

## MATERIALS FOR MOLECULAR, CELLULAR & TISSUE ENGINEERING

Applied biomaterials is the implementation of engineered materials for biomedical applications in the fields of biology, biomedical engineering, and human health. These materials are designed and engineered to interact with biological systems, ranging from cells to tissues to whole organisms depending on the application. Applied biomaterials play a crucial role in advancing healthcare through a multitude of applications.

### COMPANY SNAPSHOT

1Drop Diagnostics  
 3M Healthcare  
 Abbott Laboratories  
 AbbVie Inc.  
 ACell  
 AlgiKnit  
 Amgen Inc.  
 AMSilk  
 Arthrex  
 AstraZeneca  
 BASF SE  
 Baxter International  
 Bayer  
 B. Braun Medical  
 Becton Dickinson  
 Berkeley Advanced  
 Biomaterials, Inc.  
 Biogelx  
 CAM Bioceramics BV  
 Cartesian Therapeutics  
 Collagen Matrix, Inc.  
 Corning  
 Covalon Technologies Ltd.

CRISPR Therapeutics  
 DuPont Industrial Biosciences  
 Ecovative Design  
 Edwards Lifesciences  
 Eli Lilly and Company  
 Emulate  
 Epithelix  
 Ethicon (Johnson & Johnson)  
 Evonik Industries AG  
 GlaxoSmithKline  
 Incyte  
 Invivio Ltd.  
 Janssen Pharmaceutical  
 Kerafast  
 Kuros BioSciences  
 LabGenius  
 Medtronic  
 Merck & Co.  
 MiMedx Group, Inc.  
 Moderna  
 Noble Biomaterials  
 Nordson Corporation  
 Novartis International AG

Nuvasive  
 OrganoClick  
 Organovo  
 Orthofix  
 OssDesign  
 Picarro  
 Pfizer Inc.  
 regenHU Ltd  
 REVA Medical  
 Replication Medical Inc.  
 Roche  
 RTI Surgical Holdings  
 Sigma-Aldrich  
 Stryker  
 STRM.BIO  
 Terumo  
 Teva Pharmaceutical Industries  
 Thync  
 W.L. Gore & Associates  
 Wright Medical Group  
 Xeltis AG  
 Zimmer Biomet Holdings, Inc.  
 Zora Biosciences

### APPLICATION (PRODUCT) EXAMPLES

Artificial Organs and Tissue Engineering (skin, cornea, bladder, heart), Biofabrication (biodegradable sutures, screws), Cell-Based Therapies (CAR-T cells, pancreatic islets), Drug Delivery and Precision Medicine (drug/nucleic acid nanocarriers), Genetic Engineering (nucleic acid therapeutics), Immunoengineering (CAR-T, vaccines), Mechanobiology (artificial joints and coatings), Medical Implants (dental, orthopedic, vascular grafts), Micro- and Nanotechnology/Nanomedicine (therapeutic delivery systems), Molecular/Cellular Engineering and Regenerative Medicine (stem cell therapies), Vaccines (COVID, cancer), Wearable/Implantable Biosensors (glucose monitor, neural Implants)

## RELEVANT COURSE EXAMPLES (\*REQUIRED IN BME CURRICULUM)

BMEG 100	*Fundamentals in Biomedical Engineering	ELEG 447	Optical Properties of Solids
BMEG 301	*Quantitative Cellular Physiology	ELEG 450	Semiconductor Device Design & Fab
BMEG 302	*Quantitative Systems Physiology	MEEG 413	Nanomaterials and Nanotechnology
BMEG 310	*Bioengineering Mechanics I	MEEG 417	Composite Materials
BMEG 420	*Biological Transport Phenomenon	MEEG 451	Introduction to Microsystems
BMEG 445	Material-Human Body Interfaces	MEEG 453	Manufacturing Processes and Systems
BMEG 447	Immunoengineering	MEEG 455	Principles of Composites Manufacturing
BMEG 461	Cell Engineering	MEEG 484	Biomaterials and Tissue Eng App
BMEG 462	Engineering Biomed Nanostructures	MEEG 486	Cell and Tissue Transport
BMEG 463	Mechanotransduction	MSEG 402	Nanoscale Materials Laboratory
BMEG 464	Medical Device Development	MSEG 406	Corrosion and Protection
BMEG 465	Tissue Biomechanics and Modeling	MSEG 410	Exp Mechanics of Composites
CHEG 420	Biochemical Engineering	MSEG 415	Degradation and Failure of Materials
CHEM 322/325	Organic Chemistry II & Lab	MSEG 429	Characterization of Electronic Materials
CHEM 418/443	Physical Chemistry	MSEG 431	Organic Electronics: Design, Syn, App
ELEG 422	Semiconductor Materials Processing	MSEG 460	Biomaterials and Tissue Engineering
ELEG 446	Nanoelectronic Device Principles		

## 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: Applications of Biomaterials*

BMEG 445	Material-Human Body Interfaces
BMEG 461	Cell Engineering
BMEG 462	Engineering Biomed Nanostructures
BMEG 447	Immunoengineering
MEEG 484	Biomaterials and Tissue Eng App

### *Path 2: Fabrication & Characterization of Biomaterials*

BMEG 445	Material-Human Body Interfaces
BMEG 464	Medical Device Development
MEEG 413	Nanomaterials and Nanotechnology
MSEG 460	Biomaterials and Tissue Engineering
ELEG 450	Semiconductor Device Design & Fab

### *Extracurricular Enhancement*

Biochemical Engineering Minor  
 Materials Science & Engineering Minor  
 Nanoscale Materials Minor  
 4 + 1 MS in Biopharmaceutical Sciences  
 4 + 1 MS in Materials Science & Engineering