THE UNIVERSITY OF TEXAS
PERMIAN BASIN
COLLEGE OF ENGINEERING

College of Engineering

NEWSLETTER | SPRING / SUMMER 2022

FALCON ENGINEERS ARE ANYTHING BUT AVERAGE

UT PERMIAN BASIN STUDENTS AVERAGE PASS-RATE FOR THE FUNDEMENTALS OF ENGINEERING EXAM IS 86% – A RATE NEARLY 10% HIGHER THAN THE NATIONAL AVERAGE.

WELCOME FROM THE DEAN

Dear Students, Alumni, and Friends,

This issue of the Falcon Engineering Newsletter highlights great and exciting ***first*** time accomplishments in The University of Texas Permian Basin (UTPB) College of Engineering. Three engineering programs – undergraduate Chemical, Electrical, and the Masters of Science in Mechanical Engineering graduated their **first** students. Engineering students competed for the ***first*** time in two international competitions - Society of Automotive Engineers Aero Design Competition East and the North American Innovation for Nuclear Competition. For the SAE competition, the UTPB Team received an award in the regular class for the Best Engineering Design for fastest unloading of the aircraft payload, and **top 10 out of 45 institutions** for Most Balls Delivered, Mission Performance, and for Overall Standings. For the 2021 Nuclear competition, the UTPB team, in collaboration with North Carolina State University and Los Alamos National Laboratory, ranked **2nd place** across North America for demonstrating that Neptunium-237 waste not only has an effect of pinching the nuclear fuel cycle but also decreases the nonproliferation risk of this fission product. In addition, UT Permian Basin received ***first, second, and third places*** for their research presentations at the Permian Basin Water In Energy Conference in 2022. These accomplishments are testaments to the quality of our students and faculty, and their contributions to advancing science and technology globally.

In the last two years (2021 and 2022), UT Permian Basin awarded a total of **$1,859,656** in scholarships to engineering students - **$1,007,082** to **274** students in 2021 and **$852,574** to **230** students in 2022. These scholarships includes Presidential Scholarship, Presidential Plus Housing, Freshman and Transfer scholarships, Freshman Falcon 500, and the specific engineering scholarships listed above. These scholarships help to lessen the financial stress on students and the burden on parents to pay for their education. With these scholarships, students may be able to focus more on their studies to achieve scholastic excellence instead of joggling between work and school.

For the ***first*** time, our college of engineering faculty serving as PIs (Principal Investigators) or Co-PIs generated a total of **nearly $8 million in grants** in externally funded projects from the US Department of Education, National Science Foundation, US Department of Defense, ACS Petroleum Research Fund, THECB (Texas Higher Education Coordinating Board), and through industry contracts. Within last past five years, the college of engineering submitted grants worth **$27 million** to expand our applied research and scholarship in engineering. Their work will enhance excellence in STEM education, develop data science in Engineering curriculum, study the phase behavior of emulsion with high particle loading, develop novel theory and computational methods for nano-absorbent materials, and develop oilfield-water treatment methods based on renewable energy sources.

For the ***first*** time, UT Permian Basin Engineering received a donation of software equivalent to $2.5 million. This software is used in petroleum engineering classes to enhance student learning in the areas of oil and gas production systems including reservoir, wells, and the surface network. Our faculty was a recipient of the **Carnegie African Diaspora Fellowship** award by the Institute of International Education, and funded by the Carnegie Corporation of New York. These successes exemplify dedication of our faculty to academic excellence.

Our unwavering commitment to K-12 STEM outreach activities is stronger than ever. For the ***first*** time, the College of Engineering will host the US Army funded **UNITE** program, a four-week, pre-collegiate summer experience for talented high school students. UNITE encourages students to pursue college majors and careers in STEM-related fields through a program of focused, hands-on, rigorous academics, enrichment, and career exploration.

For the fourth consecutive year, we are hosting a two-week XTO Energy Engineering Summer Camp to expose middle school and high school students to various facets of engineering. For the fourth consecutive year, we hosted the FIRST TECH Robotics challenge for middle and high school students. We are expanding our effort to diversify the pool of talented students in our programs through the Girls in Engineering Conference and Engineering Minority Student Engagement Project (EM-STEP).

Finally, the ***first*** faculty member in the College of Engineering, Dr. Forrest Flocker, and Dr. Essam Ibrahim, both professors of mechanical engineering, will retire at the end of this academic year. We are very proud of their contributions to the University.

We hope that these great accomplishments as well as others shared in this issue will offer you reasons to be proud of the impact that your college is making in our community and the nation. Thank you for your support and friendship.

George Nnanna, Ph.D., P.E., ASME Fellow

Dean

STUDENT PROFILES

Nolan Hines

Nolan is the first Master's Mechanical Engineering Graduate from UT Permian Basin, College of Engineering.

His thesis title is Density Functional Theory and Non-Equilibrium Green Function Study on Substitutions Based Z-Scheme Photo-catalytic Materials: The case of TIO2 He graduated with honors from UTPB in December 2019 with his bachelor's in mechanical engineering after competing for four years on the NCAA swim team and participating in the undergraduate research program (SURE). Since then, he has worked in local industry for Gladiator Energy, came back to the engineering department to be amongst the first group of students in the master's in mechanical engineering program started in August 2020. Over the last three semesters, he has worked under Dr. Anveeksh Koneru to complete his master's thesis and is very proud to be the first graduate of the new master's program. He is also working on a bachelor's degree in computer science which he will complete in December 2022. Upon finishing the masters, he will move to a full-time role with Gladiator Energy for the spring 2022 semester.

Laurine Ngouatou and Stephanie Silva

Laurine and Stephanie made history as the first chemical engineering students when they walked across the stage at Fall 2021 Graduation.
They represent the first two graduating students from the Department of Chemical Engineering.

Laurine was born and raised in Douala, Cameroon before moving to the United States. She lived in Mount Prospect, Illinois where she received her associate degree in Engineering before moving to West Texas. "I decided to transfer to UTPB because I was looking for a small school in the heart of the oil and gas Industry." Laurine plans to join The United States Navy as a Nuclear Propulsion Officer.

Stephanie was born in Chihuahua, Chihuachua Mexico but grew up in Midland. She chose UT Permian Basin college of Engineering so she could stay close to home. She plans to stay at UT Permian Basin a little longer while she works on earning a Graduate Certificate in Engineering Project Management

Jaqueline made history as one of the first electrical engineering students when she walked across the stage at Spring 2022 Graduation

Jaqueline Obreque was born and raised in Chile. She came to the United States to join BS (Electrical Engineering) program during Fall 2018 at UTPB. "I decided to come to UTPB because they just started with the Electrical Engineering program and because my sister motivated me." During her stay at UTPB she participated in Semester Undergraduate Research in Engineering (SURE) program to gain experience while being a full-time student athlete. She plans to work as a full-time engineer in the power system field and become a Professional Engineer (PE).

Ankit made history as one of the first electrical engineering students at spring 2022 Graduation

Ankit Bhatia was born and raised in India. He moved to the United States to pursue a degree in Instrumentation & Control Engineering and graduated from OSU (Oklahoma State University) with a Bachelor of Technology degree in 2008. He has been employed with Chevron as an Instrumentation & Control Specialist and have held numerous positions with work assignments in the U.S.A and Africa over the period of last 14 years. He started school at U.T.P.B Electrical Engineering program in 2019 and recently graduated with a B.S degree in Electrical Engineering. He is already applying the knowledge and skills he learned through the program in his daily work in the oil & gas industry. ''The Electrical Engineering degree received will help me progress well in my career''.

STUDENTS INTERNATIONAL COMPETITION

The project objective was to develop a user-friendly and an affordable RC (radio-controlled) airplane for beginner hobbyists all across the Permian Basin. This aircraft participated in the EAST SAE Aero Design competition that was held in Dallas, Texas, on May 22, 2022.

The UTPB Team finished in 8th place for the overall result of over 45 registered international teams. According to SAE officials, no first-time competitors have ever been in the top 10 in the competition's history until now. For the duration of the competition, our designed airplane, ***Enact***, airplane no: F1-200F, Team 033, carried a payload of 3 soccer balls for nine successful flights and added weight of 5 pounds of rectangular cargo for multiple flights. ***Enact*** was the favorite plane for officials, competitors, and judges. She received many commendations.

The results from the score standings for UTPB Team are:

· 2nd Place of 45 International Teams in Regular class for Most Balls Delivered

· 7th Place of 45 International Teams in Regular Class for Mission Performance

. 8th Place of 45 International Teams in Regular Class for Overall Standings

The team is composed of UTPB Engineering students, ***Arashi Shimizu, Ramiro Andujo, Garret Martin***, ***Daniel Soteldo*** and faculty advisor ***Dr. Bibian Ogbuji.*** Below are links for more information about the competition

Video: *https://youtu.be/nL4Z9ud7SMk*
Story: *https://www.utpb.edu/success/2022/06/engineering-sae-aero-design*

North AMERICAN INNOVATION FOR NUCLEAR 2021

Dylan Ohrt, a student at UT Permian Basin College of Engineering competed in the North American Innovation for Nuclear 2021 competition, making it to the second phase. He competed on a team with Madeline Lockhart, a Ph. D. student at North Carolina state University, and Noah Kleetke from Los Almos National laboratory. Together they took second place in the competition for all of North America.

The idea pitched for this competition was for a new and exciting nuclear fuel that they termed NULU. This fuel would utilize Neptunium-237 from spent reactor waste to fuel the next generation of fast energy spectrum small modular reactors. Utilizing the Neptunium waste not only has an effect of pinching the nuclear fuel cycle but also decreases the non proliferation risk of this fission produce. Monte Carlo simulations were performed utilizing Neptunium-237, with the results validating that a mix of neptunium, plutonium, and uranium could be used to fuel a fast reactor. To this end, it was found that the production of this fuel could begin immediately. Piffy backing off existing Mixed Oxide nuclear fuel infrastructure, so that development of this fuel could begin in the near future. Meaning that NULU utilize existing infrastructure for the immediate production of NULU fuel. Providing a cheap, safe and effective fuel for the future of fast energy spectrum nuclear power.

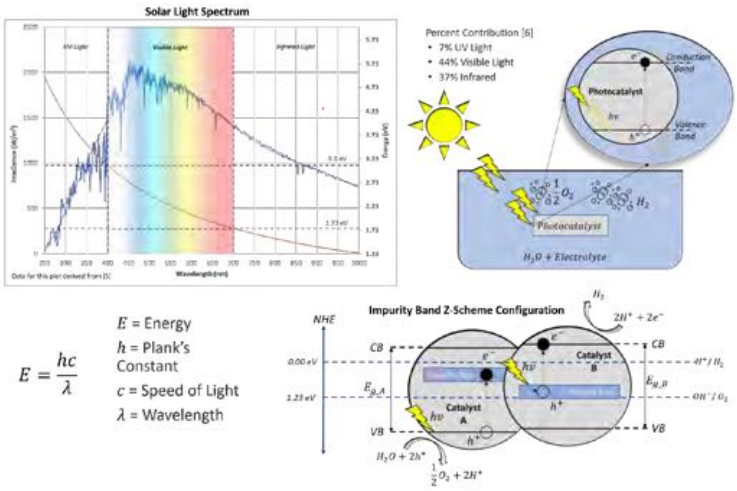
EXPERIENTIAL LEARNING

SEMESTER UNDERGRADUATE RESEARCH IN ENGINEEERING (SURE) POGRAM

The SURE program provides engineering students an opportunity to work closely with faculty and industry professionals on research projects during the academic year. These projects help prepare students for graduate school and the workforce in engineering fields. Participating in research projects prepares students in critical thinking, team-work, and hands-on experience in applying theoretical knowledge gained in classroom to solving practical engineering problems. Students will be exposed to professional development, technical and academic seminars. SURE links undergraduate students with faculty and industry mentors, and introduces them to advanced research tools and database at the frontier of engineering. The SURE program is designed for engineering students that are in the level of Sophomore, Junior, and Senior year with minimum cumulative GPA of 3.0/4.0. Students with GPA lower than 3.0 are encouraged to apply and will be considered for conditional acceptance into the program. They must be enrolled during the semester, and available to work on project for at least one semester. The selection criteria is based on academic record, a statement of purpose for the research project, and recommendation by the faculty member who will supervise the project. SURE program supports hands-on learning through the performance of experiments and cutting-edge research projects into various academic level of UTPB's engineering disciplines of chemical, electrical, mechanical, and petroleum engineering; aerospace and nuclear engineering tracks; and sub-disciplines of Water Energy Nexus and Energy Systems/ Thermo-Fluidics. Within these disciplines, the specific faculty research interests include: hydraulic fracturing fluids; modeling of reservoirs; CO_2 enhanced oil recovery; produced water and wastewater management; water reuse/recycle; nanomaterials-enhanced membrane filtration and desalting of produced water; nano-photocatalyst for advanced oxidation/reduction processes; real-time on-line sensor and monitoring system; rapid spray evaporation and direct evaporation; design of heat exchangers; 2-phase flow; Building Energy Efficiency and Heating, Ventilation, Air Conditioning and Refrigeration (HVAC & R); metal-organic framework cathode materials for Li-ion batteries; fuel cells; Computational Fluid Dynamics; Integrated Computational Materials Engineering; Particle Swarm Optimization Method; and Artificial Intelligence. Projects from the SURE program were presented at the college of Engineering Research Expo.

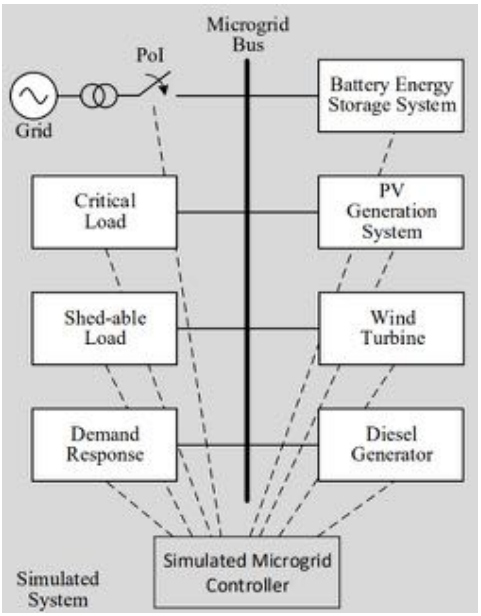
RESEARCH EXPO

The Research Expo was a joint event involving poster presentations from the SURE program students, Graduate students, and all interested participants. In conjunction with the December 2021 Engineering Advisory Board Meeting, Dr Bibian Ogbuji and Dr. Anveeksh Koneru organized the event on behalf of the College. Examples of the research work are shown below:



Nonrenewable methods make up 90-95% of current H_2 production with the majority produced through steam methane reforming. Electrolysis makes up 4-6% of H_2 production and can be carried out with renewable or nonrenewable energy. Other renewable techniques include: biomass gasification, pyrolysis and photocatalysis. Hydrogen is the most abundant element in the universe and is proven to be clean and efficient when used in a hydrogen fuel cell. However, generally Hydrogen does not exist naturally in pure H_2 gas form on earth, and current methods of production are net negative and release green house gases.

Dr Anveeksh Koneru and his graduate student, Nolan Hines, is investigating "Density Functional Theory and Non-Equilibrium Green Function based. First-Principles Study on the Effect of Substitutions in Z-Scheme Photo catalytic Materials: The Case of TIO2 ''., for potential application in H_2 production.



A Microgrid is a small-scale electric power distribution network. It is composed of various distributed electric power sources connected to the main bus through power electronics converters supplying various distributed loads. In this work, a Microgrid model is simulated in consultation with OPAL-RT that is connected to a strong electric network. This Microgrid is implemented in a hardware-in-the-loop (HIL) setup. The Microgrid is controlled by a dashboard on RT-Lab, allowing the user to manage different tasks and variables on the system. The Microgrid is controlled by the Microgrid Controller such that the user can manage various variables; switch to the main grid, battery energy storage system, PV generation system, wind turbine, diesel generator, critical load, shed-able load, and demand response. All these variables are interconnected through the Microgrid bus.

Dr Omar Ali Beg and his students, Jacqueline Obreque and Kandus Box, is investigating "Hardware-In-the-Loop (HIL) Real-Time Simulation of a Microgrid''.

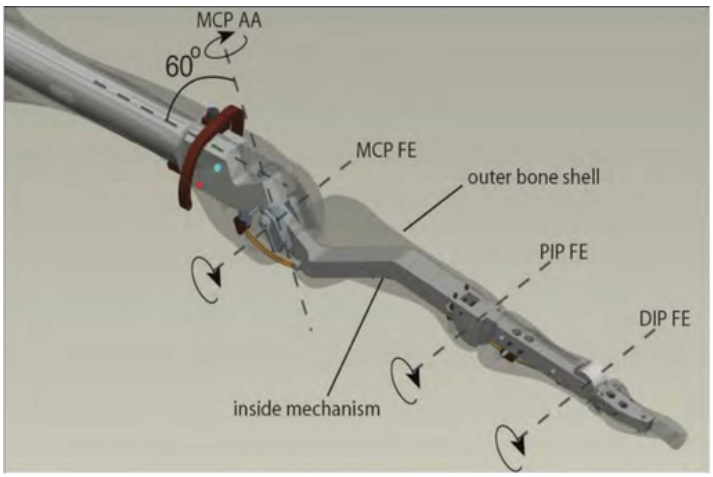
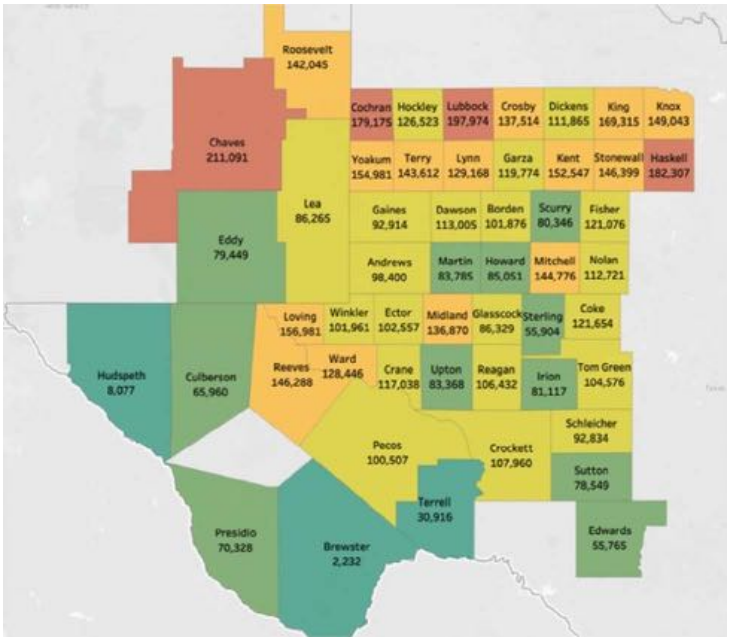
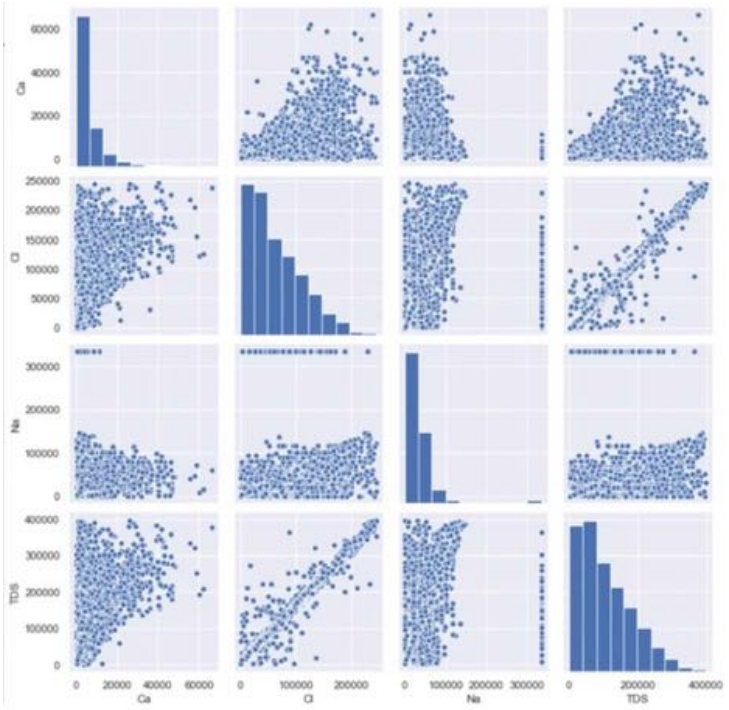


Figure 1. ACT hand inner and outer structure.

To first understand the malleability of an orthotic device during the testing studies, it is crucial to investigate the functions needed to achieve the comfort of individual users. The anthropomorphic testbed hand is focused on simulating the human kinematics and applied forces found in every day's variety of task. The human hand is connected to the wrist through the palm and is endowed with four DOF on all the fingers, five non-intersecting DOF on the thumb and six DOF on the wrist actuated by about forty muscles; in order to achieve likeness to the human hand, there should be a focus on the phalanges specific bone structure and design. When fabricating an orthosis is important to recognize the factors presented upon the trial of an orthotic device like regional pressure, weight-bearing, pronation and supination, and even skin irritability.

Dr Lokesh Saharan and his student, Melany Azocar, is investigating ''Anthropomorphic Testbed Hand to Test Orthotic Hand Devices''.

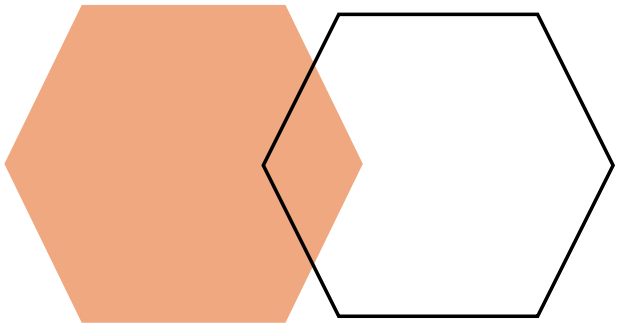




This work reports the first total dissolved solid map for produced water in the 28 counties of Permian Basin, United States. The map was developed using 87 years (1927 to 2014) worth of datasets (23 million data points) from the United State Geological Survey (USGS) database. The dataset was grouped by counties, formations, geochemical water constituents (cations, anions, organics) to gain insight into the constituent concentrations' spatial changes. Results showed spatial variability of Total Dissolve Solids (TDS) across the Permian Basin, ranging from 2,200 to 212,000 mg/l. This information is critical for designing and developing produced water treatment technologies. It suggests that the treatment technology should be flexible enough to handle the wide ranges of TDS. A one-size-fits-all technology will be inadequate.

Additionally, analyzing the USGS data and dataset from the industry suggests an empirical correlation between TDS, chlorine (Cl), sodium (Na), and calcium (Ca) for produced water. These relations are appropriate to predict TDS values for produced water, and it suggests that Cl has the most substantial influence on TDS than Na. One part per million (ppm) of Cl results in approximately 0.63 ppm of TDS, whereas one ppm of sodium leads to 0.38 ppm of TDS. Cl and Na ions contribute more to TDS concentration than Ca. Na combines with Cl to form sodium chloride (NaCl) and precipitate from extremely soluble brine, whereas Ca combines with bicarbonate, carbonate, or sulfate ions and precipitate mineral scales.

Dr Bibian Ogbuji is investigating ''Data Analytics: A Geospatial Mapping and Phenomenological Relationship For Total Dissolved Solids in Produced Water''.



RESEARCH AND EXTRAMURAL FUNDING

For the first time, our faculty serving as PIs (Principal Investigators) or Co-PIs generated a combined total of nearly $10 million in awards in externally funded projects from the US Department of Education, National Science Foundation, US Department of Defense, ACS Petroleum Research Fund, THECB (Texas Higher Education Coordinating Board), and private industry. Their work will enhance excellence in STEM education, develop data science in Engineering curriculum, study the phase behavior of emulsion with high particle loading, develop novel theory and computational methods for nano-absorbent materials, and develop oilfield-water treatment methods based on renewable energy sources. Here are a few highlisghts.

“Strengthening the STEM Pipeline – UT Permian Basin”

The PI (Principal Investigator), Dr. Omar Beg, and Co-PI, Dr. Raj Dakshinamurthy received a grant from the U.S. Department of Education through the Hispanic Serving Institutions – Science, Technology, Engineering, and Mathematics (HSI-STEM) program. The $4.9 million grant award is to enhance excellence in STEM Education program over five years between October 2021 and September 2026. The grant helps the target student population, i.e., increase the enrollment rate, increase retention rate, increase the graduation rate, and develop a skill-set for those students. The project will achieve these goals through summer camps, supplemental instructions, tutors, life coaches, student research fellowships, student internships, and expenses for the project personnel and the external evaluators. In addition, this program will help us create an additional four professional staff positions, including project manager and self-sustain, for the next five years.

"Leveraging the Phase Behavior of Particles Jammed Emulsion for Designer Porous Materials''

The PI (Principal Investigator), Dr. Molla Hasan, received an Undergraduate New Investigator (UNI) award for $55,000, from the American Chemical Society Petroleum Research Fund (ACS PRF). The funding of the research will be used to study the phase behavior of emulsion with high particle loading. A mixing pathway will be developed to make designer porous materials with tunable porosity and pore structures. The porous materials are suitable for mass transport.

"STTR Phase I: Novel Adsorbents for Selective Removal of Naturally Occurring Radionuclide Materials (NORM) from Fracking-Produced Water"

The PI (Principal Investigator), Professor Dr. Urmila M. Diwekar (Stochastic Research Technologies LLC, UIC), and Co-PI, Dr. Rajib Mukherjee (UTPB) received a grant from the U.S. National Science Foundation (NSF) of $255,947. The Permian Basin is an oil-and-gas-producing area, approximately 250 miles wide and 300 miles long, located in West Texas and the southeastern New Mexico area. Over 85,000 drilling permits (for new wells and re-entry) have been issued for the Permian Basin by the TX RRC since 2006. In recent years, oil and gas producers have employed fracking, that have changed oil and gas wastes' profile - both in terms of radioactivity and volumes produced. The geologic formations that contain oil and gas deposits also contain naturally-occurring radionuclides, which are referred to as Naturally Occurring Radioactive Materials (NORM). Oil and gas fracking bring NORM to the surface in a concentrated form, which could pose a radiation safety hazard. In 2011, GTI carried out a Techno-economic Assessment of Water Management Solutions project (2011) supported by 23 companies' consortium. This consortium identified many priority industrial challenges for the pre- and post-crossover stages of a shale gas development area's water-based life cycle and identified NORM removal as one of the highest priority research areas. They also ascertained that there is currently no commercial product on the market to selectively remove NORM from concentrated produced and flowback water. This STTR proposal addresses this problem.

The funding will be used for the development of theory and computational methods with the Group Contribution method (GCM) and a novel optimization-based Computer-aided molecular design (CAMD) framework, Dr. Diwekar's group generated order-of-magnitude better clay-based adsorbents than currently commercially available or published adsorbents for removal of produced water impurities. However, these modeling results need to be verified experimentally by synthesizing these new adsorbents and comparing their adsorption behavior to the theoretically predicted isotherms before commercializing them. The research will result in efficient and cost-effective adsorbents customized for the type of water contamination encountered using the new CAMD framework and cutting-edge experiments.

The idea of using CAMD for NORM adsorbents is a novel concept that has never been used before. The proposed research is of considerable fundamental and practical significance to the area of produced water treatment that is expected to remove 99% of NORM from produced waters effectively. This approach also reduces the cost of treatment technology. This is going to have a tremendous impact on the fracking industry. This unique capability provides a competitive edge in the produced water market for stochastic research which is expected to capture at least 5% of the market in the next ten years. The project plans to disseminate results through presentations at SBIR conferences and webinars.

TEACHING

PETROLEUM EXPERTS (PETEX) DONATE AN EQUIVALENT OF $2.5 MILLION SOFTWARE TO THE COLLGE OF ENGINEERING

The University of Texas Permian Basin College of Engineering has received a generous donation of software from Petroleum Experts (Petex), an international company that develops engineering software for the petroleum industry. The software is equivalent to $2.5 million. Dr. Alzahabi said that this software will be used in petroleum engineering classes to enhance student learning in the areas of oil and gas production systems including reservoir, wells, and the surface network.

''UT Permian Basin's College of Engineering is thrilled to offer this state-of-the-art software to our students. The Petroleum Experts software will allow hands-on training to support understanding of data while equipping students with skills they will need when they enter the workforce,'' said Dean of the College of Engineering, Dr. George Nnanna. ''UT Permian Basin engineering students will now be working with the same software that industry leaders use every day in the Permian Basin.''

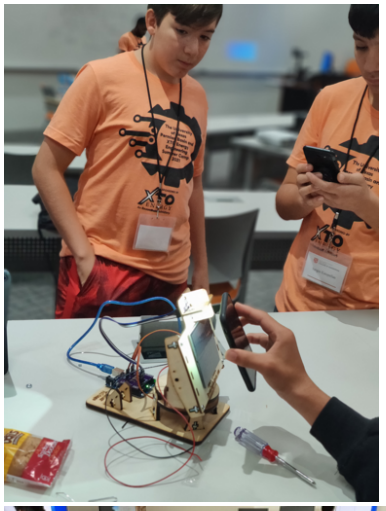
The software will challenge engineering students to determine the optimum setting to maximum production or revenue, taking account of all constraints that are set in the petroleum system. These results can then be used to implement adjustments at the field level to achieve the best results. In addition to the reservoir simulations, this software will also help students learn and model a petroleum production system more accurately. The software models will run together, allowing the engineer to design complete field models. The models can include the reservoir tanks, all the wells, and the surface gathering system. It can model and optimize the production and the water or gas injection system simultaneously.

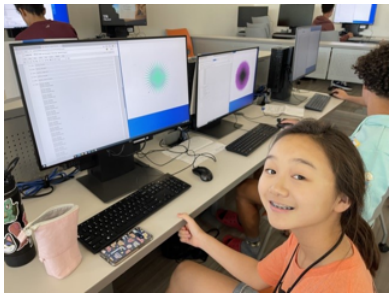
Implementing the Petroleum Experts software is just another way UT Permian Basin's College of Engineering continues to serve our region by producing high-quality graduates. Recently, the College of Engineering was awarded the #1 Best Value Engineering School in Texas by bestvalueschools.org

To learn more about UTPB's College of Engineering or to apply, visit utpb.edu/engineering

K-12 OUTREACH ACTIVITIES

2021 UTPB, XTO ENERGY SPONSORED ENGINEERING SUMMER CAMP





XTO Energy, an Exxon Mobil subsidiary, generously sponsored the engineering summer camp. It is an outreach experiential program with the objective of igniting interest among middle and high school students in various facets of engineering through hands-on activities demonstrating principles in chemical engineering, electrical engineering, mechanical engineering, nuclear engineering, petroleum engineering, solar energy, and wind energy.

This camp was for middle and high school students to learn engineering subjects under the guidance of the UTPB Engineering faculty. We offered an excellent learning opportunity to young leaders and engineers that they would not get at home. Our vision is to advance excellence and extend learning for all middle and high school students to inspire them toward future STEM pursuits. The UTPB engineering summer camp aims at promoting student engagement and completion through Science, Technology, Mathematics, and Engineering (STEM) activities.

The students put their creativity and ingenuity to the test. From coding to chemical reactions, they learned real-world engineering principles and skills. Students explored how science, technology, engineering, and math can open up opportunities, lead to rewarding engineering careers, and shape the world around them.

The UTPB College of Engineering offers a world-class and student-centered undergraduate engineering education through the integration or research into teaching, experiential learning, hands-on design competitions, and internships. Our undergraduate research in engineering program provides students an opportunity to earn stipends while working closely with faculty and industry professionals on projects during the academic year and / or summer. Our Mini-Baja SAE competition offers students hands-on experience to design, build and test an off-road vehicle. Our paid internship program offers an opportunity for students to work with practicing Engineers to solve real-world engineering problems. With over 40 Engineering Industry Advisory Board members, our students are constantly sough after for internship opportunities.

Our program in Chemical Engineering, Electrical Engineering, Mechanical Engineering, and Petroleum Engineering are highly ranked. For example, Petroleum Engineering was ranked #1 by US News & World Report for graduates with the highest salary in the nation. Mechanical Engineering in 2019 had a 100% passing rate in the Fundamental of Engineering (FE) Exam. FE is the first exam towards obtaining a professional engineering license in the United States.

Dr. Mesut Yurukcu, Ph. D., postdoctoral Researcher at UT Permian Basin College of Engineering leads the camp with a team of faculty and university student assistants.

We appreciate the time our Faculty and Students contributed to this event.

COLLEGE OF ENGINEERING HOSTS UNITE

UNITE is a four-to-six week, pre-collegiate, academic summer program for talented high school students from groups historically underserved in STEM ***(science, technology, engineering, and mathematics).*** It is open to female high school students rising 9th through 12th grade.
Some of the benefits of participation include:

•Gain confidence in your ability to participate in STEM activities
•Collaborate and solve problems as a team
•Learn firsthand from college students and professionals how engaging STEM studies and careers can be
•Prepare to pursue STEM majors in college and, ultimately, in future careers
•$100.00 stipend per week to each participant

COLLEGE OF ENGINEERING HOSTS ROBOTICS

The College of Engineering organized the 2021 FIRST Tech Challenge regional championship on February 5th, 2022 at the UT Permian Basin Gym Building. This student-centered championship program was aimed at testing the autonomous and operated robots designed by students in grades 7-12. The robots were tested and evaluated in the following categories: design, build, program, and test. A total of 36 teams around the cities of Midland and Odessa competed at the Championship. Each team had about 15 students. The event was fast-paced and exciting, and offered opportunities to design and build real-world engineering system, connect theory with practice, experimental learning, and networking with other teams and industry.

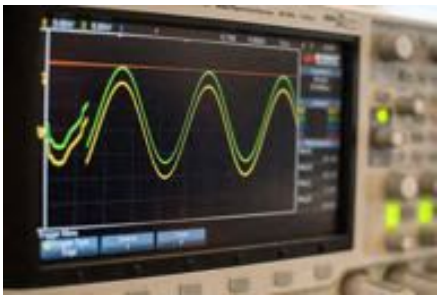
ACADEMIC PROGRAMS

THE COLLEGE OF ENGINEERING HAS ACADEMIC PROGRAMS IN CHEMICAL, ELECTRICAL, MECHANICAL AND PETROLEUM AND MASTERS IN MECHANICAL ENGINEERING

For additional Information, find out more about UT Permian Basin College of Engineering Departments below

The Chemical Engineering program prepares Engineers with necessary skills and knowledge to enter diverse job markets locally and globally. The energy sector in West Texas is thriving and chemical engineering graduates of the program are expected to find ample job opportunities in the local energy industry. Chemical Engineers use all tools of other engineering disciplines plus applied chemistry.

www.utpb.edu/academics/colleges/engineering/departments/chemical-engineering/index



The UTPB Electrical Engineering program educate and train engineers to envision and formulate solutions to the problems of today and tomorrow. Electrical Engineers design, develop, and test electrical systems, motors, generators, electronics, computer hardware, computer software, and communications systems that include the Internet, Global Positioning Systems (GPS) and cellular networks.

www.utpb.edu/academics/programs/electrical-engineering/index

The UTPB Mechanical Engineering program educates and trains Engineers to envision and formulate solutions to everyday problems. Mechanical Engineering students will learn to design a machine, a system, or a process. Students will then analyze their designs using the principles of physics to ensure the product functions safely, efficiently, and reliably.

www.utpb.edu/academics/programs/mechanical-engineering/index

The Petroleum Engineering program at UTPB, is a broad-based discipline primarily concerned with the development, exploration, conservation and transportation of oil and gas resources. Petroleum Engineers plan and supervise drilling and well-completion programs, design and select drilling and production equipment, estimate reserves and economics.

www.utpb.edu/academics/programs/petroleum-engineering/index

RESEARCH INSTITUTES AND CENTERS

What is TWEI?

The Texas Water and Energy Institute provides a multi-disciplinary and multi-institutional approach to complex issues dealing with produced water, wastewater, and drinking water.

ABOUT TWEI

The work includes: water quality, water-energy interdependencies, water security, water infrastructure protection, and related social and policy issues. The vision of the institute is to develop fit-for-purpose energy efficient and cost-effective advanced technologies that are critical for the treatment of produced water. The goal? To minimize adverse environmental impacts including groundwater depletion and induced seismicity. The treated water will be recycled and reused for hydraulic fracturing, irrigation, and municipal use to benefit the state and the nation.

"TWEI WILL PROMOTE CONVERGENT RESEARCH BY INTEGRATING EXPERTISE, KNOWLEDGE, AND TOOLS ... TO FORM A COHERENT INNOVATION ECOSYSTEM AND DEVELOP A PRODUCTIVE WORKFORCE."

TEXAS WATER & ENERGY INSTITUTE
THE UNIVERSITY of TEXAS PERMIAN BASIN

Contact us
11105 W. Highway 191
Midland, TX 79405
(432) 552-3430
utpb.edu/TWEI
twei-info@utpb.edu

TEXAS WATER & ENERGY INSTITUTE
THE UNIVERSITY of TEXAS PERMIAN BASIN

GOAL

TWEI aims to develop a multi-institutional curriculum to educate a wide array of students in a broad range of related disciplines. This entails collaborative efforts with stakeholder entities including engineers, soil and biology scientists, social scientists, students, tribal nations, regulators, and policy makers.

VISION FOR THE FUTURE

The Texas Water and Energy Institute (TWEI) will promote convergent research by integrating expertise, knowledge, and tools from various disciplines of academia, industry, and government agencies to form a coherent innovation ecosystem and develop a productive workforce. Expertise and resources from multiple academic institutions will be leveraged to address research problems in:

- Water intelligence
- Machine learning and data analytics
- Users and ground water banking
- Recycle and reuse water treatment technologies
- Recycling options
- Chemical and physical characterization
- Renewable energy based water technologies
- Energy assessments
- Performance evaluation of sustainable water treatment technologies.

CHALLENGES

The challenges with produced water treatment methods are economics of scale, reliability, waste and product generation, and energy consumption. Current industry practice is the subsurface disposal of produced water which leads to increased pressures that can contaminate overlying aquifers and may also result in induced seismicity. A global grand challenge is the management of produced water and a comprehensive strategy for reuse. These are two challenging concepts, partly because of public perception. The Institute will develop strategies to overcome social barriers of adoption and acceptance of using brackish water amongst different groups, from farmers to consumers.

TWEI SERVICES

Produced Water Analysis and Material Characterization

Database / Produced Water Analytics

Produced Water Technology Evaluation and Treatability Studies

Test: Produced Water Database/Produced Water Analysis **Pricing:** $395/Month or $4,740/Yr

Test: Cations **Description: Water Sample (>100.0ml):** Sodium, calcium, magnesium, strontium, iron, manganese, barium **Pricing:** $50

Test: Fe/Mn **Description: Water Sample (>50.0ml):** Iron and Manganese **Pricing:** $40

Test: Complete Water Analysis **Description: Water Sample (>200.0ml):** Sodium, calcium, magnesium, strontium, iron, manganese, barium **Pricing:** $100

Company/Model (All the Above): Thermo Scientific/ iCAP 7400, IC-Thermo Scientific/Dionex-Aquion

Test: SEM-EDS Analysis **Description:** For solids: Topography, Morphology, and Composition **Pricing:** $180/Hr **Company/Model:** Thermo Scientific/Prisma E

Test: Produced Water Technology Evaluation and Treatability Studies **Pricing:** $500/Hr

Test: Anions **Description: Water Sample (>100.0ml):** Chlorides, sulfates, bromide, and fluoride etc. **Pricing:** $30 **Company/Model:** Thermo Scientific/Dionex-Aquion

Test: Total Carbon Content in Water **Description:** Water sample

>100.0ml **Pricing:** $45/Sample **Company/Model:** Shimadzu/TOC-L

Test: Gravity (SpGr or API) **Description:** Water sample

>20.0ml **Pricing:** $20/ Sample

Test: Acid Gasses (pH/Bicards/ CO2/H2S) **Description:** Water sample

>100.0ml **Pricing:** $50/Sample

Test: Millipore **Pricing:** $50

The Water Lecture Series allows the community, industry leaders, academia, and government agencies to come together to network and discuss state-of-the-art treatment technologies, challenges and opportunities.

These lectures address key issues such as beneficial reuse and recycle of FPW, fit-for-purpose treatment technologies, energy-water nexus, data analytics, socio-economics, policy and regulation, and environmental impacts. International and national experts can bring invaluable insights to these key areas and to our regional political, business, and academic leadership. The Lecture Series on Water Issues, will serve to bring these leaders to our community to inspire our own academic community and policy makers to deepen their engagement with the region's industries and the university. In 2021, ten speakers from U.S Department of Energy, Stanford University, University of Texas at El Paso, Oklahoma State University, RI & C Onshore Unconventional Resources Research, Rice University, XRI, H_2O Midstream and RevoChem Presented at TWEI. Below is their brief bio

Prem Bikkina, Ph. D
Associate Professor, Oklahoma State University
Title: Produced Water Treatment and Re-use- Solar Thermal Desalination With Combined Heat & Power Cycle and High Salinity Carbonated Water Flooding

Amy Kan, Ph. D
Co-Director of the Brine Chemistry Consortium, Rice University
Title: Scale Prediction & Control in Oil and Gas Industry

Zacariah Hildenbrand, Ph.D
Research Professor, University of Texas at El Paso, Chemistry & Biology Dept
Title: The Environmental Implications of Produced Water Recycling and Reuse

Elena Melchert
Director, Office of Fossil Energy U.S Department of Energy Washington
Title: Transforming Produced Water from a Waste to a Resource

Adam Jew, Ph. D
Senior Researcher Scientist, Stanford Linear Accelerator Center
Title: Fluid/Rock Interactions in Shale, Critical Elements and Analysis of Produced Waters

Faye Liu, Ph. D
Founder & CEO RevoChem
Title: Unconventional Reservoir Characterization and Drainage Frac Monitoring Using Geochemical Fingerprinting Technology

John R. Durand
President & Chief Sustainability Officer at XRI
Title: The Way of Water and ESG in the Permian Basin

Gauri Potdar
Senior Vice President, Strategic & Analysis H2O Midstream
Title: Developing Beneficial Use Markets for Produced Water Lesson from Renewable Energy and Carbon Markets

Markus Drouven, Ph. D
Strategic Systems Analysis & Engineering Directorate, National Energy Technology Laboratory, U.S Department of Energy
Title: An Optimization Framework for Produced Water Management and Beneficial Reuse

Alexandra Hakala, Ph. D
Researcher Scientist & Technical Portfolio Leader, RI&C Onshore Unconventional Resources Research
Title: Geochemical Processes in Engineered Natural Systems Influencing Subsurface Flow & Produced Water Chemical Composition

Sponsored by:

Chevron

Special thanks to:

PIONEER NATURAL RESOURCES

DATA. INSIGHT. OUTCOMES.

SCHOLARSHIP OPPORTUNITIES

- New WAVE Energy Services Ltd
- Ortloff Engineers Ltd
- The Giovannie Castelazo Scholarship
- QEP Education Foundation Petroleum Engineering Scholarship
- Partners Scholarship/Pickering
- PBIOS Scholarship - Engineering
- ConocoPhillips Scholarship
- Robert L. Jackson, Jr. Memorial Scholarship
- RL Hamm, Jr. Memorial Book Scholarship for Petroleum Engineering
- Chevron Legacy Scholarship
- Buddy West Memorial Endowed Scholarship
- Jack D. Ladd Memorial Endowment
- API Sour Crude Endowed Scholarship
- Green Family Endowed Scholarship
- Mark Nicholas Endowed Presidential Scholarship in Engineering
- SPEE Jack Ladd Memorial Scholarship in Petroleum Engineering
- Women Energy Network Scholarship

SCHOLARSHIP AWARDS

STUDENTS EARN OVER $100,00 IN SCHOLARSHIPS

In the last two years (2021 and 2022), UT Permian Basin awarded a total of $1,859,656 in scholarships to engineering students - $1,007,082 to 274 students in 2021 and $852,574 to 230 students in 2022. These scholarships includes Presidential Scholarship, Presidential Plus Housing, Freshman and Transfer scholarships, Freshman Falcon 500, and the specific engineering scholarships listed above. These scholarships help to lessen the financial stress on students and the burden on parents to pay for their education. With these scholarships, students may be able to focus more on their studies to achieve scholastic excellence instead of joggling between work and school.

ENGINEERING ADVISORY BOARD

SPOTLIGHT

51 Advisory Board Members STRONG - from local Industry and Partners

- Pioneer Natural Resources
- OTA Compression
- SwiftWater Energy Services
- Dickson Process Systems
- Summit Engineering Services
- Rex-Tac LLC
- Surge Energy
- O'Ryan Oil and Gas & Consultant
- XTO Energy Inc
- TSPE
- HDR, Inc
- Texas Department of Transportation
- The Eastland Oil Company
- Sivalls Inc
- Crown Quest Operating
- Saulsbury Industries
- Laredo Petroleum
- Waid Environmental
- Anadarko Petroleum Corp
- H2O Midstream
- Petro Growth
- Westech Seal Inc
- Honeywell UOP / Ortloff Engineers, GPT
- Environmental Disposal Systems
- Hickman Mcclaine & Associates, Inc
- URENCO, USA
- Newman Cubed
- Conoco-Phillips
- Hy-Bon
- Halliburton
- Air Compressor Solutions
- Trey Resources
- Permian Basin Petroleum Assn
- Parkhill
- DNOW LP
- Audubon Engineering Company, LP
- 3S Services Engineering & Design LLC
- Slater Controls Inc
- Diamondback Energy
- Cudd Pumping Services
- Chevron
- SCAL Inc
- SPE-Bill Webb Inc
- Schlumberger
- Fortress Energy, LLC
- Midland College
- Mathematics Dept at Odessa College
- ExxonMobil
- City of Midland
- Cimarron
- Terracon

The Engineering Advisory Board is the primary connection between the University and industry. The board has All-Board Meetings in the fall and spring. There are three subcommittees:

1. Education and Workforce Development Initiatives (EWDI)

The purpose of the EWDI Subcommittee is to promote experiential learning through internships, design competitions, and support K-12 outreach activities. Roles include promoting and linking students to internship opportunities, and serving as mentors to students. Students would begin professional development by applying what they learn in the classroom to real world activities.

2. Strategic Research Initiatives (SRI)

The SRI Subcommittee will have two goals. The first is to work with industry partners to identify projects for the Senior Design class. This would include arranging industry speakers and serving as mentors on projects. The second goal is to work with industry to identify research opportunities. This would include surveys on research needs, serving as an industry advisor on projects, and other collaboration. This will be of particular importance with the creation of engineering graduate programs.

3. Strategic Finance Initiatives (SFI)

The SFI Subcommittee will work with the Engineering Department to identify program needs such as building and space naming, purchase of laboratory equipment, and establishing a machine shop. The SFI would also be involved in fundraising in coordination with the University's Advancement Office for endowments, scholarships, and other department needs.