

# BACHELOR OF SCIENCE IN BIOMEDICAL ENGINEERING

The true integration of the life sciences and engineering is essential in educating a substantial percentage of the next generation of biomedical engineers in order to benefit from the biological revolution and its applications to medicine. This degree program attracts outstanding students who wish to have that integration in their undergraduate education, so that they may be equipped with the tools to be leaders in this field in the 21st Century.

The curriculum includes a solid foundation in fundamental engineering, mathematics, and sciences - biology, chemistry, and physics - as well as grounding in humanities, social sciences, and communication skills. A unique aspect of the curriculum is the incorporation of problem-based learning (PBL) methodologies to foster development of both self-directed learning skills and problem-solving skills in a team-based environment.

## Program Educational Objectives

The program strives to produce graduates who are expected to demonstrate the following during the first few years after graduation:

1. mathematics, science, and engineering fundamentals expertise at the interface of engineering and the life sciences which enables them to take leadership roles in the field of biomedical engineering;
2. an ability to use their multidisciplinary background to foster communication across professional and disciplinary boundaries with the highest professional and ethical standards; and
3. the ability to recognize the limits of their knowledge and initiate self-directed learning opportunities to be able to continue to identify and create professional opportunities for themselves in the field of biomedical engineering.

Code	Title	Credit Hours
<b>Wellness</b>		
APPH 1040	Scientific Foundations of Health or APPH 10 The Science of Physical Activity and Health or APPH 10 Flourishing: Strategies for Well-being and Resilience	2
<b>Core A - Essential Skills</b>		
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
MATH 1552	Integral Calculus <sup>2</sup>	4
<b>Core B - Institutional Options</b>		
CS 1371	Computing for Engineers	3
<b>Core C - Humanities</b>		
Any HUM		6
<b>Core D - Science, Math, &amp; Technology</b>		
PHYS 2211	Introductory Physics I <sup>2,3</sup>	4
PHYS 2212	Introductory Physics II <sup>4</sup>	4
MATH 1551	Differential Calculus	2
MATH 1553	Introduction to Linear Algebra or MATH 1554 Linear Algebra or MATH 1555 Linear Algebra with Abstract Vector Spaces	2
<b>Core E - Social Sciences</b>		
Select one of the following:		3

HIST 2111	The United States to 1877	
HIST 2112	The United States since 1877	
INTA 1200	American Government in Comparative Perspective	
POL 1101	Government of the United States	
PUBP 3000	American Constitutional Issues	
Any SS		9
<b>Core F - Courses Related to Major</b>		
BMED 1000	Introduction to Biomedical Engineering	1
BMED 2110	Conservation Principles in Biomedical Engineering	3
COE 2001	Statics <sup>2</sup>	2
MATH 2551	Multivariable Calculus	4
MATH 2552	Differential Equations	4
CHEM 1211K	Chemical Principles I <sup>2</sup>	4
<b>Major Requirements</b>		
BMED 2250	Problems in Biomedical Engineering <sup>2</sup>	3
BMED 2310	Intro to Biomedical Engineering Design	3
BMED 3100	Systems Physiology	3
BMED 3110	Quantitative Engineering Physiology Laboratory I	2
BMED 3310	Biotransport	3
BMED 3410	Introduction to Biomechanics	3
BMED 3520	Biomedical Systems and Modeling	3
BMED 3600	Physiology of Cellular and Molecular Systems	3
BMED 3610	Quantitative Engineering Physiology Laboratory II	2
BMED 4000	The Art of Telling Your Story	1
BMED 4602	Capstone Design	3
<b>Other Engineering and Science Requirements</b>		
CHEM 1315	Survey of Organic Chemistry	3
CEE 3770	Statistics and Applications or ISYE 3770 Statistics and Applications or BMED 2400 Introduction to Bioengineering Statistics	3
MSE 2001	Principles and Applications of Engineering Materials	3
ECE 3710	Circuits and Electronics	2
ECE 3741	Instrumentation and Electronics Lab	1
<b>BMED Depth Electives</b>		
BMED Depth Electives <sup>5</sup>		12
<b>BMED Breadth Electives</b>		
BMED Breadth Electives <sup>6</sup>		15
Total Credit Hours		131

Pass-fail only allowed for Free Electives, Humanities, and Social Sciences.

Students must average a 2.0 for all BMED coursework required by name and number (includes BMED 1000 and BMED 2110)

<sup>1</sup> Student must earn a 2.0 average in MATH 1551, MATH 1552, MATH 1553, MATH 2551, and MATH 2552.

<sup>2</sup> Minimum grade of C required.

<sup>3</sup> If PHYS 2231 is taken, extra hour goes to Free Electives.

<sup>4</sup> If PHYS 2232 is taken, extra hour goes to Free Electives.

- <sup>5</sup> BMED 2699, any 3000- or 4000-level BMED course. Maximum of six credit hours of undergraduate research.
- <sup>6</sup> Breadth Electives can be satisfied with a minor, certificate, or other coursework. Please consult with advisor on course selection.

## Cooperative Plan

The Georgia Tech Undergrad Co-op Program is a five-year, academic program designed to complement a student's formal education with paid practical work experience directly related to the student's academic major. It is available in all engineering majors, as well as in many majors in other colleges at Georgia Tech.

Co-ops alternate semesters of on-campus study with semesters of full-time employment through their junior year, then continue in school through their senior year. Co-ops are classified as full-time students during each term, regardless of whether they are attending classes on campus or working full-time at an employer location. Most undergrad Co-op students begin the program as freshmen or sophomores. With more than 2,700 students participating, Georgia Tech's program is currently the largest optional co-op program in the United States and has perennially been listed in U.S. News & World Report as one of the "Top Ten" co-op programs in America.

As an integral part of the overall education experience, the co-op program allows students to take on increasing levels of responsibility and to use their job knowledge and classroom learning to make meaningful contributions to the organizations in which they work. Many co-op graduates are hired by their co-op employer, and more than 700 companies or government organizations throughout the United States and abroad currently employ Georgia Tech Undergrad Co-op Program students.

To learn more about Biomedical Engineering Co-op opportunities at Georgia Tech, contact Rob Rogers. Rob is a Development Co-op Advisor with the Georgia Tech Center for Career Discovery and Development, and the point person for BME students. Rob is located in the Bill Moore Student Success Center, 1st Floor. His phone number is (404) 894-1348

## International Plan

The International Plan is a challenging and coherent academic program for undergraduates that develops global competence within the context of a student's major. It is a degree-long program that integrates international studies and experiences into any participating major at Georgia Tech. It helps to prepare Georgia Tech graduates professionally and personally for successful lives in the twenty-first century.

The International Plan is not intended to replace current international programs; it supplements them. Existing study abroad opportunities continue to be offered. It is also not intended to be an add-on to the current degree programs. It is intended to be another curriculum path to earn a degree in which international competence is integrated into the program of study. The Plan can be completed within the normal timeframe of four years of undergraduate study.

The overarching model for the International Plan has four components:

1. International coursework: Three courses to include one from each of the following categories:
  - a. International relations
  - b. Global economics
  - c. A course about a specific country or region

2. International experience: Two terms abroad (not less than 26 weeks) engaged in any combination of study abroad, research, or internship
3. Second language proficiency: All students in the program are expected to reach at least the proficiency level equivalent to two years of college-level language study. Students who use the language to study, conduct research, or participate in an internship during their international experience are expected to attain a higher level of proficiency. Language proficiency is determined by testing (not course credits).
4. Culminating course: A capstone course in the major designed to tie the international studies and experiences together with the student's major. The senior design project (i.e. BMED) will be used to satisfy this requirement. The design project must incorporate a significant element of the international experience (e.g. foreign client, location of work, project customers, motivation, regulatory issues, etc).

Completion of the International Plan is recognized by a designation on the student's diploma indicating completion of the degree with global competence.

For additional information about the International Plan visit [www.oie.gatech.edu/internationalplan](http://www.oie.gatech.edu/internationalplan).

## Research Option

The Research Option is intended for students who seek a concentrated research experience, culminating in an undergraduate thesis, integrated into their undergraduate studies in biomedical engineering. Students are strongly encouraged at the end of their experience to work with their faculty mentor to develop a journal publication or conference presentation on the research in addition to the actual thesis. Students who complete this option receive a designation on their transcript.

Students may be able to satisfy the additional requirements imposed for the Research Option designation through appropriate choices of electives without additional credit hours to complete the degree. The Research Option designation may be pursued separately, or in combination with the Cooperative Plan and/or the International Plan.

## Research Option Requirements

1. Complete at least nine credit hours of undergraduate research (i.e. BMED 2698, BMED 2699, BMED 4698, or BMED 4699) spanning typically at least three terms. The research may be for either pay or credit, and at least six credit hours must be on the same research project, broadly defined.
2. Take the course LMC 4701, typically in the second semester of research. The research proposal outlining the research topic and project for the thesis will be written for this course. The proposal must be approved by a faculty advisor and one other faculty member.
3. Take the course LMC 4702 during the thesis-writing semester. The thesis documenting the results of the research will be written as part of this course. It must be approved by two faculty members and will be archived in the Georgia Tech Library.