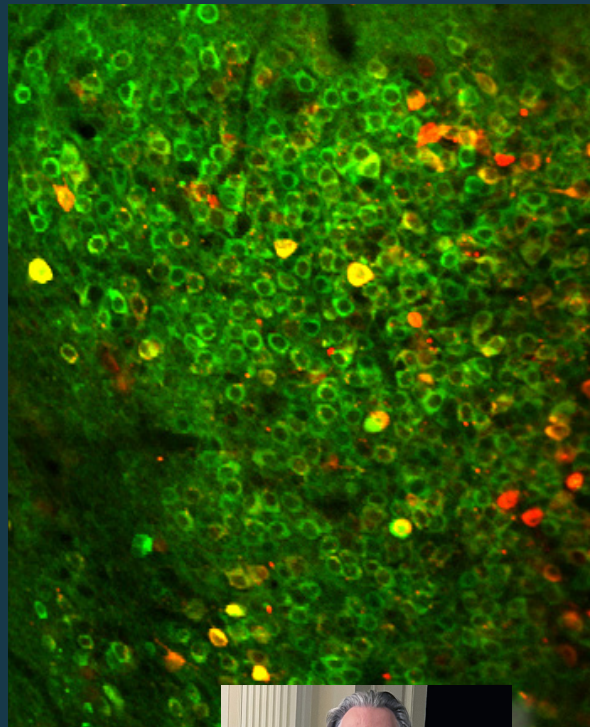


BOSTON
UNIVERSITY

Boston University College of Engineering
Department of Biomedical Engineering

BIOMEDICAL ENGINEERING

2024-2025 YEAR IN REVIEW



Path of a Neuroscientist

After 10 years of inspiring BME's award winning faculty, dramatically growing our research funding, and navigating a global pandemic, a grateful farewell to Chair John White - [PAGE 17](#)



A tradition of excellence.

The **Department of Biomedical Engineering** at Boston University is among the largest of its kind in the US and is home to award-winning faculty, exceptional students, and numerous research centers and laboratories engaged in an array of interdisciplinary biomedical activities.

Founded in 1966, BU BME was among the first to offer a bachelor's degree in the discipline. Today, we offer a full suite of undergraduate and graduate degrees, and are consistently ranked among the top BME departments in the nation by U.S. News & World Report.

BU BME 2024-2025

42 Primary Faculty

215 PhD Students

630 Undergraduates

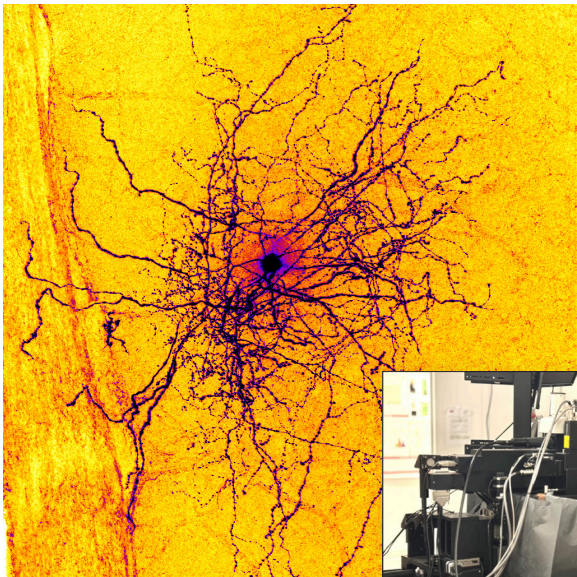
61 Courses Taught

\$29 MILLION
Research Funding



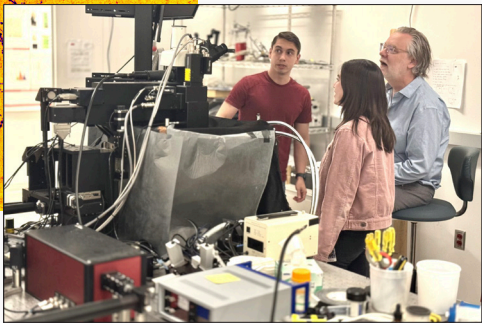
ABOVE: Research team members in the lab of Assistant Professor **Liang Hao**. Her lab focuses on integrating engineering perspectives and disease biology to improve healthcare with precision, adaptability, and portability.

BME Department 2024-2025



**// As biomedical engineers,
it's our calling in the world
to improve human health.
That's what drives every
single person here. //**

John A. White
BME Department Chair



Faculty

The BME faculty numbered 42, making the department one of the largest in the country.

Graduate Program

25 PhD degrees awarded
58 MS degrees awarded
19 MEng degrees awarded
Enrolled 309 students (215 PhD students; 4 MD/PhD; 70 MS; 20 MEng)

Undergraduate Program

153 Bachelor of Science degrees awarded
Enrolled 630 students

Research

BME faculty was awarded \$28,742,899 in extramural funds
\$878,369 per research active faculty member
The faculty submitted 228 research proposals for \$233M.
43 research laboratories
8 research centers

Primary Faculty

Our distinguished faculty is comprised of world renowned scientists and engineers who work across every scale of biology and in a wide spectrum of bioengineering subspecialties. Their research is driven by advancing fundamental understanding of biology and physiology in health and disease and then translating these principles to new technologies that impact the human condition and the practice of medicine. They also participate in 8 interdisciplinary research centers that are directed by BME faculty, and 43 research laboratories.



SAMAGYA BANSKOTA
Assistant Professor, Biomedical Engineering
PhD, Biomedical Engineering, Duke University



IRVING J. BIGIO
Professor, Biomedical Engineering;
Electrical and Computer Engineering; Physics; Medicine
PhD, Physics, University of Michigan



DAVID BOAS
Professor, Biomedical Engineering;
Electrical and Computer Engineering;
Director, Neurophotonics Center
PhD, Physics, University of Pennsylvania



CHRISTOPHER S. CHEN
Professor, Biomedical Engineering;
Director, Biological Design Center
MD, Harvard University; PhD, Medical Engineering, MIT



JI-XIN CHENG
Professor, Biomedical Engineering;
Electrical and Computer Engineering; Chemistry; Physics;
Moustakas Chair Prof. in Photonics & Optoelectronics
PhD, Chemical Physics, University of Science and Technology of China



BRIANNE CONNIZZO
Assistant Professor, Biomedical Engineering
PhD, Bioengineering, University of Pennsylvania



BRIAN DEPASQUALE
Assistant Professor, Biomedical Engineering
PhD, Neurobiology and Behavior, Columbia University



ANNA DEVOR
Professor, Biomedical Engineering
PhD, Hebrew University of Jerusalem, Israel



MARY DUNLOP
Professor, Biomedical Engineering
PhD, Mechanical Engineering, California Institute of Technology



MICHAEL ECONOMO
Assistant Professor, Biomedical Engineering
PhD, Biomedical Engineering, Boston University



SOLOMON EISENBERG
Professor, Biomedical Engineering;
Electrical and Computer Engineering;
Senior Associate Dean for Academic Programs,
College of Engineering
ScD, Electrical Engineering, MIT



JAMES GALAGAN
Professor, Biomedical Engineering;
Microbiology, BUSM
PhD, Computational Neuroscience, MIT



ALEXANDER GREEN
Associate Professor, Biomedical Engineering
PhD, Materials Science and Engineering, Northwestern University



MARK GRINSTAFF
Professor, Biomedical Engineering; Chemistry;
Director, Nanotechnology Innovation Center
PhD, Chemistry, University of Illinois Urbana-Champaign



XUE HAN
Professor, Biomedical Engineering
PhD, Physiology, University of Wisconsin-Madison



LIANGLIANG HAO
Assistant Professor, Biomedical Engineering
PhD, Chemical Biology, Northwestern University



MIGUEL JIMENEZ
Assistant Professor, Biomedical Engineering
PhD, Chemistry, Columbia University



DIANE JOSEPH-MCCARTHY
Professor of the Practice, Biomedical Engineering;
Executive Director, Bioengineering Technology &
Entrepreneurship Center
PhD, Physical Chemistry, MIT



SIMON KASIF
Professor, Biomedical Engineering
PhD, Computer Science, University of Maryland



AHMAD (MO) KHALIL
Professor, Biomedical Engineering;
Associate Director, Biological Design Center
PhD, Mechanical Engineering, MIT

\$878k Funding per Research Active Faculty

4 NIH New Innovator Awards

5 NSF/NIH Training Grants

38 AIMBE Fellows



CATHERINE KLAPPERICH
Professor and Vice Chair, Biomedical Engineering;
Director, Precision Diagnostics Center;
PhD, Mechanical Engineering, U of California, Berkeley



KENNETH R. LUTCHÉN
Professor, Biomedical Engineering;
Dean, College of Engineering
PhD, Biomedical Engineering, Case Western



JEROME MERTZ
Professor, Biomedical Engineering; Physics
*PhD, Physics, Université Paris VI and
University of California, Santa Barbara*



JOHN NGO
Associate Professor, Biomedical Engineering
*PhD, Biochemistry and Molecular Biophysics,
California Institute of Technology*



HADI T. NIA
Assistant Professor, Biomedical Engineering
PhD, Mechanical Engineering, MIT



TIMOTHY O'SHEA
Assistant Professor, Biomedical Engineering
PhD, Medical Engineering and Medical Physics, MIT



ERICA PRATT
Assistant Professor, Biomedical Engineering
PhD, Biomedical Engineering, Cornell University



DARREN ROBLYER
Professor, Biomedical Engineering
Director of PhD Program Admissions
PhD, Bioengineering, Rice University



KAMAL SEN
Associate Professor, Biomedical Engineering
Director of Master's Program Admissions
PhD, Physics, Brandeis University



MICHAEL L. SMITH
Associate Professor, Biomedical Engineering
*PhD, Biomedical Engineering,
University of Virginia*



DIMITRIJE STAMENOVIĆ
Professor, Biomedical Engineering
PhD, Mechanics, University of Minnesota



MATTHIAS STANGL
Assistant Professor, Biomedical Engineering
*PhD, German Center for Neurodegenerative Diseases & Otto-von-
Guericke University Magdeburg*



BÉLA SUKI
Professor, Biomedical Engineering
*PhD, Biomechanics, Jozsef Attila University,
Szeged (Hungary)*



MICHELLE TEPLENSKY
Assistant Professor, Biomedical Engineering
PhD, Chemical Engineering, University of Cambridge



JOE TIEN
Associate Professor, Biomedical Engineering
PhD, Physics, Harvard University



ADRIANA TOMIC
Assistant Professor, Biomedical Engineering
PhD, Infection Biology, Hannover Medical School



LUCIA M. VAINA
Professor, Biomedical Engineering; Neurology
*PhD, Mathematical Logic, Sorbonne; Doctorat d'Etat ès
Sciences and in Médecine (MD PhD); Institut National
Toulouse, France*



SANDOR VAJDA
Professor, Biomedical Engineering;
Director, Biomolecular Engineering Research Center
PhD, Chemistry, Hungarian Academy of Science



JOHN WHITE
Professor and Chair, Biomedical Engineering
PhD, Biomedical Engineering, Johns Hopkins University



JOYCE WONG
Professor, Biomedical Engineering
*PhD, Materials Science and Engineering,
Program in Polymer Science and Technology, MIT*



WILSON WONG
Professor, Biomedical Engineering
PhD, Chemical Engineering, UCLA



MUHAMMAD ZAMAN
Professor, Biomedical Engineering
PhD, Physical Chemistry University of Chicago

Selected Publications from BU BME Faculty

BU BME faculty continue to publish impactful research in top journals.

This represents a sampling from dozens of publications.

Brianne Connizzo's Lab - **AGING CELL**

Cellular senescence impairs tendon extracellular matrix remodeling in response to mechanical unloading

Alex Green's Lab - **CELL / CHEM**

Rapid, Multiplexed, and Enzyme-Free Nucleic Acid Detection Using Programmable Aptamer-Based RNA Switches

Xue Han's Lab - **NATURE COMMUNICATIONS**

Beta-frequency sensory stimulation enhances gait rhythmicity through strengthened coupling between striatal networks and stepping movement.

Wilson Wong's Lab, Mark Grinstaff's Lab - **NATURE BIOTECHNOLOGY**

Complete substitution with modified nucleotides in self-amplifying RNA suppresses the interferon response and increases potency

Ji-Xin Cheng's Lab et al. - **SCIENCE ADVANCES**

Wireless neuromodulation at submillimeter precision via a microwave split-ring resonator

Diane Joseph-McCarthy's Lab, Sandor Vajda's Lab - **VIRUSES**

Identification and Ranking of Binding Sites from Structural Ensembles: Application to SARS-CoV-2

Xin Zhang's Lab - **NATURE COMMUNICATIONS**

A robust near-field body area network based on coaxially-shielded textile metamaterial

Tim O'Shea's Lab - **ADVANCED HEALTHCARE MATERIALS**

Thioether-Functionalized Cellulose for the Fabrication of Oxidation-Responsive Biomaterial Coatings and Films

Brianne Connizzo's Lab - **JOURNAL OF ORTHOPAEDIC RESEARCH**

Coordination of Glucose and Glutamine Metabolism in Tendon Is Lost in Aging

Mary Dunlop's Lab - **MSYSTEMS**

Evaluating the predictive power of combined gene expression dynamics from single cells on antibiotic survival

Michael Economo's Lab - **NATURE NEUROSCIENCE**

Separating cognitive and motor processes in the behaving mouse

James Galagan's Lab - **NATURE COMMUNICATIONS**

Predictive biophysical neural network modeling of a compendium of in vivo transcription factor DNA binding profiles for Escherichia coli

Erica Pratt's Lab - **BIOTECHNIQUES**

Standardized droplet preamplification method for downstream circulating cell-free DNA analysis

Wilson Wong's Lab - **SCIENCE ADVANCES**

Multiplexed light-inducible recombinases to control cell fate, Boolean logic, and cell patterning in mammalian cells

Alex Green's Lab - **NATURE COMMUNICATIONS**

Generative and Predictive Neural Networks for the Design of Functional RNA Molecules

Muhammad Zaman's Lab - **APPLIED AND ENVIRONMENTAL MICROBIOLOGY**

Effects of microplastic concentration, composition, and size on Escherichia coli biofilm-associated antimicrobial resistance



BU BME Research

The vitality of research at Boston University Biomedical Engineering has never been greater. The department embraces a philosophy of **convergent research**, which integrates questions, methods and resources from multiple traditional disciplines in pursuit of solving fundamental challenges and complex problems. This approach attracts scientists inclined to engage in highly collaborative research, and encourages their work in interactive spaces, sharing ideas and technologies.

96,000 square feet of space

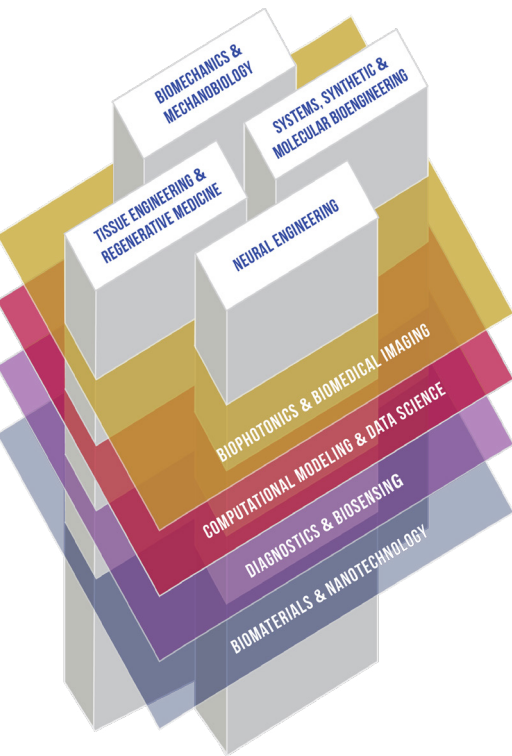
43 separate research laboratories

8 BME faculty-led research centers

\$31 MILLION in research funding



The lab of BME Assistant Professor **Brianne Connizzo** studies tissue maintenance, specifically in the musculoskeletal system, and how the cellular responses to repair and replace damaged tissue change throughout life.



Research in BME spans all length scales and most organ systems of the human body:

- Biomechanics and Mechanobiology
- Systems, Synthetic & Molecular Bioengineering
- Tissue Engineering & Regenerative Medicine
- Neural Engineering

Four enabling technologies are a critical component of our department's approach:

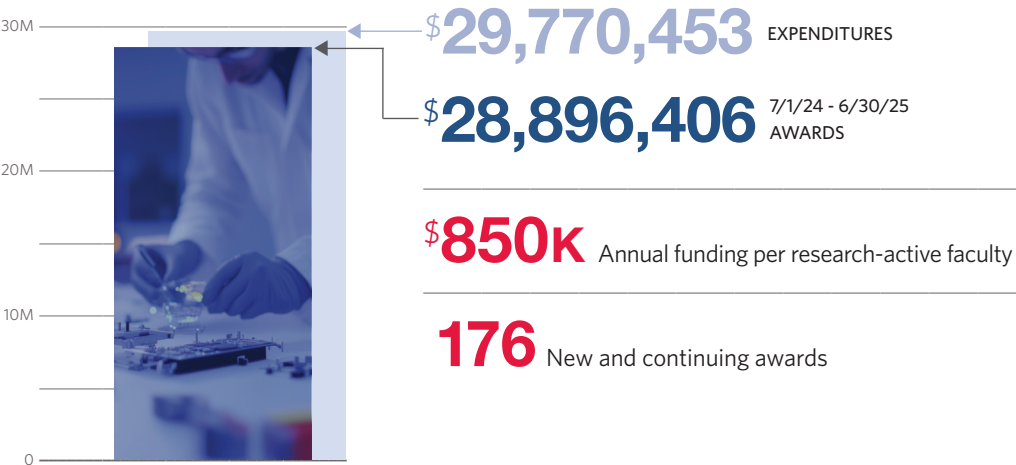
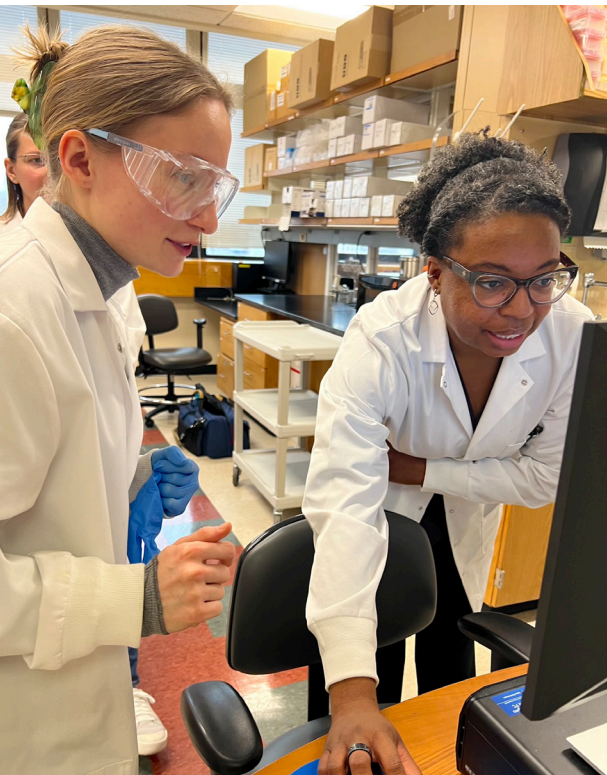
- Biophotonics & Biomedical Imaging
- Computational Modeling & Data Sciences
- Diagnostics & Biosensing
- Biomaterials & Nanotechnology

Grant Funding

Our researchers annually attract millions of dollars in support from some of the nations’s most prestigious funding agencies, and students at all levels gain hands-on experience that translates to real-world expertise.

BME Total Grant Funding AY 2024-2025

BME faculty were awarded almost \$29 million in extramural funds.



BU BME’s research can be characterized by a combination of:

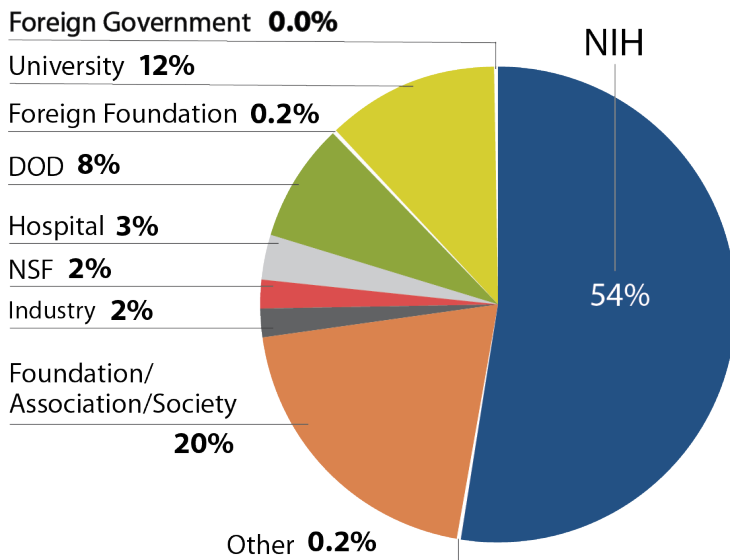
- Empirical and theoretical work with an attention to explicit mathematical models for the phenomena under study
- Intensive computer use for experimental and theoretical work
- A basic scientific flavor to the fundamental questions being asked
- An attention to the applications of improving health care, and a thorough understanding of the underlying physiological processes
- A world-class training environment for undergraduate and graduate students

BME Assistant Professor **Erica Pratt** and her lab’s research team develop liquid biopsy assays for minimally invasive cancer diagnosis and monitoring. Her work bridges the gap between complex tumor biology and personalized medicine.

BME Grant Funding by Agency

A diversity of research funding as broken down by grant agency.

7/1/24 - 6/30/25



Merging Disciplines



A continuing emphasis on Convergent Research

“Convergence is where you bring people together from different traditional disciplines who are interested in a problem or challenge for society that’s complicated and can’t be solved by one discipline,” says Kenneth R. Lutchen, BU’s Vice President of Research, and cochair of the newly founded Boston University Task Force on Convergent Research and Education. The group includes faculty drawn from fields as diverse as global studies, medicine, sociology and biomedical engineering.



Among those attracted to BU by this emphasis on convergence was BME Professor **David Boas**. A pioneer in neurophotonics, a physicist and engineer, Boas says that his work with BU medical researchers has induced a mutually beneficial cycle: he builds tools that they apply to health research, which can then spark new areas of study, and require new tools. In collaborations with researchers at BU and beyond, he’s applied the technology to studies of pain during surgery, stroke recovery, and Alzheimer’s disease.

Research Centers

BU BME has a broad range of research strengths, a wealth of resources and facilities, and also benefits from strong ties with the research-active BU School of Medicine, as well as many other top medical research centers in the Boston area.

BU has 8 interdisciplinary **research centers** that are directed by BME faculty:

BTEC	Bioengineering Technology and Entrepreneurship Center Transforming education and innovation for bioengineering students through hands-on learning in partnership with industry, from gene editing to biosensors to digital medicine
BDC	Biological Design Center To rigorously understand life's design principles and re-engineer them to revolutionize our approach to addressing critical challenges in human health and the environment
BMERC	Biomolecular Engineering Research Center Developing and applying computational methods for the analysis and design of structures, functions, interactions, regulation and evolution of biological macromolecules
CFD	Center on Forced Displacement Fostering research and engagement with the global challenge of forced displacement, through multidisciplinary teams from across BU, around the country, and around the world
CELL-MET	NSF Engineering Research Center in Cellular Metamaterials Developing tissue-engineering principles to create scalable, low-cost technologies for growing clinically significant cardiac tissues from cell-level building blocks
BUnano	Nanotechnology Innovation Center Where nanomaterials intersect medicine and energy through collaborative interdisciplinary research
NPC	Neurophotonics Center Advancing our understanding and treatment of brain disorders through advanced optical science and photonic systems
PDC	Precision Diagnostics Center Discovery, design and development and clinical translation of technology for disease screening and monitoring, treatment management and health maintenance



The Rajen Kilachand Center for Integrated Life Sciences & Engineering includes neuroscience research, systems/synthetic biology research, a satellite vivarium, and a cognitive neuroimaging center.

Research Highlights

A sampling of BME's 176 awards from AY 2024-2025 reflects the spectrum of BU BME's research strengths, and the depth of our faculty accomplishments.

BME Professor **Ahmad "Mo" Khalil** (right) at the Inaugural *Research on Tap* event. His talk celebrated BU's pivotal role in the history of synthetic biology, and how it could shape the field's future.



Alexander Green

Award \$2,519,182 Sponsor: Department of Defense/DARPA

Smart Paper-Integrated Technologies for Interrogating Readiness (SPITFIRE)

Xue Han

Award \$1,145,523 Sponsor: NIH/National Institute of Neurological Disorders and Stroke

Optical voltage imaging analysis of the cellular and network mechanisms of deep brain stimulation

David Boas

Award \$1,139,166 Sponsor: NIH/National Institute of Biomedical Imaging and Bioengineering

The Neuroscience of Everyday World - A novel wearable system for continuous measurement of brain function

Wilson Wong

Award \$966,971 Sponsor: NIH/National Diabetes & Digestive and Kidney Diseases

Precise targeting of T1D specific T cells using CAR and peptide-MHC chimeric antigen ligands

Ahmad Khalil

Award \$919,787 Sponsor: NIH/National Institute of Biomedical Imaging and Bioengineering

ePACE: automation platforms for adaptable and scalable continuous evolution of biomolecules with therapeutic potential

Ahmad Khalil

Award \$861,898 Sponsor: NIH/National Institute of Allergy and Infectious Diseases

Programmable benchtop bioreactors for scalable eco-evolutionary dynamics of the human microbiome

Sandor Vajda

Award \$825,488 Sponsor: NIH/National Institute of General Medical Sciences

Analysis and Prediction of Molecular Interactions

Ahmad Khalil

Award \$802,704 Sponsor: Carnegie Mellon University

ROGUE-Rx On-site generation using electronics

Samagya Banskota

Award \$655,618 Sponsor: Massachusetts Life Sciences Center

Advancing the delivery of genome editors with next-generation non-viral delivery systems

Anna Devor

Award \$627,611 Sponsor: Cornell University

Metabolic and neural activity normalization by cerebral blood flow increase in AD/ADRD models

Oded Ghitza

Award \$597,468 Sponsor: Department of Defense/United States Airforce Office of Scientific Research

Gravity Dependent Cortical Control of Sensation

Graduate Programs

The BME Department is known for its highly quantitative approach to biomedical science with a focus on applying engineering, computational, and analytical techniques to biological systems. Experiential learning experiences, including opportunities to work with clinicians at the Boston University School of Medicine and other Boston-area hospitals, deepen students’ knowledge base, preparing them for careers in companies producing cutting edge products and technologies.

Master of Engineering - A customized, professional master’s degree program for students focused on careers in the private sector, the MEng offers a graduate curriculum of advanced technical courses in an area of specialization and a unique practical hands-on product development project.

Master of Science - A research-focused master’s degree program designed to provide superior training in order for students to pursue advanced biomedical engineering careers. In addition to technical coursework, there is a practicum requirement for an approved mentored project. Alternatively, students may perform an original Thesis.

PhD - Candidates obtain advanced education and research training while working with our world-renowned faculty. PhD students are guaranteed funding for the duration of their program, as long as they maintain satisfactory progress.



Graduate BME program
Private Universities

AY 2024-2025

322 Grad Students

102 Degrees Awarded

133% 10 year Growth
Graduate programs

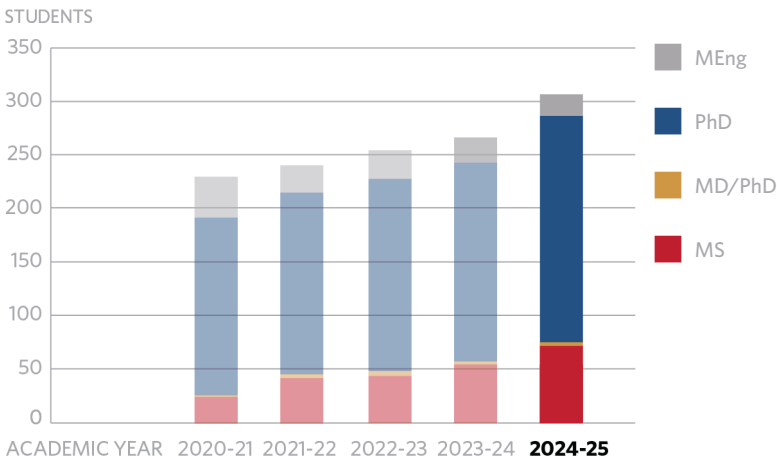
92% Placement Rate
Graduate programs



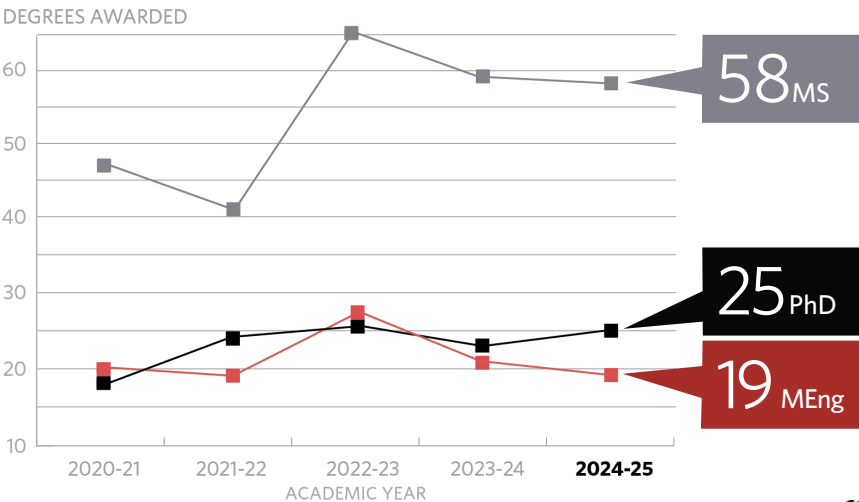


During AY 2024-2025, BU BME funded 215 PhD candidates, with 78% funded by competitive external fellowships.

GRADUATE PROGRAM POPULATION



DEGREES AWARDED



Graduate Degrees

MENG Graduates
SPRING 2025
William Arpin Ryan Baker Alyssa Eakman Jose Miguel Esteban Jennifer Field Noelle Flanagan Noah Freedman William Hanson Caitlyn Hayes Brannon McBride William McGlone Isabel Melton Alyssa Morgan Samantha St. Pierre Caitlin Streck Jadyn Suedbeck Nik Swanson Alexandra Wittstadt
MS Graduates
SUMMER 2024
Emily Davis <i>(Advisor: Christopher Chen)</i>
Maren Eltze <i>(Advisor: Erica Pratt)</i>
Eren Ergene <i>(Advisor: Mario Cabodi)</i>
Katherine Frazee <i>(Advisor: Mario Cabodi)</i>
Carlos Gomez <i>(Advisor: Darren Roblyer)</i>
Laboni Hassan <i>(Advisor: Timothy O'Shea)</i>
Xingyu Hu <i>(Advisor: Mark Grinstaff)</i>
Katarina Koziol <i>(Advisor: Erica Pratt)</i>
Eli McPherson <i>(Advisor: Mario Cabodi)</i>
Arun Nambiar <i>(Advisor: Wilson Wong)</i>
Nicole Ostrovsky <i>(Advisor: Erica Pratt)</i>
Alisha Ragatz <i>(Advisor: Mario Cabodi)</i>
Colin Skeen <i>(Advisor: Erica Pratt)</i>
Laura Thurber <i>(Advisor: Mario Cabodi)</i>
Mckayla Vlasity <i>(Advisor: Alexander Green)</i>

Paige Woods <i>(Advisor: Timothy O'Shea)</i>
FALL 2024
Amanda Adams <i>(Advisor: Mario Cabodi)</i>
Kaavya Akula Arun Kumar <i>(Advisor: Miguel Jimenez)</i>
Kyle Bohl <i>(Advisor: Dimitrije Stamenovic)</i>
Brady Camplin <i>(Advisor: Mario Cabodi)</i>
Charlotte Fitzgerald <i>(Advisor: Mario Cabodi)</i>
Hlib Maidanik <i>(Advisor: Darren Roblyer)</i>
Yixin Mei <i>(Advisor: Bjoern Reinhard)</i>
Jacob Parkulo <i>(Advisor: Alexander Green)</i>
David Vance <i>(Advisor: Mario Cabodi)</i>
Maya Weidman <i>(Advisor: Dimitrije Stamenovic)</i>
SPRING 2025
Leen Abuzir <i>(Advisor: Mario Cabodi)</i>
Isabella Claire <i>(Advisor: Catherine Klapperich)</i>
Sudan Duwadi <i>(Advisor: David Boas)</i>
Jingxin Feng <i>(Advisor: Ji-Xin Cheng)</i>
Yixin Gao <i>(Advisor: Mark Grinstaff)</i>
Jason Gashi <i>(Advisor: Mario Cabodi)</i>
Kate Herrema <i>(Advisor: Anna Devor)</i>
Joshua Jeon <i>(Advisor: Dimitrije Stamenovic)</i>
Daniel Jiang <i>(Advisor: Mario Cabodi)</i>
Mitchell Jones <i>(Advisor: Mario Cabodi)</i>
Sangsoo Lee <i>(Advisor: Mario Cabodi)</i>
Kevin Levesque <i>(Advisor: Brianne Connizzo)</i>
Chloe Li <i>(Advisor: Mark Grinstaff)</i>

Yumeng Li <i>(Advisor: Mario Cabodi)</i>
Felipe Munoz <i>(Advisor: Dimitrije Stamenovic)</i>
Adhithi Ramasubramanian <i>(Advisor: Mario Cabodi)</i>
Bradley Rauscher <i>(Advisor: Anna Devor)</i>
Jose Rosas Gonzalez <i>(Advisor: Bela Suki)</i>
Erynne San Antonio <i>(Advisor: Xue Han)</i>
Joseph Soto <i>(Advisor: Brianne Connizzo)</i>
Linda Sunil <i>(Advisor: Mario Cabodi)</i>
Leonard Tan <i>(Advisor: Dimitrije Stamenovic)</i>
Grace Tugado <i>(Advisor: Mario Cabodi)</i>
Anna Vena <i>(Advisor: Mario Cabodi)</i>
Jacob Warner <i>(Advisor: Darren Roblyer)</i>
Songting Xie <i>(Advisor: Mario Cabodi)</i>
Omri Yosfan <i>(Advisor: James Galagan)</i>
Samuel Zhou <i>(Advisor: Xue Han)</i>
MS w/Practice
Jake Bardorf <i>(Advisor: Mario Cabodi)</i>
Ethan To <i>(Advisor: Mario Cabodi)</i>

PHD Graduates

SUMMER 2024

Carlos Gomez

(Advisor: Darren Roblyer)

Non-invasive Monitoring of the Respiratory Muscles via Diffuse Optical Modalities

Caroline Blassick

(Advisor: Mary Dunlop)

Characterizing Heterogeneity in Escherichia Coli Gene Expression and Its Consequences for Antimicrobial Tolerance

Ting-Ya Chang

(Advisor: David Waxman)

Identification of Functional Enhancers at Open Chromatin Regions Involved in Sex Specificity and Xenobiotic Metabolism Using in Vivo Starr-Seq in Mouse Livers

Adam Sanford

(Advisor: Ahmad Khalil)

Development of a Scalable Yeast-Based Functional Selection Platform to Enable the Discovery of Diverse Protein-Based G Protein-Coupled Receptor Modulators

Xinwen Zhu

(Advisor: Wilson Wong)

Tools and Strategies for Gene Expression Control in Service of Understanding and Constructing Multicellular Systems

FALL 2024

Zhongyue Guo

(Advisor: Ji-Xin Cheng)

Protein Assemblies in Their Natural Environment by Mid-Infrared Photothermal Microscopy

Alex Seibel

(Advisor: Joe Tien)

Tissue-Engineered Human Lymphatic Models for the Study of Breast Cancer and Obesity

SPRING 2025

Rohin Banerji

(Advisor: Hadi Nia)

Crystal Ribcage: Development of a Platform to Probe Real-Time Lung Function With Cellular Resolution in Health and Disease

Christian DeMoya

(Advisor: Mark Grinstaff)

Addressing the Pathological Mechanisms of Osteoarthritis Using Rationally Designed Biomaterials

Neilesh Frings

(Advisor: Elise Morgan)

Characterizing the Vertebral Endplate Region and Its Risk of Failure With Respect to Aging and Disc Degeneration

Padric Garden

(Advisor: Alexander Green)

Harnessing the Untapped Potential of DNA Repair Enzymes for Biosensing

Alexander Gray

(Advisor: Irving Bigio)

Quantifying Pathological Changes to Myelin With High Resolution Birefringence Microscopy and Deep Learning

Joseph Hall

(Advisor: Bela Suki)

Advancing Multi-Scale Network and Agent-Based Computational Lung Models: Potential for Personalized Prediction of Disease Progression

Han Huang

(Advisor: Robert Reinhart)

Flexibility and Control in Working Memory Gating: Behavioral, Demographic, and Neuromodulatory Influences

Rebecca Kang

(Advisor: Alexander Green)

Adaptive Molecular Recognition Strategies for Multimodal Sensing in Biological Systems

Byungchan Kim

(Advisor: Vickery Trinkaus-Randall)

Non-invasive Measurement of Human Cerebral Blood Flow Using Speckle Contrast Optical Spectroscopy

Colin Kunze

(Advisor: Ahmad Khalil)

Synthetic Epigenetic Circuits to Investigate Robustness and Adaptability of Epigenetic Inheritance in Schizosaccharomyces Pombe

Chang Liu

(Advisor: Lei Tian)

Pushing the Limits of SNR and Resolution for in Vivo Neural Imaging via Self-Supervised Learning

Owen O'Connor

(Advisor: Mary Dunlop)

Advancing Single-Cell Analysis: Deep Learning for Cell Segmentation and Tracking With Improved Metrics

Nikola Otic

(Advisor: David Boas)

Multi-Wavelength Multi-Distance Approach for Evaluating the Metabolic Activity of the Brain in Diffuse Correlation Spectroscopy and Wearable Near Infrared Spectroscopy

Kathryn Regan

(Advisor: Hadi Nia)

The Role of Mechanical Cues in Biological Systems: From Tissue Micromechanics to Immune Cell Motility

De'Ja Rogers

(Advisor: David Boas)

Easing Utility in Multimodal Functional Near Infrared Spectroscopy (fNIRS) and Electroencephalography (EEG) in Diverse Participants

Jeremy Tran

(Advisor: John Ngo)

Expanding the Synthetic Notch Signaling Toolkit for Regulating Gene Expression in Response to Diverse Extracellular Cues

Hanrong Ye

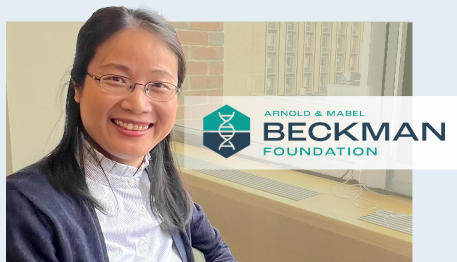
(Advisor: Ahmad Khalil)

Unlocking Macrophage Engineering and Therapies With Synthetic Polarization Circuits

Xingjian Zhong

(Advisor: Allison Dennis)

Developing NIR-II Active Nanocrystals for Biomedical Applications



BECKMAN YOUNG INVESTIGATOR

A grant from the Beckman Foundation will allow Assistant Professor **Liang Hao** and her lab to develop a first-of-its-kind protein activity imaging platform. This technology has the potential to transform how we diagnose and treat cancer and other complex diseases. This award supports a long-standing scientific dream of hers: To visualize the most invasive cancer cells at their earliest stage—deep within tissues, without a biopsy—and reimagine the future of precision medicine.

THE “COCKTAIL PARTY PROBLEM”

A new brain-inspired algorithm developed by Professor **Kamal Sen** could help hearing aids tune out interference and isolate single talkers in a crowd of voices. In testing, the research found that it could improve word recognition accuracy in noisy situations by 40 percentage points relative to current algorithms. By 2050, around 2.5 billion people globally are expected to have some form of hearing loss.

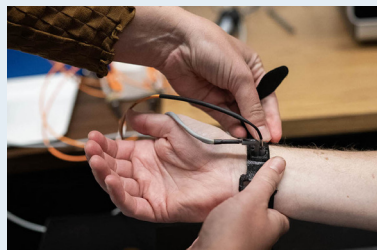


CUTTING-EDGE GENOME EDITING

With an award from the Hartwell Foundation, Assistant Professor **Samagya Banskota** is working toward a life-saving treatment for Wolfram Syndrome, a rare genetic disease caused by a pathogenic mutation. The novel editing technique has the potential to change the prognosis for other rare disorders. The Hartwell Foundation seeks to identify and support research that has not yet qualified for significant funding from outside sources, and that has the potential to benefit children in the U.S.

USING LIGHT TO MONITOR HEALTH

Understanding how light interacts with living cells and tissues is the foundation of Professor **Darren Roblyer**'s medical device inventions. In his Biomedical Optical Technologies Lab, he and his team are testing ways to monitor biological processes - like blood pressure, oxygen levels, and disease progression - with light waves. “One of the most important things I think I do is, as we’re developing these technologies, we’re talking to a lot of physicians, understanding what their unmet needs are, and helping to understand whether our technologies could help,” Roblyer says. “My hope for this work is to make a real impact in the lives of patients.”



RAININ INNOVATOR AWARDS

With an Innovator Award from the Rainin Foundation, Assistant Professors **Miguel Jimenez** and **Liang Hao** aim to create a next-generation microbial therapy for the millions of people suffering from inflammatory bowel diseases. The two labs will collaborate to work with a well-studied probiotic strain that is safe in humans, and engineer it to sense disease conditions and deliver therapeutic proteins at the site of inflammation.

2024-2025 Faculty Honors *(Selected)*

BMES-CMBE Shu Chien Achievement Award - **Chris Chen**
 NIH R35 MIRA - **Michelle Teplensky**
 PhRMA Foundation - **Samagya Banskota**
 AIMBE College of Fellows - **Wilson Wong**
 Rainin Foundation Innovator Award - **Liang Hao, Miguel Jimenez**
 SPIE Fellow - **Darren Roblyer**
 ACS Synthetic Biology Young Investigator - **John Ngo**
 AAAS Fellow - **Kenneth Lutchen**
 CMBE Rising Star - **Hadi Nia**
 Hevolution/AFAR Junior Investigator Award - **Hadi Nia, Brianne Connizzo**
 CASP16 Competition - **Sandor Vajda**
 ASME Thomas A. Edison Patent Award - **Xin Zhang**
 Controlled Release Society - **Mark Grinstaff**
 Oxford University Litchfield Lecture - **Adriana Tomic**
 MLSC Workforce Development Capital Grant - **Joyce Wong, Brianne Connizzo, Tim O'Shea, Xin Brown**
 Professor of the Year - **Joshua Kays**
 Teaching Excellence in the Engineering Core Curriculum - **Christine Mulvey**
 Charles DeLisi Award - **Bela Suki**

Undergraduate Program

Founded in 1966, the Biomedical Engineering Department was among the first to offer a bachelor’s degree in the discipline. To achieve our educational mission, we cultivate our students’ problem-solving and communication skills, nurture their creativity, promote their ability to think critically and independently, and help them to understand scientific and engineering approaches.



US News Ranking
Undergrad BME program
Private Universities

630 Students

32% of College of Engineering
56% Female students

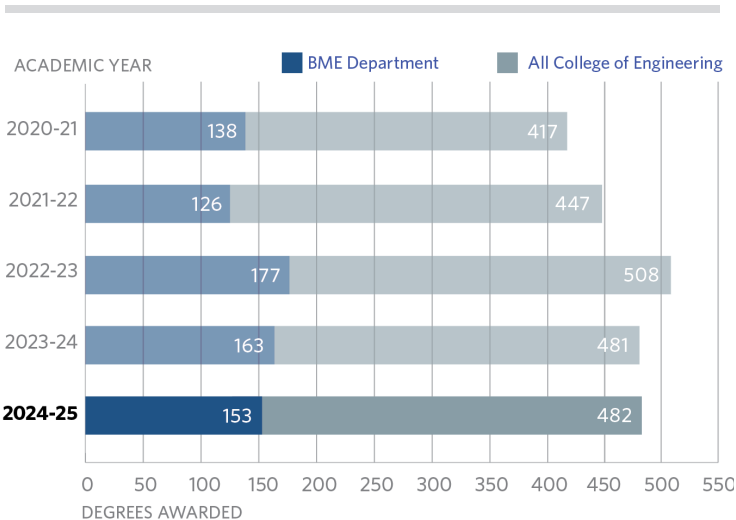
153 Bachelor of Science degrees

61 Courses taught



A variety of advanced electives allow opportunities for specialization in instrumentation, sensory and neural systems, biomechanics, signal processing, biomolecular engineering and systems & synthetic biology.

BS DEGREES AWARDED



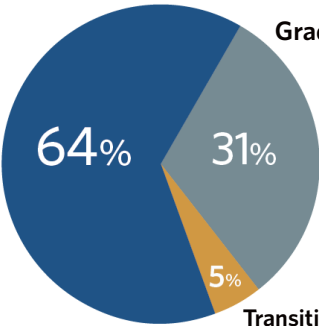


The undergraduate program in biomedical engineering fuses engineering practicum and research with a life sciences education at a world-class, urban research institution.

TRACKING ALUMNI - POST GRADUATION PLANS

96%
EMPLOYED
OR GRADUATE SCHOOL
of 2024 graduates

Employed



Graduate/Professional School

The College of Engineering conducts an exit survey of all graduating seniors in late April/early May and continues to compile data until the end of the following fall semester. The results of these interviews are shown in the chart at left for the graduating class of May 2024 and are collected approximately six months after graduation.

Transitional Jobs/Travel/Still Looking



Research experiences are available to undergraduates in many of the BME labs, as well as faculty-mentored opportunities and fellowships through the College of Engineering and the University. In addition, each BME senior develops a Senior Design Project with an individual faculty member, scientific mentor or corporate advisor.

The Path of a Neuroscientist

After 10 years of inspiring BME's award winning faculty, dramatically growing the department's research funding, and navigating a global pandemic, a grateful farewell to Professor and Chair John White

Long before he became BME chair, John White arrived at BU as a brand new assistant professor showing a lot of promise. "We loved the science he was doing," says Dean Emeritus Ken Lutchen, who is now BU's vice president of research. "He came from a great pedigree of neural engineering and bioengineering programs, and his science and research were immediately impactful." After rising to full professor, White was recruited away to the University of Utah's Brain Institute. A little over a year later, he was asked to serve as the Institute's director, a job he enjoyed.

After 8 years, when he decided to look for a position to better suit his family, it so happened that BU BME was looking for a new chair. "This opportunity to join BU as chair came up at that time, and I had a great conversation with Joyce Wong. She really encouraged me to apply, as did Ken Lutchen. They all knew me extremely well," White says. "I wasn't anxious about it, because I knew there was a ton of opportunity."

As a leader, White's contributions to the tremendous growth of BU BME have included his collegial personality and sense of community, a commitment to cultivating excellent educators, and his ability to elevate our reputation well beyond BU. White feels that his most significant accomplishment as chair is growing the BME faculty from about 30 to about 40. "And as we hire, we just keep hiring better. We've developed this culture of interaction that is just generating grant opportunities one after another. So we've about doubled the amount of the research expenditures of the department in 10 years," says White.

As a neuroscientist, Professor White's own research uses novel engineering approaches to understand neural function, including the way the brain computes, represents, stores, and retrieves information. As a young child, White was always fiddling with electronics, building radios and the like, but it wasn't until college that he developed a strong interest in neuroscience, mainly through his own independent study. His Neuronal Dynamics Lab at BU uses optical imaging, computational, and electrophysiological approaches to understand what factors drive neuronal activity and synchronization within the brain, with the goal of exploiting these findings to improve the human condition.

During White's years as BME chair there have been crises and challenges, including the COVID pandemic, one of the longest student strikes in the history of U.S. academics, and the current budget challenges. "I think we're in a very good position long-term, but those are pretty daunting challenges. But that said, we've got a great staff. We've got a great faculty. We've got terrific students," says White. "I'm glad to be wrapping up, because it's draining, but this is the best job I've ever had." ♦



BME Professor and Chair John White

// What we have here is a great leader: as a great scientist, as a great educator, as a friend, and as someone that helps people understand the value of community to advance a whole department."



Kenneth Lutchen

Vice President for Research, BME Dean Emeritus

// John's secret power is making people feel that their opinions and their viewpoints are valued and should be heard."



Elise Morgan

Dean, College of Engineering

// He cultivates a culture of collaboration, intellectual curiosity, and mutual respect that continues to define our department's spirit."



Mary Dunlop

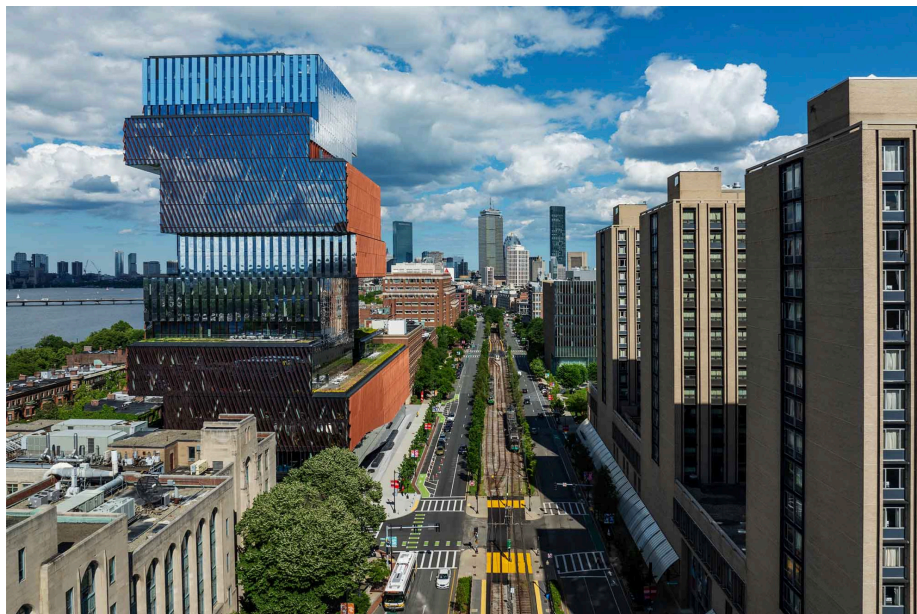
Professor and Interim Chair

// John is remarkable. He is the center of how much the department has grown, and an empathetic colleague who deeply cares. And he has an extraordinary sense of humor!"



Muhammad Zaman

Professor and Vice Chair



BU's Department of Biomedical Engineering (BME) is one of the largest departments in the nation, with 42 award-winning primary faculty, numerous interdisciplinary research centers, and exceptional talent at all levels. Research activity by primary BME faculty is \$29M per year.

bu.edu/bme

BU BME 2024-2025

59 Years - First BME Program

\$29 Million Research Funding

42 Primary Faculty

38 BME Faculty AIMBE Fellows

#13 Graduate Ranking, Private Universities

#6 Undergrad Ranking, Private Universities



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