Biomedical Engineering, B.S.E.

Educational Objectives
The department provides undergraduate students with a contemporary education in a multidisciplinary field of engineering. Its objective is to produce graduates who:
- advance the biomedical field through the responsible analysis and design of devices, systems, processes, and policies that improve human health;
- pursue a wide range of career options, including those in industry, academia, and medicine; and
- collaborate on multidisciplinary teams and become leaders in their chosen field.

Requirements
The Bachelor of Science in Engineering requires a minimum of 128 s.h. Students must have a g.p.a. of at least 2.00 on all college work used to satisfy degree requirements as well as on all work undertaken at the University of Iowa.

The major in biomedical engineering builds on the foundation provided by the B.S.E. core requirements, preparing students for the challenges and opportunities associated with careers in the profession.

The program has been designed carefully to enable students to satisfy the entrance requirements of the Graduate College. Students whose choice of electives includes a three-course sequence in organic chemistry, an additional biology course, and a biochemistry course may satisfy entrance requirements of the Carver College of Medicine, the College of Dentistry, or the allied health sciences.

All engineering students complete the B.S.E. core requirements for the Bachelor of Science in Engineering.

Biomedical engineering students must choose a track, which constitutes the elective focus area for the biomedical engineering major. They may choose one of four preapproved tracks—bioimaging, bioinformatics, biomechanics and biomaterials, and cellular engineering. Each track may be designated pre-medication by taking the necessary track electives. Each approved track has a group of four required courses and a list of suggested electives.

Tracks
Bioimaging Track
Bioimaging represents the acquisition, processing, and visualization of structural or functional images of living systems. Medical imaging and image processing are integral to the extraction of anatomical and biological information from the systems level down to the molecular level with the goal of clinically seeking to reveal, diagnose, or examine diseases, as well as to the study of normal anatomy and physiology.

Bioinformatics Track
Bioinformatics is an interdisciplinary field that develops methods and software tools for modeling and understanding biological data and systems that are typically represented by large amounts of data. Bioinformatics is a combination of computer science, statistics, informatics, and engineering to analyze and interpret biological and genomic data. It is used for the identification of candidate genes to better understand the genetic basis of disease, unique adaptations, and differences between populations.

Biomechanics and Biomaterials Track
Biomechanics is the study of structure and function. It is the application of principles from classical mechanics to problems in biological systems. This track emphasizes cardiovascular and/or musculoskeletal biomechanics. The study of biomaterials plays an important role in the design of implants and surgical instrumentation for both cardiovascular and musculoskeletal applications.

Cellular Engineering Track
Cellular engineering involves the application of engineering principles to problems in cellular and molecular biology, particularly as they relate to human health. The goal of this track is to equip students with the quantitative tools necessary to understand, manipulate, and control cellular and subcellular processes for a range of biomedical applications, including those related to stem cells, tissue engineering, and regenerative medicine.

For details about tracks and their requirements, visit bioengineering.uiowa.edu/tracks.

Combined Programs
B.S.E./M.S.
The College of Engineering offers a combined Bachelor of Science in Engineering/Master of Science for biomedical engineering undergraduate students who intend to earn a M.S. in biomedical engineering. Students admitted to this program are allowed to apply three engineering courses (9 s.h.) towards both the B.S.E. and M.S. degree requirements, take an additional 3 s.h. of graduate coursework before completing their B.S.E., and attend and participate in the departmental graduate seminar. Students may begin to work on their coursework or master's thesis starting as early as the summer following the junior year of undergraduate studies.

Students applying to the B.S.E./M.S. program in biomedical engineering must meet the following criteria at the time of application:
- a minimum of 80 s.h. completed towards their B.S.E. degree,
- a cumulative g.p.a. of 3.50 or higher, and
- identification of a thesis or project mentor.

B.S.E./M.S. in Electrical and Computer Engineering
B.S.E. students majoring in biomedical engineering who are interested in earning a Master of Science in electrical and computer engineering may apply to the combined B.S.E./M.S. program offered by the College of Engineering. The combined program permits students to count a limited amount of credit toward the requirements of both degrees. See the M.S. in electrical and computer engineering in the Catalog.
Biomedical Engineering, B.S.E.

Course Title Hours
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First Year

Fall

MATH:1550 Engineering Mathematics I: Single Variable Calculus 4
ENGR:1100 Introduction to Engineering Problem Solving 3
CHEM:1110 Principles of Chemistry I C 4
RHET:1030 Rhetoric 4
ENGR:1000 Engineering Success for First-Year Students b, f 1
CSI:1600 Success at Iowa 0

Hours 16

Spring

MATH:1560 Engineering Mathematics II: Multivariable Calculus 4
MATH:2550 Engineering Mathematics III: Matrix Algebra 2
ENGR:1300 Introduction to Engineering Computing e 3
PHYS:1611 Introductory Physics I 4
CHEM:1120 Principles of Chemistry II 4
BME:1010 First-Year Forum d, f 1

Hours 18

Second Year

Fall

MATH:2560 Engineering Mathematics IV: Differential Equations 3
BIOL:1411 Foundations of Biology 4
ENGR:2110 Engineering Fundamentals I: Statics g 2
ENGR:2120 Engineering Fundamentals II: Electrical Circuits g 3
ENGR:2130 Engineering Fundamentals III: Thermodynamics g 3
BME:2010 Professional Seminar: Biomedical Engineering d, e 1

Hours 16

Spring

HHP:3500 Human Physiology 3
BME:2200 Systems, Instrumentation, and Data Acquisition e 4
BME:2400 Cell Biology for Engineers e 3
BME:2500 Biomaterials and Biomechanics e 4
STAT:3510 Biostatistics or BIOS:4120 Introduction to Biostatistics 3
BME:2010 Professional Seminar: Biomedical Engineering d, e 1

Hours 18

Third Year

Fall

BME:2210 Bioimaging and Bioinformatics e 4
Track Requisite #1 3
PHYS:1612 Introductory Physics II 4
GE: Engineering Be Creative h 3
GE: CLAS General Education Component i 3

Academic Plans

Sample Plan of Study

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BME:3010</td>
<td>Leadership and Resourcefulness</td>
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### Spring

| Track Requisite #2 | 3 |
| Track Elective #1 | 3 |
| Track Elective #2 | 3 |
| GE: Approved Course Subjects | 3 |
| GE: Approved Course Subjects | 3 |
| BME:4010 | Biomedical Engineering Design Seminar | 1 |

**Hours** 18

### Fourth Year

#### Fall

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<td>BME:4910</td>
<td>Biomedical Engineering Senior Design I</td>
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<tr>
<td>Track Requisite #3</td>
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<td></td>
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<tr>
<td>Track Requisite #4</td>
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<tr>
<td>Track Elective #4</td>
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**Hours** 16

#### Spring

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<td>BME:4920</td>
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<td>Track Elective #5</td>
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<tr>
<td>GE: Approved Course Subjects</td>
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<td></td>
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</tbody>
</table>

**Hours** 16

**Total Hours** 134

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**Notes:**

- Enrollment in math courses requires completion of a placement exam.
- Typically this course is offered in fall semesters only. Check MyUI for course availability since offerings are subject to change.
- Enrollment in chemistry courses requires completion of a placement exam.
- 1 s.h. does not count toward 128 s.h. total required for graduation.
- Typically this course is offered in fall and spring semesters. Check MyUI for course availability since offerings are subject to change.
- Typically this course is offered in spring semesters only. Check MyUI for course availability since offerings are subject to change.
- Typically this course is offered in fall, spring, and summer semesters. Check MyUI for course availability since offerings are subject to change.
- Courses with prerequisites; students should complete a prerequisite waiver form.
- Students may select a course from all GE CLAS Core categories except Rhetoric, Quantitative or Formal Reasoning, and Natural Sciences.
- Two Track Electives must be Engineering topics courses.
- A full list of approved course subjects can be found on the College of Engineering General Education Component website.
- Choose from Engineering Electives (Other Suggestions) or courses not chosen from Engineering Topics
- Please see Academic Calendar, Office of the Registrar website for current degree application deadlines. Students should apply for a degree for the session in which all requirements will be met. For any questions on appropriate timing, contact your academic advisor. For more information visit [http://commencement.uiowa.edu/](http://commencement.uiowa.edu/).