FAMU-FSU College of Engineering

2525 Pottsdamer Street
Tallahassee, FL 32310
www.eng.famu.fsu.edu

Breaking Barriers in Diversity and Innovation

Mechanical Engineering Academic Programs

The unique model of the nation's only joint college of engineering affords our department a wonderful opportunity to combine cutting-edge research with shaping the next generation of engineers from across the demographic spectrum.

We've taken this nexus and invested heavily in partnerships and resources that offer an unequaled opportunity for graduate and undergraduate students at both Florida A&M University and Florida State University to delve into complex and exciting research in some of the most innovative labs available. From the National High Magnetic Field Laboratory to the new Institute for Strategic Partnerships, Innovation, Research and Education (InSPIRE), our research takes place in collaborative, multidisciplinary work.

Active Research Collaborations

> Florida Center for Advanced Aero-Propulsion (FCAAP)
> AFOSR Center of Excellence AEROMORPH
> Applied Superconductivity Center (ASC)
> Center for Applied Power Systems (CAPS)
> Center for Intelligent, Systems, Control and Robotics (CISCOR)

Degree Programs

B.S. Mechanical Engineering
Bachelor of Science and Master of Science (B.S.-M.S.) pathway
M.S. (non-thesis) Mechanical Engineering
M.S. Mechanical Engineering
Ph.D. Mechanical Engineering

Majors Within the Program
Materials Science
Sustainable Energy
Aerospace

Mechanical Engineering Faculty Awards

Farrukh Alvi, ASME

Lance Cooley, FInstP

Suvranu De, ASME, AIMBE, USACM

J. Murray Gibson, NAI Member, AAAS, APS, Royal Microscopy Society

Wei Guo, ASME, APS

David Larbalestier, NAE Member, Royal Academy of Engineering, AAAS, ASME, MRS, IEEE, Institute of Physics

William Oates, ASME

Chiang Shih, ASME

Steven Van Sciver, ASME

National Science Foundation (NSF) CAREER Awards

Jonathan Clark

Brandon Krick

Unnikrishnan Nair

William Oates

Kourosh Shoele

Huixuan Wu

Neda Yaghoobian

Notable Alumni

Asegun Henry – faculty member at MIT

Samuel Graham – Dean, A. James Clark School of Engineering at the University of Maryland

James Finley, faculty member at USC

David Lambert, Chief Scientist, AFRL

One **college**,
two **universities**,
unlimited **opportunity.**

The FAMU-FSU College of Engineering is the joint engineering institution for Florida A&M and Florida State universities, the only such shared college in the nation. We are located less than three miles from each campus. After satisfying prerequisites at their home university, students learn together at the central engineering campus with its adjacent, associated research centers and a national laboratory.

FAMU-FSU College of Engineering

DEPARTMENT OF **MECHANICAL** ENGINEERING

Department of Mechanical Engineering

Annual Report 2024

Innovating technological advances while educating the next generation of engineers

Fall 2024

A Message from

William Oates, Ph.D., P.E.
Chair, Department of Mechanical Engineering

Mechanical Engineering is the largest of the six departments at the FAMU-FSU College of Engineering. We offer a broad range of traditional mechanical engineering (ME) courses and unique technical electives at the undergraduate and graduate levels that set our department apart from many traditional ME programs. This puts our students in an excellent position to become leaders in fields associated with automotive, aerospace, materials, energy and robotics, among many others.

Our department benefits from many well-recognized faculty experts conducting cutting-edge research in hypersonic aircraft systems (experimental and computational), advanced materials and structures, systems operating in cryogenic temperatures (e.g., quantum computing and particle accelerators), and legged robotic and exoskeleton systems. This offers a broad array of educational experiences and hands-on experiments in our laboratories. Undergraduate students also benefit from excellent faculty heavily focused on our educational mission to ensure students are mentored inside and outside the classroom so they are prepared for an engineering career, graduate research or professional school.

Students who join our graduate programs have wonderful experiences by working closely with some of the leading faculty in the world who support their engineering mentorship and professional development. These experiences include exposure and training in unique facilities including a state-wide Florida Center for Advanced Aero-Propulsion (FCAAP), an AFOSR Center of Excellence AEROMORPH, the Applied Superconductivity Center (ASC), the Center for Applied Power Systems (CAPS), the Center for Intelligent, Systems, Control and Robotics (CISCOR), and the only national laboratory in Florida—the National High Magnetic Field Laboratory. Our students work in a diverse field among peers across two leading national public universities—offering excellent opportunities to build relationships from many cultures and cultivate leadership skills that translate to successful careers.

The Joint College by the Numbers

#60 Public Engineering College with Doctorate
(U.S. News & World Report 2024)

#49 Industrial & Manufacturing Engineering Program Ranking

#54 Materials Science & Engineering Program Ranking

#72 Civil & Environmental Engineering Program Ranking

Department by the Numbers (Fall '24)

920 Undergraduate Students

101 Graduate Students

1400+ Alumni

Enrollment

20% Female Students in ME

58% URM Students in ME

51% Increase in URM Enrollment in ME Over Past 5 years

46% Increase in Female Enrollment in ME Over Past 5 Years

Research

19 Number of Patents Held by ME Faculty

$776K Grants & Awards per ME Faculty Member

$736K Research Expenditure per ME Faculty Member

180% Increase in Research Expenditures Over Past 5 Years

72% Increase in Grants and Awards Over Past 5 Years

$30M FY24 Awards Value

Mechanical Engineering Research Laboratories at the Joint College

Florida Center for Advanced Aero-Propulsion

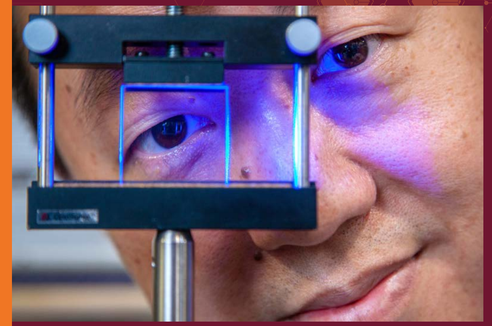
Led by **Rajan Kumar**, FCAAP focuses on cutting-edge research in aerospace technology, aiming to improve the efficiency and performance of aircraft and spacecraft. Its work is crucial for advancing innovation in the aerospace industry, making air defense and travel safer, more efficient and environmentally friendly.

Applied Superconductivity Center

Led by **Lance Cooley**, ASC advances the science and technology of superconducting magnets, working from atomic-scale fundamentals through complex conductors to constructing the highest-field superconducting magnets yet made.

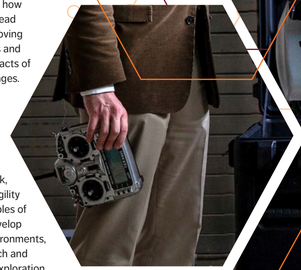
Center for Intelligent, Systems, Control and Robotics

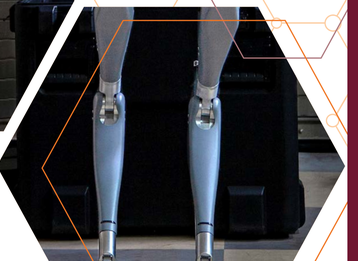
The lab led by **Jonathan Clark** uses state-of-the-art technology to develop practical solutions to problems in systems, control and robotics for applications in industry and government. Its multi-disciplinary faculty come from mechanical engineering, electrical and computer engineering, computer science and statistics, and provide expertise such as mechanical design, dynamic modeling, control, artificial intelligence, pattern recognition and computer vision.



Bounding Ahead in Quantum Computing

Wei Guo's team at the National High Magnetic Field Laboratory recently discovered that precise topography on solid neon surfaces is crucial for creating reliable qubits in quantum computers. By controlling small bumps on these surfaces, they can improve the trapping and manipulation of electrons, which is vital for enhancing the performance of quantum systems.





HYPERSONICS

Developing New Modeling for Supercharged Engines

Alexandre Berger focuses on computational fluid dynamics, particularly developing advanced models for turbulence and combustion in aerospace applications. His work is essential for improving the design and efficiency of aircraft and spacecraft and contributes to advancements in the aerospace industry.

ENERGY

Leading a $2.25 Million DOE Effort to Enable Clean Hydrogen Energy

One of the challenges of hydrogen as a clean energy is that its molecules are small and can make their way through traditional materials like steel. When the fuel enters the metal, it causes hydrogen embrittlement, rendering metals less ductile. Associate Professor **Brandon Krick** leads a team trying to develop hydrogen-tolerant materials that can survive the extreme environment associated with hydrogen use, storage and production—temperatures ranging from below -423°F to greater than 2200°F.

EXOSKELETONS

Reviving Movement with Robotic Assist

Taylor Higgins researches the biomechanics and energetics of human movement, focusing on understanding how people walk and run. Researching control of legged robots, optimization, biomechanics of human gait and human robot interactions, her work aims to improve the design of assistive devices and enhance rehabilitation strategies for individuals with mobility impairments, contributing to better health outcomes and quality of life.

ATMOSPHERIC AERODYNAMICS

Understanding the Mathematics of Aerodynamics for Climate Challenges

Neda Yaghoobian's research focuses on atmospheric aerodynamics, particularly in understanding how airflows interact with natural and built environments. Her work includes studying the cooling mechanisms of termite mounds, modeling wildfire behavior, and exploring how atmospheric conditions influence the spread of wildfires. This research is vital for improving our understanding of climate interactions and developing strategies to mitigate the impacts of wildfires and other environmental challenges.

LEGGED ROBOTS

Developing Robotic Technology for High-Risk Situations

Christian Hubicki specializes in legged robotics, focusing on how robots can walk, run and navigate complex terrains with agility and efficiency. His work combines principles of biomechanics and control systems to develop robots that can adapt to challenging environments, which has important applications in search and rescue missions, disaster response and exploration. By advancing legged robot technology, Hubicki's research contributes to creating more capable and resilient robots that can perform tasks in situations where traditional machines might fail.

Dive deeper: *famufsu.engineer/me*

Rajan Kumar

Professor of Mechanical Engineering & Director, Florida Center for Advanced Aero-Propulsion (FCAAP)

"The continued demand for improved performance of aerospace systems and safety for those in uniform operating those flight vehicles must, in large part, be met by addressing new challenges through a more comprehensive understanding of the underlying fundamental phenomena. We support the design and development of next-generation flight vehicles and solve complex high-speed aerodynamic problems."

Read more about his work: