# Engineering & Computing

**Department of Biomedical Engineering** 

# BME @ FIU

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

- Foundation
- 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 Faculty**



Engineering & Computing Department of Biomedical Engineering

# **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
    OPProgram
    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

Engineering & Computing

Department of Biomedical Engineering



# Student Success Metrics (Present)

FTIC 1<sup>st</sup> to 2<sup>nd</sup> year retention rate for GPA >2.0 Four–year Graduation rate Honors college enrollment (Fall 2016) Highest in College Highest in College Highest in College





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**



# **Research Collaborations**



2 NSF Engineering Research Center partnerships





# **BME Research Accomplishments**

#### 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 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 Hutcheson 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 would healing assessment and conducts clinical studies.





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

Near-infrared imaging for physiological wound monitoring



### Nanobioenginneering/Bioelectronics Lab Chenzhong Li, Ph.D.

Dr. Li develops biosensors for organ on a chip and Point of Care Testings.



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

licz@fiu.edu https://nanobio.fiu.edu/



Neuron devices for exocytosis mapping



#### Single cell/whole cell analysis



### 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.



Spectroscopy-based guidance system for brain tumor surgery



Multimodal imaging for in vivo epileptic cortex study





# Optical Imaging Laboratory

#### Shuliang Jiao, Ph.D.

Dr. Jiao's biophotonic devices help treat retinal degenerative disorders.



OCT-guided PAOM





OCT imaging of eyes

Imaging rhodopsin



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.



Conjugation Chemistry of Ga-68 to Chitosan Microspheres 3D-Model of liver tumors and supplying vasculature



### Cardiovascular Matrix Remodeling Laboratory Joshua D. Hutcheson, Ph.D.

Dr. Hutcheson studies cardiovascular disease mechanisms.





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



### Tissue Engineered Mechanics, imaging and Materials Lab Sharan Ramaswamy, Ph.D. FAHA

Dr. Ramaswamy advances biomechanically-derived diagnostics and regenerative therapies for cardiovascular medicine.



Cardiovascular mechanics, including computational models





# Laboratory of Vascular Physiology and Biotransport Nikolaos M. Tsoukias, Ph.D.

Dr. Tsoukias studies neuromuscular coupling.







Experiments



### Neuronal Mass Dynamic Lab

Jorge Riera, Ph.D.

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



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





Multi-modal imaging for neurovascular coupling study



# Neurological Injury & Sensorimotor Integration Laboratory Jacob McPherson, Ph.D.

Dr. McPherson is developing new treatments for neuropathic pain and motor impairments after spinal cord injury and stroke.





Clinical research: Stroke, spinal cord injury, neuro/electrophysiology, neuropharmacology, robotics and MRI.



### Applied Neural Interfaces Laboratory

#### Zachary Danziger, Ph.D.

Dr. Danziger is making strides in understanding bladder control in aging and spinal corn injury.





Novel testbeds and decoding algorithms for braincomputer 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



**Embedded Active and Passive Components** 



Fine-Pitch Hermetic Feedthroughs for Retinal Implants



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







