## BIOMEDICAL ENGINEERING PRE-MED BIOINSTRUMENTATION CURRICULUM – FALL 2021

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

| 1 | 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 | CHEM 1133 (4)  
Gen Chem 2  
(PR: CHEN 1201, CHEM 1114) | CHEM 1134 (1)  
Gen Chem 2 Lab  
(PR: CHEN 1201, CHEM 1114)  
(PR: CHEM 1133) | PHYS 1110 (4)  
General Physics 1  
(CR: APPM 1350) | Humanities & Social Science (3)  
Lower Division | APPM 1360 (4)  
Calculus 2 For Engineers  
(PR: APPM 1350) |
| 3 | BMEN 2000 (3)  
Intro to Biomedical Engineering  
(PR: MCDB 1150) | MCDB 1150 (3)  
Intro to Cellular and Molecular Biology | PHYS 1120 (4)  
General Physics 2  
(PR: PHYS 1110) | PHYS 1140 (1)  
Experimental Physics  
(CR: PHYS 1120) | CHEN 1310 (3)  
Intro to Engineering Computing | APPM 2350 (4)  
Calculus 3 For Engineers  
(PR: APPM 1360) |
| 4 | BMEN 2010 (3)  
Biomaterials  
(PR: CHEN 1201 or CHEN 1211)  
(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 1I | ECEN 2250 (3)  
Intro to Circuits & Electronics  
(PR: APPM 1360, PHYS 1120)  
(CR: APPM 2360, CHEN 1310) | ECEN 3300 (3)  
Linear Systems  
(CR: ECEN 2260) |
| 5 | BMEN 3010 (3)  
Biotransport  
(PR: CHEN 1301, PHYS 1110)  
(CR: APPM 2360)  
(Fall Only) | CHEM 3331 (4)  
Organic Chem 2  
(PR: CHEM 3311/3321)  
(PR: CHEM 3341) | CHEM 3341 (1)  
Organic Chem 2 Lab  
(PR: CHEM 3311/3321)  
(PR: CHEM 3331) | ECEN 2260 (3)  
Circuits as Systems  
(PR: ECEN 2250, APPM 2360) | ECEN 2270 (3)  
Electronics Design Lab  
(CR: ECEN 2260) | Example |
| 6 | BMEN 3030 (3)  
Bioinstrumentation  
(PR: ECEN 2260, ECEN 2270)  
(Spring Only) | MCDB 2150 (3)  
Principles of Genetics  
(RPR: MCDB 1150) |  | Engineering Technical Elective (3)  
Lower Division |  |  |
| 7 | BMEN 4010 (3)  
BME Design 1  
(PR: BMEN 1025, PHYS 1120/1140, BMEN 3030 & ECEN 3300 or MCEN 4113)  
(Fall Only) | Engineering Technical Elective (3)  
Upper Division | MCDB 2161 (3)  
Phage Genomics Lab 2I  
(PR: MCDB 1161) | Humanities & Social Science (3)  
Lower Division | Humanities & Social Science (3)  
Upper Division | CHEN 3010 (3)  
Applied Data Analysis  
(PR: APPM 1360) |
| 8 | BMEN 4020 (3)  
BME Design 2  
(PR: BMEN 4010, Writing, STAT 4000)  
(Spring Only) | Technical Elective (3)  
Upper Division | BCHM 4611 (4)  
Principles of Biochemistry  
(PR: CHEM 3311) | Humanities & Social Science (3)  
Upper Division | Humanities & Social Science (3)  
Upper Division |  |

**Effective:** Fall 2021
**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: GEEN 1025, MCEN 1025, GEEN 3830-800 (fall 2020 only)
- BMEN 4117: MCEN 4117, IPHY 3410 and IPHY 3430
- CHEN 1201: MCEN 1211 (CHEM 1113 approved for transfer students)
- CHEN 1310: ECEN 1310, CSCI 1300, (CSCI 1320, ASEN 1320 approved for transfer students)
- CHEN 3010: STAT 4000, MCMN 3047, GEEN 3853
- ECEN 2250: ECEN 3010, GEEN 3010
- MCDB 1150: CHEN 2810, EBIO 1210 and 1220
- MCEN 2023: CVEN 2121, GEEN 2851
- MCEN 2063: CVEN 3161

**Technical Electives** *(Please discuss electives with your advisor. Some classes may not be applied to degree.)*

**Lower-Division:**
- Projects Course:
  - ASEN 1400, 1403
  - ECEN 1400
  - GEEN 1400, 2400, 3400
- CSCI 2270
- ECEN 2010, 2350
- MCEN 2023, 2043, 2063

**Upper-Division:**
https://www.colorado.edu/bme/bachelors-program#technical_electives-55

**Humanities & Social Science Electives/Write Requirements**
https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements

**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 pre-requisite and co-requisite classes in our curriculum is a C. This includes courses completed outside the program (APPM, ECEN, PHYS, etc.). This does not include MCEN courses. The minimum passing grade for standalone classes is a D- In addition, students need to have a cumulative and major GPA of at least 2.25 in order to graduate from the College of Engineering.

**Effective:** Fall 2021

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**Pre-med Tracks: Biomechanics vs. Bioinstrumentation**

**Biomechanics Option**

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.

*Why pursue Biomechanics?*

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.

**Courses Added:**
- MCDB 1161 (2) Genetics Lab 1
- MCDB 2150 (3) Principles of Genetics
- MCDB 2161 (2) Genetics Lab 2
- CHEM 3311/3341 (5) Organic Chemistry 1 w/ lab
- CHEM 3331/3343 (5) Organic Chemistry 2 w/ lab
- CHEM 4611 (4) Biochemistry

**Recommended Technical Electives:**
- MCEN 2043 (3) Dynamics
- MCEN 4228 (3) Modeling Human Movement

**Courses Removed:**
- ECEN 2250 (3) Intro to Circuits & Electronics
- ECEN 2260 (3) Circuits as Systems
- ECEN 2270 (3) Electronics Design Lab
- ECEN 3300 (3) Linear Systems
- BMEN 3030 (3) Bioinstrumentation
- Free Electives (8)

**Bioinstrumentation Option**

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.

*Why pursue Bioinstrumentation?*

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-transplantation, or the rapidly developing field of neurobiology.

**Courses Added:**
- MCDB 1161 (2) Genetics Lab 1
- MCDB 2150 (3) Principles of Genetics
- MCDB 2161 (2) Genetics Lab 2
- CHEM 3311/3341 (5) Organic Chemistry 1 w/ lab
- CHEM 3331/3343 (5) Organic Chemistry 2 w/ lab
- CHEM 4611 (4) Biochemistry

**Recommended Technical Electives:**
- MCEN 2043 (3) Dynamics
- MCEN 4228 (3) Modeling Human Movement

**Courses Removed:**
- MCEN 2023 (3) Statics
- MCEN 2063 (3) Solids
- MCEN 4133 (3) Tissue Biomechanics
- BMEN 4117 (3) A&P for Biomedical Engineering
- Technical Electives (3)
- Free Electives (8)