Human-Centered Engineering for Unprecedented Times

The 2019-2020 academic year brought unique challenges on a global scale. During most of the year, research, instruction and operations continued as usual with innovative research and discoveries as engaged students worked together in classrooms and labs. Suddenly, along with the rest of the world, we adapted to the “new normal” brought about by the COVID-19 pandemic.

The Department of Bioengineering at The University of Texas at Dallas proved to be agile and responsive, quickly transitioning to remote operations while maintaining a high quality student learning experience. Faculty expanded research to include areas relevant to the COVID-19 crisis.

As we continue to move through the uncharted waters of COVID-19, the faculty, staff, and students in the Department of Bioengineering at UT Dallas remain even more committed to engaging in globally relevant work, improving lives and training tomorrow’s biomedical engineers to take on the next challenges.

Join us, virtually or in person, during the 2020-2021 academic year as we celebrate 10 years as a department!

Sincerely,

Dr. Shalini Prasad
Head of the Department of Bioengineering
Cecil H. and Ida Green Professor of Systems Biology Science
Welcome to the Department of Bioengineering in the Erik Jonsson School of Engineering and Computer Science at UT Dallas.
This year, we celebrate 10 years since the department’s founding and mark the department’s rapid progress.

Over the past half century, we have seen computer technology advance at a rapid speed. One of the greatest challenges of this new century is the development of highly technical solutions to medical conditions. The Department of Bioengineering at UT Dallas, one of the fastest growing programs at the University, is well-positioned to create the next generation of engineers proficient at working with both advanced electronics and biological tissue. Biomedical engineering integrates engineering problem solving with medicine and biology.
Students who choose this exciting and challenging major will go on to engineer and innovate medical solutions that will reduce health care costs, improve human health and increase the quality of life for all humankind. The interdisciplinary, hands-on approach to biomedical engineering combines expertise in electrical, mechanical and materials engineering, coupled with the life sciences.

The graduate program grants degrees in biomedical engineering and offers students collaboration opportunities with UT Southwestern Medical Center.
The Department of Bioengineering is pleased to introduce our newest faculty member, Dr. Girgis Obaid. Obaid’s research interests include photo-dynamic therapy and image-guided delivery.

Obaid is a member of the International Photodynamic Association (IPA), the International Society for Optics and Photonics (SPIE) and the American Society of Photobiology (ASP), as well as several additional societies. Previously, Obaid served at Massachusetts General Hospital and Harvard Medical School.

Obaid’s research is supported by a National Institutes of Health (NIH) National Cancer Institute (NCI) K99/R00 award and focuses on nanomedicine, molecular imaging and light-activated cancer therapy.

**EDUCATION**

BS in Biochemistry, University of East Anglia, Norwich, England  
PhD in Chemistry, University of East Anglia, Norwich, England  
Postdoctoral Fellow and Instructor, Massachusetts General Hospital and Harvard Medical School

**RESEARCH INTERESTS**

Molecular targeted nanotherapeutics  
Molecular imaging  
Precision medicine  
Optically activatable cancer therapeutics  
Photonically active nanomaterials  
Cancers of the head and neck
FACULTY RECOGNITION

Our faculty have been recognized both nationally and internationally by their peers as well as by their colleagues at The University of Texas at Dallas. They excel both in the laboratory and the classroom, as top researchers and dedicated educators.

Fellows of the American Institute for Medical and Biological Engineering (AIMBE)
- Dr. Stuart Cogan
- Dr. Baowei Fei
- Dr. Joseph Pancrazio
- Dr. Jie Zheng

Fellow of the Society for Lab Automation and Screening (SLAS)
- Dr. Shalini Prasad

Senior Member of the Institute of Electrical and Electronics Engineers (IEEE)
- Dr. Orlando Auciello
- Dr. Kenneth Hoyt

UT Dallas President’s Teaching Excellence Award in Undergraduate Education
- Dr. Danieli Rodrigues

Finalist nominee for the Regents’ Outstanding Teaching Award (University of Texas System)
- Dr. Danieli Rodrigues

Fellow of the American Institute of Ultrasound in Medicine (AIUM)
- Dr. Kenneth Hoyt

Early Investigator Award at the 2019 International Photodynamic Association World Congress
- Dr. Girgis Obaid
FACULTY
The Department of Bioengineering has attracted highly qualified faculty including the University’s own Vice President for Research, Dr. Joseph Pancrazio, and Dr. Shalini Prasad, head of the Department of Bioengineering, who leads a robust, comprehensive research laboratory with collaborations across the University. Several faculty members have received endowed chairs and other awards in honor of their accomplishments.
TENURE-SYTEM FACULTY

Orlando Auciello
Professor
Distinguished Chair in Engineering

Leonidas Bleris
Associate Professor
Fellow, Cecil H. and Ida Green Professor in Systems Biology Science

Stuart Cogan
Professor

Baowei Fei
Professor
Cecil H. and Ida Green Chair in Systems Biology Science

Nicholas Fey
Assistant Professor

Heather Hayenga
Assistant Professor

Seth Hays
Assistant Professor
Fellow, Eugene McDermott Professor

Kenneth Hoyt
Associate Professor

Stephen Levene
Professor
TENURE-SYSTEM FACULTY CONTINUED

Girgis Obaid
Assistant Professor

Joseph Pancrazio
Vice President for Research
Professor

Shalini Prasad
Department Head for Bioengineering
Professor
Cecil H. and Ida Green Professor
in Systems Biology Science

Danieli Rodrigues
Associate Professor

David Schmidtke
Professor

Shashank Sirsi
Assistant Professor

Mihaela Stefan
Professor
Eugene McDermott Professor

Victor Varner
Assistant Professor

Taylor Ware
Assistant Professor
TEACHING FACULTY

Tariq Ali
Senior Lecturer I

Fang Bian
Research Scientist

Soudeh Ardestani
Khoubruy
Senior Lecturer I

Clark Meyer
Senior Lecturer II

Katie Myers
Senior Lecturer I

Joe Pacheco
Senior Lecturer II

Todd Polk
Senior Lecturer II

Ben Porter
Senior Lecturer I

Patrick Winter
Senior Lecturer I

UTDesign® Capstone
Director for Bioengineering
AFFILIATED FACULTY

Poras Balsara  
Professor, Electrical and Computer Engineering

Dinesh Bhatia  
Professor, Electrical and Computer Engineering

Carlos Busso  
Associate Professor, Electrical and Computer Engineering

Xianming Simon Dai  
Assistant Professor, Mechanical Engineering

Crystal Engineer  
Research Assistant Professor, Texas Biomedical Device Center (TxBDC)

Jeremiah Gassensmith  
Assistant Professor, Chemistry

John Hart, Jr.  
Professor, Behavioral and Brain Sciences

Fatemeh Hassanipour  
Associate Professor, Mechanical Engineering

Mahadevan Iyer  
Research Professor, Electrical and Computer Engineering

Michael Kilgard  
Professor, Behavioral and Brain Sciences

David Lary  
Associate Professor, Physics; William B. Hanson Center for Space Science

Yi Li  
Postdoctoral Research Associate

Ann Majewicz Fey  
Assistant Professor, Mechanical Engineering

Faruck Marcos  
Assistant Professor, Biological Sciences

Issa Panahi  
Professor, Electrical and Computer Engineering

Balakrishnan Prabhakaran  
Professor, Computer Science

Zhenpeng Qin  
Assistant Professor, Mechanical Engineering

Robert Rennaker  
Professor, Behavioral and Brain Sciences

Jie Zheng  
Professor, Systems Biology; Chemistry and Biochemistry

ADJUNCT FACULTY

Yasin Dhaher  
Professor, Bioengineering, UT Southwestern Medical Center

Ibrahim Hashim  
Professor, Department of Pathology, UT Southwestern Medical Center

Anke Henning  
Director, Advanced Imaging Research Center, Professor, Bioengineering, UT Southwestern Medical Center

Lan Ma  
Lecturer, Fischell Department of Bioengineering, University of Maryland

Vinay Nagaraj  
Medical Science Liaison, AngioDynamics

Hyun-Joo Nam  
Consultant, RES Group Inc.

Alexander Pertsemlidis  
Associate Professor, Department of Pediatrics, UT Health San Antonio – Greehey Children’s Cancer Institute

Matthew Petroll  
Chair, Graduate Program in Biomedical Engineering, Professor, Bioengineering, UT Southwestern Medical Center

Jennifer Seifert  
Director, Research and Development, TissueGen, Inc.

Jay Shah  
Assistant Professor, Department of Orthopaedic Surgery, Sports Medicine Service, UT Southwestern Medical Center

Tre Welch  
Assistant Professor, Cardio Thoracic Surgery, UT Southwestern Medical Center
RESEARCH
RESEARCH

Interdisciplinary research, especially in clinical settings, is at the core of human-centered engineering. The department has cultivated research partnerships with organizations including UT Southwestern Medical Center (UTSW) and hospitals including the Dallas VA Medical Center. With research opportunities for undergraduate through PhD students, the program is preparing the next generation of researchers as well as future physicians who will be well-versed in emergent technologies for health care.
**RESEARCH FINANCIALS**

**FUNDING SOURCES 2019**
- Government Funded
- Privately Funded
- Private and Non-Profit (7%)
- Industry (2%)
- Local (19%)
- State (14%)
- **Federal and National** (58%)

**EXPENDITURES BY FISCAL YEAR**
- 2015
- 2016
- 2017
- 2018
- 2019

The University of Texas at Dallas

Erik Jonsson School of Engineering and Computer Science

2020 Bioengineering Annual Report
UT SOUTHWESTERN MEDICAL CENTER COLLABORATIONS

Faculty and students in the Department of Bioengineering at UT Dallas collaborate with UTSW researchers and clinicians to bring groundbreaking discoveries into practice.

UT Dallas welcomed two new doctoral students conducting research with Dr. Yasin Dhaher, professor in the Departments of Physical Medicine and Rehabilitation and Orthopaedic Surgery at UTSW. Additionally, during the spring 2020 semester, six UT Dallas bioengineering undergraduate students conducted research in UTSW labs with Dr. Matthew Petroll, Dr. Elena Vinogradov and Dr. Yasin Dhaher.
Dr. Victor Varner and Dr. David Schmidtke worked with UTSW faculty on three different projects:

They investigated corneal keratocyte healing following injury to the eye with Dr. Matthew Petroll, professor in the Department of Ophthalmology at UTSW. This research is funded by a $1.8M grant from the National Institutes of Health. UT Dallas students Kevin Lam and Tarik Shihabeddin are currently working on this project.

They are studying the role of spatial protein presentation in kidney epithelial cell tubule formation. Members of the Center for Regenerative Science and Medicine at UTSW including Dr. Thomas Carroll, Dr. Denise Marciano and Dr. Ondine Cleaver as well as UT Dallas students Tarik Shihabeddin and Gauri Renake contributed to this project.

They studied muscle cell responsiveness to overactive bladder medications with Dr. Philippe Zimmern from the Department of Urology.
**RESEARCH AREAS**

**Dr. David Schmidtke** is working with UTSW faculty on three additional projects:

Development of novel microfluidic devices for intracellular protein delivery with **Dr. Nikhil Munshi**, associate professor in the Department of Internal Medicine. UT Dallas student **Chaitra Telang** works on this project.

Regulation of host inflammation by NADPH oxidase 2 signaling with **Dr. Jessica Moreland**, professor in the Department of Pediatrics.

Effect of high shear on neutrophil function in VAD patients with **Dr. Matthias Peltz**, associate professor in the Department of Cardiovascular and Thoracic Surgery.
Dr. Baowei Fei is working with Dr. Ivan Pedrosa, professor in the Department of Radiology at UTSW, to develop machine learning and radiomics techniques to assess the aggressiveness of renal cell carcinoma and to predict therapeutic response.

Funded through a Cancer Prevention and Research Institute of Texas (CPRIT) grant, Fei also collaborates with Dr. Baran Sumer and Dr. Larry Myers to develop a smart surgical microscope for rapid cancer detection during surgery. The device combines hyperspectral imaging with artificial intelligence.

Dr. Girgis Obaid initiated a research collaboration with Dr. Deabrata Saha, associate professor in the Department of Radiation Oncology, to establish the radiation dose dependence of excited photo-activable nanoparticles for cancer therapy. The dose parameters will then be used to compare photodynamic therapy and radiotherapy using bioengineered tumor-specific nanoparticles in vitro and in animal models of head and neck cancer. UT Dallas undergraduate student Mina Guirguis is gaining research experience through work on this project.
Dr. Danieli Rodrigues, associate professor, collaborated with Dr. Javier LaFontaine, professor in the Department of Plastic Surgery, and Dr. George Tye Liu, associate professor in the Department of Orthopedic Surgery, to develop innovative orthopedic implant surface approaches to induce healing in diabetic patients. UT Dallas students Alexandra Arteaga, Lidia Guida, and Jiayi Qu are working on this project.

Dr. Heather Hayenga, assistant professor, collaborated with Dr. Kimberly Kho, in gynecology, to develop a permanent intrafallopian tube contraceptive device. UT Dallas student Lucero Ramirez is working on this project.
Bioengineering students have unique opportunities to excel in research, as well as participate in the Jonsson School’s signature UTDesign® Capstone program where they put their expertise to work toward solving real-world problems.
ENROLLMENT AND DEGREES

HISTORICAL ENROLLMENT

ENROLLMENT BY GENDER
FALL 2019
Female 45%
Male 55%

DEGREES AWARDED BY GENDER
2018 – 2019
Female 46%
Male 54%
Students have received significant awards in the past year, including nationally prestigious fellowships. As the program has grown exponentially over the years, it has attracted students who are serious about gaining the mentorship and research opportunities needed to excel in their fields.
STUDENT AWARDS
Graduate and Alumni

Excellence in Education
Doctoral Fellowship

to Kaitlin Rabe (PI: Dr. Nicholas Fey), Winner

Erik Jonsson School of Engineering and Computer Science,
UT Dallas, Dallas, TX

Excellence in Education
Doctoral Fellowship

to Emily Levy (PI: Dr. Nicholas Fey), Winner

Erik Jonsson School of Engineering and Computer Science,
UT Dallas, Dallas, TX

The Rehab Week Award

to Hassan Jahanandish (PI: Dr. Nicholas Fey), Finalist

IEEE/RAS-EMBS International Conference on Rehabilitation Robotics (ICORR) and RehabWeek, Toronto, CA

National Defense Science and Engineering Graduate (NDSEG) Fellowship Program

to Jacob Boehm (PI: Dr. Nicholas Fey), Finalist

U.S. Department of Defense, Washington, DC

Three Minute Thesis (3MT) Competition

Kara Peak (PI: Dr. Victor Varner)

National Science Foundation Graduate Research Fellowship

Danny Lam ’18
PhD student at Case Western Reserve University
STUDENT AWARDS
Undergraduate

Bioengineering Departmental Undergraduate Research Competition

1st: Joel Epperson
Use of Retrieval Tasks to Rehabilitate Sensorimotor Impairments Due to Brain Injury
PI: Dr. Nicholas Fey

2nd: Alikhan Fidai
A Failure Mechanism Analysis of Zirconia Dental Implant Systems
PI: Dr. Danieli Rodrigues

3rd: Jeremy Warren
Atrial Septal Defect Generation for Modeling with Finite Elements
PI: Dr. Clark Meyer (Dr. Heather Hayenga Lab)

4th: Smriti Natarajan
Late-colonizing Bacterial Adhesion on Surface-treated Titanium vs Zirconia
PI: Dr. Danieli Rodrigues

IEEE Region 5 Outstanding Student Member Award
MD Fiaz Islam Bhuiyan
PI: Dr. Baowei Fei

Intuitive Best Student Paper Award at the International Conference of SPIE Medical Imaging
Matthew Pfefferle
PI: Dr. Baowei Fei

National Science Foundation Graduate Research Fellowship Honorable Mention
Benjamin Allsup
STUDENT ORGANIZATIONS

Alpha Eta Mu Beta (AEMB)

The organization was established, and officers were selected, in late fall 2019. Membership opened in early spring 2020 and began meeting spring 2020.

President: Emma Henderson
Vice President: Megan Zachariah
Secretary: Alikhan Fidai
Treasurer: Han Lai
Faculty Mentor: Shashank Sirsi

Biomedical Engineering Society (BMES)

President: Benjamin Allsup
Vice-President: Emma Henderson
Secretary: Sruthi Dubagunta
Treasurer: Ashleigh Abusomwan
Bioengineering Graduate Student Association

In the first year of operation, the BMEN Graduate Student Association hosted several workshops, seminars, socials, and other events for Bioengineering MS and PhD students. New students were welcomed at the beginning of each semester with departmental socials; including a scavenger hunt and bingo competition. Bioengineering labs participated in pie making and pumpkin carving contests during the fall semester, and students attended a holiday party with cookie decorating for some end-of-semester relaxation. The BMEN GSA organized practice sessions for qualifying exams, where PhD students could present their research plan and get feedback from their peers. The group also hosted speakers from Abbott Neuromodulation and several UT Dallas offices who discussed industry and academic careers while providing resources for career development and skill-building.

Officers 2019-2020

President: Rebecca Frederick  Vice President: Sayali Upasham
Treasurer: Aditi Bellary  Historian: Joshua Usoro
Public Relations Chair: Lucero Ramirez
Alumni Outreach Chair: Muskan Pawar
The UTDesign® Capstone program is designed to provide a hands-on learning opportunity for students.

In the program, senior undergraduate students earning degrees in biomedical engineering work in teams to solve real-world problems for corporate and University sponsors over two semesters. While the studio space was closed to students following the COVID-19 campus lockdown in spring of 2020, several teams continued to work on their projects remotely.

"We have merged the biomedical and mechanical engineering capstone classes to provide a richer experience for our students,” said Dr. Todd Polk, faculty sponsor. “On average, more than 50% of the teams are multidisciplinary, with students from both biomedical and mechanical engineering as well as students from electrical and computer engineering,” said Dr. Joe Pacheco, faculty sponsor.

“We strive to provide our students with a real world engineering experience and have organized UTDesign® Capstone like a company.” Polk added, “We treat them like working engineers from day one, and the overall experience has proved to be highly beneficial to them as they enter the professional world after graduation."
27 teams with bioengineering students

101 bioengineering students participated

Interdisciplinary Team Sponsors

Abbott Laboratories
Bridging Biosciences
Essilor Group
Klockner Pentaplast Group
Laerdal
Mechanical Ingenuity Corp.
Motorola Solutions Inc.
Orthofix
OsteoMed

Bleris laboratory,
The University of Texas at Dallas
Fei laboratory,
The University of Texas at Dallas
NanoTech Institute,
The University of Texas at Dallas
Sirsi laboratory,
The University of Texas at Dallas
UT Southwestern Medical Center
ThorMed Innovation
Winning team “Nephrolitics” created a real-time kidney function monitoring system for sponsor UT Southwestern Medical Center. Team members from left to right include seniors Ryan Finnie, mechanical engineering; Justin McFarlane, biomedical engineering; Luis Jule, biomedical engineering; Saud Madani, mechanical engineering; Alexander Harper, mechanical engineering; and Daniel Kaminski, biomedical engineering.