BIOMEDICAL ENGINEERING

The biomedical engineering (BME) field has grown rapidly in the last 20 years. This growth was fueled by breakthroughs in molecular biology and many engineering technologies, symbolized by the Human Genome Project, arguably the greatest biomedical engineering accomplishment ever, and realized with creation of the National Institute of Biomedical Imaging and Bioengineering. BME now is clearly recognized as an integral part of the nation’s and the world’s efforts to deliver more effective and efficient medical care.

About this Program
• College: Herbert Wertheim College of Engineering
• Degree: Bachelor of Science in Biomedical Engineering
• Credits for Degree: 131
• Additional Information

To graduate with this major, students must complete all university, college, and major requirements.

Critical Tracking records each student's progress in courses that are required for entry to each major. Please note the critical-tracking requirements below on a per-semester basis.

Equivalent critical-tracking courses as determined by the State of Florida Common Course Prerequisites may be used for transfer students.

Semester 1
• Complete 3 of 11 critical-tracking courses with minimum grades of C within two attempts: BSC 2010; CHM 2045 or CHM 2095; CHM 2046 or CHM 2096; MAC 2311, MAC 2312, MAC 2313, MAP 2302, PHY 2048; PHY 2049; BME 3060 and PCB 3717C
• 3.0 GPA required for all critical-tracking courses
• 3.0 GPA required for all critical-tracking courses
• 2.0 UF GPA required

Semester 2
• Complete 3 additional critical-tracking courses with minimum grades of C within two attempts
• 3.0 GPA required for all critical-tracking courses
• 2.0 UF GPA required

Semester 3
• Complete 2 additional critical-tracking courses with minimum grades of C within two attempts
• 3.0 GPA required for all critical-tracking courses
• 2.0 UF GPA required

Semester 4
• Complete all critical-tracking courses with minimum grades of C within two attempts
• 3.0 GPA required for all critical-tracking courses
• 2.0 UF GPA required

To remain on track, students must complete the appropriate critical-tracking courses, which appear in bold. These courses must be completed by the terms as listed above in the Critical Tracking criteria.

This semester plan represents an example progression through the major. Actual courses and course order may be different depending on the student's academic record and scheduling availability of courses. Prerequisites still apply.

This program is limited access and competitive. Students cannot register for courses in semesters 5-8 before they have been admitted to the biomedical engineering major.

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester One</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BME 1008</td>
<td>Introduction to Biomedical Engineering</td>
<td>1</td>
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<tr>
<td>BSC 2010</td>
<td>Integrated Principles of Biology 1 (Critical Tracking; Gen Ed Biological Sciences)</td>
<td>3</td>
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<tr>
<td>BSC 2010L</td>
<td>Integrated Principles of Biology Laboratory 1 (Gen Ed Biological and Physical Sciences)</td>
<td>1</td>
<td></td>
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<tr>
<td>Select one:</td>
<td></td>
<td>3</td>
<td></td>
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<tr>
<td>CHM 2045</td>
<td>General Chemistry 1 (Critical Tracking; Gen Ed Physical Sciences)</td>
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<tr>
<td>CHM 2095</td>
<td>Chemistry for Engineers 1 (Critical Tracking)</td>
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<tr>
<td>CHM 2045L</td>
<td>General Chemistry 1 Laboratory (Gen Ed Physical Sciences)</td>
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<tr>
<td>IUF 1000</td>
<td>What is the Good Life (Gen Ed Humanities)</td>
<td>3</td>
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<tr>
<td>MAC 2311</td>
<td>Analytic Geometry and Calculus 1 (Critical Tracking; Gen Ed Mathematics)</td>
<td>4</td>
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</tbody>
</table>

| Credits | 16 |

Semester Two
Select one:
| CHM 2046 | General Chemistry 2 (Critical Tracking; Gen Ed Physical Sciences) | 3 |
| CHM 2096 | Chemistry for Engineers 2 (Critical Tracking) | 1 |
| CHM 2046L | General Chemistry 2 Laboratory (Gen Ed Physical Sciences) | |
| ENC 1101 | Expository and Argumentative Writing (State Core Gen Ed Composition; Writing Requirement: 6,000 words) | 3 |
| MAC 2312 | Analytic Geometry and Calculus 2 (Critical Tracking; State Core Gen Ed Mathematics) | 4 |
| PHY 2048 | Physics with Calculus 1 (Critical Tracking; State Core Gen Ed Physical Sciences) | 3 |
| PHY 2048L | Laboratory for Physics with Calculus 1 (Gen Ed Physical Sciences) | 1 |

| Credits | 15 |

Semester Three
| CHM 3217 | Organic Chemistry/Biochemistry 1 ¹ | 4 |
| COP 2271 | Computer Programming for Engineers ² | 2 |
| COP 2271L | Computer Programming for Engineers Laboratory ² | 1 |
| MAC 2313 | Analytic Geometry and Calculus 3 (Critical Tracking; Gen Ed Mathematics) | 4 |
| PHY 2049 | Physics with Calculus 2 (Critical Tracking; Gen Ed Physical Sciences) | 3 |
| PHY 2049L | Laboratory for Physics with Calculus 2 (Gen Ed Physical Sciences) | 1 |

| Credits | 15 |

Semester Four
| BME 3053C | Computer Applications for BME | 2 |
| BME 3060 | Biomedical Fundamentals (Critical Tracking) | 3 |
| EEL 3003 | Elements of Electrical Engineering | 3 |
| ENC 3246 | Professional Communication for Engineers (Gen Ed Composition; writing requirement) | 3 |

¹ One state core biological science course. ² Bachelor of Science in Biomedical Engineering (Gen Ed Physical Sciences)
MAP 2302 Elementary Differential Equations (Critical Tracking; Gen Ed Mathematics) 3
PCB 3713C Cellular and Systems Physiology (Critical Tracking) 4

Credits 18

Semester Five
BME 3323L Cellular Engineering Laboratory 3
BME 3508 Biosignals and Systems 3
BME 3101 Biomedical Materials 3
BME 4311 Molecular Biomedical Engineering 3
BME elective 3
EGM 2511 Engineering Mechanics: Statics 3

Credits 18

Semester Six
BME 3012 Clinically-Inspired Engineering Design 3
BME 4503 Biomedical Instrumentation 3
BME 4503L Biomedical Instrumentation Laboratory 1
BME 4632 Biomedical Transport Phenomena 3
STA 3032 Engineering Statistics 3
Gen Ed Social and Behavioral Sciences with International; Writing Requirement: 6,000 words 2

Credits 18

Semester Seven
BME 4409 Quantitative Physiology 3
BME 4621 Biomedical Thermodynamics and Kinetics 3
BME 4882 Senior Design, Professionalism and Ethics 1 3
State Core Gen Ed Social and Behavioral Sciences 1 3
ENC 3246 Professional Communication for Engineers (State Core Gen Ed Composition; Writing Requirement: 6,000 words) 3
BME elective 2 3

Credits 16

Semester Eight
BME 4531 Medical Imaging 3
BME 4883 Senior Design, Professionalism and Ethics 2 3
State Core Gen Ed Humanities with Diversity 3 3
BME electives 6

Credits 18

Total Credits 131

1 Can substitute CHM 2210 and CHM 2211.
2 BME Tracks: A total of 15 credits of 3000/4000-level courses (9 credits of engineering electives and 6 credits technical electives, both of which must be selected from an approved list).
3 Courses should cover 12,000 words.
4 Course and corresponding laboratory to be completed in same language (Matlab or C++)

Students are also expected to complete the general education international (GE-N) and diversity (GE-D) requirements. This is often done concurrently with another general education requirement (typically, GE-C, H or S).

Biomedical engineering blends traditional engineering techniques with biological sciences and medicine to improve the quality of human health and life. The discipline focuses on understanding complex living systems via experimental and analytical techniques and on development of devices, methods and algorithms that advance medical and biological knowledge while improving the effectiveness and delivery of clinical medicine.

Before Graduating Students Must
• Pass assessment by two or more faculty and/or industry practitioners of student performance on a major design experience.
• Pass assessment in two courses of individual assignments targeted to each learning outcome. Assessment will be provided by the instructor of the course according to department standards.
• Complete an exit interview in the final semester.
• Complete requirements for the baccalaureate degree, as determined by faculty.

Students in the Major Will Learn to

Student Learning Outcomes (SLOs)

Content
1. Solve biomedical engineering problems by applying knowledge of mathematics, science and engineering principles.
2. Design and conduct biomedical engineering experiments and analyzing and interpreting the data.

Critical Thinking
3. Design a biomedical device, component, technology or process to meet identified clinical needs within realistic economic, environmental, social, political, ethical, health and safety, manufacturability and regulatory constraints.

Communication
4. Communicate technical data and design information effectively in speech and in writing to other biomedical engineers.

Curriculum Map
I = Introduced; R = Reinforced; A = Assessed

<table>
<thead>
<tr>
<th>Courses</th>
<th>SLO 1</th>
<th>SLO 2</th>
<th>SLO 3</th>
<th>SLO 4</th>
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<tbody>
<tr>
<td>BME 3060</td>
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Assessment Types
• Assignments
• Exams
• Projects
• Reports
• Presentations