

## **BME Focus Area: Bioinstrumentation, Bioimaging, and Bioelectrical**

Bioinstrumentation is a field devoted to measuring, evaluating, and treating biologic/physiologic systems using devices and sensors. Bioimaging includes technologies spanning all hierarchical scales (nano to macro) to visualize (ideally non-invasively and in real-time) biologic or medical features. Bioelectrical engineering is a broad field applying the principles of electrical engineering to biologic systems.

### **Application Examples**

Medical Device Design

Robotics (surgical robotics, exoskeletons)

Prosthetic design

Rehabilitation devices

Biomechatronics

Wearable electronics

Neuroengineering

Telemedicine

BioMEMs

Biosignal Processing

Radiology

Imaging and image processing: Microscopy, SEM, TEM, MRI, Ultrasound, PET, X-Ray, CT

### **Company Examples**

10x Genomics

Abbott Laboratories

AbbVie

AngioDynamics

AveXis

Baxter International

B. Braun Medical

Becton Dickinson- Bard Biopsy

Biophan Technologies

BioTelemetry, Inc.

Bodystat

Boston Scientific

Bovie Medical

Bruker

ChemImage

Cochlear

Daxor

Dexcom

Dickson

Edwards Lifesciences

Ethicon (Johnson & Johnson)

GE Healthcare

Hitachi Medical Systems

Hologic

InBody Co., Ltd.

Innsight

Intel

Intellijoint

Intuitive Surgical Inc.

Leica Biosystems

Medtronic

Mesa Labs

MGC Diagnostics

MKS Instruments

NuVasive

Ortho Clinical Diagnostics

Orthofix

Philips

PhotoniCare

Prenosis

Qualcomm

Scanco USA, Inc.

Siemens Healthineers

Stryker

TA Instruments

Tekscan

Tempus Lab

ThermoFisher Scientific

Tristan Technologies

US Med-Equip

VICON

Viv Labs

Welch Allen

Zimmer Biomet

### Relevant Course Examples

\* required in BME curriculum

BMEG 230	*Circuits, Signals, and Systems for Biomedical Applications	ELEG 320	Field Theory I
BMEG 330	*Biomedical Instrumentation	ELEG 340	Solid State Electronics
BMEG 441	Biomechatronics	ELEG 404	Digital Imaging and Photography
BMEG 443	Magnetic Resonance Imaging	ELEG 446	Nanoelectronic Device Principles
BMEG 464	Medical Device Development	ELEG 447	Optical Properties of Solids
BMEG 471	Mathematical Physiology	ELEG 450	Semiconductor Device Design and Fabrication
BMEG 479	Introduction to Medical Imaging Systems	ELEG 482	Optics and Photonics
CISC 181	Introduction to Computer Science II	MSEG 429	Characterization of Electronic Materials & Devices
CPEG 202	Introduction to Digital Systems	MSEG 611	Theory, Experiment and Applications in Vibrational Spectroscopy
CPEG 222	Microprocessor Systems	MSEG 624	Practical Electron Microscopy
ELEG 306	Digital Signal Processing	MEEG 451	Introduction to Microsystems
ELEG 309	Electronic Circuit Analysis I	PHYS 313	Physics Optics
ELEG 310	Random Signals and Noise		
ELEG 312	Electronic Circuit Analysis II		

### Pathway Examples

Pathways are optional groupings of 6 technical electives (including at least 2 BME) that demonstrate depth and focus in a particular area. Examples below are provided for reference and are not all-inclusive. Be sure to check current course offerings, approved technical electives, and pre-requisites (all subject to change).

#### *Path 1: Biomechatronics*

BMEG 441	Biomechatronics
BMEG 464	Medical Device Development
ELEG 309	Electronic Circuit Analysis I
ELEG 310	Random Signals and Noise
ELEG 312	Electronic Circuit Analysis II
MEEG 451	Introduction to Microsystems

#### *Path 2: Bioimaging*

BMEG 443	Magnetic Resonance Imaging
BMEG 479	Introduction to Medical Imaging Systems
ELEG 306	Digital Signal Processing
ELEG 404	Digital Imaging and Photography
ELEG 447	Optical Properties of Solids
MSEG 611	Theory, Experiment and Applications in Vibrational Spectroscopy

#### *Path 3: Biosensing and Controls*

BMEG 441	Biomechatronics
BMEG 464	Medical Device Development
BMEG 471	Mathematical Physiology
CISC 181	Introduction to Computer Science II
CPEG 202	Introduction to Digital Systems
CPEG 222	Microprocessor Systems

### Other Curricular Enhancements

Electrical & Computer Engineering Minor  
 RSO: Assistive Medical Technologies  
 RSO: Orthotics & Prosthetics Club