I am very delighted to present you with this 2015 newsletter from one of the most-dynamic and fastest-growing departments at UNT. During the 2014-2015 academic year, we continued our path to offer the quality degree programs in ABET accredited Bachelor of Science in Mechanical and Energy Engineering (MEE), and Master of Science. In addition, we successfully established, in October 2014, a brand-new Ph.D. degree in MEE, a first of its kind in the nation. MEE graduated a record number of students in Spring 2015. Two new faculty members, Drs. Kyle Horne and Weihuan Zhao, have joined our department. In this newsletter, you will be able to glance at some of the exciting news and highlights from our faculty and students. Their academic and research achievements made all of us proud of being a MEEN Green “associate”, a person associated with the success of Mechanical and Energy Engineering programs at UNT.

Best regards,

YONG X. TAO, Ph.D., P.E., Fellow ASME
PACCAR Professor of Engineering
Director of PACCAR Technology Institute
Distinguished Research Professor
Greetings from UNT! The 2014-2015 academic year was full of exciting news for our MEE Undergraduate program. We saw our enrollment increase to a record number of 608 students and we awarded Bachelor of Science degrees to 92 students. Design Day was a huge success with 21 design teams showcasing their projects and prototypes. Projects ranged from Raytheon’s rocket nozzle optimization project to the Society of Automotive Engineers Formula 1 car.

Bike Helmet team

Team AD ASTRA

MEE students were also involved in several competitions throughout the year. Design team AD Astra placed 2nd top overall team at the NASA Texas Space Grant Consortium Design Challenge for its design project, Novel Air Revitalization Approach. The Bike Helmet team was selected as one of the top three finalists from the North American region to compete in the 2015 International Student Safety Technology Design Competition in Sweden. We are also very proud of the accomplishment of Alyssa Sylvester. Alyssa was one of 8 students accepted from the U.S. into the competitive NASA Aeronautics Spring 2015 Academy at the Langley Research Center, a 16-week interdisciplinary program.

Summer 2015 was a summer of learning and travel for 6 MEE undergraduates. As part of their Alternative Energy Sources elective course, the students traveled to Tongji University in China as part of a field trip to study green buildings and renewable energy. In addition to this unique elective course, we have also added new elective courses such as Geothermal Heat Pumps and Experimental Design in Engineering to our course catalog.

We are proud of the success of our students and faculty members. Thank you for being part of our MEEN Green family!
Joe Solis, a former contract welder, enrolled in the MEE program in the fall of 2012. A year later he was offered an internship with Luminant Energy. During his internship, he worked in the equipment repair department. Through this internship, Joe witnessed firsthand the importance of equipment repair specialists and the procedures that must be followed in the disassembly and reassembly of pump components. Joe’s dedication and work ethic prompted Luminant Energy to hire him upon graduation. He now currently works as a staff engineer in asset management reliability where he uses high-level statistics to calculate the reliability of components such as boiler feed pumps and combustion turbines. He also serves as a Project Manager to support gas plant operations. Joe graduated with his Bachelor of Science in Mechanical and Energy Engineering in Spring 2015.

I attribute my success in my career to the education and experience that I received while attending the University of North Texas. The student-to-professor ratio enables the students to have a more one-on-one relationship.

Sarah Forester is currently a senior in the MEE program. She serves as the President of Pi Tau Sigma and the Vice President of the Society of Plastic Engineers. She also is a member of the Society of Women Engineers and the American Society of Mechanical Engineers. In addition to her coursework and activities with the engineering organizations, she also works in the LAPOM plastics lab. Her main task in the lab is creating and testing an inexpensive alternative to nylon using different engineering plastics and ceramic fillers. In addition, she teaches new students how to use lab equipment, edits research papers before they go to publishing, and works on proposals to create shape memory alloy and plastic composites for various applications. After graduation she plans to go to graduate school for a M.S. degree in materials science and then possibly continue on to a doctorate.

Outstanding Awards

Award for Outstanding Undergraduate 2015 – Christopher Vorgert and Richard Roberts
Big Rock Oil
Sponsored by Big Rock Oil Company
Team members - Billy Davis, Joseph Medrano, Benjamin Erickson

Team Capstone
Sponsored by: Capstone Metering, Inc.
Team members - Aaran Barnes, Russel Elliott, Crystal Gilstrap, Mike Mielcarek

SAE Drivetrain Team
Team members - Ariel Jackson, Robert Jones, Trent McInturff, Travis Rigsby

ASME Human Powered Vehicle
Sponsored by: Eagle’s Nest
Team members - David Bounds, Xavier Carr, Nadiyah El-Amin, Michael Hartzler, Sara McNutt

The Mean Green Energy Efficient Building Simulation
Team members - Yovani Hernandez, Alejandro Hernandez, Zachary Lowe

Music Box
Team members - Austin Taylor, Thomas J. Estrada

Team Ghost Pepper
Sponsored by: Peterbilt Motors Company
Team members - Christian Elliott, Chad Goucher, Khemachart Kheawlang, Alan Zuefeldt

Isolated AC System
Sponsored by: Peterbilt Motors Company
Team members - Taylor Bontz, Josiah Bujanda, Christopher Hubbard, Adam Mengestab, Edgar Vazquez

Raytheon Rocket Nozzle Optimization
Sponsored by: Raytheon Space & Airborne Systems
Team members - Michael Stoddard, Christopher Vorgert, Eric Anyanwu

Thermal Expansion Storage
Team members - Don Magedara, David Paul Palmer, Ricardo Hevia

Scuba L.E.A.P
Team members - Andrew Dean, Nathan Ley, Louis Judge, Evan Judice

Friction Stir Welding of Dissimilar Materials
Team members - Mohammed Aljoaib, Hassan Alwesaibi

Evaluation of Vehicle Performance of Non-Pneumatic Tires
Team members - Sonam Sherpa, Amir Poudel, Soksan Sor

MG Ti Engineers
Sponsored by: Center for Friction Stir Processing at UNT (CFSP)
Team members - Michael Frank, Alex Gallegos, Kaongou Temedjong

Modification of a Treadmill
Sponsored by: UNT Kinesiology Department
Team members - Dana Chesley, Rachel Mahlow, Hallie McDonald

S.E.E Venturi System
Sponsored by: West Texas Fabrication
Team members - Marco De Lira, Raul Canales, Joe Solis

Deployable Ozone Guardian
Team members - Andrew Hull, Kassra Mahjoubi, Brittani Powers, Raul Soberanes

NHTSV ESV Competition
Team members - Travis Beamon, Holly Gage, Celena Lipscomb, Leannah Nichols

Cellular Phone Functional Testing Device (CPFTD)
Sponsored by: Genco
Team members - Kevin Berry, Idris Ali, Osaretin Usiagu, Shahan Hameed, Omar Montemayor

Formula SAE – Suspension Team
Team members - Jonathan Bowman, Tyler Newbold, Julian Quinterro, Alec Wells

Team Hydra
Sponsored by: Center for Friction Stir Processing at UNT
Team members - Jacob Acosta, Michael Billups, Michael “John” Luke

Thermal Expansion Storage
Team members - Don Magedara, David Paul Palmer, Ricardo Hevia
I am very much delighted with this opportunity to deliver a special message to all graduate students in the Department of Mechanical and Energy Engineering. Beginning this semester, I take a responsibility as a new graduate advisor, ready to serve in all aspects of graduate matters. In times of growth, I recall the time of the foundation of this department. As a founding member of the MEE Department, I have committed to establishing a good education and research program at UNT.

Every year or semester, we as a faculty make the same commitment, to not make the same mistakes. Likewise, as a new graduate student, you surely make a commitment to succeed in your academic life by working hard in class and producing good results in your research. I suggest herein three tools with which you can be successful in academia. When these tools become fundamental habits, they provide an effective means to find success in your academic life. As I say below, consider evaluating your personal use of each tool and determine how you could make better use of each one of them.

The first tool is ‘plan’. ‘Choose’ to converse with your graduate and research advisor to make a plan towards your graduate degree, either a MS or Ph.D. degree. Make time to share your concerns and thoughts about the progress of your degree. The first step will be to complete the degree plan by the specified time indicated in the graduate handbook. The second tool is ‘execute’. Absorb the teachings of faculty during the class. You may need to reorganize your priorities to provide time for the study of a scientific and engineering discipline. If so, ‘just do it’. The third tool is ‘follow up’. I encourage you to remember your original commitment continuously and go back to check your status to make sure you are on the right track.

Dr. Cherish Qualls received a promotion to Senior Lecturer and Director of Undergraduate Affairs this year. A few of the courses she teaches for the Department are Systems, Dynamics and Controls, Programming for Mechanical Engineers, Aerospace Fundamentals, Fluid Mechanics, and Dynamics.

Dr. Xiaohua Li received a promotion to senior lecturer and department adviser this year. He also teaches courses for the Department in Mechanics 2, MEE Lab 1, Analytical Methods.
Changlei Xia is a Ph.D. candidate in Mechanical and Energy Engineering. He obtained his B.S. (2007) and M.S. (2010) degrees both in polymer science and engineering from University of Science and Technology of China (Hefei, Anhui, China). He started his Ph.D. from summer 2012, advised by Professor Sheldon Q. Shi.

His research focus is on renewable bio-products from biomass. His research activities include: 1) activated carbon from biomass through the self-activation process; 2) high-performance composites made from kenaf fibers; and 3) soy protein isolate based films manufacturing. During the Ph.D. study at UNT, he has made great achievements under the supervision of Dr. Sheldon Q. Shi. He has published four papers as the first author, four as a co-author, seven manuscripts (first-author), which are in review, and one patent. Additionally, he has been very active in attending professional conferences. He won the 2nd place award for student poster competition at 58th Society of Wood Science and Technology (SWST) international convention in June, 2015.

The awards are presented to outstanding undergraduate and graduate Mechanical Engineering students who are ASME members and are full-time students at the University of North Texas. The awards are intended for students that have distinguished themselves through academic work, participation and contributions to ASME activities and civic activities. Most awards consisting of a check and a plaque have a corporate sponsor. Celena Lipscomb (undergraduate student) and Jiwon Mun (graduate student) received this award as shown in the following picture.


3. Zhiguang Ding, Electromagnetic shielding of iron oxide nanoparticle impregnated kenaf fiberboard (2014)


8. Guo Quan Lim, Evaluation of the Influence of Non-Traditional Sources of Emissions on Ambient Air Pollutant Concentrations in North Texas (2015)


Sustainable and energy efficiency manufacturing is one of the major focuses in the Mechanical and Energy Engineering (MEE) Department. Shi, an associate professor and researcher in UNT’s PACCAR Technology Institute, contributed to the development of the manufacturing technologies for innovative renewable bioproducts. Three years ago, Shi joined UNT as a cluster hiring. Since then, he successfully acquired key equipment through company donations and equipment transfer from his previous lab at Mississippi State University, and initiated a pilot-scale manufacturing laboratory, including a compression molding line, lamination process, mat forming process, and extrusion line. This is a one-of-the-kind bio-based composites manufacturing facility in the country. With this advanced facility, UNT is able to provide a high quality of education, research and outreach in biomass and its utilization. It is expected that a new generation of professionals will be developed to advance the renewable bioproduct manufacturing program.

Shi has been serving as PI and Co-PI for federal projects including DOE, NSF, and USDA. He and his research group have been very active in technology innovations in bioproducts. Thanks to the NSF support, he has developed a novel in situ nanoparticle impregnation technology for natural fibers, from which a variety of functional bioproducts can be fabricated through proper processes. He has been actively collaborating with faculty members within the MEE and other departments, such as Materials Science and Engineering, Electrical Engineering, Engineering Technology, and Biological Science for the development of this group of functional materials. His recently patented technology on the magnetization and self-activation technology for the functional activated carbon from biomass has drawn a considerable amount of attention from the industry. The technology provides a new way to clean water from oil and chemical spills, and may be a revolution for the water cleaning and treatment.

Shi’s recent research on the novel co-pyrolysis technology for the waste tire and waste biomass recycling is attracting attention from prospective companies. The co-pyrolysis with innovative self-activation makes the production of the activated carbon more efficient with high yield, and save the processing cost, while the syn-gases generated are favorable for methanol production.

Shi is an internationally known scholar. He was elected as the President of the Society of Wood Science and Technology (SWST) during 2013-2014, Participating Member of ASTM International (D07 and D14 subcommittees) and APA Standard Committee, Committee Chair of Markwardt Award, Editor of the Board of the International Journal of Environmental Engineering and Natural Resources and ISBN Thermodynamics. He also has been appointed as an Adjunct Professor at Northeast Forestry University, Harbin, China, and Guangxi University, Nanning, China; Ph.D. Dissertation Examiner for Deakin University, Australia, and advisor at the International Center for Bamboo and Rattan (ICBR), Beijing, China. He received an honor as Longjiang Scholar from Heilongjiang province, China in 2011.

Shi is dedicated to international collaboration. In recent years, Shi has been collaborating with international scholars for over 10 joint publications, which has increased the international recognition of UNT. Currently, Shi is partnering with Zhejiang Xinzhou Bamboo-based Composites Technology Co. Ltd. and the International Center for Bamboo and Rattan (ICBR) in developing wrapping technology with natural fibers for renewable piping products.
Dr. Kyle Horne's research centers on computational methods and simulations, both in their application to real-world problems and the theoretical aspects of their numerics. On the application side, he is currently working with both computational fluid dynamics and molecular dynamics simulations. The theoretical analyses focus on the inverse problem for photothermal radiometry measurement systems and uncertainty propagation in both particle-image velocimetry data processing as well as robust sensitivity analysis of molecular dynamics.

One interesting application of computational fluid dynamics is the optimization of thermal/fluid systems, which is frequently required in heating and cooling of both residential and industrial buildings. Dr. Horne has assisted collaborators from the University of Western Hungary with analysis of a fluid/solid heat exchanger in a zero energy building they constructed in Sopron, Hungary. This collaboration included a visit to their lab where his recommendations improved their system’s heat transfer effectiveness by more than ten percent. Some of the lab members in Sopron were surprised to learn that Dr. Horne could speak with them in their native Hungarian language.

Applications of molecular dynamics currently being pursued in Dr. Horne’s lab include simulations of graphene for improved heat egress on solid-state devices and a theoretical examination of stabilization effects observed in nano-fluids from exposure to femtosecond laser pulses. The former simulations rely on conventional interatomic potentials, but the latter are implemented using an electron force field currently under development at Caltech. In both simulations the dynamic equations of motion are solved for all the atoms (and possibly electrons) in the system, with final results computed from statistical properties of the particles’ trajectories.

Horne’s theoretical work on the inverse problem and sensitivity/uncertainty calculations revolve around the application of adjoint methods and automatic differentiation to compute the derivatives of computed quantities with regard to the input values provided to an algorithm. The computational cost of each method differs based on the number of derivatives to compute and the number of final quantities for which derivatives are required, making both methods useful additions to a computational toolbox.

Correlation map for vector computation in particle-image velocimetry and the derivative of the map with regard to input velocity.
Dr. Nandika D'Souza, a Professor of the Department of Mechanical and Energy Engineering, and associate dean of undergraduate studies in UNT's College of Engineering has been named a UNT Regents Professor, a designation for faculty at the rank of professor who have performed outstanding teaching, research, and service to the profession, and who have achieved a high level of national and international recognition. D'Souza is an Associate Chair for Research and Graduate Affairs. Her research interests lie in the interactions and properties of heterogeneous materials, blends, alloys, composites, and nanocomposites. In 2013, she was named a Fellow of the Society of Plastics Engineers.

Nandika D'Souza, has been named the 2015 Society of Women Engineers Distinguished Engineering Educator. The award is presented to educators who make significant contributions to the engineering field.

"The Society of Women Engineers has enabled students and professional engineers to develop the needed leadership skills to complement their educational excellence," D'Souza said. "Being nominated by the Dallas Section of SWE, where I serve as vice president for outreach, and having letters of support from two UNT SWE presidents, Britney Caldwell and Mayaria Johnson, my dean, and a current student was very encouraging.

"UNT SWE past-presidents are leaders in a number of engineering companies, and the current group of officers are poised to build on the structured leadership that the past leaders have enabled," said D'Souza, who advises the student organization. "The future for women engineering students at UNT is bright. Enabling an educational environment where students of all races and genders can fulfill their potential requires a proactive approach from faculty, staff, and students. Ensuring academic excellence and personal confidence in diverse populations can change the demographics of our leaders."

D’Souza has worked with undergraduate and graduate students in the area of failure analysis, viscoelasticity, and material reliability. She is a Fellow of the Society of Plastics Engineers for her contributions to the field of polymers, composites, fibers, films, and coatings. Her teaching and research focuses on mechanics and materials and how best to incorporate them reliably in design. She has recently focused on microelectronic packaging, biomedical surgical mesh, the creation of plant-based building materials, and plant-based carbon fiber.

D’Souza has published more than 160 book chapters, journal articles, and peer-reviewed conference proceedings, and has earned numerous awards, including the UNT Research Leadership Award, UNT College of Engineering Research Award and Vinyl Division Thesis Award from the International Society of Plastics Engineers. She was named the 2009 Engineer of the Year by the American Society of Mechanical Engineers Electronics and Photonics Packaging Division. She received the designation of UNT Regents Professor in 2015.

The Society of Women Engineers was established in 1950 and works to help women achieve their full potential in careers as engineers and leaders, expand the image of the engineering profession as a positive force in improving quality of life, and demonstrate the value of diversity.
Dr. Zhao is a new assistant professor joining the Department of Mechanical and Energy Engineering at University of North Texas. Prior to joining UNT she was a postdoctoral appointee in the Energy Systems Division at Argonne National Laboratory in Illinois for two years. She obtained her Ph.D. degree in Mechanical Engineering at Lehigh University.

Her research areas are in thermal-fluid sciences, including heat transfer, thermodynamics, and fluid dynamics. She focuses on heat transfer and CFD simulations by using programming languages (i.e., Matlab, etc.) as well as the commercial software (i.e., COMSOL, etc.). She is also involved in the experimental research activities in thermal-fluid sciences.

Her research activities include the thermal energy storage system for the concentrated solar power plant (e.g., study on graphite foam-phase change material combination as the storage medium for high-temperature latent heat thermal energy storage system for the power generation in the solar power plant, etc.).

Furthermore, her research also involves thermal management technologies for other electric components, devices, and equipment (e.g. investigate the technology to enhance the coolant cooling capacity by using subcooled boiling of the coolant fluid in the applications for cooling power electronics in hybrid or electric vehicles; investigate the technology to enhance the cooling capacity of the radiator in the heavy-duty vehicles by using evaporation of water, etc.).

List of Grants

Sustainability/Buildings


List of Grants

Sustainability/ Buildings

Energy

Oil and Gas

Education

Mechanics

Microelectronic Reliability
List of Grants

Vehicle & Transportation

1. Evaluation of Coating Powder from Coating by PCD Inc. for Concrete Forming Application. Coatings by PCD, Inc.
   S. Shi. $8,000. 2014-2016.

List of Publications (Book)


List of Publications (Patent)


List of Publications (Book Chapter)


List of Publications (Journal)


List of Publications (Journal)


List of Publications (Journal)


List of Publications (Journal)


William Lee - Aguirre Roden
Tom Babb - Advanced Technology Complex
Carla Ruge - Advanced Technology Complex
Andrew Wong - ARAMARK
Scott Lee - BAE Systems
Rohn Olson - Bell Helicopter
Mike Marvin - Bell Helicopter
Ashley Froisel - CRB Engineers
Jeff Marcel - Denbury
Donald Lampe - Freese & Nichols
Randy Masey - General Dynamics
Lee Green - Goodson Engineering
Finley Ledbetter - Group CBS
Allan Zhong - Halliburton
Syed Hamid - Halliburton

Don Schapker - Lockheed Martin
Russ Blum - Lockheed Martin Missiles and Fire Control
Jeff Starcher - MP2 Energy
John Conroy - Peerless Manufacturing
Majeed Kawar - Peerless Manufacturing
Siva Gopalnarayan - Peerless Manufacturing
Cliff Braddock - Pepco Energy
Jung Han - PepsiCo
Scott Newhouse - Peterbilt
Manmohan Singh - R&D
Matt Breaux - Schneider Electric
Bob Luczkowiak - Siemens
Vikas Gupta - Texas Instruments
Billy Wicker - TXU Energy

Pictured from left to right: Xun Yu, Yong Tao (MEE Chair), Landon Sproull, Cliff Braddock, Allan Zhong, Randy Masey, Don Lampe, John Conroy, and Andrew Wong
The Mayor and City Council Business Awards Breakfast was held on September 11, 2015, at UNT Apogee Stadium Club Level’s Hub Club.

MEE Students in China for Summer Field Trip