Department of Mechanical and Aerospace Engineering

Degrees Offered

- Masters of Science, Aerospace Engineering (M.S.A.E.)
- Masters of Science, Mechanical Engineering (M.S.M.E.)
- Masters of Science, Materials Science and Engineering (M.S.M.S.E)
- Doctor of Philosophy, Aerospace Engineering (Ph.D.)
- Doctor of Philosophy, Mechanical Engineering (Ph.D.)
- Doctor of Philosophy, Materials Science and Engineering (Ph.D.)

Departmental Overview

FACULTY

Faculty members in the Mechanical and Aerospace Engineering (MAE) department have extensive research, industrial, and teaching experience and have published widely. Their combined experience helps them assist students in selecting relevant courses and research topics to meet their educational goals. The Department has excellent laboratory facilities in the Engineering Sciences Building, the Engineering Research Building, and the new Advanced Engineering Research Building to provide support for both instructional and research activities. The Department has several special purpose laboratories located nearby, which include the Engine Research Center, the Advanced Combustion Laboratory, and the wind tunnel laboratory in the hangar at the Morgantown Municipal Airport (Hart Field). Funded research allows the Department to maintain up-to-date facilities that include modern instrumentation and computing and lab equipment, including simulation and computer-controlled data acquisition systems.

Areas of Research

FLUID MECHANICS AND AERODYNAMICS

A variety of courses and facilities support graduate research in aerodynamics and fluid mechanics. Laboratories are located in college buildings and remote sites. Flow facilities include instrumented subsonic and supersonic wind tunnels, and several flow loops mainly used for research in gas-solid and density stratified flows. Available instrumentation includes eight channels of hot wire/film anemometry, two single-component and one three-component, laser Doppler velocimeter (LDV) systems, and a particle image velocimeter (PIV) system. The department owns two flight simulation facilities, one that simulates translational and rotational motion in six degrees of freedom, and the other that relies on D-six software to provide “joystick only” flight simulation. Furthermore, the department built and operates different types of Unmanned Airborne Vehicles (UAV’s), as well as experimental aircraft and airborne systems that are housed in a hangar owned by the department at the Hart Field municipal airport in Morgantown. A significant portion of the current activity involves numerical solutions to flow problems and is supported by a computing facility dedicated to graduate research.

Although the faculty background and interests in the areas of aerodynamics and fluid mechanics are broad, recent research has been concentrated on applications of computational fluid dynamics (CFD) to investigate a wide variety of problems in fuel cell technology, fixed wing and rotorcraft aerodynamics, bioengineering, and combustion. The department’s faculty have accumulated extensive research experience in multiphase and density-stratified flows, low-speed aerodynamics, shock phenomena in two-phase systems, flow in microgravity, boundary layer control, and high-speed aerodynamics. Previous and current research areas include topics such as fluidized bed combustion, aerosol sampling, flow metering, flow distribution systems, numerical solutions to gas-solid flows, and fluid-particle turbulence interactions, including deposition on solid surfaces. The low-speed aerodynamics work is related to the design of vertical axis wind turbines and STOL airfoils.

SOLID MECHANICS AND DESIGN

The solid mechanics and design area encompasses the theoretical, numerical, and experimental study of solid bodies, from concentration on local behavior of deformable bodies to the global response of structural elements. Hence, students may explore the mechanical behavior of materials in the neighborhood of micro-scale defects such as cracks, or investigate the behavior of large-scale bodies such as aerospace structures.

The faculty members specialized in this area carry out basic and applied research using state-of-the-art computational and experimental techniques. The areas of research include advanced metal alloys and composite materials, lightweight structures, safety and durability enhancements, real time monitoring and diagnosis of structural systems, aero elasticity, fracture mechanics, nonlinear dynamics and vibrations, biomechanics; and computational methods and experimental techniques, including optical and ultrasound methods. Furthermore, in cooperation with the Wadsworth Department of Civil and Environmental Engineering, MAE graduate students may pursue studies related to civil engineering. A large array of research facilities includes
laboratories (materials, structures, vibrations, photo mechanics, biomechanics, fracture mechanics), computers (work stations, personal computers, computer-aided engineering), and mechanical and electronic shops.

**DYNAMICS AND CONTROLS**

The dynamics and controls area offers instructional and research opportunities for students who seek to attain the expertise required to control the behavior of an engineering system in a dynamic environment. Instructional offerings equip the students with a foundation for developing prototype systems and for improving the performance of existing systems. Selected examples of research areas include flight simulation and controls, automatic controls, advanced instrumentation, microprocessor applications and non-destructive testing; elastodynamic analysis, computer-aided design (CAD); and modeling, design, and analysis of energy management systems.

**THERMAL SCIENCES AND SYSTEMS**

The thermal sciences and systems area encompasses the fields of thermodynamics, combustion, heat transfer, and power and energy systems. Graduate course offerings cover a wide range of topics in this area with applications to both aerospace and mechanical engineering problems. Recent research efforts include topics such as alternative fuels testing, internal combustion engine performance and emissions, fuel cell technology, heat transfer, numerical analysis of thermal systems, the analysis of fluidized bed combustion, energy analysis of buildings, oscillating jet combustion, deposition on turbine blades, and reactor design.

Research facilities include a state-of-the-art engine research laboratory, three transportable emissions research laboratories, thermal analyzers, recording thermocouple data-acquisition systems, high-altitude simulation chamber for ablation and wear studies, a fluidized bed combustion laboratory, an electrically-heated, natural convection water facility, Schlieren systems for flows with varying density, and a water reservoir for thermal stratification studies.

**BIOENGINEERING**

Areas of research specialization related to bioengineering include ultrasound technology for imaging of body tissues and organs, respiratory and diseased tissue mechanics, orthopedic mechanics, bone growth and fracture, and the application to rehabilitation of computer-aided design and microprocessor-based instrumentation. Research facilities include a state-of-the-art ultrasound imaging laboratory, an aerosol inhalation exposure system, laser-based holographic and moiré interferometric equipment, a lung acoustic impedance measurement system; and modern orthopedic, rehabilitation, and computer research laboratories.

**MATERIALS SCIENCES AND ENGINEERING**

The material science and engineering area allows for the study of processing, structure, and properties of materials for structural, functional, and device applications. Areas of research emphasized within this area include advanced microscopy, composite materials, materials for fuel cells, smart materials, super alloys, facilities incorporating electron microscopy, scanning probe microscopy, electro-chemical characterization, thermal analysis, and mechanical testing facilities.

**FACULTY**

**CHAIR**

- Jason Gross - Ph.D. (West Virginia University)
  Unmanned Aerial Vehicles, Avionic Systems, Flight Testing

**PROFESSORS**

- Xueyan Song - Ph.D. (Zhejiang University, China)
  Materials Science, Electron Microscopy
- V'yacheslav Akkerman - Ph.D. (Umeå University, Sweden)
  Turbulent Combustion, Flame Tribalization
- Ever J. Barbero - Ph.D. (Virginia Polytechnic Institute and State University)
  Materials, Experimental and Computational Mechanics
- Wade W. Huebsch - Ph.D. (Iowa State University)
  Fluid Mechanics, CFD, Numerical Methods
- Bruce S. Kang - Ph.D. (University of Washington)
  Experimental Mechanics, Advanced Materials
- John M. Kuhlman - Ph.D. (Case Western Reserve University)
  Fluid Mechanics
- Hailin Li - Ph.D. (University of Calgary, Canada)
  Combustion, Emissions, Fuel Efficiency of Vehicles and IC Engines
- Xingbo Liu - Ph.D. (University of Science and Technology of China, Beijing)
  Materials Science
• Pedro J. Mago - Ph.D. (University of Florida)
  Heat and power systems, building energy simulation, and waste heat recovery technologies
• Victor H. Mucino - Dr.Eng., P.E. (University of Wisconsin-Milwaukee)
  Mechanical Engineering Design, CAD, Finite Element Analysis
• Marcello R. Napolitano - Ph.D. (Oklahoma State University)
  Aircraft Stability and Control, Feedback Control, Unmanned Airborne Vehicles (UAVs)
• Mario Perhinschi - Ph. D. (University of Bucharest, Romania)
  Flight Modeling and Simulation
• Songgang Qiu - Ph. D.(University of Minnesota)
  Thermodynamics, Heat Transfer
• Edward M. Sabolsky - Ph.D. (The Pennsylvania State University)
  Materials, Ceramic Science
• Nithi T. Sivaneri - Ph.D. (Stanford University)
  Structural Mechanics, Composite Materials, FEM, Numerical Methods

ASSOCIATE PROFESSORS
• Omid Askari - Ph.D. (Northeastern University)
  Engines, Gas Turbines, Alternate Fuels
• Cosmin E. Dumitrescu - Ph.D. (University of Alabama)
  Combustion, Alternate Fuels, IC Engines
• Jason N. Gross - Ph.D. (West Virginia University)
  Unmanned Aerial Vehicles, Avionic Systems, Flight Testing
• Yu Gu - Ph.D. (West Virginia University)
  Robotic Systems, Sensor Fusion
• Derek Johnson - Ph.D. P. E. (West Virginia University)
  Alternative Fuels, Engines and Emissions
• David S. Mebane - Ph.D. (Georgia Institute of Technology)
  Fuel Cells, Multi Scale Simulation of Chemical and Electrochemical Systems
• Osama Mukdadi - Ph.D. (University of Colorado)
  Bioengineering, Acoustics, Solid Mecanics and Materials
• Terence D. Musho - Ph.D. P.E. (Vanderbilt University)
  Nanoscale Thermal and Electrical Transport, Direct Energy Conversion
• Andrew C. Nix - Ph.D. (Virginia Polytechnic Institute and State University)
  Turbines, Engines and Emissions
• Guilherme Augusto Silva Pereira - Ph.D. (Federal University of Minas Gerais)
  Field Robotics, Autonomous Vehicles
• Loren Rieth - Ph.D. (University of Florida)
  Microelectrode Implants, Electrical & Neural Prosthesis
• Konstantinos Sierras - Ph.D. (University of Birmingham, U.K.)
  Flexible Optoelectronic Devices, Tribology, Materials for Renewable Energy
• Arvind Thiruvengadam - Ph.D. (West Virginia University)
  Emissions of Heavy-Duty Internal Combustion Engines
• Gregory J. Thompson - Ph.D. (West Virginia University)
  Thermodynamics, Machine Design
• W. Scott Wayne - Ph.D. (West Virginia University)
  Machine Design, Alternative Fuels

ASSISTANT PROFESSORS
• Xi Yu - Ph.D. (Boston University)
  Robotics
• Piyush M. Mehta - Ph.D. (University of Kansas)
  Astrodynamics, Space Situational Awareness
• Nicholas Szczecinski - Ph.D. (Case Western Reserve University)
  Robotics
TEACHING ASSOCIATE PROFESSOR
- Patrick H. Browning - Ph.D. (West Virginia University)
  Aerodynamics, Aircraft Design

TEACHING ASSISTANT PROFESSORS
- Christopher Griffin - Ph.D. (West Virginia University)
  Aerodynamics, Fluid Mechanics
- Andrew P. Rhodes - Ph.D. (West Virginia University)
  Aerospace Dynamics and Propulsion
- Emily Spayde - Ph.D. (Mississippi State University)
  Engineering education, energy sustainability and organic Rankine cycles

RESEARCH ASSOCIATE PROFESSORS
- Yun Chen - Ph.D. (Universidade Tecnica de Lisboa)
  Material Science, Metal Hydrides, Cathode Material Development
- Eduardo Sosa - Ph. D. (University of Puerto Rico)
  Thin Wall Structures

RESEARCH ASSISTANT PROFESSORS
- Ali Baheri - (University of North Carolina at Charlotte)
  Machine Learning, Autonomous Driving
- Shanshan Hu - Ph.D. (West Virginia University)
  high temperature corrosion, molten salt, anti-corrosion coating and electrophoretic deposition
- Wei Li - Ph.D. (Graduate University of Chinese Academy of Sciences)

VISITING AND ADJUNCT PROFESSORS
- Alberto Ayala - Ph.D. (University of California, Davis)
  Energy, Engine Emissions
- Dureid Azzouz - Ph.D. (University of Southampton, U.K.)
  Fluid Mechanics
- Albert Boretti - Ph.D. (University of Florence, Italy)
  Innovative Combustion Engines
- Mark Bright - Ph.D. (West Virginia University)
  Materials Engineering, Pyrotech Inc.
- Darran Cairns - Ph.D. (University of Birmingham, U.K.)
  Materials Science
- Weigiang Ding - Ph.D. (Northwestern University)
  Nanostructures
- Renguang Dong - Ph.D. (Concordia University)
  Biomechanics, Human Vibrations, NIOSH
- Mridul Gautam - Ph.D. (West Virginia University)
  Alternate Fuels, Engine and Emissions, VP for Research UNR
- Luis A. Godoy - Ph.D. (University of London, U.K.)
  Structural Stability
- Frank E. Goodwin - Sc.D. (Massachusetts Institute of Technology)
  Materials Engineering, ILZRO
- Valeriya Gritsenko - Ph.D. (University of Alberta, Canada)
  Neuroscience
- Huang Guo - Ph.D. (West Virginia University)
  Electro-Chemistry, Materials Science, Mechanical Engineering
- Srinkath Gururajan - Ph.D. (West Virginia University)
  Small Unmanned Aerial Vehicle Systems
- Nabil S. Hakim - Ph.D. (Wayne State University)
  Alternative Fuels Engines and Emissions
- Yiqun Huang - Ph.D. (University of Texas, Austin)
  Engine Emissions Control
- Paul E. King - Ph.D. (Oregon State University)
Materials Engineering, NETL
• George Kiriakidis - Ph.D. (Salford University, U.K.)
  Physics, Mechanics
• Stephen Kukureka - Ph.D. (University of Birmingham, U.K.)
  Materials Science
• Andrew D. Lowery - Ph.D. (West Virginia University)
  Control Systems
• Alejandro Lozano-Guzman - Ph.D. (University of New Castle Upon Tyne, U.K.)
  Dynamic Systems (CICATA-IPN Mexico)
• Ayyakkannu Manivannan - Ph.D. (The University of Tokyo, Japan)
  Materials Chemistry Characterization
• Eugene A. McKenzie - Ph.D. (West Virginia University)
  Mechanical Engineering Design, NIOSH
• Chris Menchini - Ph.D. (West Virginia University)
  Computational Fluid Dynamics, Fire Modeling
• Vincenzo Mulone - Ph.D. (University of Rome, Tor Vergata)
  Engine Emissions, Fluid Mechanics
• John Nuzkowski - Ph.D. (West Virginia University)
  Alternative Fuels and Engine Emissions, UNF
• Ming Pei - M.D., Ph.D. (Beijing Medical University, China)
  Tissue Engineering, HSC-WVU
• Alber Alfonse Sadek - Ph.D. (Osaka University, Japan)
  Alloys
• Brad Senor - Ph.D. (West Virginia University)
  Control Systems
• Benjamin Shade - Ph.D. (West Virginia University)
  Engine Emissions, IAV Automotive
• Alberto Traverso - Ph.D. (University of Genoa, Italy)
  Energy Systems and Control, DIMSET - Italy
• Nathan Weiland - Ph.D. (Georgia Institute of Technology)
  Energy Systems, Experimental, Computational, Theoretical Methods
• Jay Wilhelm - Ph.D. (West Virginia University)
  Unmanned Aerial Vehicles, Wind Turbine Modeling
• Gergis William - Ph.D. (West Virginia University)
  Structural Engineering
• Steven Woodruff - Ph.D. (University of Michigan)
  Combustion Optical Phenomena
• David Wyrick - Ph.D. (University of Missouri-Rolla)
  Engineering Management, Engineering Education, SME's
• Sergiy Yakovenko - Ph.D. (University of Alberta, Canada)
  Neuroscience
• Kirk Yerkes - Ph.D. (University of Dayton)
  Energy Optimized Aircraft

PROFESSORS EMERITI
• Richard A. Bajura - Ph.D. (University of Notre Dame)
• Larry Banta - Ph.D. (Georgia Institute of Technology)
• Ismail Celik - Ph.D. (University of Iowa)
• Nigel N. Clark - Ph.D. (University of Natal, South Africa)
• Eric Johnson - Ph.D. (University of Wisconsin-Madison)
• John M. Kuhlman - Ph.D. (Case Western Reserve University)
• John Loth - Ph.D. (University of Toronto, Canada)
• Ken Means - Ph.D (West Virginia University)
• Gary Morris - Ph.D. (West Virginia University)
• Michael G. Palmer - Ph.D. (West Virginia University)
• Samir N. Shoukry - Ph.D. (Aston University, Birmingham, U.K.)
• John E. Sneckenberger - Ph.D. (West Virginia University)
• Wallace S. Venable - Ed.D. (West Virginia University)
• Richard E. Walters - Ph.D. (West Virginia University)