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.

COMPANY SNAPSHOT

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
Synopsis
System Insight Engineering
TRIMEDX
Universal Consulting Services
Varian Medical Systems
Zimmer Biomet
ZMT Zurich MedTech AG

APPLICATION EXAMPLES

Synthetic biology, Metabolic engineering, Pharmacology PK/PD modeling, Pharmacometrics, Quantitative Systems Pharmacology (QSP), 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, Biomanufacturing, Simulations, Musculoskeletal modeling, Machine learning, Biomedical Analytics, Computational Medicine, Health systems engineering, Human modeling and simulation, Systems biology & physiology
### RELEVANT COURSE EXAMPLES (*REQUIRED IN BME CURRICULUM*)

<table>
<thead>
<tr>
<th>BMEG 230</th>
<th>*Circuits, Signals, and Systems for Biomedical Applications</th>
<th>CHEG 604</th>
<th>Probability and Statistics for Engineering Problem Solving</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMEG 301</td>
<td>*Quantitative Cellular Physiology</td>
<td>CHEG 621</td>
<td>Metabolic Engineering</td>
</tr>
<tr>
<td>BMEG 302</td>
<td>*Quantitative Systems Physiology</td>
<td>CIEG 642</td>
<td>Advanced Data Analysis</td>
</tr>
<tr>
<td>BMEG 340</td>
<td>*Biomedical Modeling and Simulation</td>
<td>CISC 181</td>
<td>Introduction to Computer Science II</td>
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<tr>
<td>BMEG 341</td>
<td>*Biomed Exp Design &amp; Analysis</td>
<td>CISC 210</td>
<td>Introduction to Systems Programming</td>
</tr>
<tr>
<td>BMEG 420</td>
<td>*Biological Transport Phenomenon</td>
<td>CISC 220</td>
<td>Data Structures</td>
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<tr>
<td>BMEG 447</td>
<td>Immunoengineering</td>
<td>CISC 436</td>
<td>Computational Biology and Bioinformatics</td>
</tr>
<tr>
<td>BMEG 471</td>
<td>Mathematical Physiology</td>
<td>CISC 437</td>
<td>Database Systems</td>
</tr>
<tr>
<td>BMEG 479</td>
<td>Introduction to Medical Imaging Systems</td>
<td>CISC 483</td>
<td>Introduction to Data Mining</td>
</tr>
<tr>
<td>BISC 401</td>
<td>Molecular Biology of the Cell</td>
<td>CISC 484</td>
<td>Introduction to Machine Learning</td>
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<tr>
<td>BISC 484</td>
<td>Computer Based Genetics Laboratory</td>
<td>ELEG 418</td>
<td>Digital Control Systems</td>
</tr>
<tr>
<td>CHEG 401</td>
<td>Chemical Process Dynamics &amp; Control</td>
<td>ELEG 697</td>
<td>Computational System Biology (BINF695, BMEG695)</td>
</tr>
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<td>CHEG 420</td>
<td>Biochemical Engineering</td>
<td>MATH 460</td>
<td>Intro to Systems Biology (CHEG 460)</td>
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<td>CHEG 672</td>
<td>Mathematics of Particle Systems</td>
<td>MEEG 421</td>
<td>Linear Systems</td>
</tr>
</tbody>
</table>

### 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: Disease Modeling and Treatment**
- BMEG 447  | Immunoengineering |
- BMEG 461  | Cell Engineering |
- BMEG 471  | Mathematical Physiology |
- BISC 401  | Molecular Biology of the Cell |
- ELEG 697  | Computational Systems Biology |

**Path 2: Informatics and Data Science**
- BMEG 471  | Mathematical Physiology |
- BMEG 479  | Introduction to Medical Imaging Systems |
- CISC 210  | Introduction to Systems Programming |
- CISC 220  | Data Structures |
- CISC 436  | Computational Biology and Bioinformatics |

**Path 3: Synthetic Biology**
- BMEG 461  | Cell Engineering |
- BMEG 471  | Mathematical Physiology |
- CHEG 420  | Biochemical Engineering |
- CHEM 527  | Introductory Biochemistry |
- ELEG 697  | Computational System Biology |

**Extracurricular Enhancement**
- Bioinformatics Minor |
- Computer Science Minor |
- Computational Biology Minor |
- 4+1 Master in Computer Science