

# BIOMEDICAL ENGINEERING *PRE-MED BIOINSTRUMENTATION* CURRICULUM – FALL 2022

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**BMEN 1025 (4)**  
Computer-Aided Design  
& Fabrication

**CHEN 1201 (4)**  
Gen Chem for Engineers  
(CR: CHEM 1114)

**CHEM 1114 (1)**  
Gen Chem 1 Lab  
(CR: CHEM 1201)

**Humanities &  
Social Science (3)**  
Lower Division

**APPM 1350 (4)**  
Calculus 1 For Engineers

2

**BMEN 1000 (1)**  
Explore BME  
Spring Only

**CHEM 1133 (4)**  
Gen Chem 2  
(PR: CHEM 1201, CHEM 1114)

**CHEM 1134 (1)**  
Gen Chem 2 Lab  
(PR: CHEM 1201, CHEM 1114)  
(CR: CHEM 1133)

**PHYS 1110 (4)**  
General Physics 1  
(CR: APPM 1350)

**CHEM 1310 (3)**  
Intro to Engineering  
Computing  
(CR: Math- see class search for  
options)

**APPM 1360 (4)**  
Calculus 2 For Engineers  
(PR: APPM 1350)

3

**BMEN 2000 (3)**  
Intro to Biomedical  
Engineering  
(CR: CHEM 2810)  
(RPR: CHEM 1310)

**CHEM 2810 (3)**  
Biology for Engineers

**PHYS 1120 (4)**  
General Physics 2  
(PR: PHYS 1110)

**PHYS 1140 (1)**  
Experimental Physics  
(CR: PHYS 1120)

**Humanities &  
Social Science (3)**  
Lower Division

**APPM 2350 (4)**  
Calculus 3 For Engineers  
(PR: APPM 1360)

4

**BMEN 2010 (3)**  
Biomaterials  
(PR: CHEM 1201)  
Spring Only

**CHEM 3311 (4)**  
Organic Chem 1  
(PR: CHEM 1133/1134)  
(CR: CHEM 3321)

**CHEM 3321 (1)**  
Organic Chem 1 Lab  
(PR: CHEM 1133/1134)  
(CR: CHEM 3311)

**MCDB 1161 (2)**  
Phage Genomics Lab 11

**ECEN 2250 (3)**  
Intro to Circuits &  
Electronics  
(PR: APPM 1360, PHYS 1120)  
(CR: APPM 2360, CHEM 1310)

**APPM 2360 (4)**  
Linear Algebra &  
Differential Equations  
(PR: APPM 1360)

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**BMEN 3010 (3)**  
Biotransport  
(PR: BMEN 2000, CHEM 1310,  
PHYS 1110)  
(CR: APPM 2360)  
Fall Only

**CHEM 3331 (4)**  
Organic Chem 2  
(PR: CHEM 3311/3321)  
(CR: CHEM 3341)

**CHEM 3341 (1)**  
Organic Chem 2 Lab  
(PR: CHEM 3311/3321)  
(CR: CHEM 3331)

**Engineering  
Technical  
Elective (3)**  
Lower Division

**ECEN 2260 (3)**  
Circuits as Systems  
(PR: ECEN 2250, APPM 2360)

**ECEN 2270 (3)**  
Electronics Design Lab  
(CR: ECEN 2260)

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**BMEN 3030 (3)**  
Bioinstrumentation  
(PR: BMEN 2000, ECEN 2260,  
ECEN 2270)  
Spring Only

**MCDB 2150 (3)**  
Principles of Genetics  
(RPR: MCDB 1150)

**Humanities &  
Social Science (3)**  
Lower Division

**Writing  
Requirement (3)**

**ECEN 3300 (3)**  
Linear Systems  
(CR: ECEN 2260)

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**BMEN 4010 (3)**  
BME Design 1  
(PR: BMEN 1025, BMEN 2010,  
BMEN 3010)  
(CR: Writing)  
Fall Only

**Engineering  
Technical  
Elective (3)**  
Upper Division

**MCDB 2161 (2)**  
Phage Genomics Lab 2  
(PR: MCDB 1161)

**Humanities &  
Social Science (3)**  
Upper Division

**CHEM 3010 (3)**  
Applied Data Analysis  
(PR: APPM 2360, CHEM 1310)

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**BMEN 4020 (3)**  
BME Design 2  
(PR: BMEN 4010)  
Spring Only

**Technical  
Elective (3)**  
Upper Division

**BCHM 4611 (3)**  
Principles of  
Biochemistry  
(PR: CHEM 3311)

**Humanities &  
Social Science (3)**  
Upper Division

**Free Elective (2)**

**Example**  
**COURSE NUMBER (Cr.)**  
Course Name  
(PR: Pre-Requisites)  
(CR: Co-Requisites)  
(RPR: Recommended Pre-Req)

# Biomedical Engineering Curriculum

## Standard Course Substitutions

- **APPM 1350:** MATH 1300
- **APPM 1360:** MATH 2300
- **APPM 2350:** MATH 2400
- **APPM 2360:** MATH 2130 and MATH 3430
- **BMEN 1025:** MCEN 1025, GEEN 3830-800 (fall 2020 only)
- **BMEN 4117:** MCEN 4117, IPHY 3410 and IPHY 3430
- **CHEM 1221:** CHEM 1114, CHEM 1134
- **CHEN 1201:** CHEN 1211 (CHEM 1113 approved for transfer students)
- **CHEN 1203:** CHEN 1211 (CHEM 1133 approved for transfer students)
- **CHEN 1310:** ECEN 1310, CSCI 1300, (CSCI 1320, ASEN 1320 approved for transfer students)
- **CHEN 2810:** MCDB 1150, EBIO 1210 and 1220
- **CHEN 3010:** STAT 4000, MCEN 3047, GEEN 3853
- **ECEN 2250:** ECEN 3010, GEEN 3010
- **MCEN 2023:** CVEN 2121, GEEN 2851
- **MCEN 2063:** CVEN 3161

## Technical Electives

Pre-Med Bioinstrumentation requires a total of 9 technical elective credits, of which at least 6 credits must be BME-Approved Engineering Technical Elective credits, and at least 6 credits of the total must be upper-division .

Visit the program's [Advising & Curriculum](#) webpage for options

## Humanities & Social Science Electives/Writing Requirements

Visit the college's [Humanities, Social Sciences, and Writing Requirements](#) webpage for options.

## Writing Requirement Options

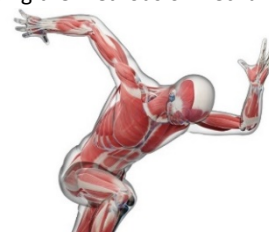

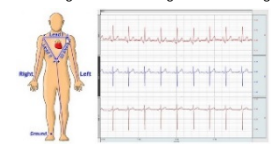
- ENES 1010 (freshmen only), ENES 3100
- WRTG 3030, WRTG 3035
- PHYS 3050
- ENLP 3100 (previous success in an ENLP course highly recommended)

## Grade Requirements

The minimum passing grade for a prerequisite or co-requisite course within the biomedical engineering curriculum is a C-. This requirement includes courses completed in another program or department (APPM, PHYS, etc.). However, if a course taught in another program or department is a co-requisite/pre-requisite for a course in the biomedical curriculum that requires a minimum passing grade of C or higher its co-requisite/prerequisite courses, then this higher requirement applies to biomedical engineering students. The minimum passing grade for standalone classes is a D-. In addition, students need to have a cumulative and major GPA of at least 2.000 in order to graduate from the College of Engineering. **Pass/Fail** is only permitted for BMEN 1000 and Free Elective credits.

Effective: Fall 2022

## Pre-med Tracks: Biomechanics vs. Bioinstrumentation

Biomechanics Option	Bioinstrumentation Option
<p>Biomechanics is the study of the structure, function and motion of the mechanical aspects of biological systems, at any level from whole organisms to organs, cells and molecules, using the methods of mechanics.</p>  <p>Image Credit: www.verywellfit.com</p>	<p>Bioinstrumentation is an application of biomedical engineering, which focuses on devices used to measure, evaluate and treat biological systems. Examples include biosensors and imaging systems.</p>  <p>Image Credit: www.EnglewoodHealth.org</p>  <p>Image Credit: www.biopac.com</p>
<p><b>Why pursue Biomechanics?</b></p>	<p><b>Why pursue Bioinstrumentation?</b></p>
<p>Biomechanics draws from the traditional engineering discipline of mechanical engineering. You may wish to take the biomechanics track if you are interested in human motion, performance, disabilities, prosthetics or orthopedics. You may find biomechanics interesting if you want to learn more about the mechanical interaction of surgical tools with tissue, the impact of mechanical stimulation on engineered tissues, or the rapidly developing field of mechanobiology.</p>	<p>Bioinstrumentation draws from the traditional engineering discipline of electrical engineering. You may wish to take the bioinstrumentation track if you are interested in medical devices, such as biosensors and imaging systems, or robotic surgical tools. You may find bioinstrumentation interesting if you want to learn more about the electrical interaction of surgical tools with tissue, methods to image the engineered tissues post-translation, or the rapidly developing field of neurobiology.</p>
<p><b>Courses Added:</b></p>	<p><b>Courses Added:</b></p>
<ul style="list-style-type: none"> <li>• MCDB 1161 (2) Genetics Lab 1</li> <li>• MCDB 2150 (3) Principles of Genetics</li> <li>• MCDB 2161 (2) Genetics Lab 2</li> <li>• CHEM 3311/3321 (5) Organic Chemistry 1 w/ lab</li> <li>• CHEM 3331/3341 (5) Organic Chemistry 2 w/ lab</li> <li>• CHEM 4611 (3) Biochemistry</li> </ul>	<ul style="list-style-type: none"> <li>• MCDB 1161 (2) Genetics Lab 1</li> <li>• MCDB 2150 (3) Principles of Genetics</li> <li>• MCDB 2161 (2) Genetics Lab 2</li> <li>• CHEM 3311/3321 (5) Organic Chemistry 1 w/ lab</li> <li>• CHEM 3331/3341 (5) Organic Chemistry 2 w/ lab</li> <li>• CHEM 4611 (3) Biochemistry</li> </ul>
<p><b>Recommended Technical Electives:</b></p>	<p><b>Recommended Technical Electives:</b></p>
<ul style="list-style-type: none"> <li>• MCEN 2043 (3) Dynamics</li> <li>• MCEN 4228 (3) Modeling Human Movement</li> </ul>	<ul style="list-style-type: none"> <li>• Take two technical electives in ECEN to earn a Minor in Electrical Engineering</li> </ul>
<p><b>Courses Removed:</b></p>	<p><b>Courses Removed:</b></p>
<ul style="list-style-type: none"> <li>• ECEN 2250 (3) Intro to Circuits &amp; Electronics</li> <li>• ECEN 2260 (3) Circuits as Systems</li> <li>• ECEN 2270 (3) Electronics Design Lab</li> <li>• ECEN 3300 (3) Linear Systems</li> <li>• BMEN 3030 (3) Bioinstrumentation</li> <li>• Free Electives (5)</li> </ul>	<ul style="list-style-type: none"> <li>• MCEN 2023 (3) Statics</li> <li>• MCEN 2063 (3) Solids</li> <li>• MCEN 4133 (3) Tissue Biomechanics</li> <li>• BMEN 4117 (3) A&amp;P for Biomedical Engineering</li> <li>• Technical Electives (3)</li> <li>• Free Electives (5)</li> </ul>