UNIVERSITY OF DELAWARE

BIOMEDICAL ENGINEERING

BIOELECTRICAL, BIOINSTRUMENTATION, & BIOIMAGING

Bioelectrical engineering involves the application of electrical engineering principles to understand and solve problems in biology and medicine. Bioinstrumentation is a field devoted to the design and development of instruments for measuring, evaluating, and treating medical conditions. Bioimaging includes technologies spanning all length scales (nano to macro) to visualize (ideally non-invasively and in real-time) physiological, anatomical, or functional features in medical research as well as clinical diagnosis.

COMPANY SNAPSHOT

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
Hamilton
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

APPLICATION EXAMPLES

Medical device design, Robotics (surgical robotics, exoskeletons, powered prosthetics), Prosthetic design, Rehabilitation devices, Biomechatronics, Human-machine interfaces, Wearable electronics, Neuroengineering, Telemedicine, Bio-MEMS (microelectromechanical systems), Biochips, Biosignal processing, Biomedical sensors, Haptic technology, Imaging and image processing: Microscopy (SEM, TEM), MRI (magnetic resonance imaging), Ultrasound, Nuclear medicine (PET, SPECT), X-ray, CT (computed tomography)

RELEVANT COURSE EXAMPLES (*REQUIRED IN BME CURRICULUM)

BMEG 230	*Circuits, Signals, and Systems for Biomedical Applications	ELEG 313	Electromagnetic Field Theory
BMEG 330	*Biomedical Instrumentation	ELEG 340	Solid State Electronics
BMEG 441	Biomechatronics	ELEG 404	Imaging and Deep Learning
BMEG 443	Magnetic Resonance Imaging	ELEG 418	Digital Control Systems
BMEG 464	Medical Device Development	ELEG 440	Opto-electronics
BMEG 471	Mathematical Physiology	ELEG 446	Nanoelectronic Device Principles
BMEG 479	Introduction to Medical Imaging Systems	ELEG 447	Optical Properties of Solids
CISC 181	Introduction to Computer Science II	ELEG 450	Semiconductor Device Design and Fabrication
CPEG 202	Introduction to Digital Systems	ELEG 482	Optics and Photonics
CPEG 222	Microprocessor Systems	MSEG 429	Characterization of Electronic Materials & Devices
ELEG 306	Digital Signal Processing	MSEG 431	Organic Electronics: Design, Synthesis, App
ELEG 309	Electronic Circuit Analysis I	MEEG 426	Applied Controls
ELEG 310	Probability, Statistics, and Random Signals	MEEG 451	Introduction to Microsystems
ELEG 312	Electronic Circuit Analysis II	PHYS 313	Physics Optics

PATHWAY EXAMPLES

Pathways are optional groupings of 5 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: Human-Machine Interfaces

BMEG 441	Biomechatronics
BMEG 464	Medical Device Development
ELEG 309	Electronic Circuit Analysis I
ELEG 310	Probability, Statistics, and Random Signals
MSEG 431	Organic Electronics

Path 2: Bioimaging

BMEG 443	Magnetic Resonance Imaging
BMEG 479	Intro to Medical Imaging Systems
ELEG 306	Digital Signal Processing
ELEG 404	Imaging and Deep Learning
ELEG 440	Opto-electronics

Path 3: Biosensing and Controls

BMEG 441	Biomechatronics
BMEG 464	Medical Device Development
BMEG 479	Intro to Medical Imaging Systems
CISC 181	Introduction to Computer Science II
ELEG 418	Digital Control Systems

Extracurricular Enhancement

Electrical Engineering Minor

4+1 Master of Science in Robotics

RSO: Assistive Medical Technologies

RSO: Orthotics & Prosthetics Club