Pushing the Possibilities

2018-19
Academic Year Summary
Innovating at the intersection of engineering and society. Fostering partnerships to promote diversity and inclusion. Educating engaged, socially conscious engineers.

Leading by Example

Through groundbreaking research and training at every level, the Boston University College of Engineering is making advances in rankings, enrollment, faculty accomplishments, and awards, distinguishing itself from the nation’s best engineering schools.

Bold investments in curriculum development and research facilities continue to expand the profile of the College and attract high-quality students, while our faculty regularly make headlines for research and scholarship on the leading edge of engineering.

ENG ranks 16th among private graduate engineering programs.

Source: US News & World Report

10 Years of Creating the Societal Engineer

In 2008, Dean Kenneth R. Lutchen put forth a vision for an engineering education that leads to advancements in quality of life and human potential. In the decade since the College embraced and trademarked Boston University: Creating The Societal Engineer®, thousands of students have graduated with the ability and commitment to use their education and quantitative problem-solving skills to improve society. Through programs promoting undergraduate research, K-12 outreach, and our Imagineering Competition, among others, we continue to provide opportunities for our Societal Engineers to use their education to make a global impact.

Cutting-Edge Bioengineering Lab Encourages Students of All Majors to Pursue Medical Innovation

The College broke ground on the Bioengineering Teaching and Entrepreneurship Center, a 5000-square-foot facility that will be available to students from all backgrounds and majors to facilitate research and entrepreneurship in engineering and healthcare. Outfitted with state-of-the-art labs and equipment, as well as spaces for co-working and collaboration, the Center will be a unique resource for students and faculty.
Undergraduates at the Top of Their Class

The College continues to attract extremely high-quality matriculating students eager to study at a world-class research institution. Selectivity has increased 59 percent over the past 10 years and overall quality of applicants has improved.

Unique Partnership with Smith College

ENG has partnered with Smith College’s Picker Engineering Program to pioneer an innovative 4+1 BS-MS partnership, offering Smith’s engineering students enriching research experiences and a path to BU’s master of science engineering programs. This unique partnership will give Picker students significant research experiences in BU College of Engineering faculty labs while they are still undergraduates. This initiative has the promise to attract additional highly qualified female candidates to our graduate engineering programs.

Graduate Degrees are in Demand

Graduate programs continued to enjoy strong growth as students seek opportunities to work with renowned faculty across a wide array of degree programs. Applications to ENG graduate programs increased 7.4 percent in the past year.

Faculty Highlights

- Division Head of Materials Science & Engineering Professor David Bishop (ECE, Physics, MSE, ME, BME) was elected to the National Academy of Engineering.
- Professor Vinod Sarin (ME, MSE) has been elected as a Fellow of the National Academy of Inventors.
- Dean Kenneth R. Lutchen and Professor John White (BME) have been elected Fellows of the International Academy of Medical and Biological Engineering, an elite group of the world’s foremost biomedical engineers. They join a group that numbers fewer than 150 Fellows worldwide.
- Professor Christopher Chen (BME, MSE) has been selected to receive the 2019 Robert A. Pritzker Distinguished Lecture Award, The Biomedical Engineering Society’s premier recognition for outstanding achievements and leadership in the science and practice of biomedical engineering.
- Professors David Castañón (ECE, SE), Siddharth Ramachandran (ECE, MSE) and Venkatesh Saligrama (ECE, SE) have been named Fellows of the Institute of Electrical and Electronics Engineers (IEEE).
- The Optical Society of America (OSA) has elevated Professor Ji-Xin Cheng (ECE, BME, MSE) to Fellow for his outstanding contributions to invention and development of label-free optical spectroscopic imaging technologies with groundbreaking applications to biology, medicine and materials science. He was also presented with the OSA’s Ellis R. Lippincott Award.
- Professor Siddharth Ramachandran (ECE, MSE) has been named a Vannevar Bush Faculty Fellow by the Department of Defense and will use the fellowship to explore tornado light beams. He has also been elected a Fellow of the International Society for Optics and Photonics for his work in structured and singular light beams, and their applications to quantum and atom optics, sensors, telecom and biophotonics; optical fibers and guided wave nonlinear optics; and photonic crystals.
Celebration of Excellence for Development and Alumni Relations

It has been an outstanding year as BU's Capital Campaign, Choose to be Great, nears its goal. ENG's overall fundraising achievement is also impressive as is the ever-growing engagement and generosity from our alumni, volunteers, faculty, students, parents, and friends. The College experienced a 40 percent increase in alumni participation alone over the duration of the campaign. The gifts ENG received throughout this time period provided exceptional momentum and support that are essential to the College's continuous growth and excellence. Our donors' philanthropy, advocacy, and professional expertise, along with a shared and steadfast commitment to the College’s mission, has made a significant impact on the next generation of future leaders of industry and government who will move society forward: these are our Societal Engineers.

STEM Program for K-12 Students Increases Reach

Over the last year, the College’s Technology Innovation Scholars Program reached 2425 students in 22 states and six countries and increased home visits by 30 percent. This specialized K-12 STEM program encourages middle- and high-school students to pursue careers in technology and engineering through visits to schools and homes. The program’s Inspiration Ambassadors, specially selected and trained undergraduates, have reached more than 25,000 students across the country since the program’s inception in 2011.

New Center Will Advance Interdisciplinary Understanding of Mechanobiology

The College has established the Center for Multiscale and Translational Mechanobiology, which will facilitate research projects between faculty from BU’s College of Engineering, College of Arts and Sciences, Sargent College of Health and Rehabilitation Sciences, and Medical School. The center aims to become a nexus for engineering and quantitative methods to understand and control how physical cues affect biological processes. This area of research is one of the most untapped and potentially revolutionary avenues for advancing the understanding of fundamental mechanisms that drive altered function in disease. Professor Elise Morgan (ME, MSE) serves as the inaugural director.

Assistant Professor Sahar Sharifzadeh (ECE, MSE, Physics) was recognized by Nature as one of 11 early- to mid-career scientists making an impact in their fields.

Professor Janusz Konrad (ECE) was named IEEE Distinguished Lecturer Speaker for 2019.

Professor Alexander Sergienko (ECE) received a Durable Equipment Award from the Air Force Office of Scientific Research in recognition of his efforts to develop devices for efficient quantum networking and communication.

Assistant Professors Brian Walsh (ME, ECE), Michelle Sander (ECE, MSE), Sahar Sharifzadeh (ECE, MSE) and Lei Tian (ECE) have received Faculty Early Career Development Program awards from the National Science Foundation (NSF), each totaling $500,000 in funding over five years.

Biomedical Engineering Graduate Program Ranking

Source: US News & World Report #9
A team of researchers led by Professor Ji-Xin Cheng (ECE, BME, MSE) have invented a blue light therapy that kills MRSA, a bacteria that causes deadly, treatment-resistant infections, without antibiotics. Their findings were published in Advanced Science.

Associate Professor Mary Dunlop’s (BME) lab has discovered that not all bacteria that develop antibiotic resistance do so under over-exposure to that drug, a finding that could lead to the development of new ways to curb antibiotic resistance other than decreasing exposure. The work has been published in Science.

Associate Professor Vivek Goyal (ECE) and a team of researchers have developed a system employing a computer algorithm and a simple digital camera to see around corners. Their research was published in Nature.

Associate Professor Ahmad ‘Mo’ Khalil (BME) and collaborators have developed a new synthetic biology toolset powered by self-assembling molecules and predictive modeling that will allow researchers to construct the complex computation and signal processing found in eukaryotic organisms, including human cells. Their work has been published in Science.

Professor Siddharth Ramachandran (ECE, MSE) and his lab have observed a new effect within fiber optics that opens up a stable and effective way to develop and use a fiber-optic cable to create a laser that can produce high-power light at desired colors. The findings have been published in Optica.

Assistant Professors Tommaso Ranzani (ME, MSE) and Sheila Russo (ME, MSE) created a novel process to eventually fabricate small, soft and flexible robots also called microfluidic origami for reconfigurable pneumatic/hydraulic (MORPH) systems. Their work has been published in Advanced Materials.

A new, ultra-sensitive detection test developed by Professor M. Selim Ünlü (ECE, MSE, BME) has the ability to measure biomarker concentrations 36-fold lower than the current gold-standard laboratory test. The work, published in the Proceedings of the National Academy of Sciences, aims to diagnose diseases and infections earlier than current methods allow.

Professor Xin Zhang (ME, ECE, MSE, BME) has led multiple technology breakthroughs with metamaterials, including developing one that can manipulate sound and electromagnetic waves; another that can block sound and create silence, and another that can amplify a magnetic resonance signal. Their work has been published in Nature Communications, Optica, Physical Review and Communications Physics.

The Department of Defense has awarded Professor Ioannis Paschalidis (ECE, BME, SE) $7.5 million in Multidisciplinary University Research Initiative funding to develop bioinspired control systems for self-navigated vehicles.

Professor Ji-Xin Cheng (ECE, BME, MSE) and Associate Professor Xue Han (BME) have been awarded a five-year $3.3 million grant from the National Institutes of Health (NIH) under the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative. The award will be used to study the mechanism of ultrasound neurostimulation.

Professor Joyce Wong (BME, MSE) and Associate Professor R. Glynn Holt (ME), have won a $1.5 million grant from the NIH for phase II of development on a non-invasive, preventative treatment using targeted microbubbles to keep abdominal adhesions from forming after surgery.

Three ENG researchers, Associate Professors Mary Dunlop (BME), Wilson Wong (BME), and Professor Ji-Xin Cheng (ECE, BME, Chemistry, Physics), were awarded a three-year, $1.5 million Department of Energy grant to develop technology to better understand and measure the synthesis of biofuels in living cells.

Associate Professor Kamal Sen (BME) and Associate Professor Xue Han (BME) have been awarded nearly $1 million from the NIH BRAIN initiative to study the neural networks that allow the brain to distinguish sounds from each other.

Professors Ioannis Paschalidis (ECE, BME, SE) and Christos Cassandras (ECE, SE, CISE) have won a $900,000 NSF grant to use machine-learning techniques to predict heart disease and diabetes using electronic health data.

The Office of Naval Research has awarded Professor Manuel Egele (ECE) with a $750,000 grant to pursue malware defense.

Assistant Professor Chuanhua Duan (ME, MSE) is a 2018 recipient of the Defense Advanced Research Projects Agency Young Faculty Award. The $500,000 award will help fund his research into replicating cell-to-cell communication.

Assistant Professor Allyson Sgro (BME) has been awarded a two-year $150,000 grant under the NSF’s 10 Big Ideas program to elucidate how cells work together to form groups.

Professors Ajay Joshi (ECE) and Manuel Egele (ECE), have come up with hardware-level protection against memory corruption attacks. Their research proposal titled “Securing Processors Using an Array of Specialized and Programmable Policy Engines” was recognized by Google with a research award.

Professor Muhammad Zaman (BME, MSE) and his team are partnering with Merck Global Health to test and optimize PharmaChk, the user-friendly, portable device he has developed to test drugs of questionable quality.
**ENG At A Glance**

### Students in 2018-19
- Undergraduate: 1,765
- Master’s: 581
- Doctoral: 464

### Degrees Granted
- Bachelor's: 394
- Master's: 327
- Doctoral: 59

### Faculty
- Tenure/Tenure Track: 125
- Non-Tenure Track: 15
- Research: 16

### Alumni
- Living Alumni: 18,892

### Academic Degrees
- Biomedical Engineering
- Computer Engineering
- Electrical and Computer Engineering
- Electrical Engineering
- Manufacturing Engineering
- Materials Science and Engineering
- Product Design and Manufacture
- Systems Engineering

### Undergraduate Concentrations
- Aerospace Engineering
- Energy Technologies
- Manufacturing Engineering
- Nanotechnology
- Technology Innovation

### Graduate Specializations
- Data Analytics
- Cybersecurity
- Robotics

### Dual Degrees
- Doctor of Philosophy and Doctor of Medicine (PhD/MD)
- MS in Product Design and Manufacture and MBA in Management Dual Degree Program (MS/MBA)
- Modular Medical/Dental Integrated Curriculum

### Interdisciplinary Research Centers & Institutes
- Biological Design Center
- Center for Autonomous and Robotics Systems
- Center for Computational Science
- Center for Information and Systems Engineering
- Center for Semiconductor Materials and Devices Modeling
- Center for Multiscale and Translational Mechanobiology
- Center for Subsurface Sensing & Imaging Systems
- Center for Space Physics
- Fraunhofer Center for Manufacturing Innovation
- Hearing Research Center
- Institute for Sustainable Energy
- Institute for Health System Innovation and Policy
- Nanotechnology Innovation Center
- Neurophotonics Center
- NSF Engineering Research Center in Cellular Metamaterials
- Photonics Center
- Precision Diagnostics Center
- Rafik B. Hariri Institute for Computing and Computational Science & Engineering

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