*Breaking Barriers in Diversity and Innovation*

## Civil Engineering + Environmental 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 Resilient Infrastructure & Disaster Response Center (RIDER) to the Rural Equitable and Accessible Transportation Center (REAT), our research takes place in collaborative, multidisciplinary work.

### Active Research Collaborations

> Florida Department of Transportation (FDOT)
> Florida Department of Environmental Protection
> U.S. Department of the Interior
> Florida State University Department of Earth, Ocean and Atmospheric Science
> Apalachicola National Estuarine Research Reserve
> National Oceanic and Atmospheric Administration
> South Florida Water Management District
> U.S. Geological Survey
> Harvard School of Public Health
> U.S. Department of Energy
> Federal Highway Administration
> Florida A&M University School of the Environment
> National Institute of Health
> U.S. Department of Transportation
> U.S. Environmental Protection Agency

### Degree Programs

B.S. Civil Engineering
B.S. Civil/Environmental Engineering
M.Eng. (non-thesis) Civil Engineering
M.S. Civil Engineering

Ph.D. Civil Engineering
B.S.-Ph.D. Pathway in Civil Engineering
M.S-Ph.D. Pathway in Civil Engineering

### Undergraduate Majors Within the Program

Civil Engineering
Environmental Engineering

## Civil Engineering + Environmental Engineering Faculty Awards

**Ren Moses** - USDOT Intersection Safety Challenge Phase 1A Winner

**Michael Elwardany** - Walter J. Emmons Award for the best paper presented at the Association of Asphalt Paving Technologists (AAPT)

**Michael Elwardany** - Road Materials & Pavement Design - Best Scientific Paper 2023 Award

**Ebrahim Ahmadisharaf** - Early Career Research Fellow of NAS

### Society Fellows

**Michelle Rambo-Roddenberry, Ph.D., P.E.** - Fellow of the American Society of Civil Engineers (F.ASCE)

**John Sobanjo, Ph.D., P.E.** - Fellow of the American Society of Civil Engineers (F.ASCE)

**Kamal Tawfiq, Ph.D., P.E.** - Fellow of the American Society of Civil Engineers (F.ASCE)

**Jerry Wekezer, Ph.D.** - Fellow of the American Society of Civil Engineers (F.ASCE)

**Jerry Wekezer, Ph.D.** - Fulbright Senior Research Fellow

### National Science Foundation (NSF) CAREER Awards

**Pedro Fernandez-Caban**

**Junyeong Choi**

**Sungmoon Jung**

### Notable Alumni

**Sebastian Bryson, Ph.D.,** University of Kentucky

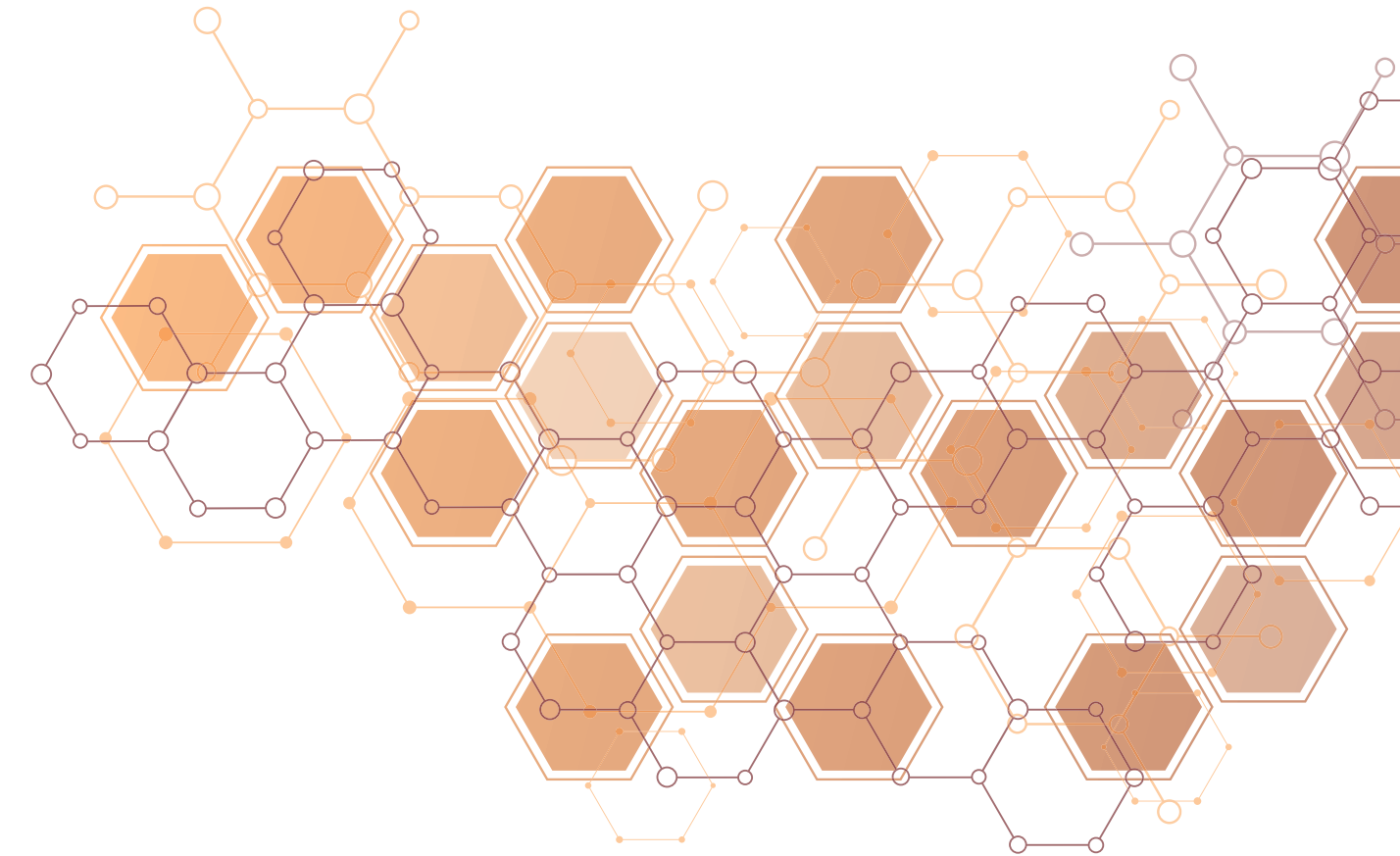**Scott Collins,** Orlando Project Controls

**Gevin McDaniel,** SpanPath LLC

**Adam Russell,** RussellRowland Inc.

**FAMU-FSU College of Engineering**

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

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
**CIVIL & ENVIRONMENTAL**
ENGINEERING

## Department of Civil & Environmental Engineering
# Annual Report 2024

*Innovating technological advances while educating the next generation of engineers*

**Fall 2024**

### A Message from

**Lisa Spainhour, Ph.D., P.E.**
Chair, Department of Civil & Environmental Engineering

Greetings from the Civil and Environmental Engineering Department at the FAMU-FSU College of Engineering. I am so proud of the accomplishments of our students, faculty and alumni, and excited about upcoming opportunities for continued growth and impact. In the past five years, we have seen major increases in faculty positions and undergraduate enrollments. Our master's and Ph.D. enrollments have doubled in the same time frame. Consistently among the top producers of African American degree-holders nationally, our enrollment is now over one-third female at all levels.

More important than numbers is our department's impact on the state of civil engineering research and practice. Under the research umbrella of our Resilient Infrastructure and Disaster Response (RIDER) Center, our faculty work in the thematic areas of intelligent mobility and community resilience, sustainable materials and resilient structures and environmental sustainability. Last year, our research expenditures increased by almost 50% to top $6 million. In addition to publishing in high-impact journals, our team helps underserved communities prepare for and respond to storms by training workers at resilience hubs in rural and underserved communities and sponsors events such as the recent Saving the Planet with Indigenous Knowledge conference. We are also excited to impact underserved communities through our new Rural Equitable and Accessible Transportation Center (REAT), a US-DOT Tier 1 University Transportation Center.

We are proud to have two CAREER Award-winning junior faculty working to make future structures more resilient to storm-force winds and to sustainably manage the debris that storms leave behind. Our faculty strives to design more sustainable pavements, prevent harmful algae blooms and make electric vehicles safer. One theme is constant across all our various work: it all positively impacts our natural and built environments and helps our communities grow and thrive.

# 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

**#65** Biomedical Program Ranking | **#52** Chemical Program Ranking

## Department by the Numbers (Fall '24)

**574** Undergraduate Students

**144** Graduate Students

**2900+** Alumni

**1:23** CEE Faculty-to-Student Ratio

**31** Total CEE Research Faculty

**10** Number of New CEE Faculty in Last 5 Years

### Enrollment

**31%** Female Students in CEE

**62%** URM Students in CEE

**43%** Increase in URM Enrollment in CEE Over Past 5 years

**118%** Increase in CEE Graduate Enrollment Over Past 5 Years

### Research

**7** Number of Patents Held by CEE Faculty

**$496K** Grants & Awards per CEE Faculty Member

**$338K** Annual Research Expenditure/CEE Faculty Member

**76%** Increase in Research Expenditures Over Past 5 Years

**132%** Increase in Grants & Awards Over Past 5 Years

**$28M** in Active awards as of August 2024

### Outcomes

**$95K** Average Salary for Civil Engineer

**$81K** Average Salary for Environmental Engineer

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# Civil & Environmental Research Laboratories at the Joint College

## Resilient Infrastructure & Disaster Response Center (RIDER)

Led by **Eren Erman Ozguven**, RIDER promotes all-inclusive and equitable disaster resilience for vulnerable populations by examining the root causes of community disaster vulnerability. This approach considers both infrastructure characteristics and social needs, with significance assessed through computational methods like machine learning, causality analysis and regression models as well as lab and field experimentation. These goals are essential, as disaster risks vary across population groups and are influenced by local factors such as infrastructure networks, land use and other contextual conditions.

## Laboratory of Advanced Operations Research and Resilience Applications (LAORA)

Led by **Maxim Dulebenets**, this lab specializes in transportation engineering, optimization and operations research, focusing on advanced algorithms and simulation modeling to enhance transportation systems. The research addresses NP-hard problems, mathematical programming and freight transportation, with applications in railroads, liner shipping and intermodal freight facilities. This work supports high-value projects funded by U.S. government agencies and private sector partners, including DoD, USDOT and Northrup Grumman Foundation.

## Methane Emission Reduction Initiative (MERI)

Under the leadership of **Tarek Abichou**, MERI develops engineering solutions to measure, estimate, predict and mitigate methane emissions from the solid waste management sector. His work focuses on converting methane concentration data collected through ground-based techniques, as well as aircraft, drone and satellite methods, into precise estimates of methane emission flux over time. MERI collaborates with public and private partners, including the Environmental Research & Education Foundation (EREF), the U.S. Department of Energy, the US Environmental Protection Agency and the National Science Foundation.

## Award-Worthy Novel Wind Research

**Pedro Fernández-Cábán**, an assistant professor, recently received NSF's prestigious CAREER Award, a grant given to promising up-and-coming researchers and future faculty leaders. The five-year, $550K grant funds his work focusing on the nature of extreme winds and their impact on the environment—critical science for Florida's hurricane-weary infrastructure.

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## PAVEMENT ENGINEERING

### Advancing Materials Testing Needed to Build Better Roads

**Michael Elwardany** received a best paper award with his co-authors David Mensching and Varun Veginati for their paper, "Evaluating the Sensitivity of Intermediate Temperature Performance Tests to Multiple Loose Mixture Aging Temperatures Using the FHWA Accelerated Loading Facility's RAP/RAS Experiment," published in the SAGE Transportation Research Record: Journal of the Transportation Research Board, in 2022. The research evaluated several proposed laboratory cracking performance tests for asphalt materials and their relation to pavement performance in the field. The study highlights the need for integrating long-term oxidative aging conditioning of the Balanced Mix Design (BMD) framework. He has since earned additional best paper awards from the TRB.

## RESILIENCE, RECYCLING AND REUSE

### Tracking Storm Debris for Better Management and Resource Allocation

**Juyeong Choi** leads a research team from the joint college and California Polytechnic State University focused on improving debris management. Using a data-driven model to track changes in debris over time and space, the team provides insights into post-storm debris management. Funded by NSF, their research aims to understand the evolution of vegetative debris and model the dynamic decomposition of uncollected waste. With these findings, they will develop a simulation model for debris collection operations, comparing it to current practices to create a more sustainable and efficient debris management framework.

## ELECTRIC BATTERY SAFETY

### Advancing Electric Vehicle Battery Safety With New Energy Absorption Design

**Sungmoon Jung** is improving the safety and performance of electric vehicles through a new design that protects their batteries. Jung and his research team use paraffin wax-filled tubes as dual-purpose crash absorbers and thermal protectors for electric vehicle batteries. These phase change material (PCM) tubes cushion impacts, absorb heat and prevent temperature spikes that could lead to fires. Experiments showed that PCM-filled tubes absorbed 74% more energy than unfilled tubes, improving EV safety and battery reliability. This innovation offers a lightweight solution to enhance electric vehicle adoption and longevity.

## OPTIMIZING FOOD WASTE CONVERSION

### Converting Food Waste to Sustainable Energy Using Microwave Technology

**Gang Chen's** team has developed a sustainable method to convert food waste into energy using hydrothermal technology, which avoids energy-intensive drying. The process produces hydrochar, a carbon-neutral solid fuel with low environmental impact, reduced moisture, and improved storage properties. A key innovation of the USDA-funded study is reusing process water, which enriches hydrochar with 5-hydroxy-methyl-furfural (HMF) during microwave hydrothermal carbonization (MWHTC), enhancing its heating capacity. This breakthrough could transform food waste processing for sustainable fuel production.

## POPULATION HEALTH

### Hidden Health Impacts of Natural Disasters

**Ebrahim Ahmadisharaf's** team studied flood-damaged homes in New Orleans and New York City, uncovering factors linked to mold growth and asthma symptoms. Led by doctoral student Maryam Pakdehi, the team used machine learning to identify influences like flood depth and roof age on mold and respiratory issues. Their findings offer insights for disaster management and public health, aiming to inform building design, educate families on indoor air pollution risks and improve responses in flood-prone communities.

## ENVIRONMENTAL RISK

### Revealing Harmful Blue-Green Algae Hotspots Across Florida's Lakes

**Nasrin Alamdari's** team is developing a predictive tool for harmful cyanobacteria blooms in Florida's lakes. Using machine learning, water quality, climatological and remote sensing data, the tool helps identify bloom-prone areas. This proactive approach allows officials to manage and prevent outbreaks, protecting public health, ecosystems and local economies impacted by blue-green algae.

*Dive deeper: famufsu.engineer/CEE*

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## Ren Moses
*Professor of Civil & Environmental Engineering*

"Working with various stakeholders in rural areas, the REAT Center projects are geared towards improving safety and access to multimodal transportation with the attendant results of uplifting economic well-being of diverse rural communities."

*Read more about his work:*