BIOMEDICAL ENGINEERING DEGREE

Students must also complete the Undergraduate Registration Requirement (https://catalogs.northwestern.edu/undergraduate/requirements-policies/undergraduate-registration-requirement/) and the degree requirements of their home school.

Requirements (48 units)

Core Courses (27 units)

4 mathematics courses (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)

4 units of basic science:

PHYSICS 135-2 General Physics
& PHYSICS 135-3 and General Physics
CHEM 131-0 General Chemistry 1
& CHEM 132-0 and General Chemistry 2
or CHEM 151-0 Accelerated General Chemistry 1
& CHEM 152-0 and Accelerated General Chemistry 2
or CHEM 171-0 Advanced General Inorganic Chemistry
& CHEM 172-0 and Advanced General Physical Chemistry

4 engineering analysis and computer proficiency courses (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)

3 design and communications courses (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)

7 social sciences/humanities courses (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)

5 unrestricted electives (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext)

Major Program (21 units)

Course Title
BMD_ENG 101-0 Introduction to Biomedical Engineering (noncredit)

15 core courses

BIOL_SCI 201-0 Molecular Biology
CHEM 215-1 Organic Chemistry I
MAT_SCI 201-0 Introduction to Materials
BMD_ENG 207-0 BME Lab: Experimental Design
BMD_ENG 220-0 Introduction to Biomedical Statistics
or IEMS 303-0 Statistics

BMD_ENG 250-0 Thermodynamics
or MECH_ENG 222-0 Thermodynamics & Statistical Mechanics - I
BMD_ENG 270-0 Fluid Mechanics
BMD_ENG 271-0 Introduction to Biomechanics
BMD_ENG 301-0 Quantitative Systems Physiology
BMD_ENG 302-0 Quantitative Systems Physiology
BMD_ENG 303-0 Quantitative Systems Physiology
BMD_ENG 308-0 Biomedical Signals and Circuits
BMD_ENG 309-0 Biomedical Systems Analysis
BMD_ENG 378-0 Transport Fundamentals
BMD_ENG 390-1 Biomedical Engineering Design

4 biomedical engineering elective courses

2 category A courses (p. 1)

2 category B courses (p. 1)

2 technical elective courses, preferably with an emphasis on engineering design, may include:

Biological Performance of Materials
Biomaterials and Medical Devices
Modern Optical Microscopy & Imaging
Magnetic Resonance Imaging
Introduction to Medical Imaging
Fundamentals of Computer Programming II

Any engineering, science, or mathematics courses at the 300 level or higher, provided they are graded.

Three, 0.34 unit basic science and biology labs may also be combined and counted as a technical elective. Six total labs can be used.

1 See general requirements (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/#requirementstext) for details.

2 PHYSICS 125-2 General Physics for ISP or PHYSICS 140-3 Fundamentals of Physics may be substituted for PHYSICS 135-2 General Physics. PHYSICS 125-3 General Physics for ISP or PHYSICS 140-3 Fundamentals of Physics may be substituted for PHYSICS 135-3 General Physics. Associated labs are PHYSICS 126-2 Physics for ISP Laboratory or PHYSICS 136-2 General Physics Laboratory and PHYSICS 126-3 Physics for ISP Laboratory or PHYSICS 136-3 General Physics Laboratory.

Biomedical Engineering Electives

Category A Courses

Course Title
BMD_ENG 311-0 Computational Genomics
BMD_ENG 317-0 Biochemical Sensors
BMD_ENG 325-0 Introduction to Medical Imaging
BMD_ENG 327-0 Magnetic Resonance Imaging
BMD_ENG 333-0 Modern Optical Microscopy & Imaging
BMD_ENG 343-0 Biomaterials and Medical Devices
BMD_ENG 344-0 Biological Performance of Materials
BMD_ENG 346-0 Tissue Engineering
BMD_ENG 347-0 Foundations of Regenerative Engineering
BMD_ENG 353-0 Bioelectronics
BMD_ENG 366-0 Biomechanics of Movement
BMD_ENG 371-0 Mechanics of Biological Tissue
BMD_ENG 377-0 Intermediate Fluid Mechanics

Category B Courses

Course Title
BIOL_SCI 202-0 Cell Biology *
BIOL_SCI 301-0 Principles of Biochemistry *
BMD_ENG 311-0 Computational Genomics
BMD_ENG 317-0 Biochemical Sensors
BMD_ENG 323-0 Visual Engineering Science
BMD_ENG 325-0 Introduction to Medical Imaging
BMD_ENG 327-0 Magnetic Resonance Imaging
BMD_ENG 333-0 Modern Optical Microscopy & Imaging
BMD_ENG 343-0 Biomaterials and Medical Devices
BMD_ENG 344-0 Biological Performance of Materials
BMD_ENG 346-0 Tissue Engineering
BMD_ENG 347-0 Foundations of Regenerative Engineering
<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BMD_ENG 348-0</td>
<td>Applications of Regenerative Engineering</td>
</tr>
<tr>
<td>BMD_ENG 353-0</td>
<td>Bioelectronics</td>
</tr>
<tr>
<td>BMD_ENG 365-0</td>
<td>Control of Human Limbs and Their Artificial Replacements</td>
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<tr>
<td>BMD_ENG 366-0</td>
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<tr>
<td>BMD_ENG 380-0</td>
<td>Medical Devices, Disease &amp; Global Health</td>
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<tr>
<td>BMD_ENG 388-SA</td>
<td>Health Systems Engineering</td>
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<tr>
<td>BMD_ENG 395-0</td>
<td>Topics in Biomedical Engineering (Check with UG Program Chair)</td>
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<tr>
<td>CIV_ENV 327-0</td>
<td>Finite Element Methods in Mechanics</td>
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<tr>
<td>CHEM_ENG 361-0</td>
<td>Introduction to Polymers</td>
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<tr>
<td>CHEM_ENG 376-0</td>
<td>Principles of Synthetic Biology</td>
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<tr>
<td>CHEM_ENG 379-0</td>
<td>Computational Biology: Analysis and Design of Living Systems</td>
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<tr>
<td>DSGN 360-0</td>
<td>Design Competition</td>
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<tr>
<td>COMP_SCI 211-0</td>
<td>Fundamentals of Computer Programming II</td>
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<tr>
<td>ELEC_ENG 302-0</td>
<td>Probabilistic Systems</td>
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<tr>
<td>ELEC_ENG 332-0</td>
<td>Introduction to Computer Vision</td>
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<tr>
<td>ELEC_ENG 360-0</td>
<td>Introduction to Feedback Systems</td>
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<td>ELEC_ENG 379-0</td>
<td>Lasers and Coherent Optics</td>
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<tr>
<td>ELEC_ENG 382-0</td>
<td>Photonic Information Processing</td>
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<tr>
<td>ELEC_ENG 395-0</td>
<td>Special Topics in Electrical Engineering (Please consult BME UG Program Chair)</td>
</tr>
<tr>
<td>ES_APPM 370-1</td>
<td>Introduction to Computational Neuroscience</td>
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<tr>
<td>IEMS 385-0</td>
<td>Introduction to Health Systems Management</td>
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<tr>
<td>MAT_SCI 318-0</td>
<td>Materials Selection</td>
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<tr>
<td>MAT_SCI 360-0</td>
<td>Introduction to Electron Microscopy</td>
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<tr>
<td>MECH_ENG 301-0</td>
<td>Introduction to Robotics Laboratory</td>
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<tr>
<td>MECH_ENG 314-0</td>
<td>Machine Dynamics</td>
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<tr>
<td>MECH_ENG 315-0</td>
<td>Theory of Machines: Design of Elements</td>
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<tr>
<td>MECH_ENG 333-0</td>
<td>Introduction to Mechatronics</td>
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<td>MECH_ENG 362-0</td>
<td>Stress Analysis</td>
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<td>MECH_ENG 382-0</td>
<td>Experiments in Micro- and Nano Science and Engineering</td>
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<tr>
<td>MECH_ENG 390-0</td>
<td>Intro to Dynamic Systems</td>
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<tr>
<td>PHYSICS 357-0</td>
<td>Optics Laboratory</td>
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* Only one course that is less than 1 engineering unit can be counted toward the BME electives.