Mechanical Engineering, MS, PhD, ME

Specialization(s): Aerospace Engineering (MS)
Department: Mechanical and Aerospace Engineering Department
College: College of Engineering

Overview

About This Degree

Mechanical engineering deals with the creation of the mechanical systems and machines that serve society. Mechanical engineers are involved in researching and designing mechanical devices of all types, including engines, tools, and machines. The broad discipline allows one to work in nearly every area of industry.

Utah State's Department of Mechanical and Aerospace Engineering is recognized at both regional and national levels. MAE graduates consistently finish in the top 10 percent in intercollegiate national student design competitions. In 2009, the USU Unmanned Aerial Vehicle Team took first place at an international competition.

Graduate students enrolled in the program have the opportunity to study with award-winning faculty. The MAE Department received the university's 2010 Department Teaching Excellence Award for outstanding teaching throughout the department.

The department is particularly strong in the following areas of study:

- **Solid mechanics** is concerned with the mechanics of displacement and stress analysis combined with material science for selection of an optimum design. Included are studies of elasticity, plasticity, and failure in traditional metals and high-tech composite materials.
- **Thermal/fluids** is concerned with the transport of mass, momentum, and energy in solids, liquids, and gasses. Included within its scope are the fundamental studies of thermodynamics, heat transfer, and fluid mechanics.
- **Dynamics and control** is concerned with describing and controlling the motion of mechanical systems. Included within its scope are the fundamental studies of dynamics, kinematics, vibrations, control theory, electromechanical systems, and machine design.

Concurrent Bachelor's/Master's Program:

The department also offers a concurrent bachelor's/master's program, which allows USU engineering students to begin taking graduate classes during their senior year as an undergraduate and to complete requirements for both the bachelor's degree and the master's degree concurrently over two years.

Career Options

Graduates may pursue careers in the following areas:

- Automotive
- Building
- Chemical
- Defense
- Electronics
- Environmental engineering
- Food processing
- Heating and air conditioning
- Heavy equipment
- Machine tools
- Manufacturing
- Nuclear
- Petroleum
- Public utilities
- Solar energy

Aerospace Engineering Specialization

- Aircraft design and development
- Aircraft flight testing
- Spacecraft and space systems design

- Spacecraft trajectory design and analysis

Additionally, some MS students enter prestigious PhD programs in top-tier schools.

What it takes

Admissions Requirements

Students must have a bachelor's degree from an accredited institution in mechanical engineering, aerospace engineering, manufacturing engineering, or a closely related engineering discipline. Students who do not have a bachelor's degree in an appropriate engineering discipline may be admitted with nonmatriculated status (not officially accepted to the program) and required to complete remedial requirements. Once these courses are completed, students may be officially admitted to the program.

Students must also be well acquainted with either the FORTRAN or C programming language.

Application Requirements:

- Complete the online application
- Pay the $55 application fee
- Score at or above the 40th percentile on the GRE (a minimum of 156 on the quantitative section is required)
- Have a 3.3 or higher GPA on your last 60 semester or 90 quarter credits
- Provide transcripts of all college/university credits
- Provide three contacts for letters of recommendation

International students have additional admissions requirements.

Admissions Deadlines

The department has the following deadlines:

- Fall semester - February 20
- Spring semester - August 1
- Domestic applications are accepted after these deadlines, but students will not be considered for financial assistance.
- International applications will be considered only at the deadline dates so accepted students have time to allow for Visa applications.

Master's Degree Plan Options

Students can receive the **MS** by pursuing one of three options:

- In the **Plan A** option, students complete graduate-level coursework and must write and successfully defend a thesis.
- The **Plan B** option requires the production of a paper or creative work of art and is expected to reflect equivalent scholarship standards as a thesis. A successful defense is also required.
- A third option, **Plan C**, does not involve a thesis or a defense meeting and is comprised of coursework only.

Financial Assistance

A variety of funding opportunities are available, including fellowships, scholarships, assistantships, tuition awards, and travel support. Additionally, students may be eligible for subsidized health insurance through qualifying assistantships.

Program Requirements

Click here to see course requirements for the **Master of Science**.

Click here to see course requirements for the **Doctor of Philosophy**.

Click here to see course requirements for the **Master of Engineering**.

PhD Qualifying Exams:

In addition to the course requirements for the degree, the PhD program requires that all students pass the PhD qualifying exams. Students must pass these three exams with 80% or higher by the end of the third semester in the program. The qualifying exams will be based on undergraduate-level coursework and will consist of individual subject area exams.

Contact

Advisor(s)

Christine Spall
Advisor
Office: ENGR 417 A
Phone: (435) 797-0330
Email: chris.spall@usu.edu

Faculty

Heng Ban, PhD, University of Kentucky
Associate Professor
Area: Heat transfer, energy systems
Office: ENGR 419 E
Phone: (435) 797-2098
Email: heng.ban@usu.edu

Steven Folkman, PhD, Utah State University
Associate Professor
Area: Applied mechanics, structural dynamics, space structures
Office: ENLAB 141 B
Phone: (435) 797-2879
Email: steven.folkman@usu.edu

Thomas Fronk, PhD, Virginial Polytechnic Institute and State University
Associate Professor
Area: Mechanics of composites and materials
Office: ENLAB 292
Phone: (435) 797-3893
Email: thomas.fronk@usu.edu

Rees Fullmer, PhD, University of Utah
Associate Professor
Area: Manufacturing, controls, robotics, dynamics, spacecraft
Office: ENGR 419 A
Phone: (435) 797-3894
Email: rrfullmer@usu.edu

David Geller, PhD, Rice University
Associate Professor
Area: Space navigation
Office: ENGR 419 B
Phone: (435) 797-2952
Email: david.geller@usu.edu

Chris Hailey, PhD, University of Oklahoma

Associate Dean
Area: Aerodynamics
Office: ENGR 413 C
Phone: (435) 797-2775
Email: chris.hailey@usu.edu

Steve Hansen, PhD, University of Durham
Research Professor
Area: Systems design
Office: ENLAB 232
Phone: (435) 797-9149
Email: steve.hansen@usu.edu

Aaron Katz, PhD, Stanford University
Assistant Professor
Area: Thermal fluid dynamics, computational fluid dynamics
Office: ENGR 419 C
Phone: (435) 797-7021
Email: aaron.katz@usu.edu

Leijun Li, PhD, Rensselaer Polytechnic University
Associate Professor
Area: Manufacturing
Office: ENGR 419 P
Phone: (435) 797-8184
Email: leijun.li@usu.edu

Ling Liu, PhD, Columbia University
Assistant Professor
Area: High performance multi-scale and multi-physics modeling of the performance of materials
Office: ENGR 419 R
Phone: (435) 797-2868
Email: ling.liu@usu.edu

Warren Phillips, PhD, University of Michigan
Professor
Area: Aerodynamics
Office: ENLAB 231
Phone: (435) 797-2950
Email: warren.phillips@usu.edu

Barton Smith, PhD, Georgia Institute of Technology
Associate Professor
Area: Thermal/fluids
Office: ENGR 419 K
Phone: (435) 797-2878
Email: barton.smith@usu.edu

Robert Spall, PhD, Old Dominion University
Professor
Area: Thermal/fluids
Office: ENGR 419 N
Phone: (435) 797-2878
Email: robert.spall@usu.edu

Shephen Whitmore, PhD, University of California - Los Angeles
Assistant Professor

Area: Astrodynamics, orbital mechanics
Office: ENGR 419 F
Phone: (435) 797-2951
Email: stephen.whitmore@usu.edu

Byard Wood, PhD, University of Minnesota
Professor, Department Head
Area: Heat transfer, energy systems
Office: ENGR 419 F
Phone: (435) 797-2868
Email: byard.wood@usu.edu

Wenbin Yu, PhD, Georgia Institute of Technology
Associate Professor
Area: Advanced structures, solid mechanics, computational solid mechanics
Office: ENGR: 419 J
Phone: (435) 797-8246
Email: wenbin.yu@usu.edu

Get Involved

Professional Organizations, Honor Societies, and Clubs

American Institute of Aeronautics and Astronautics: The AIAA is a national professional society with more than 34,000 members serving the aerospace engineering community. The mission of the AIAA is to serve the profession and to benefit the institute's individual members and member institutions.

American Society of Mechanical Engineers: ASME promotes the art, science, and practice of mechanical and multidisciplinary engineering and allied sciences around the globe.

Society of Automobile Engineers: SAE is an international society whose members are engineers, business executives, educators, and students from more than 97 countries. By sharing knowledge and new information, they help advance the engineering of mobility systems.

Society of Manufacturing Engineers: SME is a professional society keeping its members up to date on leading trends and technologies in the manufacturing world.

Society of Women Engineers: SWE is a national society whose mission is to stimulate women to achieve full potentials in careers as engineers and leaders, expand the image of the engineering profession as a positive force in improving the quality of life, and demonstrate the value of diversity. Members not only enjoy the association with each other but also enjoy various activities and service projects designed to support female students majoring in engineering.

Tau Beta Pi: This is the only engineering honor society representing the entire engineering profession. It is the nation's second-oldest honor society, founded at Lehigh University in 1885 to recognize those exhibiting distinguished scholarship and exemplary character as students in engineering, or by their attainments as alumni in the field of engineering, and to foster a spirit of liberal culture in engineering colleges.

Labs, Centers, Research

Buried Structures Laboratory: The Buried Structures Laboratory conducts research into the performance of buried pipes. The lab has performed research on both flexible and rigid pipes.

Center for Atmospheric and Space Sciences: CASS is recognized nationally and internationally as a progressive research center with advanced space and upper atmospheric research programs. CASS scientists are tackling the adverse consequences of space weather. Undergraduate and graduate students are involved in numerous research projects in CASS that provide opportunities to program computers, analyze data, and build instrumentation.

Center for Control of Flows in Manufacturing: This center focuses on the application of flow control technologies, commonly studied for aerospace applications, as applied to manufacturing processes.

Center for High Performance Computing: HPC at USU is a research service center that serves and expands the computational needs of the USU community. HPC at USU houses a 256-processor cluster called “Uinta,” with three networks.

Center for Self-Organizing and Intelligent Systems: CSOIS is a multi-disciplinary research group at USU that focuses on the design, development, and implementation of intelligent, autonomous mechatronic systems, with a focus on ground vehicles and robotics.

Center for Space Engineering: CSE is a multi-disciplinary group of faculty at USU involved in space technology, systems, and science. The center brings together academics, industry, and government to advance the understanding of the space environment and to train the next generation.

Energy Laboratory: This lab seeks to develop solutions to America's most intractable energy problems through scientific and technological innovation. It provides a cohesive framework permitting faculty, students, and partnering institutions to focus on contemporary energy-related research issues.

Experimental Fluid Dynamics Laboratory: The EFDL encompasses 3,000 square feet of laboratory space and is equipped with the latest in velocity diagnostics, particle sizing instrumentation, data acquisition equipment, and imaging sys-tems.

Materials Processing and Testing Laboratory: With more than 4,000 square feet of lab space, MPTL houses a complete set of modern materials processing and test equipment. With funded projects from NSF, NASA, and industry, MPTL has developed a significant research and education program in materials processing, thermo-mechanical properties, and microstructure characterization.

Mechanical Properties Research Laboratory: The MePRL researches mechanical properties evaluation and modeling for metals, polymers, and composites based on multiscale experiments and simulations.

Micro/Nano Mechanics Laboratory: The Micro/Nano Laboratory explores and investigates damage evolution in material under different types of environments using experimental and modeling techniques. Advanced mechanical testing facilities allows multi-scale experiments of material under different types of loading and temperatures.

Rocky Mountain NASA Space Grant Consortium: RMNSGC is one of 52 National Space Grant Consortia in the United States. As a member of the consortium, USU has awarded more than 100 fellowships to students interested in aerospace-related education and careers. The majority of Space Grant student awards include a mentored research experience with university faculty and NASA scientists, engineers, and technologists.

Space Dynamics Laboratory: SDL is known for sending 500+ successful experiments into space and brings in $54 million per year in revenue, the majority coming from grants, contracts, and appropriations. SDL’s expertise in the development of sensors and calibration, small satellites and real-time intelligence has made it an internationally known organization in the space arena.

Space Weather Center: SWC is developing innovative applications for mitigating space weather in technical systems. The ionosphere is a key region that affects communication and navigation systems of the space environments that are affected by space weather. The USTAR initiative is developing products to reduce adverse effects of the ionosphere on these types of systems.

Thermohydraulics & Materials Properties Research Center: The Thermohydraulics and Materials Properties Research Center facilitates nuclear engineering research at USU. The Center’s research areas include nuclear fuels,

thermophysical property and instrumentation, thermal hydraulics, high-temperature materials, turbulence modeling, welding, efficient high-fidelity modeling of thermo-mechanical properties of nuclear materials and structures, and other nuclear-related topics. The Center's mission is two-fold: 1) develop and disseminate the knowledge and understanding of measurement science and technology in materials thermal and mechanical properties, structure-property-processing-performance relationships for nuclear materials and fuels, and development and validation and verification of thermal hydraulic models; 2 provide research opportunities to prepare students for nuclear engineering careers in the growing nuclear energy sector.

Thermophysical Properties Research Laboratory: Thermophysical properties, such as thermal conductivity, thermal diffusivity, heat capacity, and melt viscosity, are essential for the development of advanced materials. A major thrust of the research in TPRL is for fuels and materials in nuclear applications and is closely coordinated with the Idaho National Lab of the U.S. Department of Energy.