We serve our students by offering a broad education, rigorously grounded in the fundamental engineering sciences, so they have the tools to solve the problems of tomorrow. Our faculty address the most challenging problems facing society in the fields of fluid mechanics, solid mechanics and materials, and aerospace systems and control, and, importantly, they push forward the frontiers of these fields.

Aspirations. We intend to be the first stop for the best and brightest students around the world. We aim for excellence and diversity in hiring, and demand outstanding communication skills of students and faculty. We promote an approach to discovery that sees no boundaries between academic disciplines, and that exploits the fertile area between them. By offering a rigorous, broad-based program, we seek to educate the scientific and engineering leaders of tomorrow.
We are driven by curiosity and our desire to make an impact. The AEM department has built broad expertise in the core foundations of aerospace engineering and mechanics: fluid dynamics, solid mechanics and materials, and aerospace systems. Our faculty is active and our research is in strong demand; in 2015 AEM had over $7.3 million in sponsored research expenditures. AEM research ranges from the design of hypersonic aircraft to the discovery of new active materials with unprecedented properties; from new control algorithms for drones to the discovery of MRI methods for measuring fluid flow in the respiratory system. Our research guides our undergraduate and graduate teaching and inspires our students. Our fundamental scientific approach to all our areas of teaching and research catalyzes an unmistakable atmosphere of collegiality in AEM.

Can we really go to Mars?

AEM is a world leader for research on hypersonic flows. NASA has recently adopted AEM computer code as its official software for the design of spacecraft which must withstand intense heating conditions when landing on a planet (right). Recently, a team led by AEM researchers determined the maximum entry speed at which the Curiosity Rover spacecraft could safely deploy its parachute (left).

Our Research

We are driven by curiosity and our desire to make an impact.

Our contributions emerge from fundamental understanding and discovery, having significant impact within our university, state, and nation.

Can we harvest energy from a Minnesota winter?

AEM researchers recently discovered new phase transforming materials that create electricity from small temperature differences in the environment. Students and faculty fabricated and tested a prototype (above).

Will space junk destroy our GPS and the Space Station?

Low earth orbit is a complex ecosystem. With our legacy space program and the increasing number of satellites being put into orbit, “space junk” is now a threat to our global infrastructure. AEM research on tracking space debris combined with predicting drag on objects at such high altitudes is aimed at solving this incredibly difficult problem.
Can computers fast enough to directly simulate turbulence?

The quantitative prediction of turbulent flow remains one of the unsolved problems in classical physics. Turbulence is a prominent feature in nature and technology, which increases drag on airplanes, reduces pollutants by improving combustion, and governs the weather. AEM faculty are world leaders in computational modeling of turbulent flow.

Can airplanes be silent?

Extraordinary 1,000,000 processor calculations performed by AEM researchers reveal the surprising source of noise from jet engines. And they study how to control it.

Can we design materials from angstroms to meters?

AEM researchers are pioneering multiscale computational methods that predict macroscopic properties based only on the species and placement of atoms. On the horizon: a material that is stronger than any known substance.

Our Alumni

Our alumni contribute to all levels of society and work in diverse institutions. These currently include:


Academia: AFIT, Albion College, Arizona State, Beihang University, Bethel, Boston University, Caltech*, Carnegie Mellon, Chalmers University of Technology (Sweden), Embry-Riddle Aeronautical University, ETH (Zurich), George Mason, Georgia Tech, Harbin Institute of Technology, Hong Kong University of Science and Technology, Huazhong University of Science and Technology, Illinois Institute of Technology, IIT (Bombay, Delhi, Kanpur*, Madras), Iowa State*, Jackson State, Louisiana State, Michigan State, Middle East Technical University (Turkey), New Jersey Institute of Technology, North Carolina State, Northwestern University, Okinawa Institute of Science and Technology, Politecnico di Torino (Italy), Purdue, St. Thomas, Singapore Technical University, South Dakota State; Universities of Alabama, Bari (Italy), Bristol (UK), California (Berkeley, UCLA, San Diego), Cincinnati, Ferrara (Italy), Florida, Grenoble (France), Houston, Illinois, Maryland (College Park, Baltimore County), Minnesota, Missouri, Nottingham (UK), Notre Dame, Padova (Italy), Pennsylvania, Sao Paulo (Brazil), Southampton (UK), Wisconsin; Universidad Nacional Autonoma de Mexico, Universidad del Valle (Columbia), Universidade Federal de Sao Joao Del-Rei (Brazil), Rutgers University, S.I.S.S.A. (Trieste, Italy), TU Delft, Texas A&M, Ulsan National Institute of Science and Technology (Korea), Virginia Tech


Deke Slayton, one of the original Mercury Seven astronauts, is an AEM graduate, as is former astronaut Duane Carey.

*Denotes an institution with a graduate in a major leadership role.

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Is atomistic fluid mechanics possible?

Fluid mechanics is a macroscopic science that seeks to predict the flows of liquids and gases. AEM researchers are pioneering a way to do fluid mechanics at macroscopic scales but following individual atoms, thereby opening up a new level of understanding.
Our Role in the U

Our undergraduate and graduate curricula are designed to simultaneously give students a solid grounding in the fundamentals of engineering science and its applications. Our faculty teach engineering mechanics courses that form the core of a number of undergraduate curricula in the college of science and engineering. Our aerospace undergraduate curriculum culminates in a capstone design sequence that emphasizes the "hands on" aspect of engineering. We do this by integrating the design class with faculty research and selected projects funded by industry. Through the Space Grant, AEM also sponsors undergraduate research activities centered on stratospheric ballooning and high-power rocketry, which brings students from various departments in the University together to form interdisciplinary teams. Students also regularly participate in AIAA and SAE unmanned aerial vehicle, rocket, and Solar Car competitions. At the graduate level, our faculty teach fluid mechanics courses, continuum mechanics courses, and control systems courses that form the core graduate curricula of other engineering departments, in addition to our own. Our faculty are also members of interdisciplinary research teams and college wide laboratories, particularly the Saint Anthony Falls Laboratory.

Our Role in the State

As the only engineering department in the state granting degrees in aerospace engineering, we are the primary source of the engineers who power Minnesota’s aerospace industry. Our graduates are found in key positions in Fortune 500 aerospace companies with a strong presence in Minnesota, such as Honeywell International, Orbital-ATK, United Technologies Aerospace Systems and BAE Systems, as well as in smaller Midwest aerospace companies such as Cirrus Aircraft and Rockwell Collins. In addition to training the aerospace workforce, our faculty has strong ties with the local aerospace industry including federally supported collaborative projects and as consultants. AEM faculty serve as technical experts for agencies statewide, including MnDOT, MnDEED, Aerospace Industries Association, AirSpace Minnesota, the DNR, and the Minnesota Department of Agriculture. Indeed, the influence of AEM faculty and graduates goes well beyond the aerospace community. For example, our graduates are also hired by companies such as 3M, Medtronic, Boston Scientific, St. Jude, and Seagate.

The department leads NASA’s statewide Minnesota Space Grant Consortium (MnSGC), part of NASA’s national Space Grant College and Fellowship Program. This program, which emphasizes women and underrepresented college student participation, supports students studying in areas of interest to NASA (all CSE majors qualify), expands NASA-related opportunities for college students statewide, and funds MN student interns at NASA research centers. Faculty involved in the MnSGC teach courses with NASA content, run competitions for college student teams, and provide aerospace-themed professional development for pre-college teachers and outreach on NASA-related topics.

Can we replicate turbulent weather in the laboratory?

AEM faculty and students have built a novel facility, at the Saint Anthony Falls Laboratory, to study how turbulence and precipitation interact.

Can we detect disease using fluid mechanics?

AEM researchers study pulmonary and cardiovascular fluid mechanics on 3D replicas of human organs in collaboration with members of the Center for Magnetic Resonance. A recent breakthrough uses MRI to measure fluid flow itself.

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Can drones advance aircraft safety and agriculture?

AEM faculty are developing methods for using drones to test out ideas for making future aircraft fuel efficient and safe. They are also collaborating with local companies to develop techniques for using drones to increase the productivity of agriculture.

Student groups design, build, and fly high-power rockets (above) and carry experiments on stratospheric balloon flights (right) organized by AEM through the Minnesota Space Grant. These groups attract students broadly from the College of Science and Engineering.

Non-invasive brain surgery?

In collaboration with the medical device industry in Minnesota, AEM researchers are discovering new shape memory alloys that have the potential to do non-invasive surgery of the brain.
Our Aspirations

To be the first stop for the best and brightest

We aim to steadily increase our stature nationally and internationally, as well as within the University and the State of Minnesota. We will strive for excellence and diversity in hiring, and demand outstanding communication skills of students and faculty. Ultimately, we aspire to bring profound benefits to society through scientific discovery and education.

Global Perspective

AEM researchers have ongoing collaborations at the Universities of Antwerp, Bonn, Carleton (Canada), Kiel, KU Leuven, Melbourne, Queensland, Canberra, Oslo, Oxford, Tel Aviv, the Ecole Centrale and Ecole Polytechnique, the Hong Kong University of Science and Technology; at research institutions such as the European Space Agency, the Hungarian Academy of Sciences (Sztaki), the Laboratoire de Mecanique des Solides (Paris), the Max Planck Institute on Mathematics in the Sciences (Leipzig), the Norwegian Institute of Technology, the Advanced Institute of Italy (SISSA), the von Karman Institute for Fluid Mechanics (Belgium) and SYNTHEF Energy Research (Norway). AEM researchers also currently lead the NSF sponsored KIM project (400 members in 29 countries) and “The Rise of Data in Materials Research” (participants from Belgium, Canada, Germany, Switzerland, and the UK).

with local action


and community engagement

AEM faculty volunteer at the Bell Museum, the Cedar Riverside Community School, the CSE Eureka program, CSE Backstage Pass (admissions office program), De LaSalle High School, Exploring Careers in Engineering and Physical Science (ECEPS) program, the Gillette Children’s Gait Lab, the Humboldt Secondary School, Kids on Campus, the Mesabi Range Community College, the Minnesota Aviation Career Education summer camp, Minnesota Institute for Talented Youth, the Minnesota Guild of Metalsmiths, the Native American Pre-college Population Program (UMN extension), Nova Classical Academy (St. Paul), St. Paul Aerospace Magnet schools, the Science Museum of Minnesota, the State Science Fair, STEM Expos (Minneapolis public schools and St. Cloud State), the State Fair, TripoliMN, and Washington Technology Magnet School (St. Paul).

AEM by-the-numbers

- AEM is one of the first 10 accredited aeronautical engineering programs in the country (ABET accredited since 1936)
- AEM has 16 tenured/tenure-track faculty
- AEM has 340 undergraduate and 90 graduate students
- AEM had over $7.3 million in sponsored research expenditures (2015), approximately $430,000 per faculty member
- AEM faculty base teaching load is 3 courses per year
- AEM placed 4th in the 2010 National Research Council Assessment of U.S. Doctoral Research Programs and tied for 16th in the popular U.S. News rankings for graduate aerospace programs
- AEM ranked #1 for <20 faculty in the 2007 Faculty Scholarship Productivity index from the Chronicle of Higher Education