BME @ FIU

- Established in 2003 with a $10M endowment from the WH Coulter Foundation and the State of Florida

- The first BME department in Florida with a full slate of programs (accredited BS, MS, BS/MS and PhD)

- The only one in the nation offering these degrees at a Hispanic and Minority serving institution
BME Student Opportunities

• Coulter Seminar Series
• Graduate Research Day
• Coulter Graduate Fellowships
• Senior Design Expo & Competition
  • Projects 100% sponsored by industry or clinical sponsors
• Undergraduate Research Day
• Undergraduate Research Fellowships
  • Coulter Undergraduate Research Excellence Program
    Norman Weldon Undergraduate Student Summer Research Internship
• Travel Awards
• Clinical Rotations

BME Ranked in top 50 for schools providing the best value to students
BME Student Societies

• **BMES**
  - Biomedical Engineering Society

• **AEMB**
  - Alpha Eta Mu Beta Engineering Honor Society

• **IEEE-EMBS**
  - Institute of Electrical and Electronics Engineers Engineering in Medicine and Biology Society

• **Panther Bionics**
  - Panther Bionics is a student driven organization created at FIU which aims to inspire, educate and empower students by tackling biomedical engineering project through creativity, innovation and vision.
BME Student Demographics

Out of 358 colleges and universities

• #1 BME bachelor's degrees awarded to Hispanic students

• #3 BME bachelor’s degrees awarded to African-Americans

• #23 BME number of bachelor’s degrees awarded

• 500+ Alumni

• AEMB (Honor Society) voted 2017 Most Active National Chapter
Student Success Metrics (Present)

FTIC 1\textsuperscript{st} to 2\textsuperscript{nd} year retention rate for GPA >2.0 Highest in College
Four–year Graduation rate Highest in College
Honors college enrollment (Fall 2016) Highest in College

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FTIU Engineering & Computing
Department of Biomedical Engineering
Research in BME @ FIU

Pathway to Success

Discover
Design
Develop
Deliver
Research in BME @ FIU

- Basic Research in Engineered Tissue Model Systems
- Diagnostic Bioimaging and Sensor Systems
- Therapeutic and Reparative Neurotechnology
Research Collaborations

FIU Colleges
- FIU Arts, Sciences & Education
- FIU Communication, Architecture + The Arts
- FIU Robert Stempel College of Public Health & Social Work
- FIU Herbert Wertheim College of Medicine
- FIU Biomedical Engineering

Hospitals
- Baptist Health South Florida
- UF Health
- UJ Health

Industry Partners
- ENTOP
- Medtronic
- MedStar Health
- Stryker
- Cochlear
- Mount Sinai Beth Israel
Research Collaborations

2 NSF Engineering Research Center partnerships

- PATHS-UP
  Precise Advanced Technologies and Health Systems for Underserved Populations

- CELL-MET
60+ patents
2 startup companies since 2014
2 i-Corps teams
4 Fellows

Multiuniversity Partnerships/International:
2 NSF ERC proposals granted
DARPA, NIH, NSF multiuniversity/international partnerships funded

BME Research Accomplishments

Zachary Danziger is making strides in understanding bladder control in aging and spinal cord injury.
Anuradha Godavarty is developing a low-cost, hand-held wound healing assessment and conducting clinical studies.
Joshua Hutcherson studies cardiovascular disease mechanisms.
Shuliang Jiao's biophotonic devices help treat retinal degenerative disorders.
Ranu Jung is developing neural technologies for functional restoration in individuals with limb loss or spinal cord injury.
Chenzhong Li develops biosensors for organ on a chip and Point of Care Testings.
Wei-Chiang Lin develops smart intraoperative guidance system for surgery.
Anthony McGoron develops targeted image-guided drug-delivery for combating cancer.
Jacob McPherson is developing new treatments for neuropathic pain and motor impairments after spinal cord injury & stroke.
Raj Markondeya develops packaging of bioelectronics implants for health monitoring and curing neurological disorders
Sharan Ramaswamy advances biomechanically derived diagnostics and regenerative therapies for cardiovascular medicine.
Jorge Riera-Diaz is making strides in treating multiple brain disorders.
James Schummers is working to unravel the brain circuits underlying vision.
Jessica Ramella-Roman's biophotonic device is in clinical trial for pre-mature labor and cervical cancer.
Nikolaos Tsoukias studies neuromuscular coupling.
• **Cross-Cutting**
  - Engineer the tools of scientific discovery
  - Enhance virtual reality
  - Advance personalized learning

• **Health and Well-Being**
  - Engineering better medicines
  - Reverse-engineer the brain
  - Advance health informatics
Educating Tomorrow’s Engineer
Engineering for the Benefit of Humanity

- exciting
- creative
- adventurous
- rigorous
- demanding
- empowering
Optical Imaging Laboratory

Anuradha Godavarty, Ph.D.

Dr. Godavarty is developing a low-cost, hand-held wound healing assessment and conducts clinical studies.

Near-infrared spectroscopy for brain activity studies and muscle oxygenation measurement

Near-infrared imaging for physiological wound monitoring
Dr. Li develops biosensors for organ on a chip and Point of Care Testings.

Neuron devices for exocytosis mapping

Point of care testings- wearable/stretchable, disposable, and tele-medicine

licz@fiu.edu   https://nanobio.fiu.edu/
Medical Photonics Laboratory

Jessica Ramella-Roman, Ph.D.

Dr. Ramella’s biophotonic device is in clinical trial for pre-mature labor and cervical cancer.

Medical instrumentation for pre-term labor and cervical cancer detection in low resource setting

Spectro-polarimetric system to investigate scar and wound formation

Multi-model imaging for diagnosis of diabetic retinopathy
Biomedical Optics Laboratory

Wei-Chiang Lin, Ph.D.

Dr. Lin develops smart intraoperative guidance systems for surgery.

Multimodal imaging for in vivo epileptic cortex study

Spectroscopy-based guidance system for brain tumor surgery
Optical Imaging Laboratory
Shuliang Jiao, Ph.D.
Dr. Jiao’s biophotonic devices help treat retinal degenerative disorders.

OCT imaging of eyes
Imaging rhodopsin

OCT-guided PAOM

Imaging lipofuscin with VIS-OCT
Image Guided Therapy Lab

Anthony J McGoron, Ph.D.

Dr. McGoron develops targeted image-guided drug-delivery for combatting cancer.

Ideal Drug Delivery Vehicle

- Targeting (antibody, peptide)
- Imaging (PET/SPECT Isotope)
- Linker (PLGA, PLA, Chitosan)
- Stabilizer (PVA, PEG)
- Therapy (DOX, protein, DNA)

Conjugation Chemistry of Ga-68 to Chitosan Microspheres

- Chitosan Glycol
- Emulsion
- P-SCN-b-NOTA
- Ga-68 Purification
- CHSg-NOTA
- Labeling Vial 15 min in Acetate buffer pH = 3.5

Sentinel lymph node imaging using NIR probes

3D-Model of liver tumors and supplying vasculature
Optical imaging and cell tracing techniques show cellular and extracellular matrix composition in cardiovascular tissues.

Extracellular matrix remodeling results from intracellular and cell-cell interactions.
Dr. Ramaswamy advances biomechanically-derived diagnostics and regenerative therapies for cardiovascular medicine.

Cardiovascular mechanics, including computational models

Heart valve tissue engineering and mechanobiology
Laboratory of Vascular Physiology and Biotransport

Nikolaos M. Tsoukias, Ph.D.

Dr. Tsoukias studies neuromuscular coupling.

Modeling

Experiments
Neuronal Mass Dynamic Lab

Jorge Riera, Ph.D.

Dr. Riera is making strides in treating multiple brain disorders.

Optogenetics

- Multi-electrode arrays for large-scale recording and 3D recording

Microcirculation

- Multi-modal imaging for neurovascular coupling study
Dr. McPherson is developing new treatments for neuropathic pain and motor impairments after spinal cord injury and stroke.

Preclinical research: neuro-computer interface, motor rehabilitation and neuropathic pain

Clinical research: Stroke, spinal cord injury, neuro/electro-physiology, neuropharmacology, robotics and MRI.
Dr. Danziger is making strides in understanding bladder control in aging and spinal cord injury.

Novel testbeds and decoding algorithms for brain-computer interfaces and body-machine interfaces

Peripheral nerve stimulation and mathematical modeling of the urinary tract to treat urinary retention and incontinence
Adaptive Neural Systems Laboratory

Ranu Jung, Ph.D.

Dr. Jung is developing neural technologies for functional restoration in individuals with limb loss or spinal cord injury.

Restore ventilatory function after paralysis - computational modeling; bioelectronics effecting neuroplasticity

Peripheral nerve interface to restore sense of touch and proprioception - ANS-neural-enabled prosthetic hand system (FDA Class III medical device); Sensorimotor perception studies.
Bioelectronics Packaging Laboratory

Raj Markondeya, Ph.D.

Dr. Raj develops packaging of bioelectronics implants for health monitoring and curing neurological disorders.

**BIOELECTRONIC PACKAGING RESEARCH**

- **3D Packaging with High-Component Density**
- **Fine-Pitch Hermetic Feedthroughs for Retinal Implants**
- **Embedded Active and Passive Components**
- **ThinFilm Flex Power Supply and Storage**

FIU-GT Collaboration
Visual Cortical Circuits Laboratory

James Schummers, Ph.D.

Dr. Schummers is working to unravel the brain circuits underlying vision.

Widefield and two-photon microscopy of neuronal activity patterns visual cortex

Interactions between neurons and astrocytes in the brain