

BME Focus Area: Applied Biomaterials

Biomaterials are engineered to help restore function and facilitate healing after injury or disease. Clinically applied biomaterials includes the design and fabrication of drug therapies, implantable devices, bionanotechnology, and tissue engineering. Characterization evaluates how the material impacts the living environment and how the living environment impacts the material.

Application Examples

Cell and tissue engineering
Drug and nucleic acid delivery
Materials for sensing/measuring
Antibacterial/antimicrobial materials
Anticancer materials
Biofouling and antifouling materials
Biomolecular imaging/sensing materials
Biomimetic materials
Self-healing materials
Bio-assembly materials
Sustainable biomaterials
Photoresponsive materials
Immunostimulatory or Immunosuppressive materials
Orthopaedic materials

Company Examples

1Drop Diagnostics	Invibio Ltd.
3M Healthcare	Janssen Pharmaceutica
Abbott Laboratories	Kerafast
AbbVie Inc.	Kuros BioSciences
ACell	LabGenius
AlgiKnit	Merck & Co.
Amgen Inc.	MiMedx Group, Inc.
AMSilk	Noble Biomaterials
Arthrex	Nordson Corporation
AstraZeneca	Novartis International AG
BASF SE	Nuvasive
Baxter International	OrganoClick
Bayer	Organovo
B. Braun Medical	Orthofix
Becton Dickinson	OssDesign
Berkeley Advanced	Picarro
Biomaterials, Inc.	Pfizer Inc.
Biogelx	regenHU Ltd
CAM Bioceramics BV	REVA Medical
Collagen Matrix, Inc.	Replication Medical Inc.
Corning	RTI Surgical Holdings
Covalon Technologies Ltd.	Sigma-Aldrich
DuPont Industrial Biosciences	Terumo
Ecovative Design	Teva Pharmaceutical Industries
Edwards Lifesciences	Thync
Eli Lilly and Company	W.L. Gore & Associates
Epithelix	Wright Medical Group
Ethicon (Johnson & Johnson)	Xeltis AG
Evonik Industries AG	Zimmer Biomet Holdings, Inc.
GlaxoSmithKline	Zora Biosciences

Relevant Course Examples

* required in BME curriculum

BMEG100	*Fundamentals in Biomedical Engineering	ELEG 450	Semiconductor Device Design and Fabrication
BMEG301	*Quantitative Cellular Physiology	MEEG 413	Nanomaterials and Nanotechnology
BMEG302	*Quantitative Systems Physiology	MEEG 417	Composite Materials
BMEG310	*Bioengineering Mechanics I	MEEG 451	Introduction to Microsystems
BMEG420	*Biological Transport Phenomena	MEEG 453	Manufacturing Processes and Systems
BMEG 440	Attachments in Biology	MEEG 455	Principles of Composites Manufacturing
BMEG 461	Cell Engineering	MEEG 484	Biomaterials and Tissue Eng App
BMEG 462	Engineering Biomedical Nanostructures	MEEG 616	Composite Materials Structures
BMEG 463	Mechanotransduction	MEEG 628	Multiscale Modeling of Materials
BMEG 464	Medical Device Development	MSEG 402	Nanoscales Materials Laboratory
CHEG 600	Introduction to Science and Engineering of Polymer Systems	MSEG 406	Corrosion and Protection
CHEG 608	Introduction to Particle Technology	MSEG 410	Experimental Mechanics of Composites
CHEG 617	Colloid Science and Engineering	MSEG 415	Degradation and Failure of Materials
CHEG 624	Bio-Based Materials	MSEG 429	Characterization of Electronic Materials
CHEG 648	Biomaterials for Drug and Gene Delivery	MSEG 460	Biomaterials and Tissue Engineering
CHEG 672	Mathematics of Particle Systems	MSEG 608	Structure and Properties of Materials I
CHEM 649	Molecular Biophysics	MSEG 609	Structure and Properties of Materials II
CHEM 671	Quantum Chemistry	MSEG 616	Chemistry and Physics of Surfaces and Interfaces
ELEG 422	Semiconductor Materials Processing	MEEG 622	Interface Science and Engineering
ELEG 446	Nanoelectronic Device Principles	MSEG 628	Macromolecular Design & Bioconjugations
ELEG 447	Optical Properties of Solids	MSEG 629	Characterization of Electronic Materials

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: Applications of Biomaterials

BMEG 440	Attachments in Biology
BMEG 461	Cell Engineering
BMEG 462	Engineering Biomedical Nanostructures
CHEG 648	Biomaterials for Drug and Gene Delivery
MEEG 413	Nanomaterials and Nanotechnology
MSEG 460	Biomaterials and Tissue Engineering

Path 2: Characterization of Biomaterials

BMEG 440	Attachments in Biology
BMEG 461	Cell Engineering
MEEG 484	Biomaterials and Tissue Eng App
MEEG 622	Interface Science and Engineering
MSEG 410	Experimental Mechanics of Composites
MSEG 429	Characterization of Electronic Materials

Path 3: Design & Fabrication of Biomaterials

BMEG 461	Cell Engineering
BMEG 462	Engineering Biomedical Nanostructures
BMEG 464	Medical Device Development
CHEG 600	Introduction to Science and Engineering of Polymer Systems
ELEG 450	Semiconductor Device Design and Fabrication
MEEG 451	Introduction to Microsystems

Other Curricular Enhancements

Biochemical Engineering Minor
 Materials Science and Engineering Minor
 Nanoscale Materials Minor
 iGEM (The International Genetically Engineered Machine Competition)