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
Daxcom
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

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<tr>
<th>Course Code</th>
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<tr>
<td>BMEG 230</td>
<td>*Circuits, Signals, and Systems for Biomedical Applications</td>
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<td>BMEG 330</td>
<td>*Biomedical Instrumentation</td>
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<td>BMEG 443</td>
<td>Magnetic Resonance Imaging</td>
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<td>Medical Device Development</td>
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<td>Mathematical Physiology</td>
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<td>Introduction to Medical Imaging Systems</td>
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<tr>
<td>MSEG 429</td>
<td>Characterization of Electronic Materials &amp; Devices</td>
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<td>MSEG 611</td>
<td>Theory, Experiment and Applications in Vibrational Spectroscopy</td>
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<td>MSEG 624</td>
<td>Practical Electron Microscopy</td>
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<td>MEEG 451</td>
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<td>PHYS 313</td>
<td>Physics Optics</td>
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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