BME Focus Area: Computational BME & Biosystems

Understanding the way in which complex biological processes behave in health and disease is a crucial part of improving human health. Computational Biomedical Engineering and Biosystems uses mathematical, statistical, and computational tools to develop predictive models that guide experiment design, data interpretation, and treatment design.

Application Examples

Synthetic biology
Metabolic engineering
Pharmacology PK/PD modeling
Disease modeling
Cancer modeling
Physiological systems modeling
Biopharmaceuticals
Immune engineering
Endocrinology modeling
Artificial pancreas
Diabetes management
Medical & health informatics
Hospital & clinical outcomes informatics
Bioinformatics
Genomics & proteomics
Pharmacology modeling
Biomanufacturing
Simulations
Musculoskeletal modeling
Machine learning

Company Examples

3M Healthcare
Abbott Laboratories
Altair
Amgen
ANSYS, Inc.
ARMI
bioMerieux
Cardinal Health
Catalent
Cooper Companies
Dassault Systemes
Delta Search Labs
EA Sports
Epic Systems
GE Healthcare
Genentech (Roche)
Gryphon Scientific
Hillrom
ICTT System Sciences
InSilico Trials Technologies
MathWorks
Medtronic
Origene
QPS
Regeneron
Sage Bionetworks
Sanofi Genzyme
Sema4
Sigma-Aldrich
SmartUQ
Stryker
Suvoda
Synopsys
System Insight Engineering
TRIMEDX
Universal Consulting Services
Varian Medical Systems
Zimmer Biomet
ZMT Zurich MedTech AG

Relevant Course Examples

* required in BME curriculum

BMEG 230	*Circuits, Signals, and Systems for Biomedical Applications	CHEG 604	Probability and Statistics for Engineering Problem Solving
BMEG 301	*Quantitative Cellular Physiology	CHEG 621	Metabolic Engineering
BMEG 302	*Quantitative Systems Physiology	CIEG 642	Advanced Data Analysis
BMEG 340	*Biomedical Modeling and Simulation	CISC 220	Data Structures
BMEG 420	*Biological Transport Phenomenon	CISC 436	Computational Biology and Bioinformatics
BMEG 341	*Biomedical Experiment Design and Analysis	CISC 437	Database Systems
BMEG 471	Mathematical Physiology	CISC 483	Introduction to Data Mining
BISC 401	Molecular Biology of the Cell	CISC 484	Introduction to Machine Learning
CHEG 420	Biochemical Engineering	ELEG 418	Digital Control Systems
CHEG 460	Introduction to Systems Biology	ELEG 697	Computational Systems Biology
CHEG 672	Mathematics of Particle Systems	MEEG 421	Linear Systems
CHEG 401	Chemical Process Dynamics and Control		

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: Disease modeling and treatment

BMEG 461	Cell Engineering
BMEG 471	Mathematical Physiology
BISC 401	Molecular Biology of the Cell
ELEG 418	Digital Control Systems
CHEG 604	Probability and Statistics for Engineering Problem Solving
ELEG 697	Computational Systems Biology

Path 2: Informatics and Data Science

BMEG 471	Mathematical Physiology
BMEG 479	Introduction to Medical Imaging Systems
CHEG 604	Probability and Statistics for Engineering Problem Solving
CISC 220	Data Structures
CISC 436	Computational Biology and Bioinformatics
CISC 483	Introduction to Data Mining

Path 3: Synthetic Biology

BMEG 461	Cell Engineering
BMEG 471	Mathematical Physiology
CHEG 420	Biochemical Engineering
CHEG 621	Metabolic Engineering
CHEM 527	Introductory Biochemistry
ELEG 697	Computational Systems Biology

Other Curricular Enhancements

Bioinformatics Minor
Computational Biology Minor
iGEM (The International Genetically Engineered Machine Competition)