

# ENGINEERING IMPACT 2022



**COLLEGE OF ENGINEERING** 

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COLLEGE OF ENGINEERING
MAGAZINE
VOL. 2022

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#### A MESSAGE FROM THE DEAN

On behalf of the faculty of the College of Engineering at Tennessee State University (TSU), I welcome you to the 2022-2023 Academic Year. This year marks a historical record-breaking enrollment of first-year students for the College of Engineering. This accomplishment has presented some challenges because it was unexpected, but it has resulted in the College having the chance to grow in faculty and staff, providing over 6 positions which include an Associate Dean of Research and Graduate Studies and a College Recruiter.

Civil Engineering, Architectural Engineering, Electrical Engineering, Mechanical Engineering, Computer Science, and Applied and Industrial Technologies are among the fastest growing disciplines with high employability rates and post-completion career opportunities. Successful graduates of these departments are typically employed within a short period of time and with attractive salaries. For instance, recent graduates of the Computer Science Department accepted jobs with salaries ranging from \$120K to \$175K. Two students went to work for Google, and another was hired by Amazon. Most of our engineering graduates had multiple job offers upon graduation. This is attributed to the high demand of the students in the field and the cautious efforts of our Career Development Center and College to expose our students to as many companies and opportunities as possible. These opportunities are provided by campusorganized events or by providing resources to support students traveling to conferences (i.e., BEYA, NSBE, SWE). The College attracts several new and continual industrial partners each year, as demand for our graduates is strong in the Middle Tennessee area and nationwide.

Other accomplishments of the College of Engineering include the completion of ABET accreditation campus visit in November of 2021, the hiring of a Director of Student Services to assist with student retention, and the allocation of over \$370,000 in scholarships to incoming and returning students in the 2021-2022 Academic Year. The College also conducted six summer outreach programs for students in 6th -12th grade and launched the New Master of Science program in Data Science this Fall 2022. Majority of the faculty members in the College are active in groundbreaking research in areas of Artificial Intelligence, Environmental Justice, Renewable Resources, Robotics, Cyber Security, Mechatronics, Transportation, and Material Science. Within the past year, faculty have acquired numerous new grants from federal agencies, state agencies, and industrial partners.

As Dean of the Tennessee State University College of Engineering, I look forward to working with our faculty and staff in continuing to develop and implement strategic initiatives that align with TSU's Strategic and Academic Master Plan. These initiatives will expand ACCESS for students to the university, college, and industry, provide resources that make pursuing a degree in the College of Engineering AFFORDABLE, and enhance the overall ACADEMIC

COLLEGE OF ENGINEERING

QUALITY AND EXPERIENCE of our programs.

Sincerely,

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Dr. Lin Li, PhD, PE, Fellow of ASCE Interim Dean, College of Engineering

## **CoE DEGREE PROGRAMS**

- ☐ BS in Architectural Engineering
- □ BS in Civil Engineering
- BS in Electrical Engineering
  - o Computer Engineering Concentration
- ☐ BS in Mechanical Engineering
- BS in Computer Science
  - o Data Science Concentration
  - o Cybersecurity and Networking Concentration
  - o Bioinformatics Concentration
- BS in Applied & Industrial Technologies
  - o Mechatronics Technology Concentration
  - o Aviation Management Concentration
- Master of Engineering
  - o Manufacturing | Mechanical Engineering
- ☐ Master of Science in Computer Science
  - o Bioinformatics | Cybersecurity | Data Science
- Master of Science in Data Science (online)
- Master of Science in Computer & Information Systems Engineering (MS-CISE)
- Doctor of Philosophy in Computer & Information Systems Engineering (PhD-CISE)
- ☐ Doctor of Philosophy in Engineering & Computational Sciences (PhD-ENCS)
  - o Computational Sciences
  - o Engineering Systems

More Information, visit https://www.tnstate.edu/engineering/

#### WHY TSU?

TSU is a comprehensive, urban, coeducational, land-grant university in the state capital - Nashville, "Music City USA,"

Tennessee



# **NEW ENGINEERING BUILDING**

une 1, 2022, Governor Bill Lee signed an agreement to issue \$60M to Tennessee State University for construction of a new engineering building. The building will be a state-of-the-art facility with teaching, research, and service spaces for the five departments in the College of Engineering and for future program development. Currently, the building is in the preliminary design phase, and we welcome industrial partners and individuals to support this effort through program development and/or monetary contributions towards the building fund. Our continued goal is to produce well-rounded, competent, and marketable students and research to the industry, your contribution whether technical or monetary will help us achieve this goal. If you are interested in partnering with the College of Engineering in any capacity, please contact the Director of Development, Dr. Catherine Armwood-Gordon at carmwood@tnstate.edu or 615-963-5416.





# DEPARTMENT OF APPLIED & INDUSTRIAL TECHNOLOGIES

The BS Program offers (1) Mechatronics Technology concentration emphasizes electronics, operations, management, robotics, material handling and quality control; (2) Aviation Management concentration is designed to prepare and provide students with the skills and expertise for management careers in a wide array of aviation related fields.



Dr. Mosley Management (Chair) Professor



Dr. Beane Mechatronics Asst. Prof.



Dr. Riley Pilot/Flight Asst. Prof.



Ms. Hayes Management Adjunct Prof.

# TSU'S AVIATION PROGRAM BREAKING BARRIERS TO INCREASE NUMBER OF BLACK COMMERCIAL, AIR FORCE PILOTS

Growing up in Dallas, Texas, Mateo Lannaman's dream was to be a pilot and fly high across the sky. With lack of funding and without a clear path, he didn't know where to turn, until he met a mentor in flight training at Rising Aviation who gave him an advice that would change the young man's life forever. "He told me about Tennessee State University and the outstanding aviation program there," Lannaman said. "He said there were scholarships for qualified students who were interested." Lannaman took his mentor's advice and applied. He was accepted with a full scholarship to study aviation management as a concentration in the Department of Applied and Industrial Technologies in the College of Engineering. The program is certified to train commercial pilots.

With the low number of Black commercial and Air Force pilots in the nation, Lannaman comes into an aviation program that is seeing tremendous growth thanks to a vigorous recruitment effort, outstanding faculty, and a long partnership with the Air Force ROTC (AFROTC) detachment at the University.



# DEPARTMENT OF CIVIL & ARCHITECTURAL ENGINEERING

The Department offers two BS ABET-accredited Degree: Civil Engineering and Architectural Engineering. Civil engineers plan, design, construct, operate and maintain public infrastructures such as buildings, bridges, dams, airports, power facilities, treatment systems, water supply, and transportation systems. Architectural Engineering is the profession that offers and integrated multi-disciplinary approach to planning, design, construction, and operation of buildings. The Department offers Master of Engineering and PhD ENCS program.



Dr. Armwood Structural (Chair) Assoc. Prof.



Dr. Chimba Transportation Professor



Dr. Liu Geotechnical Asst. Prof.



Dr. Painter Environmental Professor



Dr. Li Geotechnical (Dean) Professor



Mr. Du Construction Instructor



Dr. Gardiner Environmental Asst. Prof.



Dr. Wang HVAC Asst. Prof.



Dr. Parthasarathy Structural Asst. Prof.



Dr. Davis Electrical Systems Pract. Prof.

#### **NEW GRANTS IN 2022**

Dr. Armwood: \$300,000 NSF-IRES Dr. Armwood: \$1,000,000 NSF S-STEM

Dr. Armwood: \$50,000, TBR Dr. Armwood: \$50,000, TDOT Dr. Armwood: \$500,000 USDA Dr. Gardiner: \$20,000 UCOR Dr. Gardiner: \$60,000 DOE

Dr. Gardiner: \$50,000 Waste Management

Dr. Li: \$1,000,000 NSF Dr. Li/Liu: \$300,000 HUD

Dr. Li/Painter: \$200,000 NSF-MRI

Dr. Li/Wang: \$60,000 DOE Dr. Parthasarathy: \$50,000 TRB

Dr. Parthasarathy: \$480,000 NASA MUREP

Dr. Chimba: \$400,000 TDOT Dr. Chimba: \$1,000,000 TDOT Dr. Chimba: \$470,000 DHS Dr. Chimba: \$500,000 FRA



# **DEPARTMENT OF COMPUTER SCIENCE**

As the Largest Department in the CoE, there is over 350 student enrollment for BS, MS Science, MS Data Science, PhD ENCS programs. The BS program covers contemporary computer science fields such as computer architecture and organization, software systems, algorithm design and analysis, computer programming, database management systems, computer networks and data communication, cybersecurity, and artificial intelligence.



Dr. Sekmen Chair Professor



Dr. Yao Image/Robotics Professor



Dr. Rogers Networking Assoc. Prof.



Dr. Al Nasr Bioinformatics Assoc. Prof.



Dr. Shao Programming Assoc. Prof.



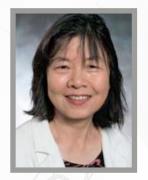
Dr. Erdemir Robotics Assoc. Prof.



Mr. Miao Bioinformatics Asst. Prof.



Dr. Samad Machine Learning Asst. Prof.



Dr. Chen
Computing
Professor

#### **NEW GRANTS IN 2022**

Dr. Sekmen: \$660,000 DOD

Dr. Yao: \$150,000 AFRL

Dr. Sekmen: \$80,000 Amazon

Dr. Al Nasr: \$535,000 NSF

Dr. Brahma: \$500,000 NSF (CAREER)

Dr. Brahma: \$190,000 USDA



The Department has the first NSF CAREER Award in TSU
The Department has Amazon-endowed Professorship

#### **FACULTY HIGHLIGHTS**



E Assistant Professor Dr. Leitao Chen won his two NSF grants in his first year at TSU. The RIA grant title is "A Boltzmann Model for Multi-Scale and Multi- Physics/Chemistry Transport Phenomena in Porous Media". The goal of this project is to develop a specialized simulation model with the high-performance computing capability based on a new methodology that solves the Boltzmann equation with the finite volume method, which allows a convenient adoption of fully unstructured grids to precisely reconstruct the complex three-dimensional boundaries rendered by porous media. The novelty of this project is that it provides a specifically tailored simulation model that demonstrates a superiority in computational performance over existing methodologies for the multi-scale and multi-physics/multi-chemistry fluid transport phenomena in porous media. This new model can accelerate the

understanding of the selected research problem. With further development, it can become a general simulation tool for the modeling of any transport phenomenon beyond fluid transport.!

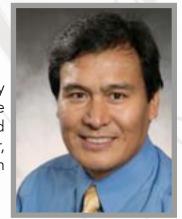
CE Assistant Professor Dr. Hason won NSF new grant "Zero- trust architecture for secure communication in beyond 5G (B5G) networks". It is a novel AI/ML aided zero-trust (ZT) framework for secure communication. Collaboration with Howard University, innovative theoretical design and practical implementation of proposed algorithms in an open source standardized prototype will be developed to design the next-generation secure communication systems.





ME Assistant Professor Dr. Fasoro won his first NSF grant "Research Initiation Award: Microstructural Evolution and Constitutive Modeling of Creep and Elevated Temperature Quasi- Static Tensile Deformation in Additively Manufactured Grade 91 Steel Alloy". It will study the creep behavior of AM ferritic grade 91 steel alloys which are potential materials for high-temperature structural applications in the aerospace and nuclear energy industries. Congratulations!

CS Professor Dr. Yao won his ARFL grant "Autonomous Software Security Vulnerability Testing based on Machine Learning and AI". It will use Python to conduct vulnerability detection based on machine learning and AI techniques. This work is based on automated techniques, e.g. CCLeaner, CDLH (Clone Detection with Learning to Hash), bidirectional LSTM, Random Forest based quantitative analysis on security patch types, Data mining.



## **DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING**

The Department offers undergraduate and graduate degree programs leading up to Master of Engineering, Master of Science, and Ph.D. in Engineering and Computational Sciences. Our undergraduate program offers BS in Electrical Engineering and a concentration in Computer Engineering under the BS degree.



Dr. Zein-Sabatto Control/AI (Chair) **Professor** 



Dr. Bodruzzaman Signal processing **Professor** 



Dr. Hong Communication **Professor** 



Dr. Keel Control Systems **Professor** 



Dr. McCurry **System Engineering** Assoc. Prof.



Dr. Hasan Cyber Security Asst. Prof.



Dr. Ghosh **Power Systems** Asst. Prof.



ontrol & Robotics

Wireless Communication

vstems

Pøwer



Dr. Ghosh: \$191,000 NSF Dr. Hason: \$400,000 NSF-TIP

Dr. Sabatto: \$30,000 CIA Dr. Keel: \$80,000 Amazon

Dr. Hasan: \$158,000 NSF

Dr. Hong: \$200,000 NSF

Dr. McCurry: \$80,000 Amazon

# **DEPARTMENT OF MECHANICAL & MANUFACTURING ENGINEERING**

Mechanical and manufacturing engineers research, design, build, test, maintain and improve mechanical tools, devices, as well as thermal and dynamic systems.



Dr. Onyebueke System Design (Chair) **Professor** 



Dr. Shirkhodaie Robotics/Sensing **Professor** 



Dr. Chen CFD/Heat Transfer Asst. Prof.



Dr. Akbar CFD/HVAC/Surge Assoc. Prof.



Dr. Fasoro **Material Science** Asst. Prof.



Asst. Prof.



Dr. Hamidzadeh **Robotics/Mechatronics Vibration/Diagnostics** Professor

SAR/IR/LIDAR Remote Sensing **NEW GRANTS IN 2022** 



Heat

Transfer &

Fluid Dynamic

Modeling

Hurricane Storm Surge Modeling

Dr. Onyebueke: \$1,100,000 DOE Dr. Akbar: \$406,000 NSF utomatic Dr. Shirkhodaie: \$50,000 GTRI (isual)

Dr. Shirkhodaie: \$150,000 AFRL repection Dr. Chen: \$300,000 NSF RIA

Dr. Chen: \$132,000 NSF

Dr. Fasoro: \$150,000 NSF RIA

Dr. Fasoro: \$575,000 DOE

#### **STUDENT ACTIVITIES**

Anairanny Espinosa, Mechanical Engineering senior student, worked as intern at Vanderbilt Institute for Surgery and Engineering in Summer 2022. She involved the creation, development, implementation and evaluation of methods, devices, algorithms, and systems designed for applications that facilitate surgical/interventional processes and their outcomes. The work described methods for developing a realistic tissue- mimicking retraction phantom and an algorithmic approach for determining soft-tissue deformations during breast conserving surgery (BCS) tissue retraction.











Ethiopine Choping is now at the University of Illinois Urbana-Champaign doing research for the National Science Foundation (NSF). Learning computational chemistry and wrapping it into Civil Engineering. She loves learning, is a scientist at heart and is currently working for Dr. Chimba for transportation research.

Pr. Chimba, transportation faculty has led five TRB minority fellow to attend TRB conference at Washington DC in January 2022. The five students are Jeannine Mbabazi, Jose Portillo, Ethiopine Choping, Joi Robinson, Bahati Chimba. Graduate student Hellen Shita and PhD student Grace Mbiaji also attended the conference and presented their research.





Travion Crutcher is senior student of mechanical engineering. As the Intern at Boeing in Summer 2022, he was selected as the WayUp/Yello National #1 Intern of the year! It is such honor to be the position. This internship was filled with great experiences, intricate problems to solve, and many new connections! He appreciated his manager and team lead for providing him insight on how to do the best work possible.

## **STUDENT ACTIVITIES**

In March 2022, 12 **NSBE** student chapter member had opportunity to travel to Anaheim, California for the 48th National Society of Black Engineers National Convention. They had an amazing time networking, seeking new opportunities and just venturing around. As black engineering excellence, they all have an incredible future ahead of them as long as they continue to excel academically, succeed professionally and positively impact the community! Thanks for industrial sponsors and faculty advisor Dr. Armwood-Gordon and Dr. Rogers.



#### STUDENT COMPETITIONS

In March 2022, ASCE student chapter concrete canoe team went to compete their canoe with regional civil engineering programs. Dr. Nathan is faculty advisor.



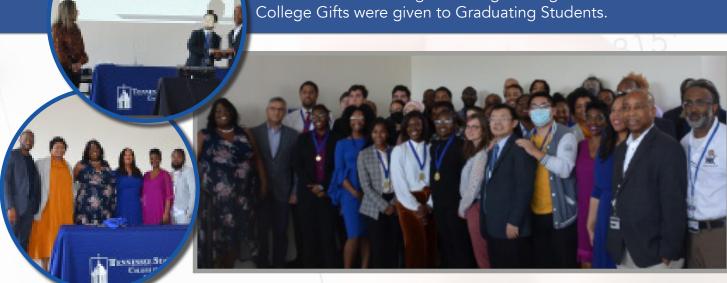




ECE students attended High Performance Computing (HPC) Competition hosted by NASA in 2022. They won 2nd place.

#### **LUNCHEON AWARDS**

In April 2022, CoE hosted annual luncheon awards. Five faculty, Dr. Chen, Dr. Beane, Dr. Keel, Dr. Akbar and Dr. Gardiner received excellent teaching award. Dr. Brahma and Dr. Parthasarathy received excellent research and service award. Dean's List students and GPA 4.0 students were recognized. Engineering Alumni Association and College Gifts were given to Graduating Students.



# **ALUMNI PROFILES**

r. Jonathan Clark, AIA, NCARB, PE, LEED AP, is President / Chief Executive Officer, Community Solutions by Design, LLC located at Nashville,

TN. He is a multi-discipline technical professional that is passionate about planning, architecture, and building systems. He strives to bring a holistic approach to the planning, design, and construction of our built environment. Mr. Clark is involved with design, building code compliance review, condition assessments, and analysis of new and existing building systems. Mr. Clark is a licensed architect currently in the states of Georgia, North Carolina, and Tennessee. Additionally, Mr. Clark is a licensed professional engineer currently in the states of Alabama, Georgia, North Carolina, and Tennessee. He has a Bachelor of Science in Architectural Engineering from TSU and a Master of Architecture from Southern Illinois University.

Don Hardin, President, Don Hardin Group, is a 1990 graduate of TSU with a B.S degree in architectural engineering. Mr. Hardin is licensed as a general contractor in the state of Tennessee, and PMP certified. In 2001, Mr. Hardin founded The Don Hardin Group and presently presides as president & chief executive officer. The Don Hardin Group is a construction consulting and project management firm, which specializes in owner's agent services, located in Nashville, TN. His company has served the city of Nashville, National Museum of African American

HCA, Nissan North America, Bridgestone/Firestone North America, TVA, and many other regional medical, educational and manufacturing clients. Don has been reported in TSU News in February 2021 as "TSU ALUM WHO DESIGNED, CONSTRUCTED NATIONAL MUSEUM OF AFRICAN AMERICAN MUSIC CONTINUES AS INDUSTRY TRAILBLAZER, PROMOTES STUDENT SUCCESS BY GIVING BACK".

Music, MARTA (Atlanta), Meharry Medical College,

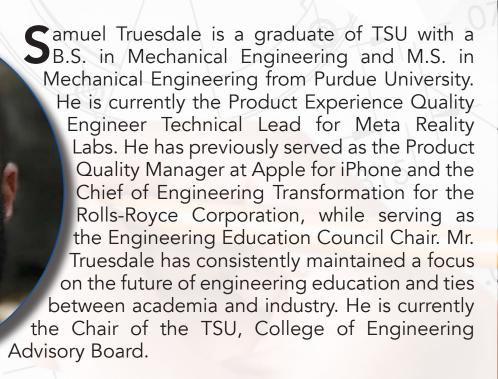
# **ALUMNI PROFILES**

Pamela Franklin is Tennessee Department of Environment and Conservation (TDEC) Environmental Manager. She has been in TDEC since 1999. TDEC is a state government agency tasked with leading effective regulatory programs to protect the quality of Tennessee's air, land, and water. Her service with TDEC began in the Division of Superfund where she conducted preliminary

environmental site assessments and provided oversight of remedial activities associated with landfills and brownfield sites. In 2007, she joined the Toxic Substances Program (TOX) in the Division of

Solid Waste Management.

She obtained federal credentials to perform polychlorinated biphenyls (PCB) inspections and later completed lead-based paint (LBP) compliance inspection training. She was promoted to manage the program's PCB and LBP compliance sections. Her managerial role includes grant management and supervisory responsibilities in addition to new-hire training. She earned her degree in Civil Engineering from TSU.





#### **SUMMER PROGRAMS**

- Boot camps (CS): Python Programming, Mathematics
- Engineering Concept Institute for incoming freshmen
- Two Engineering Exploration Camps for high school students
- National Summer Transportation Institute for high school students
- 3D Printing camp for middle school students
- Verizon coding camp for middle school students

#### **NEW SCHOLARSHIPS**

- THTC Scholarships (\$110,000)
- USDA Scholarships (\$10,000/each student/yr)
- NSF PROMISE S-STEM Scholarship (\$10,000/each student/yr)
- NSF STAR Scholarship (\$10,000/each student/yr)
- College of Engineering General Scholarship
- Boeing TMCF Scholarship
- P& G Scholarship
- Turner, Stantec Scholarship
- Raytheon Scholarship
- Lockheed Martin Scholarship
- Enbridge Scholarship
- Benesch Scholarship
- TVA Scholarship
- HCA Scholarship
- DHS Scholarship
- Eisenhower Transportation Scholarship
- ASHRAE, TRBA, ASCE, Clark Excellence in Engineering Scholarship

# **CoE LEADERSHIPS**

| Unit  | Leader Name                          | Phone<br>(615) | Email                    |
|---|--------------------------------------|----------------|--------------------------|
| College of Engineering                      | Dean Lin Li                          | 9635401        | lli1@tnstate.edu         |
| Computer Science Dept                       | Chair Dr. Ali<br>Sekmen              | 9635712        | asekmen@tnstate.edu      |
| Applied & Industrial Technologies Dept      | Chair Dr. Ivan<br>Mosley             | 9635378        | imosley@tnstate.edu      |
| Civil & Architectural<br>Engineering Dept   | Chair Dr. Catherine Armwood – Gordon | 9635416        | carmwood@tnstate.edu     |
| Electrical & Computer Engineering Dept      | Chair Dr. M Saleh<br>Zein-Sabatto    | 9635369        | mzein@tnstate.edu        |
| Mechanical & Manufacturing Engineering Dept | Chair Dr. Landon<br>Onyebueke        | 9635424        | lonyebueke@tnstate.edu   |
| College Director of Research                | Dr. Amir<br>Shirkhodaie              | 9635396        | ashirkhodaie@tnstate.edu |
| College Director of<br>Student Services     | Dr. Charmaine<br>Dennis              | 9635400        | cdennis@tnstate.edu      |
| College Director of Recruitment             | Dr. Charles D.<br>McCurry            | 9632160        | cmccurry@tnstate.edu     |
| College Director of<br>Development          | Dr. Catherine<br>Armwood –<br>Gordon | 9635416        | carmwood@tnstate.edu     |
| College Graduate<br>Coordinator             | Dr. Muhammad<br>Akbar                | 9635392        | makbar@tnstate.edu       |
| College Graduate<br>Coordinator             | Dr. Tamara Rogers                    | 9631520        | trogers3@tnstate.edu     |



#### **ENGINEERING LEADERS**

#### **ABOUT TENNESSEE STATE UNIVERSITY:**

Tennessee State University (TSU) is a comprehensive, urban, coeducational land-grant university, founded in 1912. The 500-acre campus is located in Nashville, the state capitol of Tennessee. TSU has nine academic colleges and schools and offers 83 comprehensive degree programs from the baccalaureate through doctorate degrees. It has been designated as "Doctoral/Research University" by the Carnegie Foundation.



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