Texas Tech
DEPARTMENT OF MECHANICAL ENGINEERING

CELEBRATING THE CENTENNIAL

SPRING 2023
CHAIR’S MESSAGE

Song-Charng Kong, Ph.D.
Department Chair, Don Kay Clay Cash Endowed Chair

One day Elizabeth Van, an ME sophomore, stopped by my office to show her appreciation for the emergency financial support she received from the department as she is putting herself through college. She was able to stay on track with her study plan. She then gave me a sticker and showed me a 2-million-view video she was in, a video of the robot (Atlas) she worked on with her team at Boston Dynamics during her internship there in the fall of 2022. It was amazing – robotics is not my area, so I can only marvel. Out of curiosity, I asked who her team members were. She said she was the first ever intern hired for the team comprising predominantly MIT and Harvard graduates.

Given proper opportunities, our students can compete at the highest level. The Rover Team, all ME students, was among the few selected by NASA to compete in spring 2023. Our doctoral graduates also find prestigious positions in the highly competitive academia and Department of Defense laboratories. You will find similar stories of student success in this newsletter. We want our students to excel in fundamentals and teamwork. The department strives to provide education and opportunities to enable their success.

This year Tech celebrates her 100 years of excellence. If you are reading this article, chances are you are also one of the beneficiaries. If you think the evolution of technology from 1923 to 2023 is unthinkable, how unimaginable will the difference be from 2023 to 2123? We require our graduates to be good at fundamentals so they can adapt and invent. Our department still has the highest GPA requirement and the most rigorous curriculum in the college. But then, there may be no more major called mechanical engineering in 2123. (We may need to ask ChatGPT about this.) The fundamental science remains the same no matter what the program will be called. We at Tech will continue to deliver value to students and make the world a better place.

If you have any thoughts to share or a chance to visit, please do not hesitate to contact me at sokong@ttu.edu.
Zhongkui Hong Receives NSF Support for Cellular Mechanical Oscillations Research

Dr. Zhongkui Hong is an Associate Professor in the department. His research is focused on biomechanics in cardiovascular diseases, and mechanics in biomaterial design and tissue engineering. In his most recent project, funded by the NSF, he and his team study knowledge gaps in cellular mechanical oscillations and propose an innovative approach that seeks to advance efforts to treat and prevent cell migration-relevant diseases such as cardiovascular diseases and cancers. Periodic oscillations exist broadly in animal cell mechanics. These mechanical oscillations of cells are thought to contribute to disease development, such as cardiovascular disease and cancer by triggering cell migration, moving from one location of the body to another. To elucidate the molecular mechanism of cellular mechanical oscillations and their functions in cell migration, Dr. Hong’s team is employing an innovative approach integrating a series of novel experimental approaches and data-driven mathematical models to monitor cellular mechanical oscillations, cytoskeleton dynamics, as well as cell membrane undulation and polarization. This work is also advancing undergraduate and graduate education and training in bioengineering at Texas Tech. Mentoring and authentic research experiences are being provided to undergraduate students from groups historically underrepresented in STEM. A discovery-based program is being advanced to attract Hispanic, female, and first-generation students to pursue their careers in the biomedical engineering field.

Alexander Idesman Receives Research Award

Dr. Alexander Idesman, a Professor in the department, recently received the Whitacre Engineering Research Award. Dr. Idesman’s research focuses primarily on computational mechanics related to the modeling of heat transfer, acoustic and elastic wave propagation, and stresses in structural components under static and dynamic loadings. Recently, he has developed a new general numerical method for the solution of partial differential equations used for the description of the abovementioned problems. The new approach, called the Optimal Local Truncation Error Method (OLTEM), significantly reduces the computation time by a factor of 1000 or higher as compared to existing numerical approaches such as the finite element method, the finite volume method, and the finite difference method. Another advantage of OLTEM is the use of unfitted Cartesian meshes for complex irregular domains and interfaces without the need for complicated mesh generators. Due to these advantages, many important engineering problems that cannot be currently solved due to prohibitively large computation time can be analyzed by OLTEM. For example, OLTEM can be used for many design and optimization problems, modeling of heterogeneous (composite) materials at thermomechanical loading, multiscale problems without the scale separation, problems with evolving geometry (e.g., crack propagation), and others. The results of OLTEM have been published in the leading journals on Computational Mechanics. Dr. Idesman’s research has been supported by grants from the NSF, ARO, and Sandia.
NASA-funded University Student Research Challenge

Texas Tech University is taking part in the NASA-funded University Student Research Challenge to find ways to make vectored-thrust, ducted-fan, electric vertical-takeoff-and-landing (eVTOL) vehicles more efficient and less noisy. Led by Dr. Victor Maldonado, the team of students will be testing a wind-tunnel model of a wing design that reduces exposure of the ducted fans in cruise flight and a fan-blade design that promises to reduce noise. Their eVTOL concept involves 20 tilting fans mounted on four flaps under the trailing edge of a main wing with a heavily under-cambered airfoil that hides the fans in cruise flight, reducing drag. The fans are blended into the fuselage to improve aerodynamic efficiency, taking inspiration from Dr. Maldonado’s previous blended wing body aircraft research. The first goal of this NASA project is to test the concept in a wind tunnel to compare it with a baseline design. The second part will involve noise tests of a fan-blade design with an elliptical shape similar to a maple seed, which has more area in its midsection and can spin more slowly for the same thrust, reducing noise. The project will involve tests of a standalone 10-blade ducted fan in an anechoic chamber.

Professional Excellence at Texas Tech Mechanical Engineering

In 2022, Dr. Jeff Hanson, a Mechanical Engineering Instructor at Texas Tech University, was among the distinguished recipients of the Professing Excellence award. This formal ceremony was established in 2002 by the University Student Housing as a way to honor instructors and professors who have significantly contributed to the academic success of students residing in the campus dormitories. For nearly two decades, Dr. Hanson has been teaching students from freshmen to seniors, earning a reputation as an accessible, fair, rigorous, compassionate, and student-focused professor. His commitment to teaching is evident not only in his students’ achievements but also in the positive feedback he receives. With more than 17 years of industry work experience in Management, Manufacturing, Robotics, Sales, and Industrial Engineering, Dr. Hanson brings a unique perspective to his classroom instruction. He draws on his extensive background to provide his students with a comprehensive understanding of the material presented. Additionally, for the past eight years, he has served as the Engineering Faculty Liaison during the summer study abroad program at the Sevilla Center in Spain. One of Dr. Hanson’s passions is to help students who struggle with their coursework. He devotes a significant portion of his time to tutoring students who seek his guidance. His office is often filled with students who are waiting for his assistance, regardless of whether they are enrolled in his classes. Dr. Hanson’s dedication to teaching and inspiring students to pursue their passion for engineering is commendable.
Jazmin Cruz is a first-generation college student and native of Lubbock, currently teaching Finite Element Analysis Lab as a part-time graduate instructor in the Mechanical Engineering department. As a junior at Texas Tech, she attended a job fair and landed a position at Johnson & Johnson in St. Angelo, where she gained experience in the medical field in engineering, performing quality assurance. During her time at Johnson & Johnson, she was mentored by Mary Flora, who encouraged her to go to graduate school and explore the healthcare engineering route. Returning to Texas Tech, she started by tutoring and mentoring mechanical engineering students with learning disabilities at the Techniques Center, which sparked her passion for teaching. She then pursued a Ph.D., with research focusing on multiscale modeling of the lumbar spine during manual material lifting tasks, using motion capture, muscular skeletal modeling, and finite element techniques. Jazmin’s passion for mentoring and research led her to cofound LatinX Biomechanix, a non-profit organization that provides opportunities and community for Latinx people. Even though Jazmin’s love for teaching is still there, she is set on furthering her skills as a researcher, which led her to become a post-doctoral research associate with the Air Force Research Laboratory in Ohio. During this next step, Jazmin will get access to top-notch equipment, gain grant writing experience, and expand her research horizons. Jazmin’s journey from a first-generation student to becoming an instructor and researcher is inspiring. Her passion for teaching and research, as well as her desire to give back to her community, will undoubtedly make her an excellent mentor and leader in the future.

Stefania Chirico Scheele is currently pursuing a Ph.D. in Mechanical Engineering with a concentration in Additive Manufacturing in the Food Industry (3D Food Printing), with an expected graduation date at the end of Spring 2023. She has been working at the M3D Lab at Texas Tech University with Dr. Paul Egan since Spring 2019, and more recently has served as a Graduate Part-Time Instructor for the Mechanical Engineering Department since Summer 2022. During her Ph.D., she published 2 journal articles, 3 conference-proceedings papers, 1 book chapter, and gave 2 invited talks: one at Purdue University, and another at Santo Domingo Institute of Technology. Her main research area is 3D Food Printing, which examines additive manufacturing processes, mechanical testing, engineering design, and user studies. Stefania’s research aims to explore the 3D food printability of various design features and assess how well they print through quantitative and qualitative measurements. This includes measuring consumer response to design complexity, taste, and print fidelity, and investigation of the effects of various additives on the printability, food mechanics, and consumer ratings when using various food base materials. Stefania is originally from Caracas, Venezuela, and moved to the United States in 2014 to pursue her bachelor’s degree. When not doing research or teaching, you can find her dancing, playing sports, or cooking. She assisted in reinstating MEGA (Mechanical Engineering Graduate Student Association) and also runs the Venezuela Student Association at Texas Tech University.
STUDENT ORGANIZATIONS

Robotics & Advanced Tech Society (RATS)

For the Robotics & Advanced Tech Society (RATS), free education in robotics and technology is at the forefront of their core values, and that is why they are the only TTU organization on campus that provides completely free access to hands-on engineering and robotics to students from all disciplines. They also allow students to accelerate their learning beyond the pace of the degree program; for example, rather than waiting until senior year to get access to the manufacturing facilities on campus, RATS allows their members to access them free of charge from even freshman year. RATS is currently working on several technical projects. One of the projects is a food delivery robot that will be able to pick up dining orders from any dining location on campus and deliver it to any specified location on campus. From a technical perspective, this requires the robot to be able to map out the campus to determine its current location in regard to buildings and structures, avoid hitting any objects or obstacles, and be mechanically structural in such a way as to resist flood damage or external battery. This robot is intended to be utilized all over campus for years to come as a food delivery system for dorm students. RATS also hosts several major events including RoboWars, a 12-hour competitive robotics event where students are provided with endless hardware to build and program robots to climb stairs, traverse obstacle courses, battle bots, and more for up to $1,000 in prizes.

Red Raider Racing

Red Raider Racing builds a Formula-style car every year to compete internationally every May. They allow any Texas Tech student to gain engineering experience, providing early engineering experiences. Red Raider Racing is in the process of assembling the 2023 car! The chassis is fully welded, and components are starting to be installed in the car. The team is currently all hands on deck for the manufacturing process of the Aerodynamic package. In May, they are hoping to make it to competition up north in Michigan. They drive with about 15 team officers/members to Brooklyn, to race at the Michigan International Nascar speedway, where the competition is held.

ALUMNI CORNER

The TTU Alumni Association Clear Lake Chapter was established in the last 7 years and uniquely has had three presidents that are ME graduates. Enrique Garza (BS, 1990) has worked as a senior reliability manager in various industries including power, petrochemical and midstream oil and gas. Enrique currently serves as the scholarship chairman and is a five-year trustee of the Clear Lake Chapter and former president. Ryan McCabe (BS, 2012) is a native of League City and has worked in the petroleum refinery industry, including roles in capital projects and reliability supervision. Jennifer Bell (BS, 1997) is a native Houstonian who attended Clear Creek High School in League City. She is serving as the Chapter’s current president. Jennifer is also a member of the TTU Engineering Key Society. Even more unique is Jennifer and Ryan both attended Clear Creek High School but Jennifer graduated about 20 years before Ryan!
Mechanical Engineering Graduate Student Association (MEGA)

MEGA, The Mechanical Engineering Graduate Student Association, aims to have two main branches of development for the ME graduate student body: social and professional. The main activity to encourage social development is an end-of-semester cookout held every spring and fall semester. MEGA invites students and professors to join them for an afternoon of free food, where they can mingle and learn about the work being done by other students/labs to spark interest and strengthen the bonds in the department. In tandem with this, MEGA also aims to develop its members’ professional abilities. The culmination of this effort is an annual poster competition starting this spring, where students will have the opportunity to learn how to build a poster and present a condensed version of their work. The MEGA leadership team intends for this to encourage interdisciplinary conversations between students and advisors. The event will provide a more casual environment for graduate students to learn what questions are important to ask in research, as well as how to answer them. MEGA is currently headed by President Preston Abadie, Vice Presidents Asmaou Ouedraogo and Benjamin Dankesreiter, Treasurer Sadman Labib, Secretary Stefania Chirico, and Outreach Chair Joseph Micus.

Pi Tau Sigma

Pi Tau Sigma (PTS) is the International Honor Society for Mechanical Engineers. PTS members are chosen on a basis of sound engineering ability, scholarship, service, leadership, and integrity. Junior and Senior Mechanical Engineers in the top 25% of their respective classes and who have taken or are currently taking Solids are invited to apply to be accepted as initiates. Students who are eligible to join will receive an invitation to apply in their email at the beginning of every long semester. The purpose of this organization is to strive to create better engineers through commitment to academic excellence, dedication to service, and promotion of fraternal bonds between its members. Additionally, this organization, often working with other engineering societies, serves to provide professional development and networking opportunities with PTS alumni and several prominent companies in the industry. Although Pi Tau Sigma members are accepted on the basis of academic merit, they cordially welcome MEs from all backgrounds and interests who meet their requirements. PTS is a family that is united by high ideals for the engineering profession and supporting the attainment of individual professional goals.

American Society of Mechanical Engineers (ASME)

On February 23rd and 24th, the Texas Tech University student chapter of the American Society of Mechanical Engineers (ASME) took 18 students and faculty to Arlington, Texas, and Abilene, Texas to tour several plants courtesy of Texas Tech alum. The morning of the 23rd they toured a General Motors assembly plant. After learning about the nationwide coverage of GM and how their business operates, the group got to see the production line of their vehicles and the extensive process of stamping, to chassis, to final assembly, seeing a new Tahoe, Escalade, or Suburban roll-off the line every 52 seconds. Following this, the group joined the numerous Texas Tech Whitacre College of Engineering Alumni working for Lockheed Martin in Fort Worth for a presentation on the work they do and the different fields of expertise there are for mechanical engineers. Students were then taken to see their production area to see some projects come to fruition and learn about the different design stages and complications they deal with. Finally, leaving Arlington on the 24th, the group stopped in Abilene to visit Rentech, the leading supplier of water tube boilers nationwide. Here they got the chance to see the massive amount of machinery and expertise needed to design and assemble industrial boilers, as well as the large customer base Rentech services. This gave the students an interesting perspective to see the huge difference between highly automated factories compared to a business that completely relies on one-off, hand-built structures.
Undergraduate students and faculty visiting Rentech facilities as part of the American Society of Mechanical Engineers trip.