Although this year looks different given the ongoing COVID-19 pandemic, our faculty continue to enhance their education and mentorship of students and the department’s reputation by obtaining major research grants in areas of national importance and earning recognition from their peers as recipients of prestigious awards.

I extend my sincere gratitude to our faculty and staff for their tireless efforts in preparing for this unusual semester. With their hard work, we welcomed students back for a hybrid of face-to-face and remote classes. No matter what the future holds, I am confident that our department will adapt and continue to provide an exceptional education to our students.

During the last few months, Dr. David Staack, Dr. Michael Moreno, Dr. Zheng O’Neill and other faculty have used this as an opportunity for innovation and collaboration to help meet unexpected needs and new challenges. Their contributions have already helped with combating the virus and I look forward to seeing the impact of their continuing research.

We welcome several tenured/tenure-track faculty, including Dr. Heng Pan (associate professor), Dr. Jacob McFarland (associate professor) and Dr. Zohaib Hasnain (assistant professor). The department also extends congratulations to several faculty who have been successful in their tenure and promotion.

Our faculty are responsible for the great strides our department has made in research and academia. This year they helped our undergraduate program achieve a No. 11 ranking and our graduate program reach No. 9, both maintaining their top ranking among public institutions by U.S. News and World Report. Our department also maintains its high ranking worldwide at No. 10 internationally in mechanical engineering, according to the ShanghaiRanking’s global ranking.

We are proud to induct Ralph Schmidt ’68 – retired CEO of Western Refining, Inc., William (Bill) Sims ’89 – CEO of Accent Family of Companies, and Starlee Sykes ’98 – president, Gulf of Mexico at BP, into the department’s Academy of Distinguished Graduates. Sykes was also honored with the Outstanding Alumni Award by the Texas A&M College of Engineering. We are certainly proud of all of our stellar current and former students’ contributions in all corners of the world.

And of course, our success would not be possible without the ever-generous support of our donors, whose contributions to scholarship and development funds help us continue to advance the quality and breadth of education we provide.

Sincerely,

Dr. Andreas A. Polycarpou
Department Head
James J. Cain Chair in Mechanical Engineering
## RANKINGS

- **Graduate Program**
  - #8
  - Ranked No. 8 (Public)
  - *(U.S. News & World Report, 2021)*

- **Undergraduate Program**
  - #8
  - Ranked No. 8 (Public)
  - *(U.S. News & World Report, 2021)*

- **Mechanical Engineering in World Ranking**
  - #9
  - *(Academic Ranking of World Universities from ShanghaiRanking, 2019)*

## ENROLLMENT*

<table>
<thead>
<tr>
<th></th>
<th>FALL 2020</th>
</tr>
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<tbody>
<tr>
<td>Undergraduates</td>
<td>1,490</td>
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<tr>
<td>M.S.</td>
<td>141</td>
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<tr>
<td>M.Eng.</td>
<td>82</td>
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<tr>
<td>Ph.D.</td>
<td>260</td>
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*preliminary

## ENDOwendments

- **$86.4 MILLION**
- **$28.9 MILLION**

## FACULTY

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<tr>
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<tbody>
<tr>
<td>Tenured/ Tenure Track</td>
<td>64</td>
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<td>Full Professors</td>
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<td>Associate Professors</td>
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<td>Assistant Professors</td>
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<tr>
<td>Texas A&amp;M at Qatar Faculty</td>
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<tr>
<td>Emeritus Faculty</td>
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<td>Professors of Practice</td>
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<td>Teaching Faculty</td>
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<td>NAE Members</td>
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<td>Affiliated Faculty</td>
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## ENDowed POSITIONS

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<th></th>
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<tbody>
<tr>
<td>Chairs</td>
<td>10</td>
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<tr>
<td>Professorships</td>
<td>12</td>
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<tr>
<td>Faculty Fellowships</td>
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<tr>
<td>Career Development Professorships</td>
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</table>
In hopes of mitigating the stark shortage of personal protective equipment (PPE) brought on by COVID-19, Dr. David Staack and Dr. Matt Pharr partnered with Dr. Suresh Pillai of the College of Agriculture and Life Sciences to study ways to recycle PPE by using radiation.

Building off an ongoing partnership researching medical device sterilization, the team shifted their focus to sterilizing and recycling PPE — most importantly, N95 respirators — using the FDA-approved method of electron beam irradiation.

The team sent brand new PPE through their radiation recycling process at the Electron Beam Research Facility at Texas A&M. While the recycled N95 masks, surgical masks, gowns and face shields were all still able to be worn appropriately, the N95 mask no longer filtered 95% of particles.

“The radiated masks ended up going from filtering 95% of particles 300 nanometers in size to only filtering between 50% and 60% of particles a few hundred nanometers in size,” Staack said. “That’s still a lot better than a homemade mask made from a T-shirt.”

While using a new mask each day is ideal, the team hopes their strategy might serve as a suitable backup when that is not possible.

The Electron Beam Research Facility is equipped for industrial use and can process and recycle 10,000 masks an hour.

Staack’s goal is to share the team’s results and distribute this critical information around the world so that everyone is better equipped to tackle a global pandemic.

“In these unprecedented times, I am proud to see the innovative and interdisciplinary research that our faculty are doing to tackle real-world problems,” said Dr. Andreas A. Polycarpou, department head. “Their work will have immediate implications for how PPE supplies can be sustained through shortages like the one our country is currently experiencing due to COVID-19.”

**FEATURED RESEARCHERS**

**Dr. David Staack**
Associate Professor; Sallie and Don Davis ’61 Career Development Professor; Director, Engineering Laboratory Instruction

**Dr. Matt Pharr**
Assistant Professor
Dr. Zheng O’Neill is leading a project to research, develop and demonstrate a real-time platform to improve the cybersecurity and energy efficiency of commercial grid-interactive efficient buildings (GEB).

The three-year Cyber Defense and Resilient System (CYDRES) project is funded by the United States Department of Energy’s Building Technologies Office and includes partners Raytheon Technologies Research Center, Drexel University, Arizona State University, Pacific Northwestern National Laboratory and Northwestern University.

O’Neill said current building automation systems are designed and operated with little consideration of cybersecurity challenges, leaving many building systems vulnerable to attack.

This is of special concern for GEBs, which are outfitted with next-generation sensors, controls, connectivity and communication technologies. If attacked, they could experience adverse consequences ranging from energy waste and occupant discomfort to equipment downtime and disruption of grid operations.

“The proposed CYDRES system will accurately identify cyber threats in real time and offer immediate defense against malicious network activity,” O’Neill said. “In addition, the fault detection, diagnostics, and prognosis and cyber-resilient control scheme will enhance GEB tolerance to both cyber-related and physical faults while maximizing the potential energy savings and load flexibility and maintaining occupant satisfaction.”

A hardware-in-the-loop and a local testbed will be developed to help explore and demonstrate potential approaches to cybersecurity and energy efficiency both on and off the Texas A&M campus. By the project’s conclusion, O’Neill said she expects to see CYDRES effectively monitoring, detecting and responding to cyberattacks and physical system faults.

FEATURED RESEARCHER
Dr. Zheng O’Neill
Associate Professor
J. Mike Walker ’66 Faculty Fellow II
RISING TO THE
CHALLENGE

Texas A&M, through its unique Engineering Medicine (EnMed) partnership with Houston Methodist Hospital, stepped up to help the health care system keep up with the demand for medical supplies brought on by COVID-19.

A team led by Dr. Michael R. Moreno delivered hundreds of 3D-printed diffusers for metered-dose inhalers to the Houston hospital, responding to a critical shortage after the hospital was unable to find the diffusers from its normal suppliers.

“The spacer, or diffuser, that we created will allow the doctors to use metered-dose inhalers to treat diagnosed and suspected COVID-19 patients who are not yet in need of ventilator therapy, without using nebulizers that may aerosolize the virus,” Moreno said. “And this is important because if this early stage intervention is effective, then it is possible that these patients may recover before reaching that critical point where ventilator therapy is required.”

Although the concept utilized for the diffusers is not new, this is among the first times it has been locally 3D printed and delivered on this scale.

Moreno and his team made the stereolithography file for the 3D-printable design publicly available on the EnMed website at no cost.

“As an Aggie biomedical engineer and mechanical engineer working in this biomedical space, times like these are when we really want to rise to the challenge,” Moreno said.

FEATURED RESEARCHER
Dr. Michael Moreno
Associate Professor; Director of Innovation for Engineering Medicine; J. Mike Walker ’66 Faculty Fellow; EnMed Faculty Fellow
National Academy of Engineering member Dr. Ali Erdemir comes to the department from Argonne National Laboratory, where he served as a distinguished fellow and senior scientist. His research is directed toward developing novel tribological technologies for a broad range of applications in manufacturing, transportation, and other energy conversion and utilization systems.

Erdemir is looking forward to the impact he will have in the department, not only to continue his research but also to expand his interaction with students.

“I feel that I might even be more effective by not only pursuing what I do best, which is research, but also by interacting with students and maybe passing on my expertise, my passion and my knowledge to a younger generation so that, hopefully, they can also become very successful in their future,” Erdemir said.

Erdemir has served as president of the International Tribology Council and the Society of Tribologists and Lubrication Engineers. He has published more than 300 papers, holds 23 U.S. patents and has generated more than 18,000 citations.

NEW MECHANICAL ENGINEERING FACULTY

Heng Pan, associate professor, earned a Ph.D. in mechanical engineering from the University of California, Berkeley. His research interests include additive manufacturing, high-throughput nanomanufacturing, nanoparticle-based printing, electronics/battery manufacturing, laser-assisted manufacturing, multi-material and multi-function integration, laser-material interactions, and multi-scale modeling of transport phenomena in manufacturing.

Jacob McFarland, associate professor, earned a Ph.D. in mechanical engineering from Texas A&M. His research interests include experimental and computational fluid mechanics, shock-driven hydrodynamic instabilities, multiphase flows, and reactions and magnetohydrodynamics.

Zohaib Hasnain, assistant professor, earned a Ph.D. in aerospace engineering from the University of Maryland, College Park. His research interests include dynamics and control theory, sensor technologies, applied aerodynamics and thermodynamics, and computational fluid dynamics.

FACULTY PROMOTIONS

Promotion to associate professor with tenure

- Douglas Allaire
- Jonathan Felts
- Michael Moreno
- Bruce Tai

Promotion to full professor

- Ying Li
- Srikanth Saripalli

NAMED APPOINTMENTS

Mark Balas — Leland T. Jordan Professor
Swaroop Darbha — Gulf Oil/Thomas A. Dietz Professor
Jaime Grunlan — Leland T. Jordan Chair Professor
J. Mike Walker ‘66 Department of Mechanical Engineering
engineering.tamu.edu/mechanical

J. MIKE WALKER ’66 DEPARTMENT OF MECHANICAL ENGINEERING
FIELDS OF APPLICATION

Advanced Manufacturing

Biomechanics and Human Health

Energy and Environment

Micro and Nanosystems

Robotics and Mechatronics

Turbomachinery