The Department of Bioengineering offers a Bachelor of Science degree in Biomedical Engineering, as well as two programs for earning a combined BS/MS degree in Bioengineering. The Department also offers ME, MS, and PhD degrees (described elsewhere).

This handbook is intended to give information about policies and procedures for the undergraduate program in Biomedical Engineering. Please come to the Department office at 2750 Warnock Engineering Building, or email an advisor, if you have questions not answered here. The information in this handbook as well as various downloadable forms are also available online at www.bioen.utah.edu.

The University of Utah is committed to policies of equal opportunity, affirmative action, and nondiscrimination. The University seeks to provide equal access to its programs, services and activities for people with disabilities.

Contact Information and Links

<table>
<thead>
<tr>
<th>Undergraduate Secretary:</th>
<th>email: <a href="mailto:beth.swanson@utah.edu">beth.swanson@utah.edu</a></th>
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<tr>
<td>Beth Swanson</td>
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<tr>
<td>Pre-Major and Honors Advisor:</td>
<td>email: <a href="mailto:Kelly.Broadhead@utah.edu">Kelly.Broadhead@utah.edu</a></td>
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<tr>
<td>Kelly Broadhead, Ph.D.</td>
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<td>Major Advisor/Director of Undergraduate Studies:</td>
<td>email: <a href="mailto:rob.macleod@utah.edu">rob.macleod@utah.edu</a></td>
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<tr>
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Department Web Site: www.bioen.utah.edu

See the site for links to:

- Course Descriptions
- Faculty Directory
- Undergraduate Studies

University of Utah Web Site: www.utah.edu

Biomedical Engineering Web Sites:

- www.bmes.org
- www.embs.org
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1 Program description

1.1 Mission

The mission of the Department of Bioengineering is to advance human understanding, health, and the quality of life through:

- internationally recognized research, discovery, and invention in the area of biomedical engineering;
- education of world-class Ph.D. scientists and engineers for accomplishment in research, academics, medicine, and industry;
- education of nationally-recognized B.S. and M.S. graduates for success and leadership in industry and in preparation for future study in medicine, science and engineering;
- transfer of scientific discoveries and biomedical technology to the private sector nationwide;
- delivery of high-quality M.E. continuing education to enhance the economy by supporting biomedical industries;
- training of students throughout the College of Engineering in bio-based solutions to traditional engineering problems and in the application of their specialty to biological and biomedical science.

1.2 Educational objectives

The department’s educational objectives for the undergraduate BME program are:

- graduates will be successful in entering graduate programs, in gaining admission to professional schools including medical and law schools, or in obtaining employment in a biomedical engineering aligned industry;
- graduates will be able to solve problems at the interface of engineering and biology whether in a research environment, a clinical setting, or in industry;
- graduates will be motivated to pursue life-long learning efforts in order to fulfill their professional and ethical responsibility; and they will recognize their responsibility to understand contemporary questions at the interface of biomedical science, technology, and society;
- graduates will have noteworthy careers no matter what the direction or environment they chose because of their broad education founded in science and engineering.

1.3 Program outcomes

The department’s Program Outcomes are:

- an ability to apply mathematics, science and engineering principles;
- an ability to conduct experiments and analyze and interpret data;
- an ability to design an experiment, system, component, or process to meet desired needs;
- an ability to function on multi-disciplinary teams;
- an ability to identify, formulate, and solve engineering problems;
- an understanding of professional ethical responsibility;
- an ability to communicate effectively in an oral format;
- an ability to communicate effectively in a written format;
- an understanding of the impact of engineering solutions in a global and societal context;
- an understanding of the need for and the ability to engage in lifelong learning;
- an understanding of contemporary issues;
- an ability to apply the techniques, skills, and modern engineering tools necessary for engineering practice.
2 Status and admissions

2.1 Pre-Major status

Students beginning the undergraduate program, including transfer students, should choose the Pre-Biomedical Engineering category as their major for registration purposes. Pre-major students are eligible to register for all classes listed in the freshman and sophomore years of the Suggested Biomedical Engineering Plan of Study in Section 4. Pre-majors are strongly encouraged to meet early with the Pre-Major Advisor in the Department to outline a course of study that will prepare them to apply for major status in a timely manner. Junior- and senior-year courses in the Biomedical Engineering program are open only to students with major status.

2.2 Admission to major status

Admission to major status in the Biomedical Engineering program is limited by the availability of Department teaching and laboratory resources and based solely on academic achievement. Approximately 40 applicants will be admitted to major status each year. Admission to major status is based on a specific grade point average made up of selected courses. See Application Form at the end of this document and check with the Undergraduate Secretary in the Department office for details. In order to register for Department upper-division courses (3000-level or higher), a student must have major status (or receive permission from the Department and course instructor for exceptional circumstances).

To be considered for admission to major status, a student must have completed the following courses:

- BIOEN 1101 Fundamentals of Bioengineering I
- BIOEN 1102 Fundamentals of Bioengineering II
- BIOEN 2000 Careers in Biomedical Engineering
- BIOL 2020 Cell Biology (or equivalent)
- CHEM 2310 Organic Chemistry I
- CHEM 2315 Organic Chem Lab I
- MATH 2250 Diff Eq/Lin Alg
- PHYCS 2210 Physics for Scientists I

with an overall grade point average (GPA) in these classes of 3.0 or better. In addition, the overall University GPA (including transfer credit) is combined with the GPA in these classes to arrive at a composite GPA. Note that the composite GPA required for admission (as calculated on the application form) must be 3.25 or higher for automatic admission. Students with a composite GPA below 3.25 but above 3.0 will join an admission waiting list.

2.3 Scholarships

The Department, in cooperation with the College of Engineering, provides a limited number of scholarships to highly qualified applicants. Applications for scholarships are usually due on March 1. Contact the Department Office or see the Department web site for details.
3 Requirements for the B.S. Degree in BME

The undergraduate degree (B.S.) in Biomedical Engineering is granted upon successful completion of a minimum of 122 semester hours of the following requirements:

1. University’s General Education Requirements,
2. Mathematics and Science,
3. the Biomedical Engineering Core, and
4. Track Electives.

These program requirements are described in detail below. Note that some of the requirements have changed from previous years and may continue to change.

Some of the General Education, mathematics and science courses may be waived for students who have AP credit from high school in those courses and who have achieved certain grades on the AP test. Details are in the [www.ugs.utah.edu/catalog/](http://www.ugs.utah.edu/catalog/) under the department offering the specific course.

3.1 General education requirements

See the website [www.ugs.utah.edu/student/gened/index.htm](http://www.ugs.utah.edu/student/gened/index.htm) for a description of the University’s General Education requirements. General Education includes Intellectual Explorations courses (including a Diversity requirement), and the Writing, American Institutions, and Quantitative Reasoning course requirements.

**Intellectual explorations** Students must take two courses in each of the areas of Fine Arts, Humanities, and Social and Behavioral Science. The requirement in the Physical and Life Science area is automatically met by the Biomedical Engineering curriculum. One of the Intellectual Explorations courses selected should also meet the Diversity requirement. See the website [www.ugs.utah.edu/student/gened/dv.htm](http://www.ugs.utah.edu/student/gened/dv.htm) for a description and list of Diversity courses. Note that not all of the classes that meet the Diversity criterion are also courses in the Intellectual Explorations list. Students should try to take a Diversity course that will clear two requirements (Diversity and Intellectual Explorations) simultaneously.

**Lower division writing** Writing 2010 or the equivalent is required. The University’s upper-division communication/writing requirement will automatically be met by successful completion of BIOEN 4202 (Biomedical Engineering Project II) in the senior year.

**American institutions** See the website [http://www.ugs.utah.edu/student/gened/ai.htm](http://www.ugs.utah.edu/student/gened/ai.htm) for courses that meet the American Institutions requirement. The American Institutions requirement may also be cleared by AP credit or by examination at the Testing Center in the Student Services Building during regular testing room hours.

**Quantitative reasoning** The Quantitative Reasoning and Quantitative Intensive course requirements (QA, QB, and QI) are met by the Biomedical Engineering curriculum through the calculus requirements and through BIOEN 5001 and BIOEN 5201 (Biophysics and Biomechanics).
3.2 Mathematics and Science

The following courses are required from the areas of mathematics and science:

- MATH 1250 Calculus AP Students I
- MATH 1260 Calculus AP Students II (or equivalent)
- MATH 2250 Diff Eq/Lin Alg
- MATH 3070 Applied Statistics I
- PHYS 2210 Physics for Scientists I
- PHYS 2220 Physics for Scientists II
- CHEM 1210 Chemistry I
- CHEM 1215 General Chemistry Lab I
- CHEM 1220 General Chemistry II
- CHEM 1225 General Chemistry Lab II
- CHEM 2310 Organic Chemistry I
- CHEM 2315 Organic Chem Lab I
- CHEM 2320 Organic Chemistry II
- CHEM 2325 Organic Chem Lab II
- BIOL 2020 Cell Biology

3.3 Biomedical Engineering Core

The following 13 courses are required from the BME Core:

**Premajor**
- BIOEN 1101 Fundamentals of Bioengineering I
- BIOEN 1102 Fundamentals of Bioengineering II
- BIOEN 2000 Careers in Biomedical Engineering

**Major**
- BIOEN 3201 Bimolecular Engineering
- BIOEN 3202 Physiology for Engineers
- BIOEN 3801 Biomedical Engineering Design I
- BIOEN 4801 Biomedical Engineering Design II
- BIOEN 4201 Biomedical Engineering Project I
- BIOEN 4202 Biomedical Engineering Project II
- BIOEN 5001 Biophysics
- BIOEN 5101 Bioinstrumentation
- BIOEN 5201 Biomechanics
- BIOEN 5301 Biomaterials

3.4 Tracks

The Biomedical Engineering program offers students an opportunity for specialization in the following areas:

**Bioelectrical Engineering:** based on course material from electrical engineering typically with a focus on instrumentation, imaging, or electrically based diagnostics and therapy.

**Biomaterials Engineering:** based on course material from materials science, material engineering, and mechanical engineering focused on the role of materials in biomedical applications.
Biomechanical Engineering: based on course material from physics or mechanical engineering focused on mechanical aspects of the body, mechanical characteristics of biomedical materials, fluids, use of heat and heat-inducing therapies, and prosthetics.

Biomolecular Engineering: based on course material from chemistry and chemical engineering and focused on the chemical characteristics of materials, biochemistry of living systems, and chemical-based diagnostics and therapeutic drugs and materials.

Computational Bioengineering: based on courses in computer science and mathematics and focused on the application of numerical and computational approaches to all aspects of the analysis, interpretation, visualization, and simulation of living systems.

Premedical Preparation: includes the required courses for entry to most medical and dental programs with an emphasis on clinical perspectives of engineering.

Special: for students with unique goals in their engineering degree; draws on courses from many engineering disciplines and the basic or medical sciences.

A student chooses an area based on his or her career goals and a discussion with the undergraduate advising in order to meet one or more of the following needs:

- Deeper knowledge of a particular field because of a pre-existing interest or focused career goals.
- Broader knowledge of a field in order to be prepared for a diverse career that has not yet focused on a particular aspect.
- Exploration of a wide variety of directions and courses in order to identify the most compelling and fulfilling future career directions.

The student then selects a set of courses consistent with the nature of the chosen track, which must be approved by the Program Directory. A student with special interests may design a spatial or customized track in consultation with the Department’s Major Advisor.

Section 5 contains specific requirements and lists of approved track classes. Note that discussion and approval of the track electives must occur in discussion with the Major Advisory.

3.5 COOP/Internship Opportunities

Students interested in including industrial experience in their university education should consider participating in the Department’s COOP/Internship Program. Internships can also lead to credit through BIOEN 4990, which can also be used as a track course. Contact Dr. Brenda Mann for more details (see website for contact information).

3.6 Continuing Performance

A student admitted to major status must maintain a cumulative University of Utah GPA, as reported on his or her transcript, above 3.00. Each course taken to satisfy departmental requirements in mathematics, chemistry, physics, biology, biomedical engineering core, and the track electives must be taken for credit and passed with a grade of C or better. A student may repeat these technical courses only once, and the second grade received will be counted for the requirement.

3.7 Leave of Absence

Students are expected to complete all degree requirements within four years of acceptance to major status. Students accepted into major status who are planning to be absent from the program for more than one year should request a leave of absence by submitting a letter to the Undergraduate Secretary. (A copy
Students who move to a part time status and do not take the normal course load should apply to the Major Advisor and a variance (tan colored form) and to work out an acceptable plan for continuing progress in the program. Otherwise, students accepted into major status who are not making satisfactory progress may be dropped from the program and declared inactive. To be reinstated to active status, students must submit a written petition to the Director of Undergraduate Studies. Reinstated students matriculate under the latest graduation requirements.

3.8 Probation

A student admitted to major status whose cumulative GPA falls below 3.00 is placed on departmental academic probation and given written instructions for a return to good standing. Normally, these conditions must be met during the ensuing semester. Students who fail to meet probationary conditions are dropped from the program. Reinstatement requires a written petition to the Director of Undergraduate Studies. Reinstated students matriculate under the latest graduation requirements.

3.9 Repeat and Withdrawal Policies

The Biomedical Engineering program adheres to the College of Engineering policies for a course that is repeated and for withdrawals. In particular, a technical course required for the degree may be repeated only once, and the second grade received will be counted toward application for admission to major status and to the continuing performance requirement. Grades of W, I or V on the student’s record count as having taken the class. This policy does not apply to courses taken to satisfy Intellectual Exploration and lower division Writing requirements.

3.10 Transfer Credit and Exceptions to Policy

Students wishing to apply credit from another school for any technical class which is not included in the College of Engineering Articulation Agreement (available on the University of Utah web site and in the Department of Bioengineering Office) must submit a Petition for Transfer Credit or Variance (the “tan sheet”) along with thorough supporting documentation. Only after the petition has been approved by the Department will transfer technical credit by allowed toward completion of the BS degree in Biomedical Engineering. This applies even to classes that have been accepted by the University for general transfer credit; the classes must still be submitted for Departmental acceptance for transfer credit toward the degree by petition (unless they appear on the Articulation Agreement, in which case approval is automatic). Note that any exception to the Department’s academic policies must be requested by submission of this same form, and that such an exception is allowed only after the petition has been approved by the Department.

3.11 Exit Interviews and Graduation

In order to be cleared to graduate, a student must meet with the Major Advisor to review the DARS audit report and to verify that all graduation requirements will be completed by the time of graduation. This must be done one semester prior to graduation. Immediately prior to graduation, the student attends an exit interview with a faculty member during a time announced in the senior classes. This exit interview provides important feedback to the Department to help improve the Biomedical Engineering program.

3.12 Undergraduate Advising

Please visit the Department of Bioengineering undergraduate office, 2750 Warnock Engineering Building, for academic advice and information about the undergraduate program or call (801) 585-3651.
## 4 Suggested Biomedical Engineering Plan of Study

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* As an alternative to this math sequence, students may take MATH 1270 and 1280 or the three-semester calculus series MATH 1210, 1220, and 2210.

** Students who have not had AP Biology in high school (with a score of 4 or 5) should take BIOL 1210 as a prerequisite to BIOL 2020.

*** Students participating in the COOP/Intern program would have an additional 3 hours of credit.

Descriptions of Bioengineering Department courses can be found at [www.bioen.utah.edu/](http://www.bioen.utah.edu/)
5 Track Courses

All accepted track course sequences must consist of the following:

1. a minimum of 13 credit hours of course work, of which
2. at least 10 hours must be from the College of Engineering and/or the College of Mines & Earth Sciences (ensures meeting ABET course requirements), and
3. at least 8 of the hours must be at the upper division level.

A student’s track plan must be approved by the Department’s Major Advisor by submitting a Track Coursework Plan (the “green sheet”) available from the BE office, the Major Advisor or this link. Seeking approval for the track plan should occur in the first semester after admission to major status and before starting the track sequence. Students who have not submitted a track sheet by the middle of the semester immediately following their admission will not be allowed to register for Spring semester junior-year Bioengineering courses. When planning a track, students must pay particular attention to prerequisites to be sure the courses are taken in the correct order. A list of Bioengineering Department courses suitable for inclusion in a track appears at the end of this section. Each student must check with the appropriate departments to determine if and when individual courses will be offered in the future and to identify the associated prerequisites.

Below are some samples of course selections organized by track. Note that in many cases, Bioengineering students can progress directly to the upper division classes offered by other departments without completing the usual requirements for those classes. When in doubt, the Major Advisor or the instructor of the course can provide guidance.

5.1 Bioelectrical Engineering Track

Prerequisites Note that there are prerequisites for many of these courses and that to have the most choice of courses, it is important to take these prerequisites as early as possible. Especially ECE 1270 and ECE 2270 are valuable prerequisites. For a map of the (rather complex) prerequisite pathway in ECE, see the ECE website.

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<td>ECE 5410</td>
<td>Lasers and Their Applications</td>
</tr>
<tr>
<td>ECE 5530</td>
<td>Digital Signal Processing</td>
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5.2 Biomaterials Engineering Track

MSE 2010  Introduction to Materials Science & Engineering
MSE 3010  Materials Processing Laboratory
MSE 3310  Introduction to Ceramics
MSE 3011  Structural Analysis of Materials
MSE 3210  Electronic Properties of Solids
MSE 3310  Introduction to Ceramics
MSE 3410  Introduction to Polymers
MSE 3510  Introduction to Metallic Materials
MSE 5010  X-ray Diffraction Techniques
MSE 5035  Electron Microscopy Techniques
MSE 5061  Transport Phenomena in Materials Science and Engineering
MSE 5201  Semiconductor Device Physics I
MSE 5202  Semiconductor Device Physics II
MSE 5211  Semiconductor Device Fabrication Laboratory I
MSE 5212  Semiconductor Device Fabrication Laboratory II
MSE 5240  Principles and Practice of Transmission Electron Microscopy
MSE 5353  Physical Ceramics
MSE 5354  Processing of Advanced Ceramics
MSE 5471  Polymer Processing
MSE 5473  Polymer Synthesis and Characterization
MSE 5475  Introduction to Composites
ME EN 1300  Statics and Strength of Materials
MET E 1620  Introduction to Physical Metallurgy
MET E 3530  Experimental Techniques in Metallurgy
MET E 5260  Physical Metallurgy I
MET E 5450  Mechanical Metallurgy
MET E 5600  Corrosion Engineering

5.3 Biomechanical Engineering Track

ME EN 1300  Statics and Strength
ME EN 2080  Dynamics
ME EN 2300  Thermodynamics I
ME EN 2450  Numerical Techniques in Engineering
ME EN 3300  Strength of Materials
ME EN 3650  Heat Transfer
ME EN 3700  Fluid Mechanics
ME EN 5300  Advanced Strength of Materials
ME EN 5500  Engineering Elasticity
ME EN 5510  Introduction to Finite Elements
ME EN 5520  Composites
ME EN 5720  Comp. Fluid Mechanics
5.4 Biomolecular Engineering Track

BIOEN 5090  Biophysical Chemistry
BIOEN 6140  Fundamentals of Tissue Engineering
BIOEN 6421  Fundamentals of Micromachining Processes
BIOL 2030  Genetics
BIOL 3215  Cell Biology Laboratory
BIOL 3230  Developmental Biology
CH EN 5103  Biochemical Engineering
CH EN 5104  Biochemical Engineering Laboratory
CHEM 3510  Biological Chemistry I
CHEM 3515  Biological Chemistry Laboratory
CHEM 3520  Biological Chemistry II
CHEM 3525  Molecular Biology of DNA Lab
CHEM 5810  Nanoscience: Where Biology, Chemistry and Physics Intersect
MSE 2010  Introduction to Materials Science & Engineering
MSE 3410  Introduction to Polymers
MSE 5010  X-ray Diffraction Techniques
MSE 5035  Electron Microscopy Techniques
MSE 5061  Transport Phenomena in Materials Science and Engineering
PATH 5030  Basic Immunology
5.5 Computational Bioengineering Track

CS 1010 Introduction to Unix
CS 1410 Introduction to Computer Science I
CS 2420 Introduction to Computer Science II
CS 2010 Discrete Structures
CS 3200 Scientific Computation
CS 3500 Software Practice I
CS 3505 Software Practice II
CS 3700 Fundamentals of Digital System Design
CS 5300 Artificial Intelligence
CS 5310 Robotics
CS 5320 Computer Vision
CS 5530 Database Systems
CS 5540 Human/Computer Interaction
CS 5600 Introduction to Computer Graphics
CS 5610 Interactive Computer Graphics
CS 5630 Scientific Visualization
CS 6210 Advanced Scientific Computing I
CS 6220 Advanced Scientific Computing II
CS 6760 Modeling and Analysis of Biological Networks
ECE 3700 Fundamentals of Digital System Design
ECE 5340 Numerical Techniques in Electromagnetics
CH EN 3510 Introduction to Metallic Materials
CH EN 5353 Computational Fluid Dynamics
CH EN 6703 Applied Numerical Methods
MATH 5110 Mathematical Biology I
MATH 5120 Mathematical Biology II
MATH 5600 Survey Numerical Analysis
MATH 5610 Intr. Numerical Analysis I
MATH 5740 Mathematical Modeling

5.6 Premedical Track

Students planning on applying to medical school may wish to design a track that supports this goal. The track courses selected should meet, to the extent possible, three criteria:

1. They complete course requirements set by the medical schools for admission;
2. They are from a subject area in which the student does well;
3. They provide the student a sound foundation for an alternative career choice should the medical schools not respond favorably.

BS in Biomedical Engineering generally meets all the course requirements for medical school with the possible exception of laboratories in introductory courses in Biology and Physics. However, the Biomedical Engineering core courses taken in the junior and senior years supply laboratory course hours which may be accepted in lieu of these explicit laboratory courses. Because there is considerable variability in what is both recommended and required among different medical schools, students should review the entrance requirements of the medical schools to which they are considering applying and determine which of the following courses to include in their tracks.
BIOEN 5460  Engineering Aspects of Clinical Medicine
BIOEN 6000  Systems Physiology I: Cardiovascular System
BIOEN 6010  Systems Physiology II: Nervous/Endocrine Systems
BIOEN 6140  Fundamentals of Tissue Engineering
BIOEN 6230  Functional Anatomy for Engineers
BIOEN 5480  Ultrasound
BIOL 2030  Genetics
BIOL 3215  Cell Biology Lab
BIOL 3230  Developmental Biology
BIOL 3510  Biological Chemistry I
BIOL 3515  Biological Chemistry Lab
BIOL 3520  Biological Chemistry II
PATH 5030  Basic Immunology
5.7 Department of Bioengineering courses approved for inclusion in BME tracks

The following courses are all approved for inclusion in the track plan for Biomedical Engineering. This course list is changing constantly and course offerings change in other departments so please consult with the Major Advisor whenever making a decision on the track plan. **It is up to the individual student to ensure that the courses in the track exist and are offered at the time the student wishes to take them. Note that many courses are taught only every second year.**

- BIOEN 5090 Biophysical Chemistry
- BIOEN 5401 Medical Imaging Systems
- BIOEN 5460 Engineering Aspects of Clinical Medicine
- BIOEN 5480 Ultrasound
- BIOEN 4990 Internships and Cooperative Education (1 Credit Hour)
- BIOEN 6000 Systems Physiology I: Cardiovascular System
- BIOEN 6010 Systems Physiology II: Nervous/Endocrine Systems
- BIOEN 6002 Molecular Biophysics
- BIOEN 6003 Cellular Electrophysiology and Biophysics
- BIOEN 6050 Cellular Physiology for Engineers
- BIOEN 6080 Ideas Into Dollars: Writing Grant Proposals
- BIOEN 6140 Fundamentals of Tissue Engineering
- BIOEN 6230 Functional Anatomy for Engineers
- BIOEN 6310 Physics of MEG, X-Ray and Ultrasound
- BIOEN 6320 Physics of Nuclear Medicine and MRI
- BIOEN 6410 Bioinstrumentation
- BIOEN 6421 Fundamentals of Micromachining Processes
- BIOEN 6422 Biomedical Applications of Micromachining
- BIOEN 6430 Systems Neuroscience
- BIOEN 6433 Biological Statistical Signal Processing
- BIOEN 6440 Neural Engineering
- BIOEN 6450 Bioengineering Control Systems
- BIOEN 6460 Electrophysiology and Bioelectricity
- BIOEN 7111 Physicochemical Approach to Proteins and Nucleic Acids
- BIOEN 7120 Biocompatibility
- BIOEN 7130 Pharmaceutical Applications of Colloid and Interfacial Science
- BIOEN 7140 Advanced Topics in Tissue Engineering
- BIOEN 7150 Introduction to Biomimetic Engineering
- BIOEN 7155 Neural Interfaces Laboratory
- BIOEN 7160 Physical Nature of Surfaces
- BIOEN 7168 Proteins at Interfaces and in Membranes
- BIOEN 7210 Biosolid Mechanics
- BIOEN 7220 Biofluid Mechanics
- BIOEN 7310 Advanced Topics in Magnetic Resonance Imaging
- BIOEN 7320 3D Reconstruction Techniques in Medical Imaging
- BIOEN 7410 Advanced Bioinstrumentation
- BIOEN 7420 Modeling of Physiological Systems
5.8 Courses NOT acceptable for inclusion as a track elective

The following courses are not acceptable as a track elective for the Biomedical Engineering program. The reasons for excluding courses include:

- course does not include adequate engineering or biomedical content;
- course overlaps too much with a course already in the core curriculum of the BME program;
- course level, requirements, or evaluation are not equivalent to the rest of the BME program;
- course does not require active participation of the student

BE 4999 Honors Thesis/Project
BE 5020 Interactive Science Exhibits
BE 5950/6910 Independent Study
BE 6062 Biomedical Engineering Literature Survey
BE 6480 Biomechanics Seminar*
BE 6464 Cardiac Electrophysiology and Biophysics Seminar*
BE 6900 Special Topics**
BE 6930 Special Project
MSE 2160 Elements of Materials Science and Engineering
  Take MSE 2010 instead (Introduction to Materials Science & Engineering)
MSE 2170 Elements of Materials Science and Engineering
  Take MSE 2010 instead (Introduction to Materials Science & Engineering)
PHYS 3110 Physics of the Human Body I
PHYS 3111 Physics of the Human Body II

* students may take these courses for track credit only if they otherwise have adequate numbers of hours but need to achieve the required number of college hours.

** Special topics class may count for track electives depending on the type and structure of the course. Please see the Major Advisor before taking a special topics class to determine its status.

6 Senior Project

A major component of the undergraduate program is the senior project, which involves two components:

1. A substantial involvement (approximately 200 hours) in one of three activities:
   - A scientific research project supervised by a faculty member either in or affiliated with the Bioengineering Department.
   - A design project that extends above and beyond the scope of the Bioengineering Design Course, mentored by a Bioengineering faculty member.
   - A substantial design or research project undertaken as part of an industrial or academic internship.

2. Completing the Senior Project class (BE 4201 and BE 4202).

The goals of the senior project are to develop specific experience and skills in scientific research and/or engineering design and development and to learn to present the results of such a study in all forms: written, oral, and visual. For most students, the senior project should be the culminating activity of their program in which they use skills acquired from numerous courses and previous laboratories and develop a whole new set of abilities in the science (and art) of organizing and presenting ideas.

Success in the senior project requires taking the following steps:
1. As the very latest in the spring of the Junior year, obtain a placement in a research lab, with a biomedical engineering form, or in a lab related to the design class project.

2. Discuss with a mentor the specific needs of the senior project and develop a plan to carry out a project of adequate scope to generate the results for the senior project.

3. Make sure that by the **beginning of the fall semester** in the Senior year, there is enough results/data to write and talk about in the Senior Project class BE 4201.

If there are questions or uncertainty at any step in the process, the Major Advisor will be available to help.

### 7 B.S./M.S. Program

The Department offers for students interested in rapidly advancing to the Master’s level a combined B.S./M.S. program. The program is described in a separate document on the [Department website](https://www.bioengineering.utah.edu) and students interested in the program should read this description carefully to ensure that their course of study complies with the requirements.

Note that international students on visas are not eligible to participate in the combined BS/MS programs, per SEVIS regulations according to the U.S. Immigration and Customs Enforcement ([URL: www.ice.gov/sevis](https://www.ice.gov/sevis)).
Department of Bioengineering
Application for Admission to Major Status in Biomedical Engineering

Instructions: In order to earn a Bachelor of Science degree in Biomedical Engineering, you must be admitted to major status before you can register for any upper level Biomedical Engineering classes. To be considered for admission to major status, you must have completed, as a minimum, the courses listed below with a grade point average of 3.00 or better. You may repeat technical courses only once, and the second grade received will be counted for the requirement. Actual admission is based on the composite GPA as calculated on this form. For the 2006-2007 academic year, students with composite GPAs of 3.25 or higher will be automatically admitted to major status; students with composite GPAs below 3.25 but above 3.0 will be put on a wait list and admitted as space permits at the end of the 2007 summer session. Target enrollment is 40 students.

To apply for admission to major status, submit this application form, an official copy of your University of Utah transcript and a summary of transfer credits (if applicable) to the Undergraduate Secretary any time during the academic year but no later than one day after the posting of grades for the 2007 summer session. Applications for admission will be considered as they are received. Students admitted to major status before the beginning of spring semester may start taking major classes that semester.

Name: ___________________________ Student No. __________________
Address: __________________________ Phone: __________________

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<th>Letter Grade</th>
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* Grade Values: A = 4.00, A- = 3.70, B+ = 3.30, B = 3.00, B- = 2.70, C+ 2.30, C=2.00

A GPA from courses above (Total Points / Total Credit Hours):

B U of U Cumulative GPA reported on transcript (adjusted to include transfer grades weighted by hrs.):

C Composite GPA: (0.50 x A + 0.50 x B):

Student Signature: ___________________________ Date: __________________

Office use
Confirmed:

Action date(s): ________ Admit ________ Wait list ________ Decline

2006
Department of Bioengineering
Track Coursework Plan (2007)

Name: ___________________________________________ Student No: __________
Address: _______________________________________________________________________
Phone number: ___________________________ email address: _________________________

Indicate one of these areas that best describes your track:
- Bioelectrical Engineering
- Biomechanical Engineering
- Computational Bioengineering
- Biomaterials Engineering
- Biomolecular Engineering
- Premed
- Special

List below a set of courses that is consistent with meeting your career goals. The plan must be well-thought out and coherent in terms of these goals. Examples of possible track courses are given in the Undergraduate Handbook.

Each of the courses listed below must be in the area of science or engineering. They must total 13 or more credit hours. At least 10 of the hours must be from the College of Engineering and/or the College of Mines & Earth Sciences. At least 8 of the hours must be at the 3000 level or above.

Consult with the Bioengineering Department’s Major Advisor in planning your track. Submit this completed form to the Department's Major Advisor for approval before taking courses toward the track requirements. Any subsequent changes to your plan must also be approved using this form.

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Student Signature: ___________________________________________

Department Approval: ________________________________________ Date: __________