



## Biomedical Engineering

### Freshman Year

#### Fall Semester

Math 1371 Calculus I <i>(placement into course, or pre-req)</i>	4
Phys 1301W Intro Physics I <i>(&amp;Math 1371)</i>	4
Chem 1065 Chem Princ I Lab <i>(&amp;1061)</i>	1
Chem 1061 Chem Princ I <i>(placement into course or 1015, &amp;1065)</i>	3
BME n 1601 UG Seminar I	1
CSE 1001 1st Yr Experience	1
Liberal Education course or Writ 1301	3/4

#### Spring Semester

Math 1372 Calculus II <i>(1371)</i>	4
Phys 1302W Intro Physics II <i>(1301, &amp;Math 1372)</i>	4
Chem 1066 Chem Princ II Lab <i>(1061/1065, &amp;1062)</i>	1
Chem 1062 Chem Princ II <i>(1061/1065, &amp;1066)</i>	3
BME n 1602 UG Seminar II	1
Liberal Education course or Writ 1301	3/4

### Sophomore Year

#### Fall Semester

Math 2373 Lin Alg/Diff Eq <i>(1372)</i>	4
Chem 2301 Organic Chem I <i>(1062/66)</i>	3
BME n 2501 Molec/Cell Biol w/lab <i>(Math 1372, Chem 1062/66, Phys 1302)</i>	4
BME n 2401 Prgming for BME <i>(Math 1372, Phys 1302)</i>	2
Liberal Education course	3/4

#### Spring Semester

Math 2374 Multivariable Calc <i>(1372)</i>	4
BME n 2101 Biomed Thermo <i>(2501, Chem 1062, &amp;Math 2373 or &amp;Math 2374)</i>	3
Stat 3021 Applied Statistics <i>(Math 1372)</i>	3
Liberal Education course	3/4
Liberal Education course	3/4

### Junior Year

#### Fall Semester

Phsl 3061 Prin of Physiology <i>(UD, 1 yr college Math/Phys/Chem)</i>	4
Phsl 3701 Physiology Lab	2
BME n 3011+15 Biomechanics <i>(UD, Math 2374, Phys 1302)</i>	4
BME n 3211+15 Bioelec/Bioinstr <i>(UD, Math 2374, Phys 1302)</i>	4

#### Spring Semester

BME n 3311+15 Biomaterials <i>(UD, Math 2374, Phys 1302)</i>	4
BME n 3111+15 Biomed Tnspt <i>(UD, 3011/15, Math 2374, Phys 1302)</i>	4
BME n 3411+15 Biomed Sys An <i>(3211, &amp;3111, &amp;2401)</i>	4
Technical Elective	3/4

### Senior Year

#### Fall Semester

BME n 4001W Design I <i>(2501, 3111, 3211, 3311, 3701)</i>	3
Technical Elective	3/4
Technical Elective	3/4
Technical Elective	3/4

#### Spring Semester

BME n 4002W Design II <i>(4001W)</i>	3
Technical Elective	3/4
Technical Elective	3/4
Technical Elective	3/4

### About This Plan

- This plan is not a contract. Curriculum can change. The APAS is the official method for tracking completion of University degree requirements.
- Shaded courses are only offered in the indicated semester.
- Course pre-requisites and co-requisites (designated by &) are listed below the course number and title. Upper Division (UD) requires admission to the major prior to enrollment.
- Students can take either the CSE-only or University-wide versions of the math courses (Math 1371/1271, 1372/1272, 2373/2243, 2374/2263).

### Applying to your Major

Students who have completed the required courses for admission to this major (double-boxed and one with dashed outline on plan) and have a 3.2 UM-TC technical GPA at the end of the fall semester will be guaranteed admission. All other students who have completed the required courses will be considered for admission on a space-available basis. Admission following the spring semester is only based on space availability. The major application database is available at [z.umn.edu/csemajorapp](http://z.umn.edu/csemajorapp).

**Total Credits Needed for Degree: 124**

### Department Contact Information

- Website: <http://bme.umn.edu/undergrad/>
- Main Phone: 612-626-3446
- Main Office: 7-105 Hasselmo Hall
- Director of Undergraduate Studies: Professor Chun Wang
- Departmental Contact: Ashlee Haluptzok; [bmedus@umn.edu](mailto:bmedus@umn.edu)

### University Degree Requirements

All students must complete the following Writing & Liberal Education requirements, as noted on their APAS report.  
See link for full Core & Theme names: [z.umn.edu/liberaleducation](http://z.umn.edu/liberaleducation)

#### Writing Requirements:

**University Writing:**  
Writ 1301/1401 or equivalent

**Writing Intensive (WI):**  
Two: 1xxx or 2xxx level \*\*  
One: 3/4/5xxx level (in major)\*  
One: 3/4/5xxx level (any dept.)\*

Requirements with an (\*) will be fulfilled by taking courses at UM-TC required for this major.

#### Liberal Education

<b>CORES:</b> Bio* Phy* His SocS Ltr AH Mth*	<b>THEMES:</b> <b>4 of 5:</b> Civ DSJ Env GP TS
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## What can I do with a major in... Biomedical Engineering?

### ACTIVITIES BIOMEDICAL ENGINEERING MAJORS DO:

By combining biology and medicine with engineering principles and practices, biomedical engineers develop devices and procedures that solve medical and health-related problems. Many biomedical engineers do research, along with life scientists, chemists, and medical scientists, to develop and evaluate systems and products such as artificial organs, prostheses (artificial devices that replace missing body parts), instrumentation, medical information systems, and health management and care delivery systems. Biomedical engineers also design devices used in various medical procedures, such as the cardiac pacemaker, computers used to analyze blood, laser systems used in corrective eye surgery, and imaging systems such as magnetic resonance imaging (MRI). They develop artificial organs, imaging systems such as ultrasound, and devices for automating insulin injections or controlling body functions. Less well known, but of great importance, are the applications of basic principles to the quantitative modeling and simulation of physiological systems. Some specialties within biomedical engineering include:

- **Bioinstrumentation:** Application of electronics and measurement techniques to develop medical devices.
- **Biomaterials:** Understanding of materials for placement in the human body.
- **Biomechanics:** Study of motion and flow within the body and devices.
- **Cellular, tissue, and genetic engineering:** Development of devices to attack biomedical problems on the microscopic level.
- **Clinical engineering:** Intersection of technology and healthcare.
- **Medical imaging:** Electronic data processing and analysis to display medical images in non-invasive ways.
- **Orthopedic bioengineering:** Understanding of bones, joints, and muscles to design artificial replacements.
- **Rehabilitation engineering:** Improvement of the quality of life for people who have physical and cognitive impairments.
- **Systems physiology:** Understanding of the function of living organisms.

### INDUSTRIES BIOMEDICAL ENGINEERING MAJORS WORK IN (SAMPLE LISTING):

Healthcare	Laboratories	Pharmaceuticals	Diagnostics
Biomaterials	Medical software companies	Institutes	Tissue and cellular engineering
Biotechnology	Bio-Instrumentation	Medical imaging	Universities
Invasive devices	Biomechanics	Orthopedics	

### EMPLOYERS WHO HIRE BIOMEDICAL ENGINEERING MAJORS (SAMPLE LISTING):

Accenture	Heraeus Medical Components	National Instruments	Zimmer Inc.
AMS	Mayo Clinic	St. Jude Medical	Minnetronix
Beckman Coulter	Medical Graphics Corporation	Starkey Hearing Technologies	General Electric
Boston Scientific	Medtronic	Vascular Solutions	Lake Region Medical
Minneapolis VA			

### TYPES OF POSITIONS FOR BIOMEDICAL ENGINEERING MAJORS (SAMPLE LISTING):

- **Research and development engineer:** Develops new products and improves existing products for groundbreaking medical device equipment.
- **Quality engineer:** Ensures that medical devices meet FDA standards for safety and efficacy.
- **Biomechanical engineer:** Develops mechanical devices such as the artificial hip, heart, and kidney.
- **Clinical engineer:** Works directly with doctors to train them on devices.
- **Prosthesis designer:** Designs, creates, and fits prosthetic devices such as artificial limbs for patients who have lost limbs or hands.
- **Medical device designer:** Uses technology and research to design new medical devices.

*\*\*Some of these positions may require an advanced degree.*

#### More Information

<b>Career Center</b>	<a href="http://cse.umn.edu/career">cse.umn.edu/career</a>
<b>Salary Information</b>	<a href="http://z.umn.edu/csosalary">z.umn.edu/csosalary</a>
<b>More Information on Undergraduate Majors</b>	<a href="http://cse.umn.edu/majors">cse.umn.edu/majors</a>