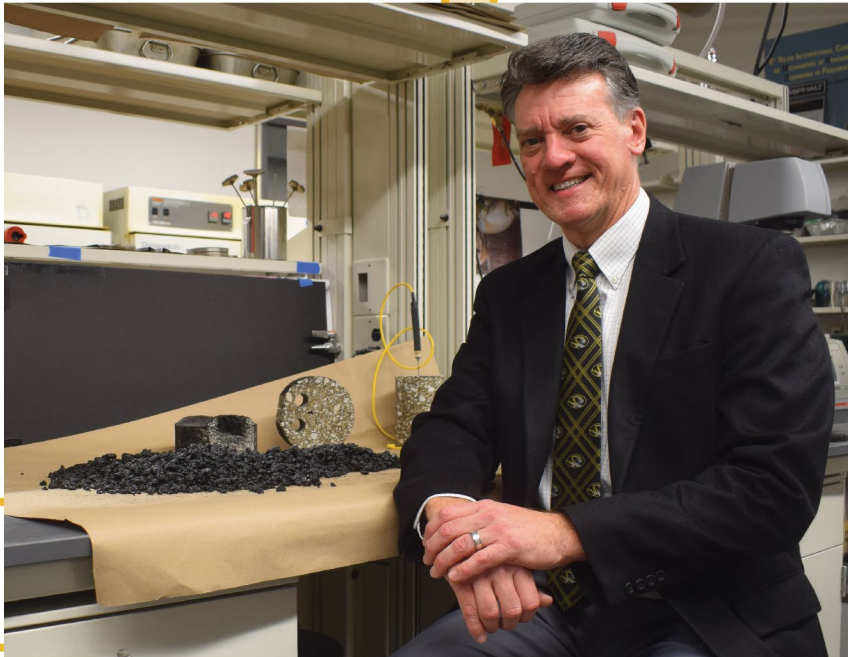
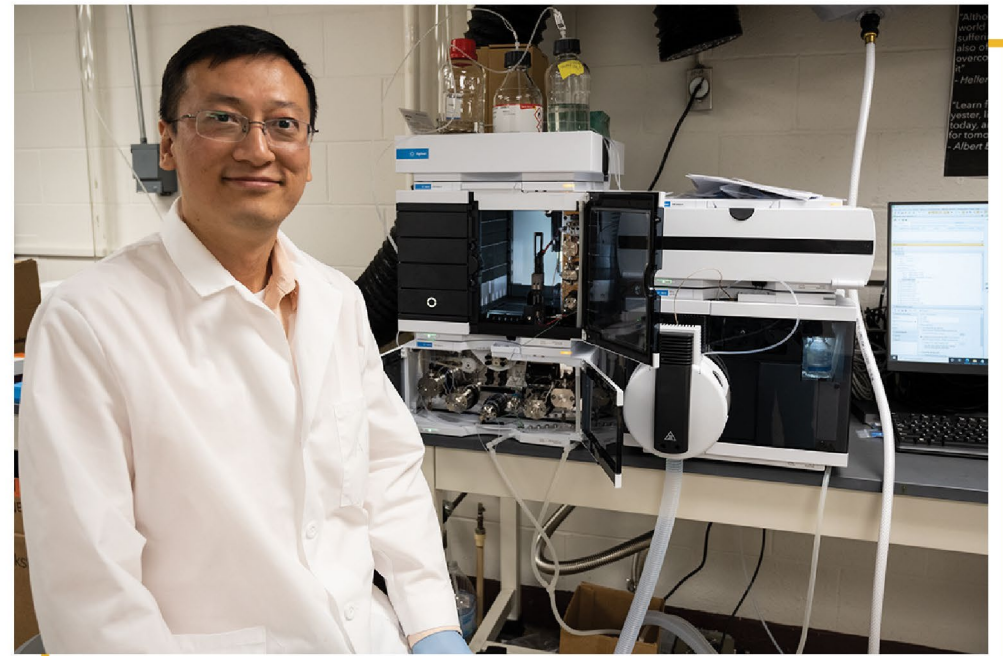


CIVIL & ENVIRONMENTAL ENGINEERING



College of Engineering
University of Missouri





376

Total Civil and Environmental
Engineering Students

309

Undergraduate Students

67

Graduate Students

42%

URM Students
(Including Women)

20

Tenure Track
Faculty Members

10

Post Doctoral
Fellows

2

Fullbright
Faculty Awards

6

URM
Faculty

15:1

Undergraduate Student
to Faculty Ratio

\$4.9M

Annual Research Expenditures

\$5.3M

Scholarship Endowment

\$3.9M

Annual Department Budget

6 Construction Management Industry Consortium Members

5 Faculty in AAAS, ASCE, ACI, ASNT & ASME

96% Undergraduate Professional Placement Outcomes

8 Early Career Awards

9 Support Staff

11 Faculty who are Professional Engineers

Program introduced to Mizzou in **1849**



Civil & Environmental
Engineering
University of Missouri

MESSAGE FROM THE CHAIR

It's been an incredible year of research and discovery in the Department of Civil and Environmental Engineering at Mizzou. Our faculty have made great strides in the areas of transportation, structural engineering, geotechnical engineering, environmental engineering and water resources. We've celebrated faculty, student and alumni successes both on campus and across the country. And we're pleased to announce the creation of MOWZES, our new center around work zone safety. Through this center, we'll focus on further advancements to keep motorists and workers safe in work zones along Missouri's highways.

In 2024, we're launching a Bachelor of Science in Environmental Engineering that will allow students interested in sustainability to more directly receive the coursework and experiences needed to be successful. I look forward to welcoming new students into the program.

Thanks for taking a moment to explore our work over this past year. We appreciate your support!

Praveen Edara
Interim Dean
Chair, Civil and
Environmental Engineering





MISSOURI ESTABLISHES MISSOURI WORK ZONE SAFETY CENTER OF EXCELLENCE

A new center has been established at Mizzou Engineering to leverage emerging technologies such as artificial intelligence and autonomous vehicles to keep drivers and workers safe along Missouri's interstates and highways.

The Missouri Work Zone Safety Center of Excellence (MOWZES) will lead research and outreach efforts with the goal of reducing fatalities and serious injuries in work zones. Praveen Edara, interim dean and chair of environmental and civil engineering, is founding director.

"Fatalities and serious injuries continue to be on the rise in highway work zones, with data showing a disproportionate amount of distracted driving, speeding and commercial motor vehicle involvement in these crashes," Edara said. "The center establishes a one-stop resource for transportation and industry partners within the state of Missouri by leveraging our existing strengths in research and our collaborative partnerships. As part of a land-grant university, our mission is to help the citizens of our state, and we all use highways and travel through work zones."



SELF-DRIVING TRUCKS CAN REDUCE WORKER INJURIES IN MOBILE WORK ZONES

Using a self-driving truck to follow a manned vehicle has the potential to reduce worker injuries in mobile work zones, a Mizzou Engineering team has concluded.

Research Engineer Henry Brown presented the findings to the Missouri Department of Transportation (MoDOT).

Moving work zones such as pavement striping typically involve a series of vehicles, with the last truck at most risk of being in a wreck. MoDOT uses mounted crash cushions known as truck mounted attenuators (TMAs) to absorb impact, however dozens of injuries still occur each year.

“We want to eliminate worker injury by getting the driver out of the last vehicle,” Brown said. “The idea is you pair the last two vehicles as a leader and a follower retrofitted with kits that allow the second vehicle to follow GPS crumbs from the vehicle in front of it.”

SOUNDING AN ALARM— AUTONOMOUSLY

Associate Professor Yaw Adu-Gyamfi and collaborators have developed an innovative alert system that warns drivers when they're in danger of colliding with a mobile work zone vehicle.

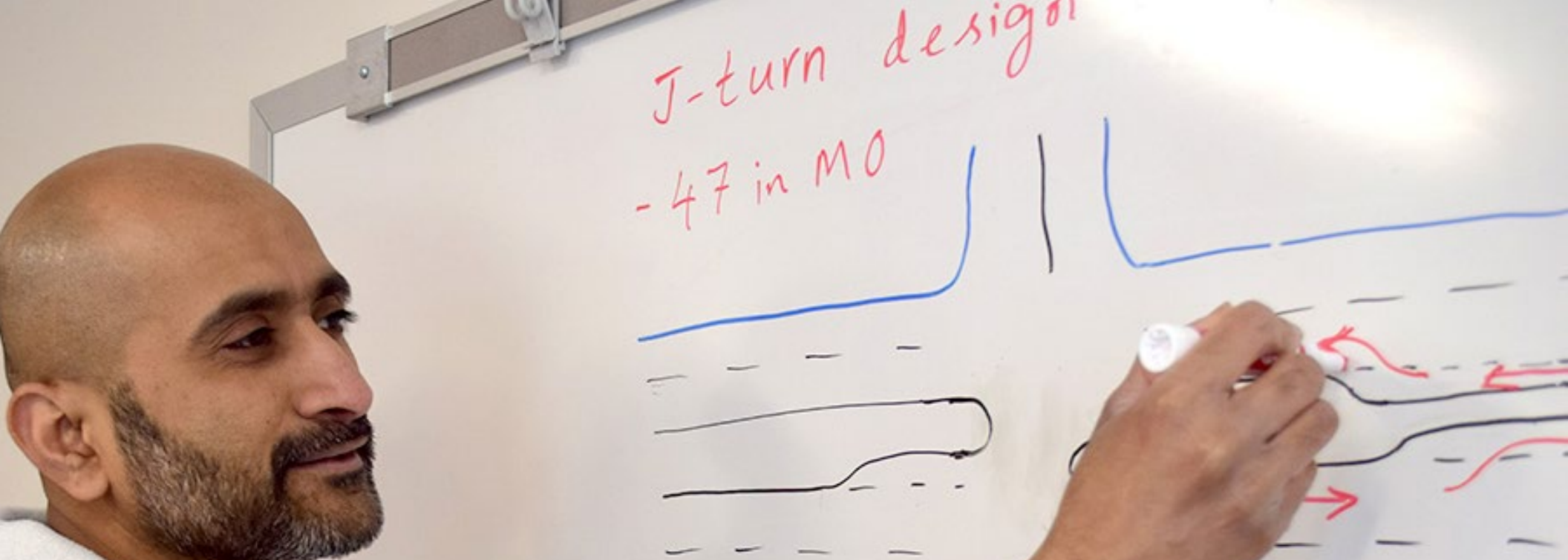


By utilizing both a mounted camera and lidar, the alert system automatically assesses a vehicle's speed and distance. If the system detects risky behavior, it automatically triggers flashing lights to warn the driver. If corrective action is not taken, a horn will sound.

The system is specifically designed for mobile work zones such as pavement striping, which involve a series of vehicles. While the Missouri Department of Transportation uses crash

cushions known as truck mounted attenuators (TMAs) to absorb impact, dozens of crashes still occur each year, resulting in injury and death.

"I believe this is going to save lives," Adu-Gyamfi said. "Right now, what happens is someone sits in the TMA and looks back to see if a driver is not doing what they're supposed to do and then hits the horn manually. We don't want someone to have to do that all of the time. This will provide warnings autonomously."



ASSESSING THE EFFECTIVENESS OF J-TURNS

A Mizzou Engineering team has been tasked with assessing the effectiveness of J-turn intersection designs across Missouri's state highway system.

Specifically, Praveen Edara, interim dean and department chair, is working with the Missouri Department of Transportation (MoDOT) to determine how J-turns have reduced crashes compared to traditional stop-sign intersections.

J-turn intersections redirect traffic where minor roads intersect divided highways. They provide an alternative to traditional two-way stop intersections in which motorists must cross anywhere from two to six lanes of traffic in order to turn left or proceed straight to an opposite side road.

J-turn intersections instead require motorists to turn right, then merge into a left lane and continue along the route until provided the opportunity to make a U-turn onto the other lane. The U-turn is typically within 3,000 feet "downstream" of the intersection, adding no more than a minute to travel time.

Earlier studies across the country have shown J-turn intersections work. In Missouri, an MU study from 2013 showed that J-turns reduced crashes by 25%, decreased fatal crashes by 88% and eliminated entirely right-angle, or T-bone, crashes.

LEVERAGING AI TO PREVENT CRASHES

A Mizzou Engineering team is hoping artificial intelligence (AI) can be leveraged to prevent vehicle crashes in the future. To that end, they've developed realistic artificial data sets (RAD) that can be used to train machines to predict the factors that cause wrecks. These data sets are now available through the U.S. Department of Transportation. The three-year \$1.1 million project was supported by the US DOT's Exploratory Advanced Research Program.

"Over 90% of crashes are caused by human error," said Praveen Edara, interim dean and department chair. "How can we influence human behavior through engineering, enforcement and behavioral countermeasures? AI and predictive modeling is a promising new approach to developing crash models that can be used to inform road design, signage and other decisions that positively influence driver behavior."

The RAD data sets provide a baseline of crash data that can be used to develop algorithms to predict crashes. In addition, researchers also developed virtual reality simulation test beds.



"The main advantage of RAD is you have people in the research community using different kinds of statistical and AI approaches on different datasets," Edara said. "The RAD offers benchmark datasets and test beds that will allow them to apply emerging AI techniques and compare their performance with others."

A SMART SOLUTION TO SUSTAINABLE ROADS

Civil engineers at the University of Missouri are using recyclables, including plastic waste, as a sustainable solution to fix America's fracturing road system.

In partnership with the Missouri Department of Transportation (MoDOT), researchers from the Mizzou Asphalt Pavement and Innovation Lab (MAPIL) created a real-world test road using recycled materials like scrap tires and plastic waste along a portion of Interstate 155 in the Missouri Bootheel. By increasing the sustainability of asphalt mixes, this innovative method can help reduce the number of items going into landfills or leaking into the environment, said Bill Buttlar, director of MAPIL.

"Missouri is the Show-Me State, so we take a very pragmatic view," Buttlar said. "The science can be thorny and difficult, but we are up to the task. We're excited that while our approach is complicated in the lab, it's simple to execute in the field, so it makes it easily adaptable, scalable and cost-effective to incorporate into many types of road environments."

The I-155 project takes the group's previous test road, installed along a stretch of Stadium Boulevard in Columbia, Missouri, one step further. Instead of just testing four different types of recycled materials, the I-155 project will evaluate the real-world effectiveness of nine different types of recycled materials in the creation of asphalt pavement. This includes three different types of polyethylene (PE) — a material commonly found in plastic grocery bags — and ground tire rubber, which is a newer way of disposing scrap tires.

"These projects afford us an opportunity to intentionally build the next generation of roads with these materials not as a type of linear landfill, but to also help the environment while making the value of dollars spent on transportation infrastructure like this stretch farther into the future," said Buttlar, who is also the Glen Barton Chair in Flexible Pavements.



FACULTY RECOGNIZED AT TRB ANNUAL MEETING

Several faculty from Mizzou's civil and environment engineering department were recognized at the Transportation Research Board (TRB)'s 102nd Annual Meeting in Washington, D.C. in January.

During the event, Professor Carlos Sun and his team received a High Value Research Award from the American Association of State Highway and Transportation Officials (AASHTO) for studies around autonomous truck platoons. For the project, Sun used simulation equipment in his ZouSim Lab to gauge how motorists behave when encountering self-driving trucks, especially in work zones.

Associate Professor Kate Trauth and collaborators also received an AASHTO High Value Research Award, allowing them to present their findings on pollinator habitats. For that project, researchers helped departments of transportation better understand whether and where ecosystems should be placed along highway rights of way.

Professor Bill Buttlar's team received recognition at the TRB for winning the Best Poster Award from the Standing Committee on Design and Rehabilitation of Asphalt Pavements last year outlining the team's work around integrating waste plastic and tire rubber into pavement mixtures.





BREAKING DOWN FOREVER CHEMICALS

In a recent study, Associate Professor Feng “Frank” Xiao and colleagues demonstrated an innovative method using thermal induction heating to rapidly break down PFAS left on the surface of granular activated carbon and anion exchange resins after these materials have been used to filter PFAS from municipal water systems. The team’s goal is to clean the materials before they are properly disposed.

“In this study, we explored the use of an engineering technique used to melt metals,” Xiao said. “This method produced 98% degradation of PFAS on the surface of absorbents like granular activated carbon and anion exchange resins after just 20 seconds, which makes this process highly energy efficient and much faster than conventional methods.”

In recent years, experts have raised concerns about the risks to human health from environmental exposure to PFAS. While PFAS can be filtered out of water using adsorbents, the disposal of used or “spent” adsorbents also creates issues of environmental contamination.

The study drew inspiration from proposed regulation by the Environmental Protection Agency (EPA) that, if finalized, would require public water systems in the U.S. to monitor and reduce PFAS contamination in drinking water and spent adsorbents. Potential drawbacks of this method include by-products created during this process — organic fluorinated species and hydrogen fluoride. While these by-products are considered toxic to consume through breathing or ingestion, Xiao has a solution.

“Based on my previous studies, some of these products can be degradable by regular thermal approaches,” Xiao said. “Simultaneously, the generation of hydrogen fluoride is increased, which is desirable because it means greater mineralization, or decomposition, of PFAS. We’ve found hydrogen fluoride can be removed simply using clay or soil at moderate temperatures.”



MACRO SOLUTIONS TO MICROPLASTICS

A Mizzou engineer is investigating the effects of plastic pollutants in stormwater runoff.

“I’m looking at the fate of plastics as they’re exposed to sunlight and become degraded and brittle, leading to more fragments being released into our water system,” Assistant Professor Maryam Salehi said. “Heavy metals such as lead, copper and zinc can cling to plastic particles, making water more toxic.”

Salehi is also working with the U.S. Department of Agriculture to study the fate of plastic mulch and plastic-coated fertilizers on our soil system.

“These plastics accumulate year after year and can be transported to deep soil, potentially polluting groundwater,” she said. “The additives they carry could also leach into the soil and be transported into the crops being grown.”

STUDENTS EARN HONORS

Assistant Professor Maryam Salehi’s graduate students earned honors at the 2023 Missouri Section of the American Water Works Association (MO-AWWA) and the Missouri Water Environment Association joint meeting.

Dibya Kanti took second place in the Wastewater Track for his poster focused on heavy metal-microplastic-sediment interaction in urban stormwater runoff. Anandu Nair took third place in the Water Track for his poster on producing novel nanofibrous media for microplastics removal from water.

DEPARTMENT WELCOMES NEW FACULTY



James Ogechi Kereri

Assistant Teaching Professor

James Ogechi Kereri holds a Ph.D. in Engineering Science with a concentration in Construction Management from Louisiana State University. Kereri previously worked as a construction manager overseeing residential and commercial projects as well as environmental and other infrastructure. His research interests are in relationship management, relational contracting, construction project team behaviors, relationship quality and construction labor issues including safety and other emerging workforce related topics.



Punyaslok Rath

Assistant Research Professor

Punyaslok Rath works in the Missouri Asphalt Pavement and Innovation Lab (MAPIL). His research focus is on asphalt materials, specifically in asphalt material characterization. Rath, who has a Ph.D. from the University of Missouri, has worked in collaboration with many industry entities to promote sustainability through use of recycled materials in asphalt mixtures. He has worked extensively on dry process rubber-modification of asphalt mixtures.



Feng "Frank" Xiao

Associate Professor, P.E.

Feng "Frank" Xiao's research focuses on water and soil quality engineering, including disinfection byproducts and black carbon. Currently, he is leading an interdisciplinary team with diverse expertise to address open questions in area such as fat and transport of per-and polyfluoroalkyl substances (PFAS), water treatment and soil remediation technologies and analytical tools and non-target identification by high-resolution mass spectrometry. He has a Ph.D. from the University of Minnesota.



Hessam Yazdani

Associate Professor, P.E.

Hessam Yazdani is the director of the Sustainable Infrastructure, Geotechnics and Materials (SIGMa) Research Lab where he specializes in geotechnical engineering, experimental and computational multiscale mechanics of materials (particularly polymer nanocomposites), reliability analysis, machine learning, and optimization. His multidisciplinary research centers on fostering sustainability and resilience in civil and marine infrastructure through addressing the geotechnical aspects of renewable energy systems, designing high-performance and multifunctional materials.



HU NAMED CURATORS' DISTINGUISHED PROFESSOR

Zhiqiang Hu has been named a Curators' Distinguished Professor at the University of Missouri, the highest honor bestowed on faculty, for his outstanding research around environmental engineering.

Hu is a William Andrew Davidson Professor in the Department of Civil and Environmental Engineering and is internationally recognized for his work in water and wastewater engineering.

Hu has conducted pioneering studies on the impact of nanomaterials on various environmental processes such as nitrogen removal, anaerobic sludge digestion and landfill efficiency. He is a Fellow of the American Association for the Advancement of Science. Over the past three years, Hu has been named among the World's Top 2% of Scientists List published by researchers at Stanford University.



STRESSING THE IMPORTANCE OF SIMULATION-DRIVEN TECHNOLOGIES

A Mizzou Engineer is demonstrating that simulation-driven technologies can be used to design efficient structures that can withstand variable loads.

This spring, Assistant Professor Oliver Giraldo-Londoño discussed those opportunities during a keynote at the Society for Experimental Mechanics' 41st International Model Analysis Conference and Exposition on Structural Dynamics.

"It is important that we appreciate the value of simulation to obtain designs that are non-intuitive," Giraldo-Londoño said. "Computers can crunch numbers much faster than humans and obtain much better designs faster and more efficiently. We have to learn new techniques to develop designs of the future."

FROM THE DIRECTOR OF UNDERGRADUATE STUDIES

The Department of Civil and Environmental Engineering at Mizzou continues to assess curriculum and programming to ensure students are able to combine foundational coursework with hands-on experiences. In recent years, we have:

- Continued to support civil engineering students through the STEM Scholars Program. This scholarship, awarded based on need, is funded through the National Science Foundation. In addition to financial aid, recipients receive one-on-one mentoring and opportunities to participate in community service projects. This year, we expanded the program beyond our department and welcomed 11 new STEM Scholars to Mizzou Engineering.
- Implemented a comprehensive system to assess student outcomes in required Civil Engineering courses. This will help us determine trends in student achievement and identify solutions to improve outcomes.

Sarah Orton
Director of Undergraduate Studies
Associate Professor

- Continued to expand upon our offerings around construction management with guidance from a Construction Management Consortium comprised of six companies: ARCO, Brinkman Constructors, Burns & McDonnell, Emery Sapp and Sons, Kiewit and P&D Electric.

Undergraduate students also have opportunities to apply what they learn through a variety of organizations, including the Concrete Canoe Team, Steel Bridge Team, American Society of Civil Engineers, Institute of Transportation Engineers Student Chapter and the Water & Environmental Technologists club.

We recently completed a successful ABET accreditation review. Thank you to faculty, students, alumni and employers for helping us prepare for that process.



FROM THE DIRECTOR OF GRADUATE STUDIES



In the Department of Civil and Environmental Engineering at Mizzou, our goal is to provide more flexible options to allow students to earn master's and doctorate degrees, as well as graduate-level certificates.

This year, we're launching a Construction Management Leadership Institute for professionals who want to advance in their careers. The leadership institute is an intensive three-day program developed in partnership with the Missouri Training Institute. It's designed to help those working in heavy civil, commercial or industrial construction stay ahead of issues as federal funds support constructions of new roads, bridge and public infrastructure.

The institute comes on the heels of a new graduate certificate

Maria Fidalgo
Director of Graduate Studies
Associate Professor

program in construction management that is offered entirely online and includes interdisciplinary courses from engineering, business and architectural studies.

Additionally, we offer a 100% online project-based master's degree to allow working professionals to advance their education. This is offered with emphasis areas in both transportation and environmental engineering.

We also provide an accelerated program to give high-achieving students an opportunity to graduate with a B.S. and M.S. in five years, in any of the emphasis areas of the department: environmental, water resources, geotechnical, transportation and structural engineering.



CONSTRUCTION MANAGEMENT CONSORTIUM GUIDES PROGRAMMING

Mizzou Engineering continues to expand programming around construction management with assistance from industry representatives from some of the top firms in the country.

The Construction Management Industry Consortium at Mizzou held its second meeting on campus this spring with nearly 90 attendees. The consortium is comprised of six companies: ARCO, Brinkmann Constructors, Burns & McDonnell, Emery Sapp and Sons, Kiewit and P&D Electric.

“We appreciate these industry partners working with us to shape academic programming and extracurricular opportunities for our students,” said Praveen Edara, interim dean and department chair. “They’re helping us ensure our

programs are relevant, innovative and meet the needs of today’s employers.”

Mizzou offers a construction management minor and a graduate certificate in construction management.

This coming year, a new Construction Management Leadership Institute will be offered to working professionals. The three-day intensive program, in partnership with the Missouri Training Institute, will help participants stay ahead of issues that directly impact the construction industry. It’s scheduled to start Feb. 7.

NSF STEM SCHOLARS PROGRAM SEES SUCCESS

A scholarship program that began for civil and environmental engineering students in 2021 has proven so successful, it was expanded to other engineering majors. And eventually, the coordinator, Professor Vellore Gopalaratnam, would like to see a similar support system for students studying other STEM programs across Mizzou.

Funded with a five-year National Science Foundation grant, the Mizzou Engineering STEM Scholars is a comprehensive program that provides scholarship funding, mentorship, networking opportunities and holistic support to students from low-income backgrounds.

“We started this program to help more students

succeed in engineering with the ultimate goal of making sure diverse backgrounds are represented in the industry,” said Gopalaratnam, Principal Investigator on the grant and an IDE Faculty Fellow for the College. “While that’s important

in civil and environmental engineering — a field that is dedicated to serving the public in all fields — we recognize the need to increase that diversity and representation across all STEM disciplines.”

Of the first cohort of eight STEM Scholars, seven returned to Mizzou for a

second year, with one student transferring to a STEM program at a different UM System campus. The majority of both the 2021 group and the 12 STEM Scholars selected this past fall were named to the Dean’s List for high academic achievement.





STUDENTS TAKE HONORS AT REGIONAL COMPETITION

Mizzou civil engineering students won awards at the 2023 American Society of Civil Engineers Mid-America Student Conference.

The Steel Bridge and Concrete Canoe teams competed against other colleges from the Mid-America region. The Steel Bridge team placed 2nd in construction speed, 2nd in economy, 3rd in overall lightness and tied for 3rd place in aesthetics. Concrete Canoe placed 6th out of 12 teams.

“I’m proud of how well everyone on the team performed,” said Emily Kramer, Steel Bridge team president. “Not only during the competition but also the amount of time and effort put in during the months leading up to competition. Our goal this year was to not get disqualified after the build portion was over and to come home with awards, and we exceeded these goals by placing in four categories.”



MONITORING SUSTAINABILITY FROM SPACE

Jaweed Nazary, a Ph.D. student, participated in NASA’s DEVELOP National Program, which trains students to leverage Earth observation data to investigate environmental challenges.

During the program, Nazary spent 10 weeks analyzing sophisticated satellite imagery to see how rising sea levels and melting permafrost are impacting drainage networks in Unalakleet, Alaska. The community is at risk of coastal erosion and sea-level rise. Findings from the work will help determine new locations less at risk.



SPRIGGS EARNS FULBRIGHT

As part of a Fulbright fellowship, Amber Spriggs, B.S. CiE '21, M.S. CiE '23, is collaborating with Dutch officials and researchers from Delft University of Technology to use GIS and remote sensing technology for flood mitigation measures in the Netherlands. She hopes to develop a methodology to examine how similar infrastructure changes could work along the Missouri and Mississippi rivers.

After she completes the fellowship in May 2024, Spriggs plans to pursue an engineering career in the public sector, such as with the Federal Emergency Management Agency or Army Corps of Engineers.



NEW FACES OF CIVIL ENGINEERING

Shishi Chen, B.S. CiE '18, M.S. CiE '20, was among the 2023 class of American Society of Civil Engineers (ASCE) New Faces of Civil Engineering Professionals. Honorees represent inspiring young engineers already making a difference, according to ASCE. Chen is a civil engineer at HVJ Associates and works on state highways, city streets and airports projects in Austin, Texas.

RECOGNIZING OUTSTANDING ALUMNI

Eight Mizzou Engineering alumni were inducted into the Civil and Environmental Engineering Academy of Distinguished Alumni (CEADA) at a banquet on Sept. 15. Now in its 25th year, CEADA recognizes extraordinary graduates and friends of the Department of Civil and Environmental Engineering. Election to the Academy honors outstanding professional achievement.

“Inductees demonstrate excellence and leadership not only in their fields but in community and civic affairs,” said Praveen Edara, chair of civil and environmental engineering and interim dean of the College. “And CEADA members help the department maintain a high standard of excellence. In fact, goals of the academy include motivating students and helping the university achieve national prominence in civil engineering education. CEADA members are, indeed, partners with us as we prepare a new generation of students to become civil engineers and leaders in industry.”





BRANDI BALDWIN

B.S.'05, State
Construction and
Materials Engineer for
the Missouri Department
of Transportation
(MoDOT)



SARA BECKMAN

B.S. '05, Vice
President-Power
Market, Ulteig



CORY CARLSON

B.S. '98, Leadership
Coach, Author



JENNIFER HARPER

B.S. '99, Research
Director, MoDOT



DARRIN KELLY

B.S. '93, Executive
Vice President,
General Manager,
DeLong's, Inc.



ALEXA MITCHELL

B.S. '99, Enterprise
Digital Delivery
Services Director,
HDR



JONATHAN NELSON

B.S. '03, Assistant to
the State Highway
Safety and Traffic
Engineer, MoDOT



GARY WISCH

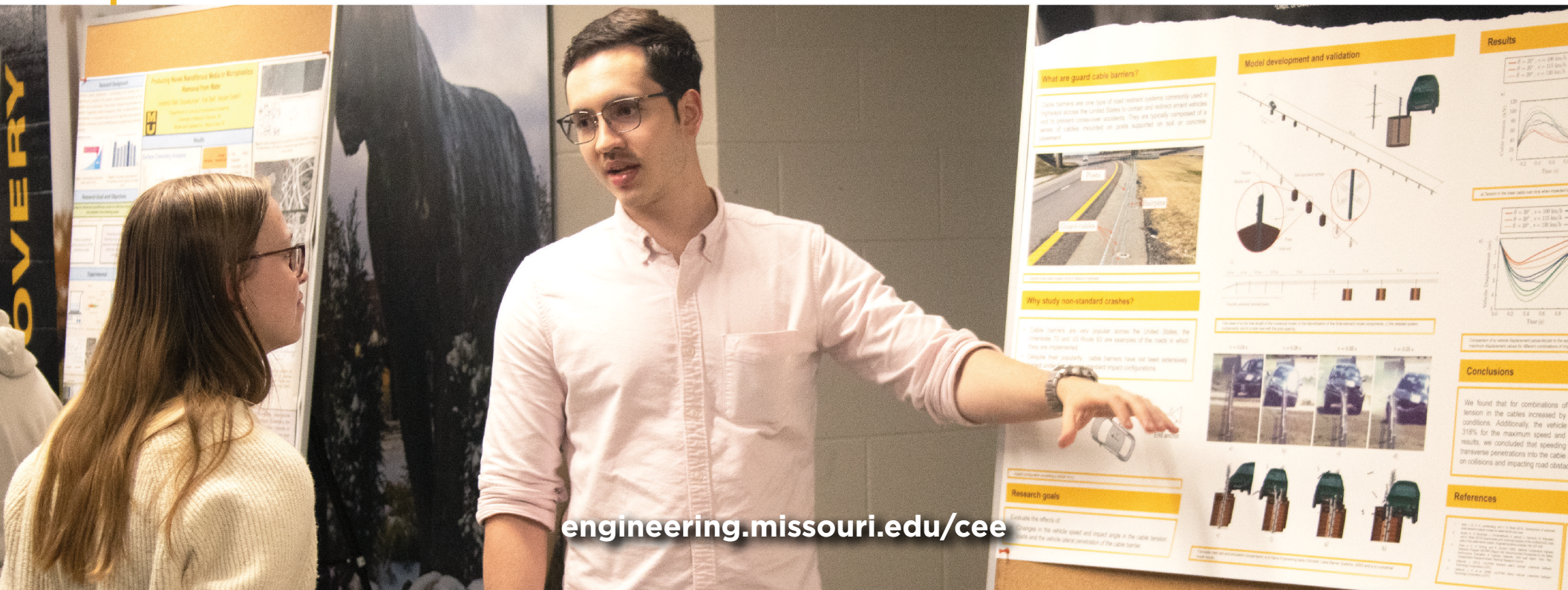
B.S. '82, Vice President
of Engineering,
DeLong's Inc.



Civil & Environmental Engineering

University of Missouri

416 S 6th Street
Columbia, MO
65211



engineering.missouri.edu/cee