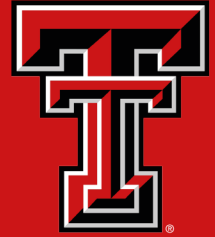


MECHANICAL ENGINEERING



Innovate & Create





CHAIR'S MESSAGE

Song-Charng Kong, Ph.D.

*Department Chair, Don Kay Clay
Cash Endowed Chair*



The Whitacre College of Engineering hosted the Distinguished Engineers Award celebration on May 6, 2022. We are most proud that one of this year's two recipients is an ME graduate and the sole Young Distinguished Engineer Award recipient is also an ME graduate. Our program has a rich history of delivering value to students. We will continue to educate students to be excellent at fundamentals and able to work with others in solving problems. As the world changes and problems become complex, our graduates can adapt, think critically, and provide solutions.

I am privileged to serve as ME department chair – I started this position in January this year. We promise to provide high-quality education to students, regardless of the mode of delivery. By keeping our promise to students, we will cultivate a better faculty-student relationship, build a community of scholars, create an attractive environment, and grow our program with quality.

We have all returned to campus; classrooms are at their total capacity! In this issue, you will find that the faculty continue to excel in their fields of research and students have enthusiastically resumed their on-campus activities. Nonetheless, there are challenges in motivating students in classroom learning environments after the recent disruption. But one thing is for sure: ME continues to be the most popular major at Tech and we will continue to deliver value to students and enrich their educational experience.

Mechanical Engineering by the number

- 691 Undergraduate ME students
- 829 Foundational mechanical engineering students whose goal is to be accepted into ME; some have started taking the beginning ME courses
- 76 Masters students
- 69 Doctoral students
- 28 Tenure-track faculty
- 7 Instructional faculty

DISTINGUISHED ENGINEERS

*Jerome D. Hall "Joey",
B.S. Mechanical
Engineering, 1989*



*Mark Olsen, B.S. Me-
chanical Engineering,
2009*



GET TO KNOW OUR STUDENT ORGANIZATIONS

Get to know the Mechanical Engineering clubs, RAS, ASME, and RATS, their story, and their future projects.



FACULTY STORIES

Dr. Pantoya, director of the Combustion Lab, joined the ME department at Texas Tech in 2000, and this year she celebrates the 22nd anniversary of the lab.



RESEARCH INNOVATION



Dr. James Yang receives grant to study the impact of parachute opening shock on paratroops.



Dr. Ming Chyu closes the gap between healthcare and engineering

Focus on New Faculty

The ME department welcomes four new faculty members this year



Zhongkui Hong, Ph.D.

Associate Professor

Dr. Hong joined the department from University of South Dakota where he was a tenured associate professor. His research is focused on biomechanics in cardiovascular diseases, and mechanics in biomaterial design and

tissue engineering. Dr. Hong's research has been funded by the American Heart Association, National Institutes of Health, and National Science Foundation. His research and teaching have been recognized with the 2021 University President's Award for Research Excellence, one of the highest honors at the University of South Dakota, and the 2022 Richard and Sharon Cutler Outstanding Faculty Award from the College of Arts and Science for promoting liberal arts education at the University of South Dakota.

Haiwen Ge, Ph.D.

Associate Professor of Practice

Dr. Ge is appointed Associate Professor of Practice effective of fall 2022. His research is focused on computational fluid dynamics, combustion, multiphase flow, internal combustion engines, respiratory flow, and optimization. His goal is to develop accurate mathematical models for complex reacting and multiphase flows, create efficient optimization methods for engines, and reveal the fundamental mechanisms of thermal fluid phenomena. He teaches courses related to thermal fluids and numerical methods. His awards and recognitions include SAE Forest R. McFarland Award, SAE Outstanding Oral Presentation Award, and Most Influential Faculty Member by TTU College of Engineering. Currently, he is the chair of SAE General Powertrain Development Committee, and Executive Committee Associate of ASME Internal Combustion Engine Division.



Zeeshan Ahmad, Ph.D.

Assistant Professor

Dr. Ahmad's research is focused on the design of functional materials and interfaces for energy storage and conversion. The research aims to advance renewable energy and electrify transportation through first principles understanding and design of materials for batteries and solar photovoltaics. He develops a combination of theory, computation, and data-driven methods to accelerate the design of functional materials and interfaces for solid-state lithium metal batteries. He received numerous awards including the Institute Silver Medal at IIT Delhi, the Bushnell Fellowship in Engineering and the Phillips and Huang Family Fellowship in Energy at Carnegie Mellon University.

Tanushree Roy, Ph.D.

Assistant Professor

Dr. Roy aims to build a resilient future for human-centric smart cities. The high level goal of such smart cities is to provide better value of services by optimally using the available resources, minimizing the operational cost, maximizing the safety and security, and improving quality of life. Her current research is focused on the resilience of socio-technical systems, such as smart transportation and energy storage systems. She combines control theory, mathematical modeling, and machine learning to ensure the safety and cybersecurity of such human-centric smart city infrastructures.



HOMEcoming

Many Red Raiders have already marked this date on their calendars – October 22, 2022; TTU vs. West Virginia. The department also welcomes you back to campus on that weekend. We will host the Industrial Advisory Board meeting on October 21. The Board is chaired by Mark Olsen and meets once every semester on campus to provide advice to the department on curriculum, research, and fundraising. The Board members will meet with students for dinner on October 20. Meanwhile, the ME Academy, chaired by Jimmy Powell, also stays active and interacts closely with the department leadership.

Distinguished Engineer 2021

Jerome D. Hall, Jr. "Joey" grew up in Amarillo, Texas. He began his oil and gas career while attending Amarillo College when he applied for what he thought was a drafting job at Mesa Petroleum; however, it turned out to be a job in the mailroom. He continued his part-time roles in the mailroom and later as a maintenance man for the remainder of his time in Amarillo College and during summers and weekends while he attended Texas Tech. Joey was a first-generation college student and graduated in 1989 with a BS in mechanical Engineering.

After graduation, he moved back to Amarillo to continue his career with Mesa Petroleum as a Building Engineer. In 2010 he moved back to Texas to be Vice President of the Eagle Ford Asset Team where he was responsible for all of Pioneer's activities and was promoted to Sr. Vice President of South Texas. He is an honorary member of both the Petroleum and Mechanical Engineering Academies at Texas Tech. He serves on the Dean's Council for the Whitacre College of Engineering and is a board member for Dallas Area Habitat for Humanity.



Research Creativity



Michelle Pantoya, Ph.D.

*J. W. Wright Regents Endowed Chair
Professor &
Director, Combustion Lab*

This year, Dr. Pantoya celebrates the 22nd anniversary of the Combustion Lab. With their grant funding growing and many graduate students involved, the Combustion

Lab has been very successful. She has published over 200 archival journal publications with graduate or undergraduate students as the first author and several children's books

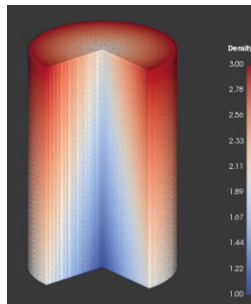
introducing the engineering design process to young kids (Designing Dandelions, Engineering Elephants, and Optimizing an Octopus). Throughout the years, Dr. Pantoya has been awarded many prestigious awards including the US Presidential Early Career Award (PECASE) and the DoD Young Investigator Award. She is also the director of the growing STEMS Consortium.

Her group's vision is to promote the development of safer and more effective energetic materials through formulation development and rigorous combustion characterization analyses. Her group receives research grants from various federal agencies, particularly Department of Energy and Department of Defense.

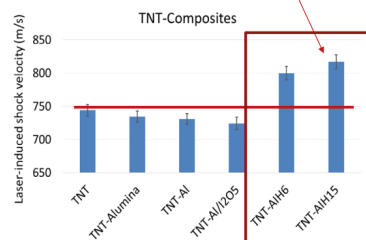
Recent Projects

Among the most recent projects conducted by the lab, we can see a lot of creativity and passion from our students. The groundbreaking research is based on new directions for improving fuel particle combustion. One focus is on using surface chemistry from the alumina shell passivating an aluminum particle to increase energy release rates, sponsored by the Army Research Office. The other focus is to alter the stress state within the core-shell aluminum particle towards greater reactivity, sponsored by the Office of Naval Research. We have also expanded our projects to synthesize and characterize energetic material reactivity for mission needs, sponsored by the Department of Energy and Department of Navy. Other research projects are to characterize the penetration and impact events of structural reactive materials (Air Force Research Lab), develop ad-

vanced combustion characterization diagnostics (DOE, DoD, Industry), and develop technologies to print materials with functionally tailored density gradients (Army Research Lab).



30% Increase in TNT Performance



React on a time
scale relevant
to a detonation
event

Young Distinguished Engineer 2021



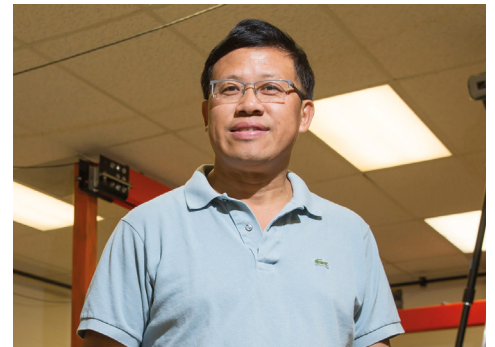
Mark Olsen began his career as a drilling engineer, providing technical support for both onshore and offshore drilling operations within the United States. Three years into his career, Mark leveraged his technical knowledge to negotiate a \$100M rig contract for an exploration venture in the Middle East. He then served as the lead engineer for an offshore platform in Sakhalin, Russia where he drilled the world's longest oil and gas well (42,650 ft) and drilled ExxonMobil's first multilateral well. Mark later moved to the Production Company

where he supervised a team of engineers to optimize oil and gas production for dozens of assets across eight different countries. Since his graduation, he has remained active in the Whitacre College of Engineering, supporting student development through meaningful, educational experiences. Mark has been an active member of ExxonMobil's recruiting team at Texas Tech for over 10 years and has placed dozens of students into internship and full-time positions within his company.

James Yang receives grant to study the impact of parachute opening shock on paratroops

Dr. James Yang, a professor of Mechanical Engineering, recently received a \$450,000 grant from the U.S. Army Medical Research and Development Command (USAMRDC) to model the biometrics of parachute opening shock. The focus of his project is to study what happens inside the human body during parachute opening shocks. His goal is to develop a multiscale human model to conduct biomechanical analyses where they can study the parachutists' potential injuries during this action, seeking the improvement of capabilities and safety of these operations. The results will be used by instructors and developers to prevent, reduce, screen, and diagnose musculoskeletal injuries in

military free-fall parachute jumps. His research is designed to lower injury rates in paratrooper's bodies, but this is not the only project in mind. "Later we'll do other aspects," Yang said. "The DOD is interested in what happens from the time soldiers jump out to the landing, so this is just the first project we will be working on." Yang's research is part of a larger effort by the U.S. Army Aeromedical Research Laboratory (USAARL) and the U.S. Army Research Institute of Environmental Medicine (USARIEM) entitled "Parachute Health Hazard Effects." "Our soldiers are our most important asset," said Song-Charng Kong, chair of the Department of Mechanical Engineering. "Dr. Yang's



research will mitigate the health risks in parachuting and provide additional protection to our soldiers. The health benefits to the soldiers go far beyond their military careers. The impact of Dr. Yang's work is tremendous."



Dr. James Yang with his new PhD graduates – Qihong Cui (left) who will be working at Collins Aerospace and Amanda Oliveira (right) who will be an assistant professor at Oklahoma State University. In Dr. Yang's 14 years at TTU, he has graduated 11 PhD students, and three of them have become tenure-track faculty in peer institutions.

In the academic year of 2022 (including Fall 2021, Spring 2022, and Summer 2022), the mechanical engineering department awarded 246 BS, 26 MS, and 7 PhD.

The Pioneer in Healthcare Engineering



Ming Chyu, Ph.D., P.E.

Professor and Coordinator of M.Eng. Healthcare Engineering Option

This is a year of reward for Dr. Chyu who is featured in the Top 100 Innovators and Entrepreneurs Magazine due to his accomplishment in healthcare engineering. Dr. Chyu is also recognized as

the Pioneer in Healthcare Engineering in the cover story of the Exeleon Magazine. In addition, he is one of the top five dynamic leaders in healthcare recognized by CIO Times, a respected magazine in the international business world.

Dr. Ming-Chien Chyu, Founding President of Healthcare Engineering Alliance Society (HEALS), is one such erudite personality who has been bridging the gap between healthcare and engineering for over 15 years. "Engineer-

ing has been playing a crucial role in serving healthcare, bringing about revolutionary advances in healthcare. Many healthcare problems have benefited from engineering solutions, while many advancements in healthcare stem from breakthroughs in engineering/technology. Healthcare engineering encompasses engineering involved in all aspects of healthcare," mentions a passionate Dr. Chyu.

A transformational leader in every right, Dr. Chyu spearheads over 15,000 members and followers in a quest to bridge the gap between healthcare and engineering, advancing the industry, and promoting collaborative and innovative exchanges between the two domains. As an engineering professor, Dr. Chyu helped many of his students explore job opportunities in the healthcare industry. In doing so, he has realized that there is a deficiency in the current engineering curricula and students should be trained to work in healthcare. Due to this, he began exploring the industry of healthcare and introduced several programs that would tackle this burgeoning deficiency.

Professor to Lead Pathway Toward Global Engineers Program

Dr. Stephen Ekwaro-Osire, a professor of mechanical engineering, received a five-year, \$816,392 grant from Jimma University in Ethiopia to help lead the institution's Pathway Toward Global Engineers program. "This grant was motivated by the pandemic disruptions, and there are two objectives," Ekwaro-Osire said. "One is to increase the capabilities and quality of the undergraduate engineering students from Jimma University. The second is to increase the capacity – meaning the faculty, the facilities, everything – to offer high-quality engineering programs." Ekwaro-Osire will work with professors and administrators at Jimma University as well as local industry members and stakeholders during this process.



*Stephen Ekwaro-Osire, Ph.D., P.E.
Professor*

"We aren't going to be physically teaching classes," Ekwaro-Osire said, "but we will conduct workshops for faculty and administrators on how to do certain things and, with other additional interventions and collaborations, a shift in the educational paradigm will be facilitated." Jimma University's purpose is to have a program that is shock responsive. With 12,000 students, 13 engineering bachelor's degree programs, and 1,000 undergraduate engineers a year, this is a challenge that they are excited about. Lloyd Heinze, a professor in the Bob L. Herd Department of Petroleum Engineering, also is involved and sees the opportunity for Texas Tech to recruit potential graduate student candidates for our college.

Advancing the Cause

Hands-on and teamwork are essential traits of TTU ME graduates. In the past few years, we have received donations to renovate the Feltz Controls Systems Lab, Rentz Family Materials Testing and Metallurgy Lab, and McDermott Advanced Manufacturing and Prototyping Facility. But the Thermal-Fluids Lab remains to be upgraded. This lab has served the student community well, but most of the equipment is decades old, and the room also requires a renovation. The upgrade will revitalize the traditional strengths of the lab and incorporate a modern interdisciplinary approach to energy transfer and conversion, propulsion and power, and bio-inspired thermal systems. The department has been working with the college's development office for fundraising and would welcome your general contributions. Other areas of need also include undergraduate student scholarships for financial emergencies and renovations for a large lecture hall and the graphics and visualization classroom.

Student Organizations

RATS

The Robotics and Advanced Tech Society is the leading robotics and engineering organization on campus, focusing on providing hands-on engineering access to all students without any high costs or dues. We want to promote STEM education and its growth to all disciplines through the research, design, innovation, and creation of teleoperated and autonomous robotics and other advanced technologies. RATS has accumulated sponsors and partners within several departments across campus, including the Whitacre College of Engineering, TTU Athletics, the Davis College, the College of Media and Communication, and more. This interdisciplinary nature is at the heart of RATS as it highlights the differences and unique characteristics of our members; we have brought in more than just engineers, but business, English, and kinesiology majors.



RAS



Raider Aerospace Society is Texas Tech's premier aerospace and aeronautics organization. Founded in 2016 by students from the Edward E. Whitacre, Jr. College of Engineering, the mission has been to provide students an opportunity to explore and gain experience in the fields of aerospace and aviation. This mission is accomplished through the participation and sponsorship of multiple aerospace-related projects led by students throughout each academic year. In addition, RAS aims to create a community among engineering students to allow for professional, academic, and personal growth. RAS continues to establish lifelong relationships among students and alumni.



ASME

American Society of Mechanical Engineers is an educational and technical society whose main concern is the in-depth coverage of mechanical engineering technology and its interpretation to the general public. As a student section, ASME serves as a link between the university and the professional community. Specific purposes of this society are to promote the art, science, and practice of mechanical and multidisciplinary engineering and allied sciences to diverse communities throughout the world. This society also aims to encourage original research, foster engineering education, promote the exchange of information among engineers, students, and others, and broaden the usefulness of the engineering profession in cooperation with other engineering and technical societies.





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Red Raiders at SpaceX



On March 4, 2022, the American Society of Mechanical Engineers took a trip to the McGregor SpaceX Rocket Development Facility to tour the grounds and witness some test fires up close. Details and pictures of the trip are limited at request of SpaceX.