



2023 Research in Review

Resilience has become one of the leading research thrusts at the nation's only joint college of engineering. From transportation planning to food waste conversion and better solar electricity systems, 2022-2023 has proved to be our year for surging ahead in resilience engineering.



Suvranu De, Sc.D.

Dean FAMU-FSU College of Engineering

In a world where adaptability is as crucial as durability, the concept of "Engineering Resilience" has become the bedrock of our profession. This principle guides our efforts at the FAMU-FSU College of Engineering, proudly the only joint college of its kind in the United States, as demonstrated in our 2023 Annual Engineering Research Report.

The theme of this year's report, Engineering Resilience, underlines our commitment to research that prepares for, responds to, and fundamentally withstands the unpredictable elements of our changing world. Our faculty and students have risen to the occasion, focusing their talents on the design and implementation of systems that address risk, manage disruption, and adapt to new realities with agility and insight.

We are delighted to share our advancements in critical areas such as rural transportation networks and grid resilience, reflecting our proactive stance toward sustainable and robust engineering solutions.

The pages that follow weave a story of achievement and ambition, narrating how our academic community's resilience has driven us to new heights of research excellence and societal impact.

Join us in exploring the contributions and discoveries that position the FAMU-FSU College of Engineering as a leader in cultivating a resilient future.



Engineers Secure \$10 Million from the USDOT for Transportation Research

Researchers from a consortium of six institutions led by Florida A&M University have secured a five-year grant for \$2 million per year from the U.S. Department of Transportation (USDOT) to establish a new Tier One University Transportation Center (UTC) at FAMU.

The Rural Equitable and Accessible
Transportation (REAT) Center is an idea born
from a proposal from several researchers
affiliated with the joint engineering program
at the FAMU-FSU College of Engineering.
It focuses on core issues of mobility challenges
for people in rural communities.



Ren Moses, Ph.D.

Director

REAT Center



Eren Ozguven, Ph.D.Associate Director
REAT Center













Engineering Resilience.

We know natural disasters. Situated in one of the nation's geographically most vulnerable states, we are also a leader in resilience research for natural and manmade calamity.



PERHAPS THE CROWN JEWEL in this past year's research portfolio is the Rural Equitable and Accessible Transportation (REAT) Center, an idea proposed by several of the college's engineering faculty members.

Transportation research solutions proposed for urban and suburban transportation needs—for instance, connected and automated vehicles—are transferrable to rural areas, but the efficacy of implementing those solutions requires a concerted and focused approach to understanding the needs of diverse rural populations.

The center's work will target senior citizens, minorities, and the poor who live in rural areas.

The REAT Center was launched in Washington, D.C., earlier this year as a consortium of six institutions led by Florida A&M University with \$10 million from the U.S. Department of Transportation (USDOT). It establishes a new Tier One University Transportation Center (UTC) at FAMU.

"The REAT Center is going to focus on core issues of mobility challenges for people in rural

communities, which are increasingly marked by growing diversity and expanding inequities within and across regions," said Center Director *Ren Moses*, a civil engineering professor in the college's Department of Civil & Environmental Engineering.

Research projects through the REAT Center will expand access to transportation and improve safety in rural communities, especially for vulnerable populations. The center will grow the infrastructure needed to be more resilient in a natural disaster, an initiative that complements the Resilient Infrastructure & Disaster Response Center (RIDER), at the college.

Eren Ozguven, director of the RIDER Center and associate director of the REAT, is working with Moses on issues involving transportation resilience specific to natural disasters.

"The RIDER Center specializes in resilience for disasters and part of it involves evacuations," Ozguven said. "Rural areas don't always have the infrastructure in place for our most vulnerable to successfully evacuate. This is one of the issues the REAT Center can help us with."

MODERNIZING THE ELECTRIC GRID

Whether stemming from a natural disaster or a problem in the electrical system itself, power outages are typically marathon events that bring civilized life to an abrupt halt. The Center for Advanced Power Systems (CAPS) is dedicated to finding solutions that would instantly resolve those problems, whether on an electric ship or a municipal power grid.

CAPS researchers from the college are developing improvements for electric power systems modeling and simulation, power electronics and machines, control systems, cybersecurity for power systems, superconducting power devices and more.

\$435M

REAT is part of \$435 million in national awards from the USDOT to advance research and education programs that address critical transportation challenges in the U.S. We secured one of only two grants awarded to universities in Florida.

"CAPS takes on big challenges in the fields of several power and energy engineering areas, with a large investment in power systems technology," said *Roger McGinnis*, director of the center at Florida State University. "The work happening here is helping Florida and the nation meet current and future energy needs in a variety of ways."

At CAPS, *Professor Helen Li* is helping with the nation's transition to more renewable energy sources for the electric grid, courtesy of a \$3.8 million grant from the Department of Energy's Solar Energy Technologies Office and a \$1.8 million investment from FSU and other partners. Working with colleagues from the City of Tallahassee,

Northeastern University, the National Renewable Energy Laboratory and Siemens, her team is developing technology that could help make renewable energy solutions more feasible and thus increase their adoption. They are developing converters that are smaller and lighter than existing technology and can function at a higher voltage, which is crucial for use in the power grid.

These converters also enable grids to quickly and reliably switch between a connection within the wider electric system and a self-contained system. A so-called "microgrid" allows cities to be more resilient to disruptions in an outside power supply. In the case of a hurricane that downs power lines, for instance, the microgrid could supply power when the larger grid is down.

The controls developed by Li and her team incorporate artificial intelligence, which helps power plant managers efficiently use the energy captured by renewable sources. For example, Al can tell managers whether energy from solar panels should be used immediately or stored for later use, when the sun is down, or wind isn't blowing. The algorithm driving that decision will consider how much energy users need and when it makes financial sense to sell it back to the grid. It also considers how to use storage devices, such as batteries, so they last longer.

It's all part of making a grid that's more adaptable and sustainable.

"The electric grids of the future will need to be designed to handle more renewable energy sources," Li said. "The work we're doing at CAPS is helping that transition."

BUILDING A BETTER SOLAR CELL

Another piece of that grid resilience is improving the solar array itself. Researchers at Florida
State University and the FAMU-FSU College of Engineering are helping build the solar cells of tomorrow by examining how a next-generation material can operate efficiently under real-world extreme conditions that include baking temperatures and hours of sunlight.

Most solar cells are made of silicon, but ongoing research is looking at other options, including

Strategic Priorities

Our impact on engineering research is varied and important. With these five-year main priority areas, we will affect the most urgent issues in our society today.

Both FAMU and FSU have invested millions in this college to make a mark in these key areas for a more resilient society overall.



Resilient. This word encompasses our strategic research priorities AND is one of our main thrusts. With engineering advancements in these four key areas, our state and world will be a more resilient system overall—from disaster mitigation to a more efficient healthcare system.



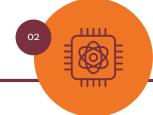
Zhiyong (Richard) Liang, Ph.D. Interim Associate Dean, Research & Graduate Studies



Resilience

Engineering

Developing robust solutions for infrastructure and communities in the face of environmental, technological and societal challenges. We aim to create adaptable systems that can withstand and recover from natural disasters, climate change effects, and cyber threats, ensuring safety and sustainability for future generations.



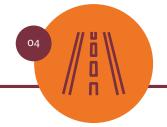
High-Performance Materials

Exploring nanomaterials, biomaterials, functional polymers, quantum and superconducting materials to revolutionize industries from aerospace to healthcare, focusing on sustainability, efficiency and innovation. Creating materials that are not only stronger and lighter but also more environmentally friendly.



Sustainable Energy Systems

Advancing renewable energy technologies and improving energy efficiency, encompassing solar, wind energy, biofuels and novel energy storage solutions. We aim to develop technologies to ensure energy independence and also promote environmental stewardship, aligning with the global shift towards a more sustainable energy future.



Integrated Transportation Systems

Centered on advancing the future of mobility, encompassing both ground and aerospace transportation. We focus on integrating smart technologies and advanced aerodynamic solutions in transportation infrastructure, developing efficient electric and autonomous vehicles, and traffic management systems optimization. Our aim is to create seamless, sustainable and safe multi-modal transportation networks that address the needs of society on the ground, in the air and beyond.



Engineering Healthcare

Encompassing biomaterials, cellular and tissue engineering, imaging and spectroscopy, nanoscale science and engineering, and Al-assisted medical training and neuroimaging. Our goal is to create engineering solutions that significantly improve patient care and safety in the healthcare industry.

a material known as perovskite. In addition to acting as a solar cell, perovskites can also enable a phenomenon called upconversion in organic molecules, a process in which the perovskite absorbs low-energy photons and the organic molecules then convert these particles into high-energy photons.

"The idea is that one usable high energy light particle is emitted again after the upconversion process," said Lea Nienhaus, assistant professor in FSU's Department of Chemistry and Biochemistry, who is working on the project with *Theo Siegrist*, a professor in the college's Department of Chemical and Biomedical Engineering.

Previous research into perovskites examined how high temperatures and light degrade them but hadn't considered the upconversion process in perovskite/ organic bilayers under real-world conditions.

Understanding how these devices work in typical heat and light conditions shows researchers how they might be used in commercial solar cells.

"The perovskite on its own, if you heat it and shine light on it, degrades," Niehaus said. "As soon as you put the organic molecules on top, it no longer degrades. The organic molecules are contributing to a more long-lived perovskite, which I think is a very useful result. There are still engineering issues to be solved to make perovskite-based upconversion devices viable, but our hope is that this work is part of addressing those issues."

CONVERTING FOOD WASTE TO ENERGY

The obvious connection to climate change and resiliency is one that concerns many faculty at the joint college. In the U.S., over 80 billion pounds of food waste is discarded annually, and the bulk of it is deposited in landfills. Beyond the storage issue, food waste emits methane, contributing to 11% of the world's total greenhouse gas emissions.

In a new Department of Energy (DOE) study, engineering researchers have discovered a new

method to convert food waste into sustainable energy, a discovery that may revolutionize the way food waste is processed for fuel and help promote a sustainable energy source for the future.



"Food waste is an untapped resource with great potential for energy production," said *Gang Chen*, a civil engineering professor at the college. "Our study uses microwave-mediated hydrothermal carbonization (MWHTC) to convert food waste to conversion-ready hydrochar."

Hydrothermal technology is a promising carbon-neutral method to convert wet biomass into valuable products by eliminating a high energy-consuming drying step. MWHTC uses a low-temperature thermochemical conversion process to convert wet food waste biomass to hydrochar without pre-drying. Hydrochar is a carbonaceous material ideal for combustion with low environmental impact as a solid fuel. It also has less moisture and is more hydrophobic than raw food waste, which will decrease transportation costs and improve storage.

This project's novelty is reuse of the process water, which contains high organic content levels. During MWHTC, 5-hydroxy-methyl-furfural (HMF) is released from food waste by dehydration. This HMF is transferred to the produced hydrochar, which significantly improves the heating capacity of the material.

NEWEST Faculty

Noted Inventor, National Academy Member **Manoj Shah** Joins the College as Distinguished Professor of Engineering

99

I'm very excited to join the college and share my knowledge and experience with the engineers of tomorrow. I hope I can pass on the lessons that I've learned in my career as we educate the next generation of problem solvers.



MANOJ SHAH is a Distinguished Professor of Engineering and focuses on fostering industry partnerships and introducing new courses on electric machinery to students.

Shah worked as an engineer with General Electric and GE Research for more than 34 years and then also served as a professor of practice at Rensselaer Polytechnic Institute. His research largely focused on electric machines and systems.

He has authored or co-authored 90 U.S. and foreign patents and written over 50 technical publications.

Shah was named a member of the National Academy of Engineering in 2022. He also is a Life Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and in 2015, received the 2015 IEEE- IAS Gerald B Kliman Innovation Award. In 2012, he received the GE Research Coolidge Fellowship Award (the highest individual honor a GE scientist can receive for a lifetime of extraordinary achievements), and the IEEE Nikola Tesla Award.

"Dr. Shah's extensive industry experience and deep understanding of technological advancements, together with his inspiring, forward-looking vision, make him an invaluable addition to our college, particularly in fostering industry partnerships and introducing new courses on electric machinery to our students," said Suvranu De, dean of the FAMU-FSU College of Engineering.

"The significant technical challenge of conventional hydrothermal carbonization is handling the process water, which contains high levels of organic contents and is difficult to remediate," Chen says. "MWHTC overcomes this obstacle by recirculating the water to the MWHTC process."

SHORTENING POWER OUTAGES

Natural disasters are inevitable, and scientists expect them to occur even more frequently because of climate change. For a state whose electric grid is regularly disrupted by storms, any increase in uptime is critical. FAMU-FSU College of Engineering researchers are developing a modular solar electricity system that can help communities keep electricity flowing during natural disasters. The project is one of 20 designated by the U.S. Department of Energy to increase community resilience from disruptions caused by extreme weather and other disasters.

"Extreme weather can knock power out for a few days, especially if it damages crucial parts of electricity infrastructure," said Yuan Li, an assistant professor in the Department of Electrical and Computer Engineering leading the project. "Our solution is to develop a system duplicating that crucial infrastructure as many submodules, so an electric system can keep working even if a part is compromised."

Li and her team are developing lightweight, compact inverters for solar power plants. The inverters help regulate the flow of electricity from power plants to the electric grid. The submodules are small enough that a team of two people can set them up without heavy equipment, allowing solar power plants to quickly restore electricity in the wake of disruptions, such as the hurricanes that batter Florida during the summer.

The technology allows workers to replace the failed part while the rest of the inverter system generates power.

IMPROVING ACCESS TO SHELTERS

Hurricanes are commonplace in Florida, but while they pose a risk for all residents, that's especially true for people whose physical or cognitive impairments require them to use the state's special

New research from the FAMU-FSU College of Engineering and the Resilient Infrastructure and Disaster Response Center (RIDER) shows how repurposing regular shelters could significantly cut travel times for vulnerable populations.

In work published in the journal Transportation Planning and Technology, researchers showed that repurposing one regular shelter into a special needs shelter in the Panama City area would lower the average travel time to reach it from 28.5 minutes to 7.4 minutes. The travel time went down to 4.3 minutes when three regular shelters were repurposed.

"We hope with the improved methodology, we will save lives and provide a roadmap for other areas that are susceptible to hurricanes," said *Eren* Ozguven, RIDER director and an associate professor in the Department of Civil and Environmental Engineering at the college.

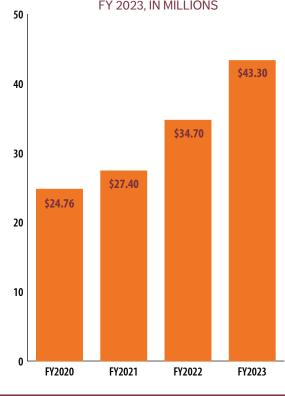
The researchers incorporated storm surge modeling into their GIS analysis of how quickly residents could reach the shelters. Flooding that disrupts roads and bridges could cause intense traffic congestion, which makes evacuating especially difficult for special needs populations.

"We incorporated storm surge modeling into hurricane planning in Panama City because it is close to the landfall location where Hurricane Michael hit," said co-author Wenrui Huang, a professor in the Department of Civil and Environmental Engineering. "Integrating the uncertainty of hurricane tracks into evacuation planning is critical for the impacted communities, as recent hurricanes have shown." ■

Research Growth

Research Expenditures

FY 2023, IN MILLIONS





Zhiyong (Richard) Liang, Ph.D. Interim Associate Dean. Research & Graduate Studies



\$420,436

Expenditures per Tenure-Track Faculty

Our expenditure per faculty member is among the highest of the engineering schools in Florida.

This ongoing annual increase in research productivity is the result not only of the *strategic investment* in our joint model by federal sponsors but also the *determination* of our faculty and supporting staff to push the boundaries of engineering research every day. Gains like this do not happen by accident—they are vigorously planned, worked toward and reached. We aren't done yet. - Z. LIANG, PH.D.



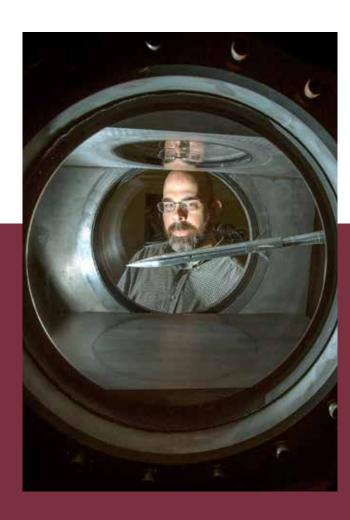
\$43.30M

Record Research Expenditures in One Year

Our research expenditures have increased 75% since 2020 and continue to rise every year.

Growth

U.S. Air Force Invests \$5M Grant for New University-Led Center of Excellence



THE AIR FORCE RESEARCH LABORATORY (AFRL) AND AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (AFOSR) awarded the FAMU-FSU College of Engineering \$5 million to launch a new university-led Center of Excellence (COE) at the joint college.

This new Center of Excellence on morphing structures for aerospace applications will develop technologies for next-generation high-speed flight vehicles.

William Oates, Ph.D., leads the collaborative effort that brings a diverse team of expert researchers to address a broader nature of research relevant to



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



Rajan Kumar, Ph.D. Director, Florida Center for Advanced Aero-Propulsion

these challenges. Researchers from Florida State University, the University of Florida, and the USAF will leverage their expertise in munitions, aerospace systems and materials and manufacturing in the multidisciplinary facility.

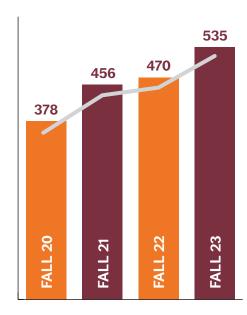
The work has military as well as civilian applications. In addition to potential commercial use for advanced aircraft, the research can enhance energy systems to advance wind power and gas turbines. Researchers want to develop technology that tightly integrates computations into aerodynamic morphing structures for better control and agility.

In addition to the research-specific goals, the center will provide unique opportunities for student development. The AFRL views Center of Excellence programs as a prime opportunity for academic engagement and a pipeline for highly skilled researchers.

This facility and partnership will serve as the nexus for designing, modeling and testing integrated aerospace systems and structures. It will support students and faculty, promote discovery of new intelligent aerospace systems, and help create a workforce of aerospace engineers for the Air Force Research Laboratory and industry partners.

Graduate Engineering Student Metrics

Much of our engineering research is carried out by the next generation of faculty that academia needs—women and minoritized groups.



GRADUATE ENROLLMENT



30.3% Female Doctoral Students

More than 30% of our Ph.D. students are female, and 42% of those are domestic students.



16 DistinctResearch Centers/Labs

Including several nationally-renowned centers such as the National High Magnetic Field Laboratory.

The nexus of an HBCU and an R-1 university

provides an opportunity to level STEM inequities.

Minoritized groups attend our joint college via either
Florida A&M University or Florida State University,
and all students learn, work and develop together in
our shared labs, classrooms and research centers.
This synergy provides benefits far beyond the obvious.
Future faculty members are able to form positive,
experience-based relationships with professors
who are mentors and strong models of engineering
research success—a critical factor in increasing
the number of engineering faculty who are from
minoritized groups.

Total engineering graduate student population, Fall 2023

535

Underrepresented Minority Grad Students: 32%

Asian Grad Students: 35%

White Grad Students: 30%

Alumni

College Alumnus Earns High Engineering Honor





2 World Records

Florida A&M University and FAMU-FSU College of Engineering alumnus *Asegun Henry*—a contributor to two world records—recently received the **Alan T. Waterman Award,** which is the highest honor that the National Science Foundation can bestow on early-career engineers and scientists.

He holds the Guinness World Records book record for the highest-temperature pump and a record in the 2022 Physics World Top 10 Breakthroughs for "super-efficient electricity generation."

Henry graduated from FAMU in 2004 through the FAMU-FSU College of Engineering with his bachelor's degree in mechanical engineering before going to MIT to earn both his master's and doctoral degrees in mechanical engineering in 2006 and 2009. Previously he taught at Georgia Institute of Technology as an assistant professor. His main research focus is heat transfer with an emphasis on developing technologies to mitigate climate change.

Last year, he became the founder and CEO of the Thermal Battery Corporation, a company that develops rechargeable batteries and works on scaling up the technology of its products.

Undergraduate Engineering Student Metrics

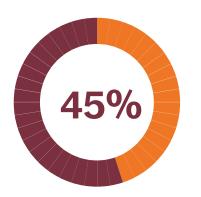


FALL 2023

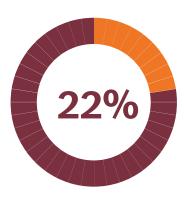
Our college benefits from the strong influence of both FAMU as an HBCU and FSU as a near-HSI to produce a student body as diverse as nearly any nationwide and far more hetergenous than the average engineering college.



Female UG Students







White UG Students

Hispanic UG Students

Black UG Students

Increase in undergraduates through Florida A&M University since 2022 $\,$

11%

Total engineering undergraduate student population, Fall 2023

2506

National Spotlight

Eight (and Counting) Distinguished NAE Fellows Visit the College in One Academic Year

The infusion of ideas and momentum from

overstated for our college. It was a chance to be influenced and engage in important conversations around the future of our

college and engineering research. — DEAN DE

these distinguished engineers can't be

Dean's Distinguished Seminar Series

Eight of the world's most distinguished engineers visited the nation's only joint college of engineering during the most recent academic year. These National Academy of Engineering Fellows toured our campus and research centers, met with faculty and mentored engineering graduate students during their visits. Each event was anchored by a keynote address for the academic audiences at the college and our parent universities, Florida A&M and Florida State.



Ned Mohan
Regents Professor
University of Minnesota



David PerreaultFord Foundation Professor
Massachusetts Institute
of Technology



Philip T. Krein
Professor Emeritus
University of Illinois at
Urbana-Champaign



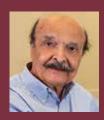
Charles Zukoski Professor & Provost University of Southern California



Chen-Ching Liu Professor Virginia Tech



Manoj Shah
Professor
Rensselaer Polytechnic
Institute



Surendra P. Shah Professor University of Texas at Arlington

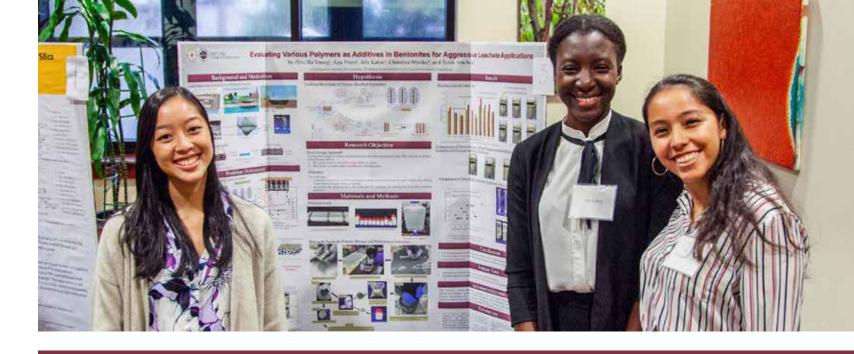


George Pharr Professor Texas A&M University

Accolades

Tenure-track faculty
Research faculty
Post-doctoral researchers

Researcher	Year	Award
Wei Guo, Ph.D.	2023	Fellow of the American Physical Society (APS)
Unnikrishnan Nair, Ph.D.	2023	ONR Young Investigator Award
Kamal Tawfiq, Ph.D.	2023	Outstanding Technical Achievement of the Year award, Florida Engineering Society
Hui Li, Ph.D., and Zhehui Guo, Ph.D.	2023	2nd Place Paper award from the IEEE Transactions on Power Electronics (TPEL)
Theo Siegrist, Ph.D.	2023	Elected to the Academy of Science, Engineering, and Medicine of Florida (ASEMFL)
Yuan Tang, Ph.D.	2023	Peter Kapitza Award, International Institute of Refrigeration (IIR)
Shonda Bernadin, Ph.D.	2023	Google Endowed Professor, FAMU
Yan Li, Ph.D.	2023	Fellow, 2023-2024 Drexel University ELATES Program
Ebrahim Ahmadisharaf, Ph.D.	2023	2023 Best Case Study from the Environmental and Water Resources Institute
Juyeong Choi, Ph.D. and Lichun Li, Ph.D.	2023	NSF (CAREER) awards
Michael Elwardany, Ph.D.	2023	2023 Fred Burggraf Award, Transportation Research Board (TRB)
Jonathan Clark, Ph.D. and Christian Hubicki, Ph.D.	2022	University Innovation Award from L3Harris Technologies
Sastry Pamidi, Ph.D.	2022	Board of Directors, Cryogenic Society of America
Rufina Alamo, Ph.D.	2022	Fellow of the American Association for the Advancement of Science
Fang Peng, Ph.D.	2022	National Academy of Inventors
Nasrin Alamdari, Ph.D.	2022	American Society for Engineering Education DELTA Junior Faculty Institute
Joshua Degraff, Ph.D.	2022	Engineering Postdoctoral Fellowship from the ASEE



Graduate and Undergraduate Student Awards

Jamini Bhagu, graduate student	2023	Best Presentation, International Society for Magnetic Resonance in Medicine annual meeting
Benhur Asefaw, graduate student	2023	Coastal Plains Chapter of the Air and Waste Management Association (AWMA) Scholarship
Aspen Reyes, graduate student	2023	Zonta International 2023 Amelia Earhart Fellowship
Toshiaki Kanai graduate student	2023	Best Poster, Florida State University Quantum and Science Symposium
Greg Moller, undergraduate student	2023	National Science Foundation Graduate Research Fellowship (NSF-GRF)
Gary Germanton, graduate student	2023	National Defense Science and Engineering Graduate (NDSEG) Fellowship
Michael Romega, Kristine Villarino, Andrew Burkhardt, Caleb Ward, Max McCammon; undergraduate students	2023	"People's Choice Award," 2023 Atlantic Coast Conference (ACC) InVenture competition
Natalie Boggess, undergraduate student	2023	Department of Energy's Science Undergraduate Laboratory Internship ORNL
Bailee Ku, undergraduate student	2022	First Place (Bachelor's) Research, SAMPE university research symposium
Mehul Tank, graduate student	2022	Fourth Place (Doctoral) Research, SAMPE university research symposium
Mitesh Patadia, graduate student	2022	Second Place (Master's) Research, SAMPE university research symposium
Yavuz Oz, graduate student	2022	Jan Evetts SUST Award
Ashleigh Francis and Shaon Barua, graduate stduents	2022	IEEE Graduate Study Fellowships in Applied Superconductivity
Shaon Barua, Shah Alam Limon, Virginia Phifer, Srikar Telikapalli, graduate students	2022	ASC 2022 Best Student Paper Prize
Shah Alam Limon, graduate student	2022	Alexander Shikov Prize
Ashley David, undergraduate student	2022	Second Place, Electrochemical Society Poster



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, nationally-renowned associated research centers and a national laboratory.

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