (3)
MET	375	Manufacturing Processes II (4)
MET	424	Industrial Safety (2)
MET	425	Project and Value Management (3)
PHYS	212	Principles of Physics II (4)

Major Restricted Electives

Programming (choose 3 credits)

CS	271	Introduction to Graphical Programming (3)
EET	315	Programmable Instrumentation (3)

Required Minor: None

AUTOMOTIVE ENGINEERING TECHNOLOGY MINOR

Required for Minor

AET	102	Introduction to Automotive Engineering Technology (1)
AET	160	Automotive Technology & Systems (4)
AET	261	Automotive Driveability and Diagnosis (4)
AET	262	Automotive Computers and Electronics (4)

Electives (choose 3 additional credits of AET/MET courses)

COURSE DESCRIPTIONS

AET 102 (1) Introduction to Automotive Engineering Technology
An overview of careers, technology and requirements of the Automotive Engineering Technology program. Careers in engineering technology are examined along with professional organizations and ethics.
Fall

AET 160 (4) Automotive Technology & Systems
This course is centered on the theory, operation and service of the systems found in modern automobiles. Lectures and demonstrations cover the course topics and open lab sessions allow students to practice procedures on their own vehicles in the completion of course assignments.
Fall, Spring

AET 261 (4) Automotive Driveability and Diagnosis
This course focuses on the engine's mechanical, ignition, fuel, and emission system using a systems approach to diagnose problems. Test equipment used in the course includes: fuel and fuel system; emission system; ignition oscilloscopes; valve refurbishing and mechanical diagnostic equipment.
Fall, Spring

AET 262 (4) Automotive Computers and Electronics
This course is centered on the theory, components, and diagnostic procedures related to modern automobile electrical and electronic systems. The major emphasis of the course involves the computer, sensors, and actuators as used in vehicles to control the ignition, fuel, emission, ABS, and chassis systems.
Prerequisite: AET 160, AET 261, EET 113
Fall, Spring

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.
Fall, Spring
Prerequisite: MATH 121, PHYS 211

AET 364 (4) Chassis Design and Performance Testing
This course is an exploration of the theory and design of chassis systems, in addition to evaluation of these designs. Research tools include software design simulators, chassis geometry gauges, and dynamometers.
Prerequisite: MATH 121, PHYS 211
Fall, Spring

AET 366 (3) Automotive Thermodynamics and Engine Design
This course focuses on the study of thermodynamics as it relates to internal combustion engines and their design. Static and dynamic engine measurements are thoroughly covered along with an introduction to fuel cell and hybrid applications. Thermochemistry topics are covered including fuel characteristics, mixture ratios and emission characteristics.
Prerequisite: CHEM 104, MATH 121, PHYS 211
Fall, Spring

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.
Prerequisite: MET 177, MET 324, CHEM 104
Fall, Spring

AET 387 (3) 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.
Prerequisite: ENG 271W, MET 144, STAT 154
Spring

AET 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.
Prerequisite: AET 102. At least 60 credits earned; in good standing; instructor permission; co-op contract; other prerequisites may also apply.
Fall, Spring, Summer

AET 435 (1-4) Automotive Design and Construction
Focuses on the design and construction of prototype vehicles. Topics include: vehicle design decisions, rules, budgets, chassis design, body and aerodynamics, drivetrain choices, construction techniques, and test procedures. An experimental vehicle will be built in the course. May be repeated.
Prerequisite: Permission Required
Fall, Spring

AET 436 (3) Hybrid and Electric Vehicles
This course covers advanced vehicle propulsion systems within the electric and hybrid electric category. Fundamentals of the operation of electric motors, controllers, inverters, and batteries utilized in electric and hybrid platforms will be covered. In addition a significant focus will be placed on the application, modeling, integration, testing, and optimization of the systems in electric and hybrid electric vehicles.
Prerequisite: AET 366, MATH 122, PHYS 212
Variable

AET 465 (2) Automotive Laboratory Experience
This course designed to provide experience in management, organization, supervision, and maintenance in a laboratory environment. Enrollment is limited. Sign up at least two semesters ahead.
Prerequisite: AET 364, Permission required
Fall, Spring

AET 468 (4) Automotive Research Methods
Automotive research techniques and equipment form the basis for this course. Environmental measurement, air flow testing, dynamometer testing, emission measurement and fuel efficiency testing is covered. Emphasis is placed on research procedures, data acquisition and interpretation.
Prerequisite: AET 366, PHYS 211, STAT 154
Fall, Spring

AET 488 (3) Senior Design Project I
The first of a two-course sequence where students carry out their capstone design project. Weekly meetings are scheduled where the design team carries out the tasks required for completion. Formal design presentations and research papers are presented at the end of the course.
Prerequisite: AET 364, AET 387, MET 324, MET 341
Co-requisite: AET 468
Fall

AET 488W (3) Senior Design Project I
The first of a two-course sequence where students carry out their capstone design project. Weekly meetings are scheduled where the design team carries out the tasks required for completion. Formal design presentations and research papers are presented at the end of the course.
Prerequisite: AET 364, AET 387, MET 324, MET 341
Co-requisite: AET 468
Fall

AET 489 (3) Senior Design Project II
The second of a two course sequence where students build upon the first semester's work. The course culminates with the completion of the capstone project with a formal technical paper following SAE format that would be ready to be submitted for publication.
Prerequisite: AET 468, AET 488
Spring

AET 489W (3) Senior Design Project II
The second of a two course sequence where students build upon the first semester's work. The course culminates with the completion of the capstone project with a formal technical paper following SAE format that would be ready to be submitted for publication.
Prerequisite: AET 468, AET 488
Spring

AET 492 (1-4) Automotive Seminar
Selected automotive topics.
Prerequisite: Permission required
On Demand

AET 497 (1-10) Internship: Automotive
Automotive work experience in an area pertinent to the student's career objectives. Consent of internship coordinator required prior to the beginning of employment and registration. Typically done between the junior and senior year.
Prerequisite: 40 earned credits in AET/MET
Fall, Spring, Summer

AET 499 (1-4) Individual Study
Prerequisite: Permission required