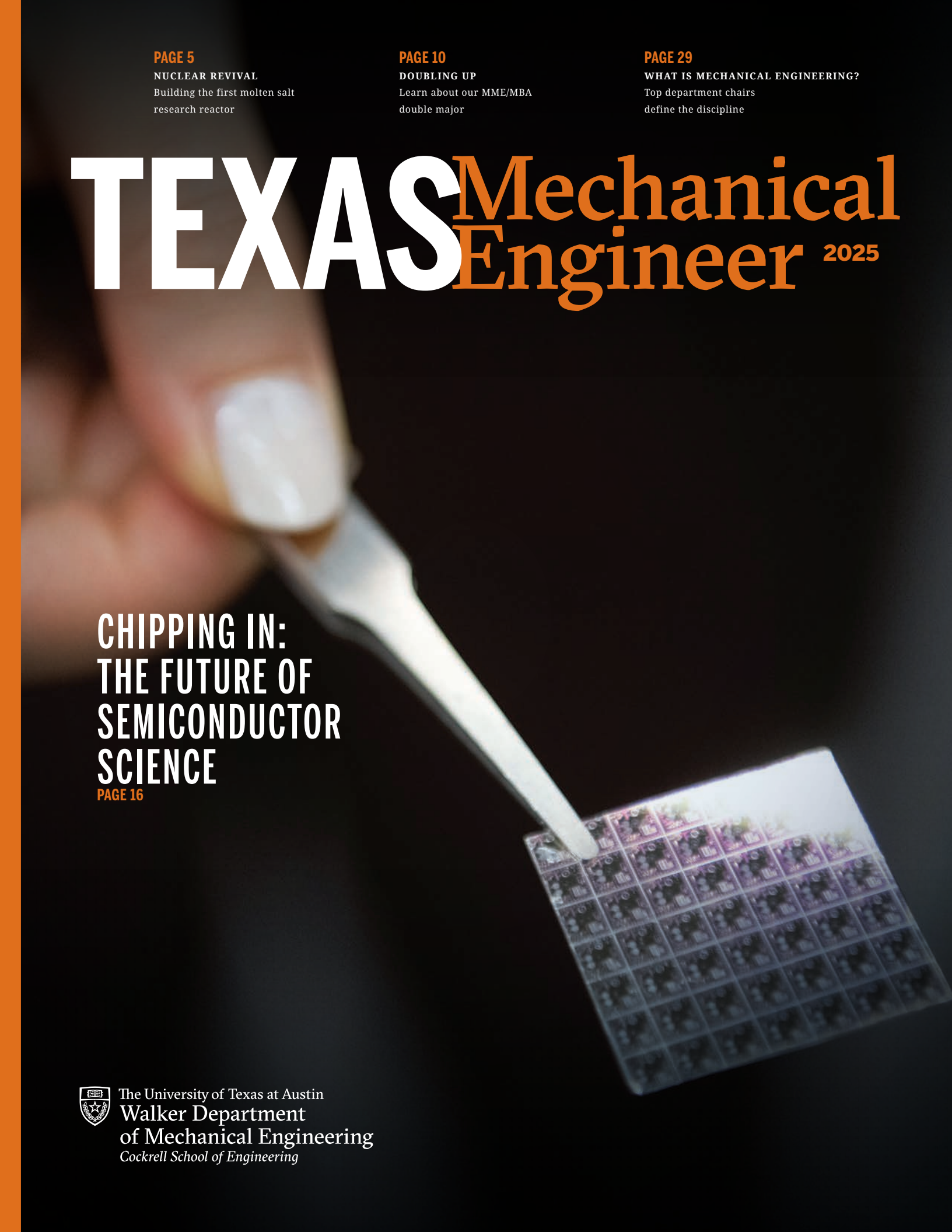
TEXAS Mechanical Engineer 2025



CHIPPING IN: THE FUTURE OF SEMICONDUCTOR SCIENCE

PAGE 16

The University of Texas at Austin
Walker Department of Mechanical Engineering
Cockrell School of Engineering

TEXAS MECHANICAL ENGINEER

Texas Mechanical Engineer is published annually for alumni and friends of the J. Mike Walker Department of Mechanical Engineering in the Cockrell School of Engineering at The University of Texas at Austin.

—

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WANT TO SUPPORT TEXAS ME?

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—

ON THE COVER

Semiconductors are tiny computer chips that power our world. UT leads in the research and manufacturing of these chips.

DEAR FRIENDS

Welcome to the latest issue of the Texas Mechanical Engineer Magazine! The Walker Department remains an extremely active and vibrant community. Reflecting this, the present issue is the largest we have produced. There's a lot going on in the Department!

To kick things off, I'd like to highlight a few noteworthy items:

» **Our cover story** focuses on the future of semiconductor science. Mechanical engineers have long played a leading role in the manufacturing of semiconductor devices. Our department's footprint in this area has increased dramatically in recent years. These efforts include the awarding of a 10-year NSF Engineering Research Center, NASCENT (Nanomanufacturing Systems for Mobile Computing and Energy Technologies), back in 2012. Continuing this legacy, in 2024 ME faculty member S.V. Sreenivasan and the Texas Institute for Electronics landed $840 million from DARPA to establish a microelectronics manufacturing center focused on heterogeneous integration, page 17. In addition, several other ME faculty have recently received funding through the NSF's Future of Semiconductors programs, FuSe and FuSe2, page 20. The research launched by these new grants will also nucleate new educational opportunities for UT students within and beyond ME. These include a master's program (page 19) and an undergraduate minor in semiconductor science and engineering.

» **Highlighting senior design.** Starting with this issue we are introducing a new recurring feature that highlights significant projects (and the students responsible for them) from this year's capstone design class, ME 266K/P (page 6). Josh Keena, the department's first professor of practice, leads the capstone course and is on the lookout for new projects. Please use the QR code on page 6 if you or your company would like to submit a project idea.

» **A milestone for the Academy of Distinguished Alumni.** The Academy celebrated its 20th anniversary in 2024, and marked that milestone with the construction of a new interactive exhibit highlighting the accomplishments of the Academy members (page 30). Located in the T-room, the "Academy Wall" aims to inspire the next generation of UT mechanical engineers and demonstrate the variety of career paths that a degree in ME unlocks.

In the pages that follow you'll also learn about many other happenings within the Department, including our newest faculty members, a new publication on *What is Mechanical Engineering?*, and the latest accomplishments of our students.

Alumni, we want to know what you're up to. If you have a milestone you'd like to share, please submit it using the link on page 14.

As always, thank you for your support of the Walker Department of Mechanical Engineering,

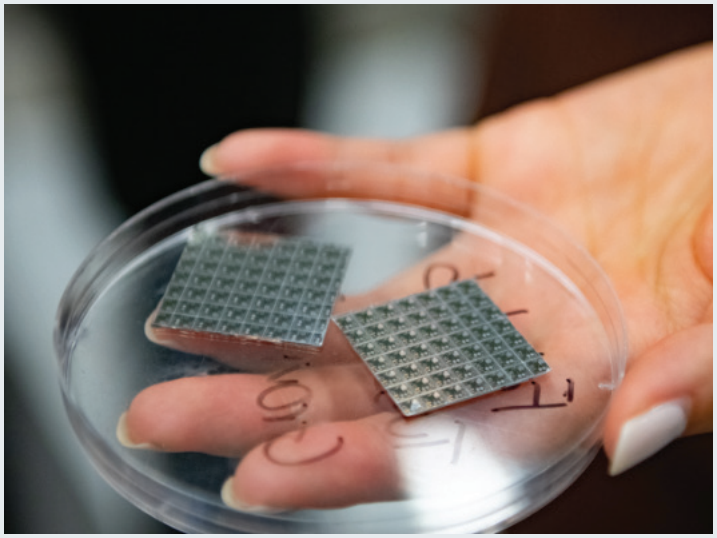
DON SIEGEL
CHAIR, WALKER DEPARTMENT OF MECHANICAL ENGINEERING

8

ENGINEER'S BEST FRIEND

5

NUCLEAR REVIVAL



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CHIPPING IN

26

MY SUMMER IN GREECE

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GOING GREEN

Oil and gas extraction in places like Texas' Permian Basin leads to several waste products, including significant amounts of wastewater and flares firing into the sky. Associate professor Vaibhav Bahadur is researching how those byproducts, which are harmful to the environment, could be repurposed to serve as key elements in the creation of "green" hydrogen.

1

YOU RECENTLY PUBLISHED RESEARCH IN THE JOURNAL DESALINATION ABOUT REUSING WASTEWATER IN OIL PRODUCTION TO HELP GENERATE HYDROGEN. TELL US MORE ABOUT THAT.

This is about a problem that touches three areas: energy production, water management and environment protection. At the heart of it is green hydrogen, which is generated by splitting water — removing the "H" from H20 — using energy from renewables. While we have abundant wind and solar in many parts of the planet, those places often lack the clean water needed to produce green hydrogen. Texas and other oil-producing areas have plenty of water as a byproduct of energy production; however, this water is packed with dissolved salts, and it costs a fortune to transport and dispose of it. It makes sense to treat this wastewater and use the treated, pure water to produce green hydrogen locally. Importantly, the energy needed to treat wastewater can be provided by onsite excess natural gas, which is typically flared.

2

WHY IS GREEN HYDROGEN IMPORTANT?

Hydrogen is set to play a critical role in our future energy mix for several reasons. It provides a way to store wind and solar energy, enabling its use without any emissions. Additionally, hydrogen allows us to utilize existing gas-related infrastructure, such as pipelines, making the transition to cleaner energy more feasible. Furthermore, hydrogen is likely the only viable solution for decarbonizing many heavy industries and heavy-duty transport sectors.

3

WHAT ARE THE BARRIERS TO PRODUCING GREEN HYDROGEN TODAY, AND HOW DOES YOUR WORK OVERCOME THOSE?

Most experts will say that the biggest barriers for green hydrogen are the high costs of renewables and their intermittent nature. An additional barrier comes from the fact that green hydrogen production is water intensive. A single kilogram of green hydrogen can need up to 12 gallons of water withdrawals. The quality of water is also very important. Water going into the electrolyzer (for splitting) needs to be stripped of all dissolved salts, gases etc. So, this is of higher quality than demineralized water. In contrast, water from oilfields is hypersaline with salt levels much higher than those in seawater. In our research, we analyze the use of reverse osmosis to convert hypersaline water to high-purity water. Reverse osmosis is a low-energy consuming, membrane-based technique that is associated with municipal and seawater treatment.

4

WHAT ARE THE IMPLICATIONS OF THIS RESEARCH IN THE CONTEXT OF SUSTAINABILITY?

While we want our energy to be 100% carbon-free right now, the reality is that we will likely have a gradual transition from hydrocarbons to renewables over the next few decades. Oil and gas will continue to meaningfully contribute to the global energy mix, and it is vital to minimize its environmental footprint. We are using waste products from oil and gas production, which harm the environment, to develop greener energy solutions for the planet. In particular, we are helping numerous oil and gas producing states and communities participate in this energy transition, and not lose out because of it. ■

NUCLEAR REVIVAL

After a down period, exponential demand for clean energy at large scale has led to renewed interest in nuclear. UT Austin is at the forefront of the movement.

Above: A conceptual rendering showing a section view of the molten salt research reactor along with supporting systems and a simulator room for training students at Abilene Christian University. (Image: ACU)

The Nuclear and Radiation Engineering Program in the Walker Department of Mechanical Engineering is in the midst of an innovative project to build the first-ever molten salt university research reactor. The project, developed by Natura Resources and owned and operated by Abilene Christian University, also includes Texas A&M University and Georgia Institute of Technology. UT is participating in the design and safety analysis of the entire system, leveraging experience licensing and operating a research reactor, reactor modeling tools and high-performance computing.

A molten salt reactor is different from a typical nuclear reactor because it uses liquid fuel instead of solid fuel. Liquid fuel provides advantages in efficiency and safety, and the research reactor will produce valuable data supporting the licensing of future commercial reactors.

Molten salt reactors are part of a new class of small, modular reactors. These facilities are smaller than large-scale power plants, but they can be built in more places, using smaller footprints and less land. According to the International Energy Agency, the most realistic path to decarbonization by 2050 includes doubling nuclear energy.

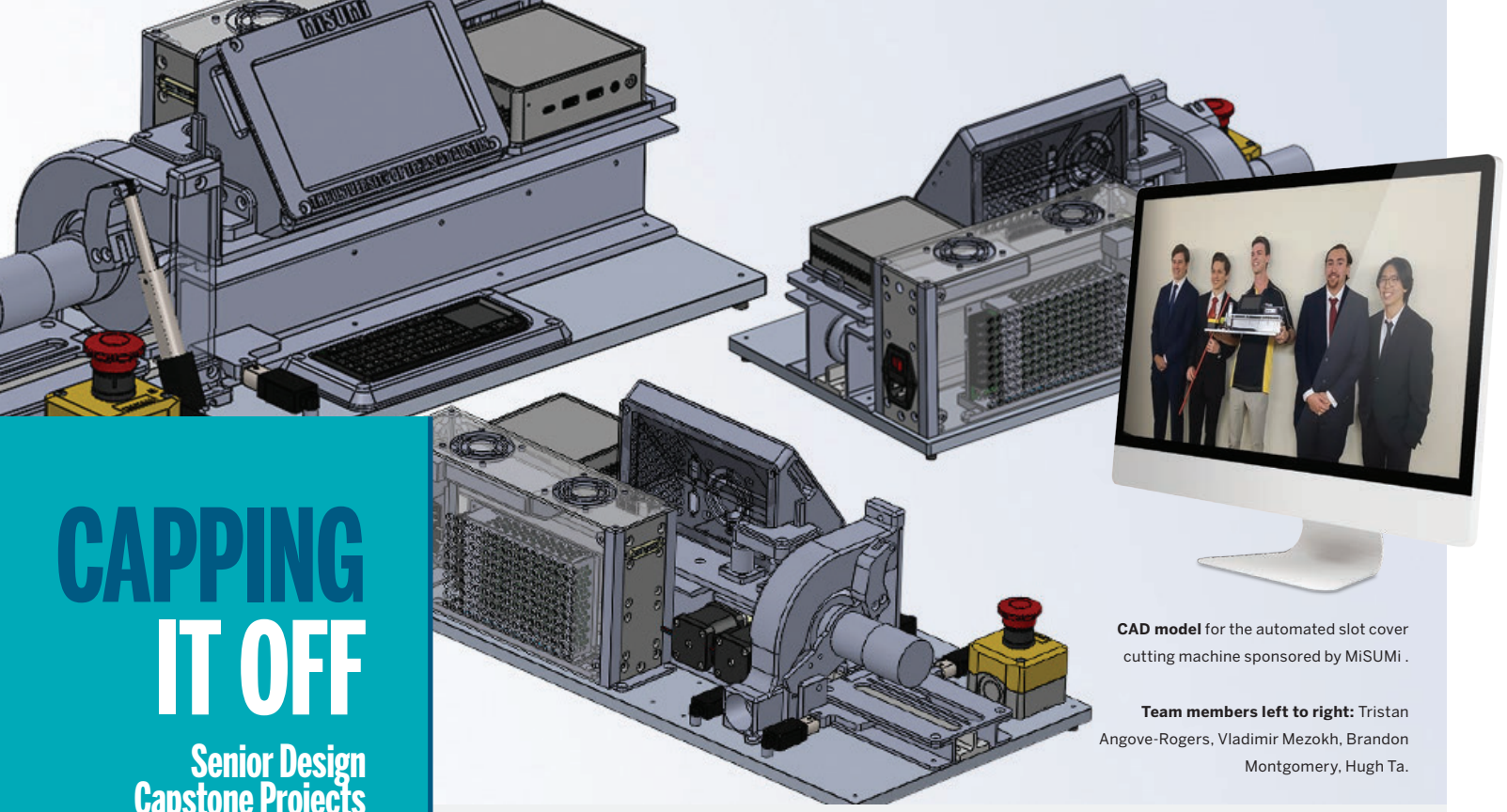
“All eyes are on nuclear right now; student and industry interest is the highest it’s been in decades. We need more energy experts to engage with nuclear and to find ways to streamline licensing of advanced nuclear reactors to respond to the increased interest in nuclear energy,” said Derek Haas, associate professor and leader of the UT team.

In addition to Haas, the UT team is co-led by mechanical engineering professors Kevin Clarno and William Charlton.

One way to streamline licensing of future reactors is through the use of digital twins, which are physics-based models of complex, physical systems. The state of Texas recently granted UT $18.4 million to develop molten salt reactor digital twins.

“Using digital twins with nuclear reactors could enable a design to be quickly licensed and used because the software is continuously proven to be accurate,” said Clarno.

UT’s Nuclear and Radiation Engineering Program dates back more than 60 years. The Nuclear Engineering Teaching Laboratory’s TRIGA Mark II Nuclear Research Reactor, which is housed at UT’s J.J. Pickle Research Campus, is one of only 31 research and test reactors in the United States. UT’s research reactor is among the most active in the U.S., with capabilities in materials analysis, isotope production, radiochemistry, and instrumentation development. ■



CAPPING IT OFF

Senior Design Capstone Projects

71 PROJECTS | **274** STUDENTS

INDUSTRY PARTNERS PARTCIPATING IN 2024

15

CAD model for the automated slot cover cutting machine sponsored by MiSUMi .

Team members left to right: Tristan Angove-Rogers, Vladimir Mezokh, Brandon Montgomery, Hugh Ta.

To cap off their undergraduate education, our mechanical engineers embark on capstone projects where they apply their engineering skills to real-world problems.

Sponsors for these projects include industry partners, government agencies and academia. Each year, Texas ME assigns over 70 projects to capstone teams. These design problems can span multiple engineering fields as well as non-engineering disciplines.

INTERESTED IN SPONSORING A FUTURE DESIGN PROJECT?

"MY FAVORITE PART WAS THE BREADTH OF THIS PROJECT. WE WERE ABLE TO USE A VARIETY OF SKILLS RELATED TO MECHATRONICS, CODING, AND CAD WHILE ALSO BEING HANDS-ON. I ALSO APPRECIATED HOW MUCH TIME THE ENGINEERS WE WORKED WITH DEDICATED TO PROVIDING RESOURCES AND ASSISTANCE WHEN NEEDED DESPITE THEIR BUSY SCHEDULES."

— Gloria Huan, Samsung Ultrasonic Monitoring Device

TEAMS, FALL 2024

1. MiSUMi Cutting Machine
2. NAPA Pediatric Leg Press
3. NAPA Board
4. Samsung Nozzle
5. Samsung Ultrasonic Monitoring
6. Siemens
7. UTME Paddleboard
8. UTME Simulator
9. Velocity Wind Turbine
10. SLB Friction

FACULTY ADVISORS, FALL 2024

- David Bogard
- Chih-Hao Chang
- Michael Cullinan
- Tanya Hutter
- Joshua Keena
- Chad Landis
- Filippo Mangolini
- Maryam Tilton
- Preston Wilson

INSTRUCTORS

- Chris Rylander
- Nick Fey
- Joshua Keena

MAKING CAREER MOVES

Tanya Hutter, 2024 NSF CAREER Award Recipient

Last fall, assistant professor Tanya Hutter joined an elite group of over 30 past and present mechanical engineering faculty at UT Austin who have received the Faculty Early Career Development Award (CAREER) from the National Science Foundation.

Hutter, whose primary research interest is molecular sensing technologies, seeks to improve thermal control within porous gas adsorbent materials. Because these porous materials, often used in air purification, carbon capture and molecular sensing, are not good thermal conductors it is difficult to heat them evenly and quickly. To address this limitation, Hutter will incorporate these porous materials inside high thermal conductivity, 3D micro-structured substrates such as silicon.

Providing reliable thermal control, this approach will lead to significant improvements in the design of devices that use gas adsorbents. It will also advance the current state-of-the-art technologies for gas sensing, gas storage and separating complex gaseous mixtures. Applications for this work will span multiple industries including healthcare, homeland security and defense and climate science.

In addition to cutting edge research, the CAREER award also prioritizes educational programing. Hutter hopes to utilize her industry contacts to engage with her research group. The goal would be for these experts to provide insight and feedback as well as host technical seminars.

Hutter is thankful to have reached this milestone as she looks ahead to the next phases of her academic career. Ultimately she credits the mechanical engineering department and associate professor Ann Majewicz Fey for getting her to the finish line.

Fey hosts a summer workshop for junior faculty interested in pursuing a CAREER award which she hopes will foster a community of support and accountability. As a recipient herself, Fey is able to use her experience to lead discussions, facilitate peer reviews and help faculty make their proposals more eye-catching and polished.

“She [Fey] was instrumental and facilitated the whole process. I might not have applied without it. I’m really grateful to her and department chair Don Siegel for pushing the interdepartmental workshops,” said Hutter.

Fey is confident that Hutter, and future CAREER recipients, can not only augment the educational experiences of ME students, but also elevate the profile of the department as an exciting place to learn and do cutting edge, high impact engineering. ■

ENGINEER'S BEST FRIEND

CHECK OUT MORE TEAMS AND PUPS ON INSTAGRAM

Texas Engineers and **Austin Pets Alive** design wheelchairs for doggies with disabilities

Senior design courses are common across the Cockrell School, but the students in mechanical engineering 366J recently got the chance to create something for a unique customer: dogs.

As part of this course about design methodologies, assistant professor Maryam Tilton partnered with Austin Pets Alive, a shelter that works with the most vulnerable animals. Together, they tasked students with designing wheelchairs for dogs with health issues. A long-time dog owner and fosterer herself, Tilton was looking for a way to use her engineering skills to help dogs.

"One of the best parts about this project, aside from the fact that we got to help dogs in need, is that each dog was facing a different challenge," said Tilton. "That meant every design had to be unique and customized to that dog."

Tilton, who has taught the course twice since joining the Walker Department of Mechanical Engineering in Fall 2023, had fostered a dog who had cancer and several other medical needs. Tilton saw firsthand the challenges these dogs face in receiving care.

After learning about Austin Pets Alive, Tilton made a spontaneous trip to the shelter, walked in the door, and asked if they had any dogs that needed wheelchairs.

This set off a long, collaborative process where APA found dogs for Tilton and her students to work with. And last spring, the class of 70 students built 10 custom wheelchairs for these pups in need.

The project proposed unique challenges to each group because every dog had different needs. It gave them the experience of building a unique solution for their customers.

The dogs came to campus several times during the semester, and many of the design teams formed connections with the animals. As the project wound down, the students continued to stay in touch, providing their contact information in case anything goes wrong in addition to spare parts for the components of the chair that are the most likely to need replacement.

"It's been rewarding to watch these students not just build these wheelchairs to help the dogs but becoming emotionally invested in their creation," Tilton said. "As engineers, we want to help others, and this is a great example of doing that."

Tilton will not teach the ME 366J course in 2025, instead focusing on her graduate courses in additive manufacturing. But she hopes to continue working with APA to develop projects to help pets in need.

Tilton came to UT from the Mayo Clinic, where she served as a NIH-T32 musculoskeletal research postdoctoral fellow in the Biomaterials and Regenerative Medicine Laboratory. Her research focuses on the development of functional tissue-mimicking structures using visible light-induced 3D bioprinting techniques. ■

Left: Student teams put the finishing touches on custom wheelchairs for pups in need.

Laura Rivera becomes one of the first students at UT Austin to pursue a dual master's degree in mechanical engineering and business administration

It was not an easy decision for Laura Rivera to leave behind her industry career to pursue not one, but two master's degrees. There was uncertainty, even fear. Uncertainty in uprooting her and her husband's life. Fear that she had long forgotten all she learned as an undergraduate. Now, a year into the dual degree program, she knows it was the right choice.

As an undergraduate in mechanical engineering at UT Austin, Rivera had not yet found her path, her niche. Then she took thermodynamics with professor Michael Webber. It had a large impact on her life, as it had for many others before her. Webber helped put into context the extent to which energy, in its many forms, touches all the parts of a person's life. This led her to join the Webber Energy Group (WEG) as an undergraduate researcher.

With experience working with WEG and completing internships at Cummins and General Electric, Rivera was able to land a position with Ethos Energy after graduation. The job took her around the country and abroad to work with power plants and industrial facilities on upgrades and maintenance projects. After over five years with the company with a demanding schedule, she was ready for a fresh start.

She had been working with clients who wanted to incorporate the use of clean hydrogen into their facilities. However there seemed to be a large gap in the industry of how to implement the new equipment as well as the economic ramifications. To fill this gap, Rivera decided to go back to school to learn as much as she could about emerging technologies, specifically hydrogen initiatives. To better inform the end users about the policy and market considerations surrounding this technology she also decided it would make sense to pursue a degree in business. Thus her dual master's in mechanical engineering and business administration was born.

Rivera was born in Colombia and immigrated to the United States when she was eight years old. After high school while studying abroad in Germany, Rivera's family made the move from Michigan to Houston, the energy capital of the world. Her mother and father are both engineers and her grandfather was a mechanic in Colombia who helped farmers upgrade and mechanize their equipment. The exposure to this engineering mindset growing up as well as her passion for innovation led her to carve her own path in mechanical engineering.

Now back at UT, Rivera also rejoined

DOUBLING UP

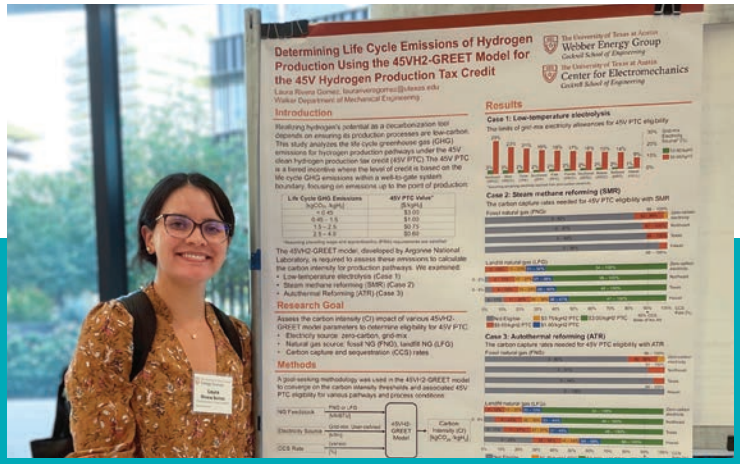
WEG as a graduate researcher. Currently the majority of her work is done with Emily Beagle, senior research associate and lecturer with WEG. Rivera is continuing work on a life cycle assessment of hydrogen production pathways in addition to assessments on hydrogen production tax credits under the Inflation Reduction Act. A cornerstone of WEG's mission is to inform policy makers about energy and the environment which also serves as a driving force for Rivera.

Rivera hopes to go into consulting when she graduates in 2027. For her, this would include advising government agencies and private industry to give recommendations based on her experience in energy systems analysis. She also has the entrepreneurial bug. Starting her own firm and being her own boss are lifetime goals.

After a period of transition, Rivera is finally able to reflect and give advice to those seeking to come back to academics or those interested in pursuing a dual degree.

> "IT'S NOT EASY, BUT I'M REALLY GLAD I CAME BACK. MY ADVICE IS THAT IF IT FITS INTO WHAT YOU WANT, THE SHORT TERM FEAR OR DIFFICULTY IS WELL WORTH IT TO REACH YOUR LONG TERM GOALS. THIS EXPERIENCE HAS BEEN A GREAT WAY TO GET EXPOSED TO A NEW AND FRESH MINDSET AND TO BE ABLE TO LOOK AT THE WORLD DIFFERENTLY."■

FOR MORE DETAILS ON THE OUR GRADUATE DEGREES:



MEET THE WALKER SCHOLARS

To support our outstanding junior faculty, the Walker Department of Mechanical Engineering created the Walker Scholar award. This award recognizes early-career faculty who have made significant contributions to research, teaching and service. This year's recipients are Nick Fey and Zenghui Sha.

Fey

NICK FEY
Assistant Professor

TELL US ABOUT YOUR RESEARCH.

Research interests can come easy, it's the way we pursue them that defines a good engineer. Our Systems for Augmenting Human Mechanics (SAHM) Lab is a group of persistent and talented engineers that have a "clinical heart." We pursue research that blends the basic/fundamental and translational science topics that encompass how and why humans move the way they do, as well as how environmental and internal factors challenge this. For example, the use of a prosthesis for ambulation requires the physical integration of a person with a technology, but both must adapt to each other and to the continuously varying settings that we encounter and how we intend to engage in it. We use biomechanical engineering and biorobotics help people live healthier, happier lives.

HOW WILL THIS AWARD IMPACT YOUR CURRENT OR FUTURE RESEARCH PROJECTS?

This award provides some bridges for sure in terms of research projects that are in transition or to support new ones that are starting. More than that, I plan to use this award to positively grow the impact and community of our group. I am excited to support more team-based research and community-building activities with these resources. As with any journey, there are highs and lows, and it's nice to feel like we have some "extra" to smell the roses (celebrate our successes) or work together in synergy as a collective every once in a while before returning to the grind on mostly-independent research projects.

WHY DO YOU THINK IT'S IMPORTANT TO RECOGNIZE JUNIOR FACULTY MEMBERS THROUGH THESE TYPES OF AWARDS?

Recognizing junior faculty members can be "centering" for them during a relatively ambiguous and uncertain time. For the early years of a new principal investigator-led lab, we often feel the tension between taking on or exploring new projects and the risks of doing so. Receiving recognition during or following these years provides some reinforcement or an anchor to reflect and say, "maybe our path is or was not as random and unpredictable as it seems. Keep it up; keep it moving."

ZHENGHUI SHA
Assistant Professor

TELL US ABOUT YOUR RESEARCH.

My research interest generally lies in advanced design and manufacturing. In particular, my research unfolds in three directions: 1) AI in design and decision making,

Sha

2) autonomous and cooperative manufacturing, and 3) complex systems engineering.

HOW WILL THIS AWARD IMPACT YOUR CURRENT OR FUTURE RESEARCH PROJECTS?

First of all, I would like to thank the department for selecting me as the Walker Scholar awardee this year. I am humbled and grateful as this award has been only made to recognize early-career faculty. It impacts my research in two ways. First, it is such a rewarding experience and will encourage me to pursue excellence in the long term. Second, the award comes with $5,000 in discretionary funding for three years. So, the funds provide our lab with the flexibility of purchasing necessary lab supplies and computing resources and hosting visits from my academic and industrial collaborators.

WHY DO YOU THINK IT'S IMPORTANT TO RECOGNIZE JUNIOR FACULTY MEMBERS THROUGH THESE TYPES OF AWARDS?

Junior faculty members, especially tenure-track assistant professors, will benefit from these types of awards because internal recognition can positively impact their career development. This is especially true for many assistant professors in the later stages of tenure track where, on the one hand, they work hard to get recognition for tenure and promotion, and on the other hand, the timely discretionary funds associated with this award play a significant role bridging the gap as their start-up funds may have been used up or expired. ■

ON MUTE

Wireless headphones always dead when you need them? **Associate professor Yijin Liu** and his team are focusing new research on real-world technology and why battery life erodes over time.

Temperature gradients within these devices as well as other environmental factors can affect your battery. Liu performed a multitude of tests alongside UT's Fire Research Group, led by **professor Ofodike Ezekoye**, using infrared imaging and x-ray technology to get the full picture.

Watch: https://bit.ly/headphones-dead

A CLOSER LOOK AT

MECHANICAL ENGINEERING

In 2024, our department continued its commitment to educating courageous engineers, hiring exceptional faculty, and expanding research pursuits.

ALUMNI

15,346
alumni around the world

185
Members of the Academy of Distinguished Alumni

OUR GRADUATES ARE LEADERS IN:

- research
- government
- industry
- academia
- military
- and more

ALUMNI SURVEY

Are you one of the more than 15,000 alumni from the Walker Department of Mechanical Engineering at UT Austin? ***Scan the QR code to take a short survey and we might feature your story in our next magazine!***

STUDENTS

ENROLLMENT, FALL 2024

UNDERGRADUATE	**1,297**
Women	327
Black	39
Hispanic	50
GRADUATE	**460**
Women	119
International	172

DEGREES AWARDED 2023-24

Bachelor's	276
Master's	123
Doctoral	58

$84.2K
average starting salary, B.S. graduates

- **NSF Graduate Fellowship Recipient,** Kara Samuel
- **Honorable Mention,** Benjamin Broekhuis, Arturo Hernandez, Eric Hu, Rachel Paddock

FACULTY

TENURE/TENURE-TRACK FACULTY **67**

HONORS AND AWARDS

1 **Nobel Laureate**
5 Members, *National Academy of Engineering*
32 Winners, *National Science Foundation CAREER Award*

FACULTY AWARDS

In recognition of our esteemed faculty:

DEPARTMENTAL AWARDS

- **Farshid Alambeigi,** Outstanding Research by an Assistant Professor
- **Michael Cullinan,** Outstanding Teaching by a Professor or Associate Professor
- **Nick Fey,** Walker Scholar

- **Michael Haberman,** Outstanding Research by a Professor or Associate Professor
- **Alexander Marras,** Outstanding Teaching by an Assistant Professor
- **Robert Moser,** Outstanding Service by a Professor or Associate Professor
- **Zhenghui Sha,** Walker Scholar

UNIVERSITY AWARDS

- **Michael Cullinan,** 2024-2025 Provost's Distinguished Leadership Service Academy
- **Filippo Mangolini,** 2024 Provost's Teaching Fellow

EXTERNAL AWARDS

- **Narayana Aluru,** 2024 ASME Charles Russ Richards Memorial Award; 2025 A.C. Eringen Medal, Society of Engineering Science
- **David Bogard,** ASME IGTI Aircraft Engine Technology Award; ASME Gas Turbine Heat Transfer Committee Dedicated Service Award
- **Emma Fan,** American Institute for Medical and Biological Engineering's College of Fellows Inductee
- **Arumugam Manthiram,** International Battery Materials Association Yeager Award; National Academy of Inventors Inductee; Faraday Medal Award, Society for Advancement of Electrochemical Science and Technology
- **Junmin Wang,** Fulbright Distinguished Scholar; 2024 ASME Charles Stark Draper Innovative Practice Award
- **Michael Webber,** Energy Thought Leader: Higher Education, American Energy Society; Fulbright Technical Specialist
- **Guihua Yu,** Falling Walls Breakthrough of the Year; American Association for the Advancement of Science Fellow
- **Yuebing Zheng,** Fellow of SPIE, International Society for Optics and Photonics

RESEARCH ON THE RISE

$39.1M

in research expenditures

RANKINGS IN THE U.S.

NO. 8 — *Cockrell School, Graduate Program*

NO. 10 — *Cockrell School, Undergraduate Program*

NO. 9 MECHANICAL ENGINEERING
GRADUATE PROGRAM

MECHANICAL ENGINEERING
UNDERGRADUATE PROGRAM 10

RESEARCH AREAS

- **Acoustics**
- **Advanced Manufacturing & Design**
- **Advanced Materials Science & Engineering**
- **Analytics & Probabilistic Modeling**
- **Biomechanical & Biomedicine**
- **Clean Energy Technology**
- **Complex Systems**
- **Computational Engineering**
- **Engineering Education**
- **Nano & Micro-scale Engineering**
- **Nuclear & Radiation Engineering**
- **Robotics & Intelligent Mechanical Systems**
- **Thermal Fluids Systems & Transport Phenomena**

STAFF

Our staff continue to be recognized for their exemplary service. We appreciate their hard work and dedication to the department.

- **Mary Cantu-Garcia,** senior student program coordinator, 2024 ME Staff Excellence Award
- **Sam Kirkland,** associate academic advisor, 2024 Outstanding FIG Facilitator Award, Cockrell School of Engineering
- **Kelly Smith,** former building operations administrative coordinator, 2024 ME Staff Excellence Award

CHIPPING IN

MECHANICAL ENGINEERS STEER THE FUTURE OF SEMICONDUCTOR SCIENCE

A look at the semiconductor research facility at J. J. Pickle Research Campus.

Mechanical engineers are more than chipping in on the growing demand for semiconductor manufacturing, education and innovation. In the last few years, The University of Texas at Austin has landed more than $1.4 billion in state and federal funds to bolster its work in this booming sector. The faculty in the Walker Department of Mechanical Engineering have their finger on the pulse of what's new and what's needed.

Semiconductors power our world. Driven by technological advances in nano-scale technology and their growing use in artificial intelligence, the demand for these chips has never been higher. This demand, in addition to supply shocks during the COVID-19 pandemic, created a political groundswell to make the U.S., particularly Texas, a global hub for semiconductor manufacturing.

With this demand for increased U.S. semiconductor production comes a need for a much larger workforce, from the people who lead these plants to the technicians and engineers who design and operate the machines.

Infrastructure

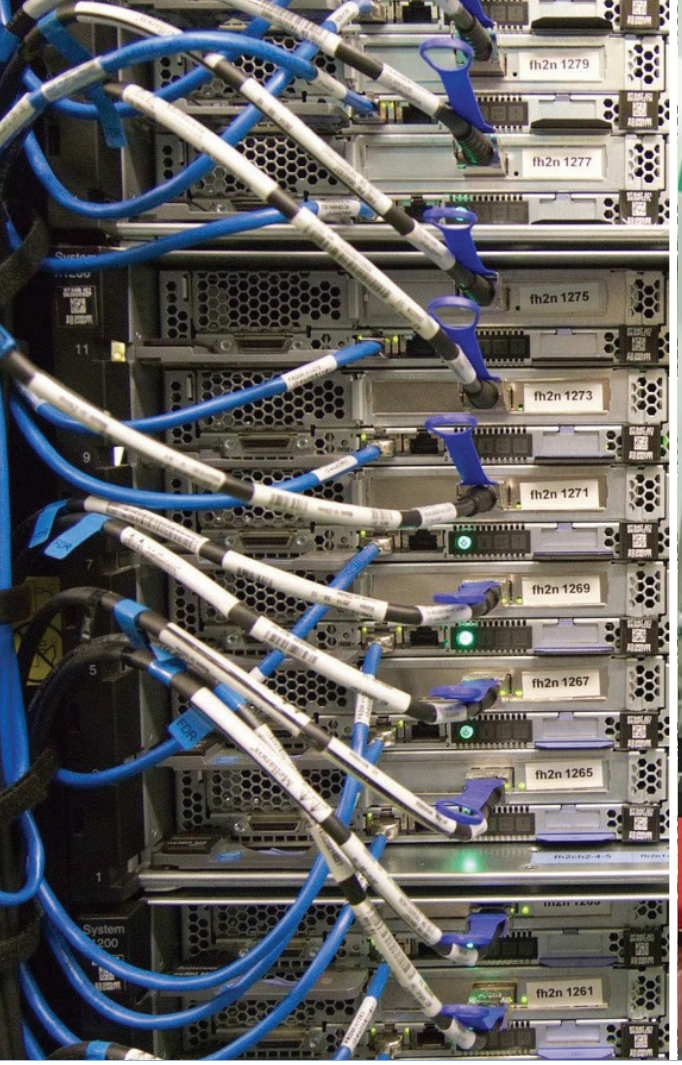
Last summer, the U.S. Defense Advanced Research Project Agency selected UT and the Texas Institute for Electronics (TIE) to engineer the next generation of high-performing semiconductor microsystems. The $840 million agreement is among the largest awards ever granted to a UT System institution.

As part of this project, UT and TIE will establish a national open-access research and development and prototyping fabrication facility to create higher-performance, lower-power, lightweight and compact semiconductor systems. Such technology could apply to advanced computing, radar, satellite imaging and more.

The 66,000-square-foot former Sematech facility in South Austin will complement 18,000 square feet of new and existing space at the J.J. Pickle Research Campus to house the state-of-the-art equipment needed to address the semiconductor industry's future challenges.

> "WITH THESE NEW FACILITIES AND PROGRAMS COMING ONLINE, THE COCKRELL SCHOOL WILL BECOME THE DESTINATION FOR STUDENTS TO COME AND LEARN AND FACULTY TO DO RESEARCH THEY CAN'T DO ANYWHERE ELSE. WE'RE GOING TO HAVE ACADEMIC VISITORS AND COMPANIES FROM AROUND THE COUNTRY WHO WANT TO COME AND TAKE ADVANTAGE OF EVERYTHING WE'RE OFFERING AT THIS FACILITY."
>
> **—Roger Bonnecaze, dean, Cockrell School of Engineering**

TIE also plans to work with startups that couldn't otherwise afford to spin up their own semiconductor manufacturing infrastructure. The organization aims to support a healthy, U.S.-based semiconductor innovation ecosystem.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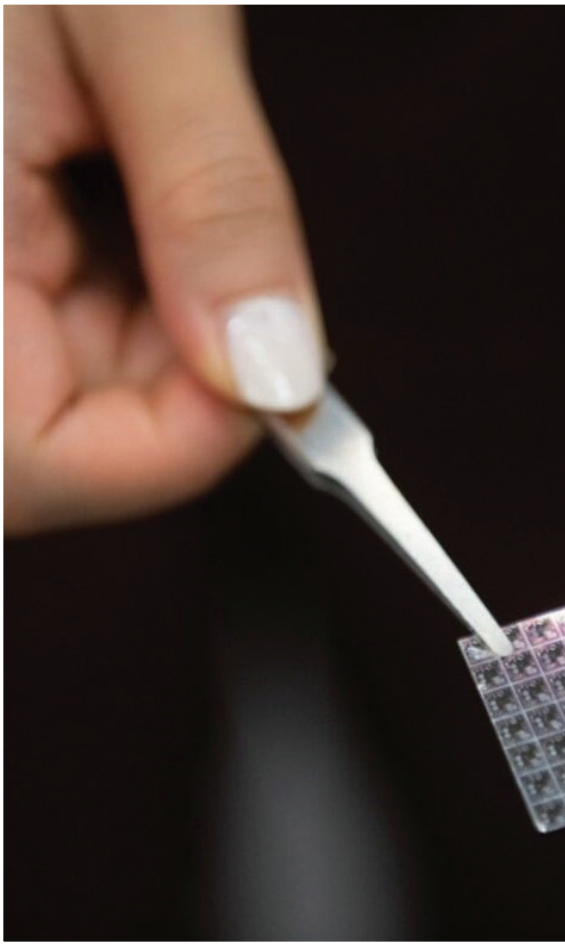
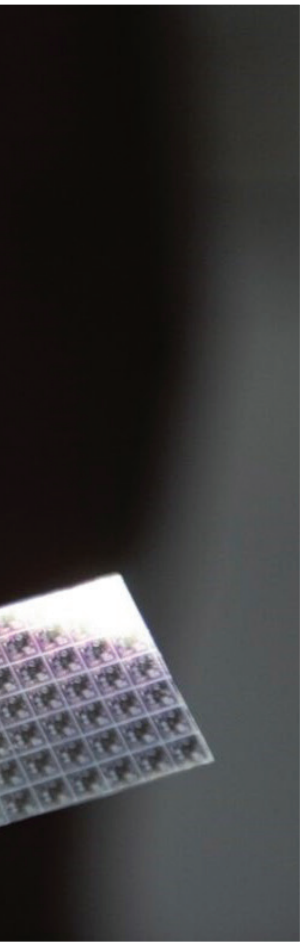
TEXAS
The University of Texas at Austin





Starting this fall, UT will offer a new master's of semiconductor science engineering degree program. This is the only in-person master's degree program at a top-10 nationally ranked engineering school exclusively dedicated to semiconductors.

"It can cost hundreds of millions of dollars for semiconductor startups to establish their own infrastructure, which just isn't feasible," said S.V. Sreenivasan, professor and TIE's chief technology officer. "We want to derisk hard tech startups and make them more attractive to investors."

TIE was founded three years ago to respond to increased government support for domestic semiconductor manufacturing. Organizers quickly identified packaging, which refers to the variety of layers used to combine and protect the various components, as a vulnerable area. Only 3% of global semiconductor manufacturing work occurs in the U.S., per the U.S. Department of Defense and IPC International, a global electronics association.

Education

The massive demand for semiconductors means an already short-staffed industry will need many more workers. This need for talent galvanized the creation of several new educational semiconductor programs at the Cockrell School. Starting this fall, UT will offer a new master's of semiconductor science engineering degree program.

This is the only in-person master's degree program at a top-10 nationally ranked engineering school exclusively dedicated to semiconductors. It offers students the opportunity to work in real-world cleanrooms alongside industry partners.

"There aren't many places to get experience with production-level semiconductor equipment at a master's level," said Michael Cullinan, associate professor and director of the master's program. "And nobody does it in a way that you can do research, work closely with leading companies and learn how the ecosystem actually works."

The program is a collaboration between the Cockrell School and the College of Natural Sciences, and it includes approximately 40 affiliated faculty. The program features aspects of semiconductor manufacturing, device design, circuit and system design, metrology and packaging.

Left: Semiconductor manufacturing spans many UT labs and facilities, including the new Texas Institute of Electronics (TIE).

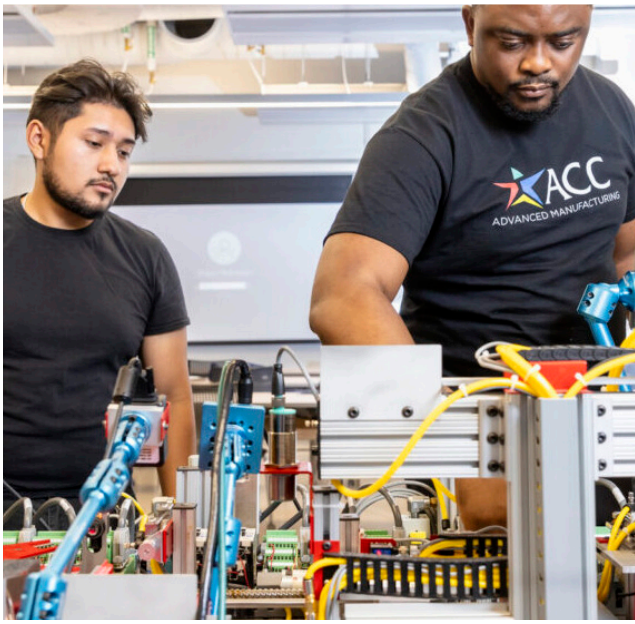
Early industry investors include Emerson/NI and Samsung, and their support will fully fund 8+ of the first cohort of Masters students.

Each job in the semiconductor industry requires its own set of skills and experience. Companies need engineers to develop new equipment, process engineers to make sure everything is running properly, design engineers to design the chips and work with manufacturing teams to scale them, supply engineers to ensure the right components get to the right places on time, and technicians to run and maintain the equipment.

To build this diverse workforce, UT is creating several other educational offerings. The Texas Engineering Executive Education program offers an online, stackable certificate program for people already in the field who want to level up their skills or to help them transition into the field.

UT is also partnering with Austin Community College to address every skill set on the semiconductor workforce continuum. Together, they will develop a joint Semiconductor Training Center, allowing students to receive hands-on technical training combined with academic

Below: Austin Community College students working in semiconductor manufacturing.



theory. The institutions will also host programs designed to help people break into the industry and advance their careers.

Support

With any burgeoning industry there comes a need for additional innovations to help counteract potentially negative side effects. In the world of semiconductors one such issue is the growing energy demands needed to cool high-powered electronic devices. Data centers that evaluate AI models are expected to increase their energy consumption anywhere from 35% to 128% by 2026, according to the International Energy Agency.

Professor Guihua Yu and his team are tackling this challenge by developing a new "thermal interface material" that could remove heat from high-powered electronic devices, reducing or even eliminating the need for extensive cooling. Cooling accounts for about 40% of data center energy usage, or 8 terawatt-hours annually. The researchers estimate their technology could shave 13% off that cooling requirement — or 5% off overall data center energy usage — a significant savings if applied across the industry. The heat dissipation capabilities also allow for significant growth in processing power.

> "THE POWER CONSUMPTION OF COOLING INFRASTRUCTURE FOR ENERGY-INTENSIVE DATA CENTERS AND OTHER LARGE ELECTRONIC SYSTEMS IS SKYROCKETING. THAT TREND ISN'T DISSIPATING ANYTIME SOON, SO IT'S CRITICAL TO DEVELOP NEW WAYS, LIKE THE MATERIAL WE'VE CREATED, FOR EFFICIENT AND SUSTAINABLE COOLING OF DEVICES OPERATING AT KILOWATT LEVELS AND EVEN HIGHER POWER."
>
> **–Yu, about his new research published in *Nature Nanotechnology***

Key Players

In addition to Cullinan, Sreenivasan and Yu, several other mechanical engineering faculty members are contributing to the semiconductor space.

Three research projects supported by our faculty have been funded through the Future of Semiconductors (NSF FuSe and FuSe2) competitions hosted by the National Science Foundation and industry partners. These projects bring together researchers from multiple universities and include an educational development component.

One project, led by professor Li Shi, is focused on the integration of two types of semiconductors, gallium nitride and boron arsenide, which have complimentary properties. Boron arsenide conducts heat much more efficiently than current-generation materials and can help to prevent overheating of operating devices. This integration will enhance performance and increase energy efficiency of semiconductor devices.

The next project, which includes professor Chih-Hao Chang, will establish a framework to develop new materials for advanced computer chips. These new materials will be designed for extreme-ultraviolet patterning to produce smaller, more precise features on chips, leading to better performance and energy efficiency. Additionally, a novel low-temperature method will convert these features into high-performance transistors, potentially reducing production costs and environmental impact.

The final project brings together professor Jamie Warner, director of the Texas Materials Institute at UT Austin, and associate professor Yuanyue Liu. Their team aims to improve the capabilities of interconnects, which are layers of metal conductors, typically made of copper, that connect the different pieces of a computer chip. By developing a new way to synthesize copper nanowires and designing effective encapsulation layers based on two-dimensional materials, this project will enable high-performance and energy-efficient computer chips.

Some other semiconductor stars in the department include Vaibhav Bahadur, Dragan Djurdjanovic, Tanya Hutter, and Yaguo Wang. ■

TEXAS ME SEMICONDUCTOR RESEARCH FACULTY

Vaibhav Bahadur, an associate professor specializing in the thermal management and packaging of microelectronics

Chih-Hao Chang, an associate professor specializing in low cost, scalable fabrication of 2D/3D multifunctional nanostructures

Michael Cullinan, an associate professor specializing in the development of novel nanomanufacturing systems and creation of micro- and nanoscale devices for mechanical sensors and energy systems

Dragan Djurdjanovic, a professor specializing in advanced quality and process control for multistage manufacturing systems including semiconductors

Tanya Hutter, an assistant professor specializing in molecular sensing technologies, microfabrication and nanophotonics with applications in environmental and industrial sensing and medical diagnostic

Li Shi, a professor specializing in the science and engineering of ultrahigh-thermal conductivity materials in information, energy and manufacturing technologies

S.V. Sreenivasan, a professor specializing in nanofabrication techniques for electronics and displays, memory devices and biomaterials for therapeutics

Yaguo Wang, an associate professor specializing in ultrafast carrier dynamics and micro/nano-scale heat transfer in nanomaterials with applications in clean energy

Jamie Warner, a professor specializing in atomic-level structure and dynamics of nanomaterials impacting electronic and energy applications

Guihua Yu, a professor specializing in creative design and synthesis of functional nanomaterials for applications in energy, environment and sustainability technologies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WME
WOMEN IN MECHANICAL ENGINEERING
Community Outreach
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ROCIO BAUTISTA

Charting her path to be a problem solver — a courageous engineer.

Currently a fourth-year mechanical engineering student student, Bautista is enrolled in the integrated bachelor's/master's program which allows undergraduates to earn both degrees at an accelerated pace. Bautista is used to a hectic environment; she thrives in it.

Growing up in San Antonio, Bautista was a high achiever at an early age. She participated in the FIRST Tech Challenge robotics competition in middle school and was a part of the UT OnRamps dual enrollment program. Additionally, she completed multiple Career and Technical Education courses all before officially starting her undergraduate education at UT Austin.

It was an adjustment coming from a very small, close-knit high school to the large, bustling Austin campus. During her freshman year Bautista participated in the Women in Engineering mentoring program where she was matched with Rebecca Lin. Lin helped Bautista through the transition into college life and would later inspire her to become a mentor herself.

Choosing engineering was a no-brainer for Bautista, who has family in the industry. But it wasn't until she was here taking courses that she discovered her passion for the biomechanical/biomedical field. She cites professor Chris Rylander and his biomedical device design and manufacturing class as a huge inspiration.

"I'm interested in the direct impact to the patient. In biomechanics you are constantly pushing the boundaries of medical technology which creates a net benefit. It will allow me to further advance research while increasing the overall accessibility to life-saving care," said Bautista.

This drive for positive impact extends to her mechanical engineering community as well. Throughout her four years, Bautista has been involved in The American Society of Mechanical Engineers (ASME), the Student Engineering Council (SEC) as a Cockrell relations chair, and the Elevate ME recruitment program. She is serving a second term as president of the Women in Mechanical Engineering (WME) program.

The work she's done with WME is the most impactful for Bautista. One of her favorite events has been the machine shop workday. Volunteers take fellow students to the ETC machine shop where they can become comfortable using the various machines in a safe, hands-on environment. During her tenure, WME has won awards from the Healthy Student Organization Program and been recognized by the City of Austin.

Leadership and engineering go hand in hand, according to Bautista. "At some point, whether in the classroom or in your career, you will need to step up and be heard. It can also help you identify your core values so you are better equipped to advocate for yourself and others." She's been able to hone these skills as a participant and facilitator with the Cockrell School's LeaderShape Institute, a week-long intensive leadership development program.

As a first-generation college student, Bautista is grateful for the "go for what you want" mentality she learned from her parents. The culmination of their support and the culture and community she's been a part of in mechanical engineering has made Bautista the upbeat, ambitious person she is today.

"I see myself as a really passionate person when it comes to engineering. I see a path for myself. It's not 100% clear, but I know there will be a positive impact at the end of it. I'll be able to help people and enjoy myself along the way." ■

"There is beauty in problem solving and it always excites me when a problem is solved."

WELCOME NEW FACULTY

LEAH CHONG

Assistant Professor

Advanced Manufacturing and Design

Q: TELL US ABOUT YOUR RESEARCH.

My research focuses on human-AI collaboration in engineering design. Unlike some other design domains, in mechanical engineering, products often need to be made physical, which makes it a unique and exciting setting for human-AI collaboration research. Particularly, I seek to understand how the integration of computational tools like AI affects designers/engineers and the design process and explore opportunities for complementary partnership between humans and computers. As technology continues to advance in engineering design (e.g., CAD to AI), my research finds its meaning in identifying its impact on engineers, both positive an negative, and striving for a collaboration that benefits humanity.

Q: WHAT HAVE YOU ENJOYED MOST ABOUT JOINING UT?

I look forward to working with the ME students! Multiple colleagues have already told me about how brilliant and engaging the students in the department are. Also, I have always enjoyed teaching and interacting with both undergraduate and graduate students, especially through office hours and meetings, which I am excited to do with the fresh (and large!) pool of students at UT ME.

Q: HOW DO YOU SPEND YOUR FREE TIME?

In my free time, I typically knit, read, explore coffee shops, and go on walks! One of my favorite weekend activities is to combine all four: take a long walk to a coffee shop where I knit while listening to an audiobook. Given the warmer weather in Austin, I am also very excited to pick up some old/new hobbies like playing tennis and hiking/camping. ■

ANASTASIA SCHAUER

Assistant Professor

Advanced Manufacturing and Design

Q: TELL US ABOUT YOUR RESEARCH.

My research is in the field of design theory and methodology, and my lab specifically focuses on design cognition, which is the study of how designers think and make decisions. By building our understanding of factors that influence engineering decision-making processes, my goal is to promote equitable, novel, and high-quality design practices, and to develop interventions that increase the likelihood of successful design outcomes. Two of my main interests right now involve studying how engineers use new technologies like generative artificial intelligence to aid in solving design challenges, and how we can best equip designers for success in humanitarian engineering scenarios by implementing empathy-building and perspective-taking interventions.

Q: WHAT HAVE YOU ENJOYED MOST ABOUT JOINING UT?

All of the people here are great — faculty, staff, and students! It's great to be at such a big school with strong programs in so many different fields, because it means that there are many opportunities for collaboration, plus the students are very well-rounded. I've really enjoyed teaching senior design because the students have had a diverse range of experiences in their past few years at UT, which means that they all relate to design in different ways and bring fresh perspectives to the classroom.

Q: HOW DO YOU SPEND YOUR FREE TIME?

Something I love about Austin is how much nature and green space there is all around the city. On the weekends, I like to go running around the lake (I'm training for my first marathon), or ride my bike to try new restaurants with my husband! As you may be able to tell from some of my research, I'm also very interested in how art and crafting interfaces with engineering. Recently, I've been into crocheting and using my Cricut to design and make stickers, t-shirts, and etched glass art. ■

FANGZHOU XIA

Assistant Professor

Advanced Manufacturing and Design

Q: TELL US ABOUT YOUR RESEARCH.

I direct the MINIMAX Lab, which develops MINIaturized devices for MAXimized impacts. To be specific, my research interests include mechatronics, physical/computational intelligence, and nanorobotics for applications in precision instrumentation, medical devices, and manufacturing automation. My work focuses on designing high precision nanorobotic manipulation and imaging instruments as enabling technology for two-dimensional material studies and semiconductor manufacturing. Making use of fundamental understanding of materials and novel tools, a new generation of transducers can be developed and benefit society directly through personal healthcare. To realize this goal, I am also working on the design and control of magnetically guided miniaturized capsule robots as a "swallowable surgeons" platform to incorporate these novel transducers for diagnosis and treatment of gastrointestinal disease.

Q: WHAT HAVE YOU ENJOYED MOST ABOUT JOINING UT?

I am deeply impressed by the UT Austin community for its friendly and supportive atmosphere. I attended many events that helped me navigate the campus resources and start my career as an assistant professor. Connecting with like-minded people who are willing to help others has been a great experience so far. I managed to make many friends and establish research collaborations in this past semester and look forward to more friendly encounters in the near future.

Q: HOW DO YOU SPEND YOUR FREE TIME?

In my free time, I like watching movies and capturing/editing videos. I am also enthusiastic about DIY home improvement and decoration projects. I enjoy spending time with my family and friends playing tennis, taking on board game adventures, and listening to relaxing music. ■

MY SUMMER IN GREECE

STUDY ABROAD WITH HUMANITARIAN ENGINEERING

My name is Eman Zaheer, and I'm a fourth-year mechanical engineering student. While I've always loved the technical challenges of engineering—the detailed calculations and intricate designs—what brought me to this major is designing for people. As engineers, we rarely see the direct impact of our work on the individuals and communities we serve. Interning at large companies, I often felt like a small cog in a massive machine, and even in classes, the problems we solve often focus on idealized systems that don't exist in the real world.

I stumbled upon this class, technology needs of refugee communities, by chance. I wasn't planning to study abroad, but as I glanced at a bulletin board in the EER, the course title caught my attention. By this point in my junior year, I had taken most engineering classes, but this one offered something different—an opportunity to design for and collaborate with people in a tangible and impactful way.

This Maymester course is the starting point of a year-long effort, a part of the Projects with Underserved Communities (PUC) program. Our team's mission was gathering input from camp residents and conducting detailed land surveys. These insights would lay the groundwork for the next phase, where PUC students will develop and implement a playground design that fosters safety, play, and community. Led by Janet Ellzey, professor and director of the Humanitarian Engineering program, and her teaching assistant Hannah Suarez, a master's student in the School of Social Work. Along with 18 dedicated students participating in the program, myself included, I was excited to experience this course.

May 15, 2024

Our day began with a visit to the International Hellenistic University (IHU) for a lecture course—a chance to delve into Greek academia and culture. I quickly grabbed a koulouri Thessalonikis (a sesame-covered bread ring) and a packet of Nutella from the hotel breakfast before heading to the bus. Upon arrival, everyone made a beeline for the café, where freddo cappuccinos and espressos—Greek coffee staples—became the morning's fuel. The warm Greek sun set the scene as professor Maria Drakaki, the IHU professor who facilitated our five-day course, joined us for casual conversation, creating a relaxed yet engaging atmosphere to start the day.

The lecture focused on EU policies regarding refugee issues. It was eye-opening to explore the frameworks governing refugee resettlement and asylum, particularly in Greece, a key entry point for refugees in Europe. This discussion provided vital context for our upcoming work in refugee camps, highlighting the human rights considerations and challenges faced by displaced communities. After class, we headed to a Greek cooking class by a serene lake, where we learned to

make spanakopitas (spinach pies) and tzatziki (a yogurt-based dip). As we rolled dough and mixed ingredients, laughter filled the air, and bonds with fellow students deepened. Immersing ourselves in the food and hospitality of Greek culture was the perfect introduction to the trip, leaving us with full hearts and satisfied appetites.


COOKING + CULTURE

May 19, 2024

Today, we ventured over 100 miles outside Thessaloniki to visit the breathtaking Meteora monasteries. On the bus ride, our team discussed and refined potential questions for upcoming interviews with camp residents and management. Arriving at Meteora felt like stepping into a postcard. The monasteries, perched atop towering rock pillars, were awe-inspiring marvels of beauty and engineering. Their intricate designs seemed almost impossible, standing as testaments to human ingenuity and determination. Walking through these ancient sites, we gained insights into Greece's deeply rooted religious traditions and cultural history. This context felt essential, helping us navigate the cultural and religious nuances of the refugee communities we sought to support.

Back in Thessaloniki, we hit unexpected traffic and discovered the city's football team, PAOK, was competing in a championship game that night. Some classmates and I decided to join the buzz, heading to a local restaurant where we stood among a lively crowd of Greeks, all eagerly watching the game. When PAOK scored the winning goal, the city erupted in pure joy. Fireworks lit up the night sky, red flares illuminated the streets, and chants filled the air as people celebrated together. The energy was electric, and being swept up in the excitement, even as outsiders, was an unforgettable experience.

May 21, 2024

After weeks of preparation, today was the day we visited the refugee camp for the first of two visits. The mix of dread and anticipation weighed heavily on me as we drove through the Greek countryside. When we arrived, I was struck by how alive Camp Vagiochori


CELEBRATING THE WIN

was: temporary housing adorned with murals and bright colors, children running around, and cats and dogs strolling about. The camp management greeted us warmly with snacks and juice, easing my initial fears. After a presentation on our plans, the land survey team went off to work, leaving me with time to absorb my surroundings.

Slowly, children began to emerge, curious about the games we had brought. They eagerly joined in, and soon we were laughing and running around together. I must have played Ring Around the Rosie a dozen times, amazed at the kids' endless energy. As we played with frisbees, I found myself chatting with a little girl no older than 4. Though we couldn't understand each other's words—she spoke Dari, and I didn't—we communicated through hand motions and smiles. Her mother, an Afghan refugee, noticed my friend and asked if she spoke Urdu. When she realized I did, she invited me over. What followed was a deeply personal conversation. The mother shared her journey—fleeing Afghanistan, living in Turkey, and briefly in Pakistan before arriving at the camp. She spoke of her family in Pakistan, how much she missed them, and her experiences along the way. Her story resonated deeply with me, and on the bus ride back, I couldn't stop thinking about her and the sacrifices

"SLOWLY, CHILDREN BEGAN TO EMERGE, CURIOUS ABOUT THE GAMES WE HAD BROUGHT. THEY EAGERLY JOINED IN, AND SOON WE WERE LAUGHING AND RUNNING AROUND TOGETHER...I FOUND MYSELF CHATTING WITH A LITTLE GIRL NO OLDER THAN FOUR. THOUGH WE COULDN'T UNDERSTAND EACH OTHER'S WORDS–SHE SPOKE DARI, AND I DIDN'T–WE COMMUNICATED THROUGH HAND MOTIONS AND SMILES."

she had made. Once we returned, I walked to a nearby coffee shop, needing time to process. It was clear to me now that this project wasn't just an assignment or a humanitarian effort—it was deeply personal and human, leaving a lasting connection within me.

May 28, 2024

By this day, I felt more prepared. I had even practiced my Urdu using a translation exercise we had done to practice switching between English and another language. While we didn't have a professional translator, we were fortunate to have a resident fluent in both Dari and English. He was incredible—patient, insightful, and genuinely kind. Together, we went around the camp recruiting residents for the questionnaire. I learned that he had picked up Urdu by watching Desi dramas, which led to him teasing me for not speaking as fluently as I "should" as a Pakistani myself. That exchange was lighthearted and unexpected, a small moment of connection amid an otherwise busy day.

Through the questionnaire, we gathered insights into residents' needs, particularly regarding an outdoor play area. I also learned how to say "thank you" in Dari. As we wrapped up our final visit to the camp, unsure if I would return, I said goodbye to our translator. In that moment, he shared something deeply personal—he had been studying to be an engineer in Afghanistan before circumstances forced him to leave. Now, he was here, working to get his family to safety. "I had a lot of potential," he said. His words stayed with me. That evening after dinner, Hannah guided us through a reflection to help us unpack the emotions and experiences of the day. It was overwhelming, but the shared reflections with my classmates reminded me that this wasn't just my experience—it was ours.

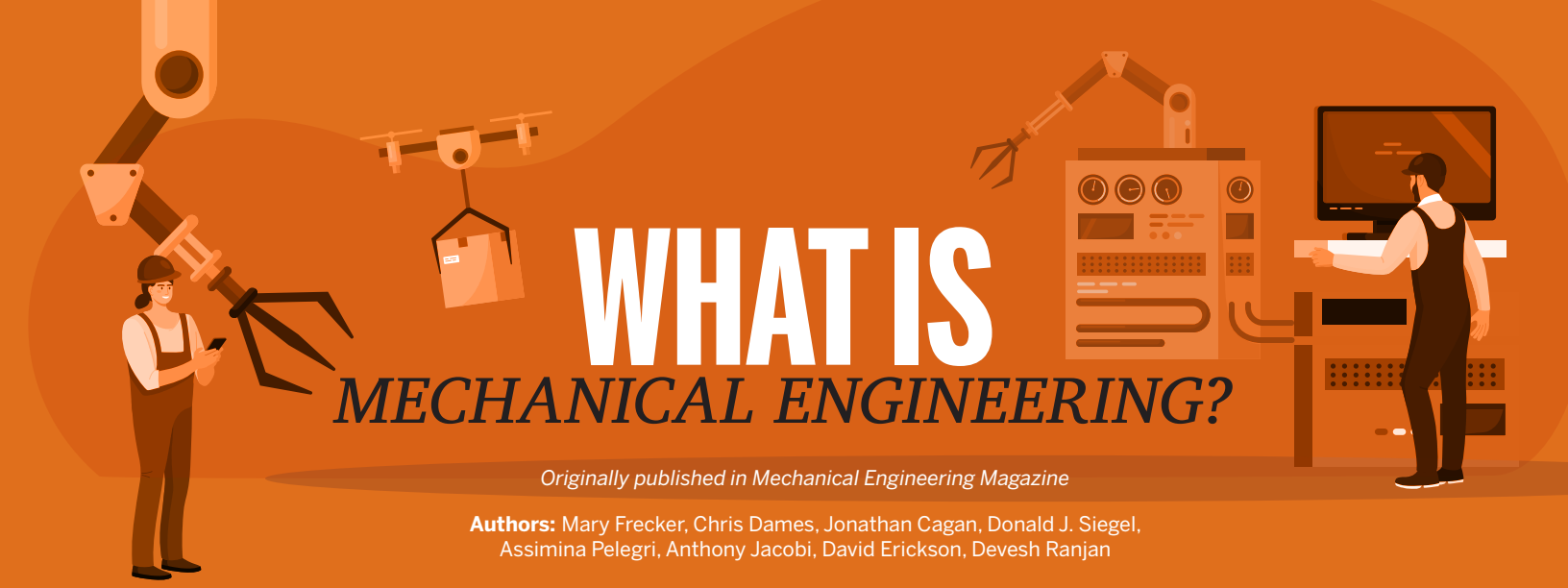
June 5, 2024

The last day arrived, and our final class felt bittersweet as we wrapped up our journey together. We finalized our project, reflected on the standout experiences, and shared feedback on what had worked well and what could be improved. The day was also spent tying up loose ends on our report, a culmination of everything we had learned and accomplished during this Maymester. It was a moment to pause and appreciate how far we had come.

After class, I decided to take a solo walk to experience Thessaloniki one last time. There's something magical about wandering through a city alone, just observing and soaking it all in with my last freddo cappuccino in hand. I walked from one side of the city to the other, along the bustling port and through quiet alleys, letting the rhythm of the city guide me. Along the way, I picked up a few random souvenirs—a tangible way to hold onto the memories of this place. Naturally, I had to get an "I Thessaloniki" shirt, because how could I not? Our final dinner together was the perfect culmination of the trip—a large, beautiful feast by the seaside. All 18 students, Professor Ellzey, Hannah, and the collective memories we had created shared one last meal as the sun set over the water. We laughed, reminisced, and captured every moment in photos, holding onto the bonds we had built and the experiences we had shared. This was our goodbye to Thessaloniki, to the Maymester, and to this unique chapter in our lives. ■

INTERESTED IN THE PROJECTS WITH UNDERSERVED COMMUNITIES (PUC) PROGRAM?

Email Catherine McGovern at catherine.mcgovern@austin.utexas.edu, book an appointment with a staff member or drop by a campus informational sessions.



WHAT IS *MECHANICAL ENGINEERING?*

Originally published in Mechanical Engineering Magazine

Authors: Mary Frecker, Chris Dames, Jonathan Cagan, Donald J. Siegel, Assimina Pelegri, Anthony Jacobi, David Erickson, Devesh Ranjan

Almost everyone comes into contact with the products of mechanical engineering on a daily basis, but very few people—including some engineers themselves—can provide a succinct explanation of what mechanical engineering is. Even ASME, our field's professional society, offers no written description of mechanical engineering as a field. Someone looking to understand what mechanical engineers (MEs) do might be left cold by the definitions provided by reference books, Wikipedia, or ChatGPT.

That's a problem, because it can be difficult to attract students into engineering programs if they don't have a clear understanding of what they would actually do once they get a degree.

We are eight ME professors, leaders of our respective departments, who are eager to share our forward-looking perspective about the excitement, breadth, and social impact of our chosen field.

As academics we have a unique vantage point on the frontiers of university education, as well as the cutting edge of advanced research that is shaping our world for decades to come. To be sure, mechanical engineering has its roots in the engines and vehicles of the Industrial Revolution, yet today it encompasses so much more: from 3D printing to AI-driven autonomous cars, from greener aircraft engines to lab-on-a-chip medical devices.

While we know that MEs tackle society's greatest challenges head on, we also realize that too many people don't have a clear understanding of what MEs do.

To remedy that, we would like to define our profession through four perspectives:

1. MEs solve societal challenges
2. MEs share core knowledge
3. MEs are creative and collaborative
4. MEs follow diverse career paths

While the four perspectives above don't lead to a quick and easy definition of the mechanical engineering field, that should be expected. Any definition for mechanical engineering must be as dynamic and evolving as the profession itself.

Even more important than what MEs learn and do today, is where we are heading tomorrow. The profession is future facing, and that perspective has never been as valuable as it is today. As global resources continue to shrink, out-of-the-box thinking will be imperative to tackle the present and impending challenges. The most powerful tools MEs possess are their fundamental versatility and creative problem-solving skills. The next generation of MEs will not only need to master the core disciplinary knowledge but also position themselves to work in highly interconnected engineering systems. This will entail the creative use of state-of-the-art data tool and openness to rapid changes in consumer trends and societal needs.

The future will offer countless diverse and challenging career prospects for mechanical engineers, and their strong foundation will provide tremendous opportunities to work together to make the world a better place.

SEE THE FULL PAPER, USE THE QR CODE.

HIGHLIGHTING OUR
DEDICATED AND TALENTED

STAFF

SHANTE TYUS

Academic Advising Coordinator

Shante holds a Bachelor of Science in applied learning and development from UT Austin as well as a Masters of Education in student development and leadership in higher education from Angelo State University. She was promoted to academic advising coordinator in 2022 after joining the department in 2019 as an assistant academic advisor. In 2022, she received the ME Staff Excellence Award.

WHAT DO YOU ENJOY MOST ABOUT WORKING WITH ENGINEERING STUDENTS?

I enjoy seeing the students learn and grow into young adults as they progress through the highs and lows during their time at UT. It is also fulfilling to know that my guidance is making a positive impact on the students I work with.

WHAT LEAD YOU TO PURSUE A CAREER IN HIGHER EDUCATION?

My UT Austin Vick Center advisor inspired me to work in higher education. When I first enrolled at UT, I was lost and confused about what to do with my life, but during every advising meeting they were patient, kind and helped me through major exploration to find a major that best fit my interests.

WHAT DO YOU LIKE TO DO IN YOUR FREE TIME?

Build Legos! My last project was a 30,000-piece dragon that took 43 hours over 12 days. ■

Leaving a Legacy

In 2024 we marked the 20th anniversary of the Mechanical Engineering Academy of Distinguished Alumni. The department established this group to recognize the accomplishments and careers of its outstanding alumni. The academy's purpose is to recognize high-achieving mechanical engineers from among the UT Austin and the engineering community at large, to champion the mechanical engineering profession, and to build a strong community and facilitate interactions among students, faculty, alumni and corporate partners.

To showcase these distinguished alumni in a more permanent way, a new digital recognition installation was erected in the Engineering Teaching Center's main gathering area, the T-room. Academy members from across the country returned to campus on Nov. 8 to attend the unveiling of this new display as well as the academy's annual awards banquet. This recognition wall serves as a directory of the 185 academy members, with plans to increase the interactive functionality in the coming years. ■

CLASS OF 2024

ACADEMY *of* DISTINGUISHED ALUMNI

Established in 2004, the Academy of Distinguished Alumni represents the highest honor the Walker Department of Mechanical Engineering bestows on its alumni. Including this year's honorees, 185 alumni have been selected for this award, recognizing them as highly respected professionals, dedicated engineers and supporters of higher education.

The academy honors alumni in four different categories: Outstanding Young Mechanical Engineer, Distinguished Mechanical Engineer, Mechanical Engineering Hall of Fame and Honorary Mechanical Engineer.

Outstanding Young Mechanical Engineer

Ashley Durand
B.S. ME 2008, M.S. ME 2012
Senior Manager, Avionics Integrated Design
Relativity Space

Distinguished Mechanical Engineer

Fred Buckingham
B.S. ME 1975, M.S. ME 1980, Ph.D. 1993
Consultant
NAES Corporation

Stephen N. Smith
B.S. ME 1990
Associate Technical Fellow
Boeing

Yuntian Zhu
B.S. Met 1983, M.S. MSE 1991, Ph.D. 1994
Chair Professor
City University of Hong Kong

Mechanical Engineering Hall of Fame

Gerardo Pinzon
B.S. ME 1987, MBA 1995, M.S. EE 2002
Consultant & Academic Director
AOKA Engineering

Learn more about the inductees
http://tinyurl.com/me-ada

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BACK TO SCHOOL BASH

This fall marked the return of our annual back to school event. Students, faculty and staff gathered outside of the Clock Knot to enjoy food trucks, lawn games and, of course, engineering swag.

STAY CONNECTED @UTMECHENGR