

MESSENGER

Tennessee Tech Department of Mechanical Engineering

The newsletter for alumni and friends of the Department of Mechanical Engineering | Spring 2022



A Note from the Chair

Dear ME Alumni and Friends:

I am writing to express my deep gratitude for your continued support of the ME department! I'm also happy to say that after more than two tumultuous years of COVID pandemic challenges, spring 2022 is certainly looking a lot brighter for us all. Still, I can assure you that our faculty and staff never compromised on delivering the highest quality education to our students we could, no matter what issues we've faced. I am grateful for the extraordinary effort and resilience demonstrated by our faculty, staff and upper administration to keep the university not only functioning, but even moving forward, throughout the entire pandemic, which we hope has finally abated. Additionally, we have continued to make progress in teaching, research and outreach to meet our strategic goals.

Spring is in the air, and many exciting things are happening on campus. The official groundbreaking for the new engineering building was held last fall, and we hope you'll stop and check out the construction progress the next time you are in Cookeville. There's an article about the new building included in this newsletter, plus you will find information about two new degree options, Baja SAE event details, faculty research, including two prestigious NSF CAREER awards, ABET accreditation, outstanding alumni, and many more newsworthy items. We are getting ready to host the Baja SAE event again in May 2022, and we truly hope you'll consider getting involved if you can. Information on how you can join us is included too.

Another positive note is that while enrollment has been a real challenge for many universities, the numbers for ME in Fall 2022 look very promising. The number of students who have applied for ME is up 12% from Fall 2021, and the number already admitted for Fall 2022 is up over 9%. Just in 2021, ME hosted well over 300 prospective high school students on VIP tours, plus hundreds more at the large fall and spring recruiting events. The number of degrees awarded has also remained strong. Our Vehicle

Engineering concentration is gaining in popularity, and we now have over 50 students currently in that program. We know many current and prospective students are specifically interested in Aerospace, so we expect that new concentration to also do well in coming years.

Please check out our website and enjoy the great stories and [departmental news](#) within its pages. You can also [check out our previous newsletter](#) for highlights, faculty and student spotlights and more. The Mechanical Engineering Department at Tennessee Tech is proud of its loyal and hardworking alumni, and we count on your kind support to update our facilities, equipment and laboratories. We continue in our mission to provide the highest quality of education and research in the mechanical engineering domain for the next generation of engineers and the future of the engineering field itself. Your generous contributions help us achieve our goal of making Tennessee Tech's ME program the best program, not just in Tennessee, but also to help put us on the national map. Please select Mechanical Engineering under the drop-down menu when you pledge your support on our web site at <https://www.tntech.edu/graduatestudies/masters.php>. The Mechanical Engineering department wishes you a beautiful and joyous 2022!

Best Wishes,

Mohan Rao, Ph.D.
Mechanical Engineering
Department Chair



Mechanical Engineering Launches Online Masters Degree Option

Now you can earn your Master of Science in ME from Tennessee Tech online! This MSME program is ideally suited for working professionals who need the flexibility to balance full-time employment with their desire to earn an advanced degree. Now you can do just that, plus earn your degree from a university with a reputation for excellence in engineering, especially Mechanical Engineering.

Degree Program Features & Benefits

- An MSME can help your career progress faster and provide more opportunities and greater earning potential.
- No thesis is required in this program! The non-thesis program is only 33 credit hours, including 3 credits for an independent study project, instead of a thesis requirement.
- It's easy to apply online! See the link below.
- The online learning format means you are in charge of your schedule, and you can set your own pace during the semester. You can even review lecture presentations more than once from wherever you want, and when you have the time.

- You can customize your degree to your area of interest in research and industry! Students will enjoy a variety of courses offered each semester so they can study the topics they feel are most beneficial to their career goals.

MSME Areas of Interest

- Vehicle Engineering
- Robotics / Mechatronics / Controls
- Design / Mechanical Systems
- Energy Harvesting / Smart Materials
- Energy Storage / Fuel Cells / Batteries
- Material Characterization and Modeling
- Acoustics and Vibrations
- Thermal Science / Fluid Mechanics
- Aerospace Engineering
- Heating, Ventilation and Air Conditioning

Take the next step and learn more!

Admission requirements:

<https://www.tntech.edu/graduatestudies/masters.php>

How to Apply:

<https://www.tntech.edu/graduatestudies/how-apply.php>

New Aerospace Concentration will help ME Students Soar

In addition to the new online MSME program, we are thrilled to announce the launch of a new BSME concentration in aerospace engineering beginning in Fall 2022. Our graduates have always been in high demand from employers in both the aeronautical and astronautical engineering fields, and hundreds of those graduates are already enjoying successful careers. This concentration will give students who dream of working in these fields even more of an advantage as they pursue their professional potential. The program will focus on aerodynamics, propulsion including electric propulsion, and noise control. The lead faculty member for this program is Rory Roberts, Ph.D., and he's anxious

to get the program started. "The new aerospace new concentration will be focused on educating our students to have an interdisciplinary foundation in both mechanical and aerospace technologies," Roberts said. "We are excited to provide this opportunity to students who are interested in pursuing a career in aerospace. That interdisciplinary approach to this program will prepare graduates to thrive professionally in aerospace fields spanning from space exploration to urban transport, and even small unmanned aircraft."

For more information, contact the ME department at me@tntech.edu or 931-372-3254.



Brookshear Becomes Baja SAE Faculty Advisor

After co-advising the Baja SAE (Society of Automotive Engineers) during the 2020-2021 academic year, **Will Brookshear, Ph.D.**, officially assumed the role when Dale Wilson, Ph.D., retired in summer 2021 (see Faculty Retirements article later in this newsletter). If you ask the new faculty advisor about how it's going, he'll tell you it's been quite a ride so far.

"There's been a lot to learn, but it's very exciting to inherit a program with such a rich history of success," commented Brookshear. "This is the first year our team has attempted to build and field a four-wheel-drive car in competition, and I'm enjoying watching the students grow and learn through that experience. I hope I can continue to help our program and team members add to the Baja SAE legacy at Tennessee Tech."

Brookshear is a lecturer in Mechanical Engineering, and is also in his first year serving as the faculty advisor for Tennessee Tech's Baja SAE program. Brookshear was born and raised in Johnson City, Tennessee, and obtained

his B.S., M.S., and Ph.D. degrees from the University of Tennessee at Knoxville. He previously conducted and published research related primarily to vehicle emissions control technology during his graduate studies and as a post-doctoral researcher with the Fuels, Engines, and Emissions Research Center at Oak Ridge National Laboratory. Following his time at Oak Ridge, he chose to pursue his passion to teach by first serving as an adjunct professor in his home town at East Tennessee State University before joining the mechanical engineering faculty at Tennessee Tech in the Fall.



Roberts Awarded Electric Aviation Research Grant

Rory Roberts, Ph.D., says he believes the future of aviation is electric. The federal government is going to help him make that a reality.

Roberts, associate professor of mechanical engineering at Tennessee Tech, has received a \$1.6 million grant from the United States Department of Energy for his research. "This project is looking to electrify commercial aviation," said Roberts. "This is looking at the larger 737 Boeing type aircraft for moving a large number of people for flights that are six to eight hours long, cross country and even U.S. to Europe."

The official name for the project is High Power Density Carbon Neutral Electrical Power Generation for Air Vehicles. Roberts says the idea is to utilize carbon neutral fuels such as bio-derivatives, bio natural gas and methane to be integrated with traditional propulsion systems on aircraft to produce electricity.

"This is very cutting edge," Roberts said. "This grant was awarded by the DOE Advanced Research Program for Energy. This is set up to look at very high-risk, high-reward, far out objectives and goals, kind of like a moon shot." The \$1.6 million grant would be followed by a second phase grant of \$1.8 million more over a total of four years if milestones in the research are met. Special Power Sources, Boeing and Raytheon have partnered with the project, along with cooperation from Oak Ridge National Laboratory and Wright State University. Roberts previously generated funded research as a professor at Wright State,

founding the Advanced Propulsion, Power and Thermal Systems program there.

"This is a project that combines my last 20 years of experience into one project," said Roberts. "I have a unique set of tools and happen to have what I think is all the tools needed for this project. It's a great opportunity to hopefully make a great impact in electric aviation."

While strides are being made in short range electric power for regional aircraft, Roberts admits battery technology just isn't there yet for large amounts of energy. He says that's why the DOE is looking to the strategy of converting chemical energy into electricity.

"This is more of a clean slate design," Roberts said. "Reducing the amount of fuel consumption, operation costs, noise levels so we don't have annoying airports, this plays a part. Low emissions, nearly zero emissions, would be the final chapter to have a cleaner more socially accepted technology that's economically viable in the future."





Tennessee Tech Hosting Baja SAE Event in May 2022

Baja teams from all around the United States and other countries will converge on Tennessee Tech for a huge event May 12-15, 2022, at Tech's Hyder-Burks Agricultural Pavilion. The 100 teams, along with their roughly 1,200-1,300 team members, will be here to vie for the top spots in the Baja SAE Collegiate Design Series Competition governed by the Society of Automotive Engineers (SAE). This will be the ninth time Tech has hosted a Baja SAE event, most recently in 2019.

"Tennessee Tech is known as one of the top locations that teams love to come to for competition events, and it's a great way to show off the university and our Baja SAE program," said mechanical engineering professor Will Brookshear, faculty advisor for the team.

The Baja SAE competition consists of students designing and building small off-road cars, and competing in a wide range of events. The car designs are unique to each team, but the engines must all adhere to the same specifications. The cars are put through a very rigorous series of technical inspections and are then tested in events such as a sled pull, traction and suspension, accelerations, land maneuverability, and culminating in a four-hour endurance race, which includes challenging features and rough terrain.

"The design and building process provides valuable hands-on experience for the students," said Brookshear. "In addition to the dynamic events, teams are also required to do a sales presentation, a design presentation and more. It's a very comprehensive competition and a great way for students to put their engineering skills to the test, literally."

Volunteer or be an event sponsor!

Want to be there? We still need volunteers for a variety of roles that will help the event run smoothly, and you can have a front-row view of all the action! You'll also receive a free event t-shirt, along with snacks and lunch in the hospitality room. Volunteers must be at least 18 years old. Signing up is easy! Scan the QR code to the right with your phone, and the link will take you directly to the Baja SAE volunteer sign-up page. Questions about volunteering can be directed to Kris Craven, Ph.D. (kraven@tntech.edu) or John Tester, Ph.D. (jtester@tntech.edu).

Want your business represented at the event? Contact us for ways you can sponsor a meal or other event needs. For questions about sponsorship opportunities, please contact Michelle Arbogast (marbogast@tntech.edu) or Beth Smith (basmith@tntech.edu).





Vehicle Engineering Lab Opens New Opportunities for Students

Completed in 2021, the Vehicle Engineering Lab on the south side of Lewis Hall is an incredible asset and gives student more hands-on experience. The lab features an array of vehicles and other learning tools that students use to apply their skills and do research. The VE lab's equipment includes everything from basic hand tools to on-board diagnostic (OBD) scanners, to a Bend Pak 2 post lift and much more. Our students use these tools to showcase different vehicle systems, as well as for the students to gain crucial experience using the equipment itself. The lab also includes 4-6 Mercedes Benz/Nissan Motor Group engines that students can disassemble and reassemble while learning about the different sensors and parts in the engine. Current student research continues using multiple Nissan LEAFs as well as a hybrid Ford

Fusion truck; and undergraduate and graduate students are in the process of making the vehicles fully autonomous, plus trying to make sure the systems are less vulnerable to hacking. The cars have been retrofitted with additional radar sensors, cameras, lidar and vehicle-to-vehicle communication devices. More equipment and technology are still being added to the lab as the research advances. Many of the vehicles and tools in the lab were generously donated by Nissan, DENSO and other industry partners. Students often collaborate with these industry partners in order to better understand the cars or other pieces of equipment that have been donated. Their support makes a lab like this possible and enhances the quality of education for every student in the VE concentration.

ABET Accreditation Renewed for ME

The summer of 2021 brought a welcome announcement from ABET regarding the undergraduate mechanical engineering degree programs when they officially renewed our accreditation status through 2026. After reviewing the hundreds of pages of the report and thousands more pages of electronic supporting materials the ME department submitted, the ABET program evaluator resoundingly

recommended renewing the prestigious accreditation for all of ME's bachelor of science programs. with no concerns mentioned.

ABET, <https://www.abet.org>, is a nonprofit, non-governmental agency that accredits college and university programs in the disciplines of applied science, computing, engineering, and engineering technology.

ABET accredits over 3,100 programs at more than 670 colleges and universities in 24 countries. ABET is guided by industry, government, and academic constituents. The organization's accreditation process assures Tech's College of Engineering programs meet the quality standards established by the various engineering professions for which the college prepares its students.





Construction on New \$62 Million Engineering Building Begins

Tennessee Tech University broke ground on its new \$62 million engineering building in September 2021, celebrating the history, legacy and future of the university's flagship engineering programs and showing appreciation for donors and state support.

The 100,000-square-foot Ashraf Islam Engineering Building will anchor Tennessee Tech's engineering corridor and fuse innovation, smart building technology and a living water laboratory to foster interdisciplinary and collaborative learning while inspiring new generations of engineers.

"This building represents a major leap forward for the college as we continue to improve the engineering education we are renowned for," said Joseph C. Slater, dean of the College of Engineering. "It is designed to reflect the cross-disciplinary nature of modern engineering. In bridging artificial boundaries between disciplines just as they would in the workplace, students will learn to apply their skills outside of the classroom to solve engineering problems in today's complex teams."

More than 200 guests celebrated groundbreaking for Tech's first new engineering facility in 50 years. Located in Sherlock Park, the building is an investment in Tennessee's only technological university, which annually awards a fifth of the total engineering and computer science degrees from the state's nine public universities. The state is providing \$54 million in funding for construction of the building, which was approved by the Tennessee Higher Education Commission this summer.

Approximately 55 faculty, staff and students from across the university worked across 20 teams during the building's planning process. With a focus on active learning labs and

more than a dozen flexible, collaborative workspaces, the building was designed with one mission in mind, said Tech President Phil Oldham: "Put students first."

"Putting students first includes providing classroom and laboratories that foster innovation and discovery like the spaces this new engineering building will provide," Oldham said. "I am grateful for the assistance and vision of our elected officials, our campus leaders and generous donors. This building and its outdoor lab are game changers for our students."

The building is named for alumnus Ashraf Islam, a highly respected Texas businessman who credits his Tennessee Tech civil engineering degree for his success in the transportation industry. Well known for his philanthropic and professional accomplishments, Mr. Islam has committed \$3 million to the building and is among 40 donors supporting the building.

Active learning labs in the facility will apply the most advanced teaching technologies available, while a dozen flexible spaces enable students to collaborate across their majors on solving real-world problems.

The building also features additional space for Tech's championship Baja SAE team, the award-winning Formula SAE team, and vehicle-related mechatronics. Intentionally designed high-bay doors provide access for large equipment in the future. A hydraulics lab enables a variety of students from different majors to study fluid dynamics. The second floor includes significant space for computer science and computer engineering as Tech continues to lead Tennessee in cybersecurity education through the Cybersecurity Education, Research and Outreach Center.

Continued, next page.



The project will also harness Tech's natural water resources, "daylighting" an underground stream to provide a living, outdoor laboratory for students studying environmental engineering. "Not only is it an environmentally sound thing to do, it's also the most direct and accessible way for students to gather water samples," Slater said. "They can take them straight to the chemical, biological and environmental lab on the building's fourth floor."

"The Ashraf Islam Engineering Building is something that will completely transform the college," Slater said. "I have no doubt that the great gift of labor by everyone involved in this design, the great gift of resources by our gracious donors, and the support from the great state of Tennessee will propel us into a future of which we are just beginning to dream."



RANCS Research Group Tests New Ford Fusion Hybrid for NSF Research in Connected and Autonomous Vehicles

Students and faculty in the Resilient, Autonomous, Networked Control Systems (RANCS) Research Group recently conducted the first test of its new Ford Fusion Hybrid research vehicle as part of a National Science Foundation grant for testing and verifying the safety and security of Connected and Autonomous Vehicles (CAVs). The \$350K grant has provided for research and development of a large-scale Hardware-in-the-loop (HiL) simulation facility for CAVs, which also offers the opportunity for students to gain hands-on experience and attract industrial partners to test their systems.

Software-driven products such as CAVs can be targets of digital disruption. RANCS Director Arman Sargolzaei, Ph.D., assistant professor of mechanical engineering, is developing the Vehicle-in-the-Loop (ViL) facility at Tennessee Tech for testing connected and autonomous vehicles in a virtual world. This concept, known as "digital twins," uses a virtual representation of an object or system combined with real-time data and simulation to see information happening in the physical world.

Technology partners AutonomouStuff, IPG Carmaker, and Genesys equipped the Fusion with state-of-the-art

sensors that, when combined with this virtual technology, enable Sargolzaei and other researchers to simulate real-world crashes and driving scenarios to conduct tests on faults and failures in these systems, learn the potential for cyberattacks and develop a technical language for industry and regulators to communicate safety issues.

"Vehicle-in-the-Loop implementation is a significant step toward achieving safe, realistic and cost-efficient test procedures before moving the experiments onto roadways, said Sargolzaei. "The ability of this research vehicle to detect and react to simulated actors makes it an excellent platform for testing against cyberattacks in a safe and realistic environment."

The RANCS research laboratory focuses on advancing the science in the field of Networked Control Systems (NCSs) and focuses on safety-critical cyber-physical systems such as power systems, transportation systems (unmanned aerial and ground vehicles), and biomedical systems. RANCS provides the infrastructure and support services necessary to engage faculty and students interested in multidisciplinary research, educational activities or community services.



ME Students Help Special Needs Children with Life-Enhancing Solutions

Jacob Nelson said it best.

“In this project, it’s hard to find anything bad,” said Nelson, a senior mechanical engineering major from Hendersonville. “We get education. We get experience. A family gets the benefit from that. Coming in, installing it, seeing that it works, seeing Mira smile, that’s everything.”

This project was a dining room table with a track rail sliding chair to support three-year-old Mira, who has cerebral palsy. The project was part of the Early Intervention and Mechanical Engineering program that creates and provides engineered products to children with special needs and their families in the Upper Cumberland region. Steve Canfield created the program, which has done more than 300 projects.

“Students look at the syllabus and it says we’re going to cover differential equations, solve linkages, their eyes glaze over,” said Canfield, professor of mechanical engineering at Tennessee Tech. “But when you say we’re going to build a machine to help this child, they say, Ah, I can understand that, although it turns out they need the engineering that we’re going to be covering in the class to make that work.”

Numerous projects are conducted each semester, with students working in teams of four. Jacob Nelson, Bryant Crawford, John Austin and Wes Yunker created and built the table. It has knobs attached so Mira, who can only use her left hand, can be mobile and get exercise at the table.

“To see her be able to sit there with good posture and be able move herself and see how happy and proud she was of herself for doing that, it doesn’t get better than that,” said Ashley Steakley, Mira’s mom. The project originally began as a sit and spin play chair. It evolved



after conversations with the family. “We started talking to the family and it seemed like a good thing to do,” said Bryant Crawford, a senior mechanical engineering major from Waverly. “She needed the table.”

The program has built relationships for funding and sponsorships for materials. But the students have to be innovative in their design, as parts can be costly.

“We needed 14 feet of rails for the table,” said Crawford. “We looked at one website and they wanted \$20 to \$30 per millimeter. We ended up buying off of Amazon for a couple hundred dollars. They were built for a lathe, so if it will hold up a lathe, it will hold up Mira.”

“They don’t charge us for it,” said Steakley. “If we did find a company that would modify something like this, they are undoubtedly going to charge us thousands and thousands of dollars.”

This is actually the third project the Tech program has done for the Steakley family, which has seven children and resides in McMinnville.

“We had an artificial spine built with a gait trainer when she was a year old,” said Steakley. “The second year we had a seizure box built for her wheelchair that I kept on the back of my truck. All of her projects are delivered in December before her birthday so it’s like happy birthday from TTU!”

As for any student, the goal at the start of the project is to make a good grade. That focus changes as the project develops, and the impact can be long lasting.

“I’ll get feedback from these students five to ten years later,” said Canfield. “Some students keep up with the families. It’s amazing, the connection.” “I’m glad it’s going to help make their lives a little easier,” said John Austin, a mechanical engineering major from Livingston. “It’s very satisfying, a sense of accomplishment.”

“When you’re working on it, you’re thinking how is this going to benefit my grade,” said Nelson. “But then you get here and you see it. I wish I had the type of character to do this all the time, or had the money to build something like this just to help people.”

U.S. Department of Energy Awards \$4M for Green Economy Proposal

Tennessee Tech has been awarded more than \$4 million by the U.S. Department of Energy for its proposal to build the clean energy economy in rural areas.

The project title is “Rural Reimagined: Building an EV Ecosystem and Green Economy for Transforming Lives in Economically Distressed Appalachia.” Rural Reimagined is Tennessee Tech’s Grand Challenge initiative to harness science, technology and innovation to transform rural communities.

“Today is a great day,” said Pinggen Chen, assistant professor for mechanical engineering at Tennessee Tech. “With the rise of the clean energy economy around electric vehicles, rural and low-income communities in Appalachia have struggled in the transition, due in part to a lack of infrastructure, low awareness and limited-to-no access to electric vehicles and clean energy jobs.”

The total cost of the project is \$8 million. Tennessee Tech is the leading organization among more than 50 partners from Tennessee, Ohio, Kentucky, West Virginia and Virginia sharing the balance of the funding. Chen is the principal investigator of the project.

“This project aims to provide clean and affordable mobility options to the underserved communities by developing needed charging infrastructure and adopting and demonstrating various cost-effective electric vehicles in diverse applications,” said Chen. “In addition,

the project aims to create outreach, training and education opportunities to the residents of rural and low-income communities.”

Five major components make up the project; charging infrastructure development, electric vehicle acquisition and demonstration, data collection and analysis, outreach and education and workforce training and economic development. The proposal says long term impacts on rural areas would include transition from a fossil fuel-based fuel economy to clean energy, improved environmental quality and public health as well as creating new job opportunities.

“This will facilitate collaborative opportunities between universities, automotive electric vehicle manufacturers, charging station suppliers and other stakeholders on workforce training to serve the rapidly growing electric vehicle industry and clean energy economy,” said Chen. “The goal is to build the underpinnings of a green economy in the most economically distressed Appalachian region to transform the lives of rural and low-income communities.”

Vice President Kamala Harris and U.S. Secretary of Energy Jennifer M. Granholm recently announced a total of 25 projects across the nation awarded a total of \$199 million. The focus is research, development and demonstration projects to advance electrification of freight trucks, reduce vehicle emissions and improve the electric charging infrastructure.



Two Faculty Receive Prestigious NSF CAREER Awards



ME faculty member **Ahmad Vaselbehagh, Ph.D.**, was recently honored with an NSF CAREER award for just over \$500,000 that will support his research and educational efforts in understanding and modeling thermal transport processes within the atmosphere through June 2027. The full title of the project is “Understanding Thermal Transport

Processes in Atmospheric Boundary Layer with Utility-Scale Solar Photovoltaic Plants.”

Using field campaigns and computer simulations, Vasel and his team will discover the impact of artificial canopies of millions of photovoltaic panels on thermal transport dynamics within the atmospheric boundary layer. The knowledge gained will allow the introduction of such giant solar plants into climate models. This research will also lead to a new Atmospheric Transport course, a textbook, and a mobile app, namely ATMOSPport. This NSF award will allow him to advance lower-level curriculum courses and help students obtain “the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context,” an ABET criterion currently missing in the department’s undergraduate courses.



Another ME faculty member, **Arman Sargolzaei, Ph.D.**, has also earned an NSF CAREER award for \$500,000 that will support his research and teaching activities in the area of connected and autonomous vehicles through January 2027. Entitled “Systematic Approach for Extensively (SAfEly) Testing and Verifying the Security of Connected and Autonomous Vehicle,” the

technical goal of his research is to expand the research using mixed reality to create a technical language and framework for commercial testing for industry and regulators. The research of Sargolzaei, and his team of undergraduate and graduate students, on autonomous vehicles will directly impact the future of automotive technology and the automotive industry in the US and ultimately reduce crash-related fatalities and save lives. And the funding of this grant will also aid him in creating curriculum for K-12 schools to boost STEM learning opportunities in underserved rural communities.”



Inspiring Future Engineers

In addition to the over 500 prospective high school students ME hosted for VIP tours and at recruiting events in 2021 and earlier this year, our department got to be part of a special event called “Kindergarten Goes to College,” hosted by the College of Education last fall. This was an outreach event organized for the youngest students at Prescott South Elementary, a STEM-focused school in Cookeville. Although it was a chilly day, the 90+ kids were super excited to see and explore the Baja SAE and Formula SAE competition cars and talk to members from each team. Every child got to climb into the seats and imagine what it would be like to design, build and drive one of these cars in a race someday. The kindergarteners also learned more about what mechanical engineers do and the many incredible things they design, and we all enjoyed seeing their wide-eyed excitement.



Faculty Retirements

In the summer of 2021, Glenn Cunningham, Ph.D., and Dale Wilson, Ph.D., two of our longest-serving and most respected professors, retired. We can hardly begin to express to each of them how grateful we are for their many years of service, and wish them both all the best as they enjoy this new chapter in their lives.



Glenn Cunningham, Ph.D., taught mechanical engineering courses since he came to Tennessee Tech in 1986 and was the director of the Industrial Assessment Center, which has provided hundreds of energy assessments for small to medium-sized industries funded by the U.S. Department of Energy (DOE). Cunningham was involved in performing these assessments for a wide variety of clients over 35 years. The assessments involved investigating areas of pumping, steam, HVAC, compressed air systems, etc. He also provided HVAC and plumbing design services for several local architects since 1994 and was the engineer of record on over 100 projects. He holds the following licenses and certifications: Fellow of the American Society of Mechanical Engineers; Certified Practitioner in Energy Management Systems and Registered Professional Engineer in Tennessee and Kentucky. He also holds the following U.S. Department of Energy certifications: US DOE Steam System Instructor; US DOE Qualified Specialist in Process Heating Systems; US DOE Qualified Specialist in Steam Systems US DOE Qualified Specialist in Pumping Systems, and US DOE Qualified Specialist in Fan Systems.



Dale Wilson, Ph.D., was a professor of mechanical engineering at Tennessee Tech and served as interim chair of the Manufacturing and Engineering Technology Department on campus before retiring. He previously served for four years as chair of the Mechanical Engineering Department at Tech, has thirty years of academic experience and six years of industrial experience as a senior engineer at Pratt & Whitney Aircraft. He had applied research projects with numerous companies and government agencies. His research interests were focused on the mechanical behavior of material, especially fatigue and fracture, as well as the mechanical design process. Professor Wilson was active in the American Society of Mechanical Engineers as a section chair, and also in the Society of Automotive Engineers as a faculty adviser to the Baja SAE team. He was active as well in the American Society for Engineering Education as the mechanical engineering division chair and materials division chair. He participated in a number of outreach efforts such as Odyssey of the Mind, Lego League, and the Governors School on Emerging Technologies. He is a mechanical engineering program evaluator for the Engineering Accreditation Commission of ABET and is a registered Professional Engineer.

With these retirements, the Mechanical Engineering Department is currently interviewing candidates to join our faculty in August. With more than 200 applicants for two tenure-track positions, we know we'll be adding top-notch professors this fall with the expertise and research acumen our department is known for. Look for more exciting news about our new faculty later this year!



Cunningham and Wilson left a legacy of excellence in teaching and inspiring students during their many years in the Mechanical Engineering Department. If you would like to honor that legacy, please consider making a donation in honor of one or both professors.

To make a donation to the ME department, please do so at <https://www.tntech.edu/engineering/programs/me/support-me.php>.

To make a donation in honor of Wilson's dedication to the Tennessee Tech Baja SAE team, please do so at <https://www.tntech.edu/engineering/programs/me/support-baja.php>.

Thank you for your support!



Alumni Spotlight: Amy Elliott

Amy Elliott, who earned her undergraduate degree in mechanical engineering from Tennessee Tech University, has joined an initiative designed to empower current innovators and inspire the next generation of pioneers.

Elliott is a 3D-printing specialist and manufacturing scientist for the Oak Ridge National Laboratory (ORNL), but her impressive career as a woman in STEM has found her on TV, as an ambassador for the American Association for the Advancement of Science and even as a 3D-printed statue at the Smithsonian's Women's History Month exhibit. "Everything that I have gotten to experience and accomplish has been amazing and very unique and has changed my life," she said.

Elliott went on to receive her Ph.D. from Virginia Tech, which led her to be a contestant on the Discovery Channel's *Big Brain Theory*, a reality show competition for engineers, where she placed second out of 10 contestants. Since 2016, she has served as an on-camera science personality for the Science Channel's *Outrageous Acts of Science*, explaining the engineering and science behind viral video clips.

In 2021, she was named ORNL's most accomplished innovator for her work in transforming advanced manufacturing in automotive, aerospace and other industries.

Currently, Elliott is an ambassador for the American Association for the Advancement of Science (AAAS). The association created the IF/THEN initiative, which is a part of American philanthropist Lyda Hill's, commitment to funding game-changing advancements in science and nature. The ambassadorship was created to help this philanthropy build the workforce in STEM and allowed them to showcase women in the field.

"At first, I wasn't really sure what would be involved, but I thought being an ambassador for AAAS would be a great opportunity to become a role model on a larger scale, and it turned out to be just a really amazing experience," she said. "We go to meet, and the other ambassadors and I just thought we would get some social media coaching and a few other things, but then we get there, and they tell us we can apply for a \$10,000 grant to do a project towards outreach. They also told us they were going to be scanned in 3D and making a statue of us in life-size."

The 3D-printed statue is on display in Washington, D.C., as part of a Smithsonian exhibit of groundbreaking 'female power players in STEM,' celebrating Women's History Month. Elliott's statue in the IF/THEN initiative, "if she can see it, then she can believe it," is among 120 other statues depicting real women in STEM and is the largest collection of statues depicting women ever assembled.



"With this grant, I chose a project that has allowed me to be in the process of launching a children's book called *Where Does Electricity Come From: Superheroes in STEM and Trades*. I wrote and illustrated the book, which includes characters that are role models for women in STEM. In the back of the book, I have included real-life role models that were the inspiration for each of the characters," she said.

When Elliott was a young girl, she didn't have an idea of what she wanted to do until her brother joined a robotics team in high school that allowed him to travel to Florida for a competition. That piqued her interest because she wanted the opportunity to also go to Florida, even if that meant joining a team she knew nothing about.

"Luckily, I had some really great mentors along the way, one in particular that just sat me down on the design team and let me go. He ended up putting one of my designs on the robot, and that was like my light bulb moment when I realized this is what I want to do. This is so cool," she said. "I just fell in love with all the bits and pieces along the way of being a mechanical engineer, and it is cool to have the opportunity to be a role model for young girls and women through this initiative."



Outstanding ME Alumni Named

Just before the 2021 holiday season, the ME department honored two ME alums, Richard Carlton and Ray Sells, with the Mechanical Engineering department's Outstanding Alumni Award.

Mechanical Engineering alumnus **Richard Carlton** (1975, 1977) is certainly True 2 Tech, having given back to the university for 35 years. After graduating, Richard enjoyed a very successful career in Silicon Valley, first in the solar energy field, and then as the owner and president of Carlton Engineering. Now that he's retired, Richard is looking forward to having more time to engage with the university that shaped so much of his life and career.

According to Richard, "The hands-on learning experience I gained at Tennessee Tech, along with the nurturing environment and small class sizes, prepared me to take on Silicon Valley and succeed. The faculty at Tech were like coaches, teaching us not only the technical skills we

needed, but the practical and pragmatic skills, which are just as crucial, that led me to the top of my field. Tech felt like home, and I will always be grateful I choose to go there."

Harold Ray Sells ('57 mechanical engineering) made his first gift to Tennessee Tech in 1983 and since then, has become one of the Department of Mechanical Engineering's most generous supporters. From scholarships to classroom renovations, his philanthropy has impacted generations of engineering majors and faculty. Through his philanthropy, Sells says he hopes to enhance the quality of training mechanical engineering students receive, provide better classrooms and equipment, assist faculty and set an example for others.

"Even ordinary people like myself can help," he said. "I like to think I'm not only 'giving back' but 'paying it forward.'"

Want to see yourself in our alumni spotlight? Let us know about your awards, promotions, and other professional achievements! If interested, please send an email to Outreach Coordinator Beth Smith at basmith@tntech.edu.

Those We Have Lost

Sadly, we lost two very important figures in the history of the Mechanical Engineering department and Tennessee Tech University in 2021.

The Tech community lost a man admired by many when **Arthur W. Gardiner, Jr., Ph.D.**, died Feb. 12, 2021, at the age of 91. A native of Detroit, Michigan, Gardiner graduated from Cornell University. After service in the Army, he earned his master's degree in mechanical engineering from Cornell. He spent a number of years working at Hughes Aircraft in the Los Angeles area and Cummins in Indiana before pursuing his doctorate in mechanical engineering at Virginia Tech. In 1972, he moved with his family to Cookeville and joined Tech as an associate professor of mechanical engineering until his retirement in 1994. He loved teaching, whether it was on the subject of internal combustion engines, healthy habits or the history of World War II. He designed and partially machined a steam engine that unofficially broke the world speed record for steam dragsters. His colleagues appreciated his great sense of humor, his deep knowledge of thermodynamics and his patience with the less technically minded.

We then mourned the loss of former Tech first lady **Mary Etta Roaden**, the devoted wife and supporter of Arliss Roaden, Ph.D., who passed away Wednesday, April 21. Mary Etta served the university with grace and friendliness while her husband was the fifth president of Tech from 1974 until 1985. They cultivated a deeper love of arts and music on campus while at the same time Tech built its foundation for distinguished research. Mary Etta graduated from Carson Newman College, after which she taught elementary school. During college she met the love of her life, Arliss Roaden, and they were married for 65 years. Mary Etta was at his side when her husband served as president of Tennessee Tech University, executive director of the Tennessee Higher Education Commission, and dean of the Graduate School and vice provost at the Ohio State University. She organized and hosted innumerable events, seemingly effortlessly making everyone feel welcome.



Recognizing Our Generous Donors

On behalf of the entire Mechanical Engineering department, we want to take this opportunity to thank the many alumni and friends who have contributed to support our students and academic programs in the last year and so far in 2022. We could not provide the same quality of education without your kindness, so please accept our deepest gratitude!

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Tennessee
TECH

 Department of Mechanical Engineering
Brown Hall 224
115 W. 10th St.
Cookeville, TN 38505



Department of Mechanical Engineering
Campus Box 5014
1000 N. Dixie Ave.
Cookeville, TN 38505-0001



<https://www.tntech.edu/me>
me@tntech.edu



(931) 372-3254

