Bioengineering (B.S.)
U.A. Whitaker College of Engineering
Department of Bioengineering and Software Engineering

(239) 590-7390

2013-2014, 2014-2015 Catalog Year

Bioengineering plays an important role in transforming discoveries at the intersection of engineering, the life sciences, and health care into innovative products and capabilities by applying new technologies to biomaterials, biomechanics, and biomedical instruments and procedures. Bioengineering combines engineering principles with biology and physiology from the molecular, cell, and tissue level up to the human form. Bioengineers solve problems to help improve human health and quality of life. Bioengineers can work in the medical device and biotechnology industries, in health care and research, and for government agencies, such as the FDA.

The Bachelor of Science in Bioengineering emphasizes the application of new technology to biomaterials, biomechanics, and biomedical tools and procedures. Students learn how to solve problems associated with interactions between living and non-living materials and systems. Bioengineering students complete core courses common to all engineering majors as well as specialized courses in bioengineering. With the addition of another 4-credit general biology course, graduates will meet the pre-requisites for most medical schools.

Graduates of the FGCU B.S. Bioengineering degree program are expected to attain within a few years of graduation:

- Technical competence as bioengineers and recognition as contributors in their communities as professionals or in the pursuit of advanced education.
- Accomplishment in communicating and working collaboratively in a diverse, dynamic, multidisciplinary environment.
- Proficiency in making use of entrepreneurial and/or learning skills to successfully adapt to a global society.

Program Admission Requirements

Degree-seeking students are classified as pre-majors prior to formal acceptance into a U.A. Whitaker College of Engineering (WCE) major. As pre-majors, students may enroll in:

- Lower level (1000-2999) courses to satisfy General Education and Common Program Prerequisite requirements;
- Lower level electives; and
- EGN1006L, EGN1041C, and EGM3420C from the Engineering Common Core courses, if course pre-requisites are met.

Pre-majors may not enroll in Engineering Common Core classes beyond EGN 1006L without first being admitted to an Engineering Major or in any upper level (3000-4999) Required Courses for the Major without meeting the course pre-requisites and prior approval, where appropriate, by the WCE Academic Advisor.

Admission to Florida Gulf Coast University does not guarantee acceptance into a WCE major. Students are accepted into a WCE major upon satisfaction of the following:
1. Admission to FGCU as a degree seeking student in good academic standing.
2. Attendance at a Freshman Transition Workshop or Transfer Student Orientation session.
3. Completion of Calculus I with a grade of C or higher. Exceptions may be made for AP/IB credit with approval of the WCE Academic Advisor.
4. Submission of the U.A. Whitaker College of Engineering Application for Acceptance into a Major upon completion of the above steps 1 through 3 before the start of registration in any given semester.

Program Requirements

1. FGCU General Education Program (GEP) (36 hrs)
   Refer to the General Education Program for more information.
   
   A. Communication (6 hrs)
      1. Select ENC 1101 (3)
      2. Select ENC 1102 (3)
   B. Mathematics (6 hrs)
      1. Select MAC 2311 (4)
      2. Select STA 2037 (3) or STA 2023 (3)
   C. Humanities (9 hrs)
      1. Select HUM 2510 (3)
   D. Social Sciences (6-9 hrs)
   E. Natural Sciences (6-9 hrs)
      1. Select BSC 1010C (4)
      2. Select CHM 1045C (4)

   Note: At least one Natural Sciences course must include a laboratory or field component. Courses meeting this requirement contain a "C" or "L" in their course numbers. Each combined lecture and laboratory course (marked with a C) is equivalent to taking the lecture and laboratory separately.

2. Common Program Prerequisites (GEP + 27)
   
   - BSC 1010C General Biology w/Lab I (GEP)
   - CHM 1045C General Chemistry w/Lab I (4)
   - CHM 1046C General Chemistry w/Lab II (GEP)
   - CHM 2210C Organic Chemistry w/Lab I (4)
   - MAC 2311 Calculus I w/Analytical Geometry (GEP)
   - MAC 2312 Calculus II w/Analytical Geometry (4)
   - MAC 2313 Calculus III w/Analytical Geometry (4)
   - MAP 2302 Differential Equations (3)
   - PHY 2048C General Physics w/Lab I (4)
   - PHY 2049C General Physics w/Lab II (4)

3. Engineering Common Core (10 hrs)
   
   - EGN 10061. Intro to the Engineering Profession (1)
   - EGN 1041C Computational Tools for Eng (2)
   - EGM 3420C Engineering Mechanics (4)
4. Required Courses in the Major (53 hrs)

- EGN 3641C Engineering Entrepreneurship (3)
- BME 3100C Introduction to Biomaterials (3)
- BME 3261C Biofluid Mechanics (3)
- BME 3403C Human Physiology for Engineers I (3)
- BME 3404C Human Physiology for Engineers II (3)
- BME 3506C Circuits for Bioengineers (3)
- BME 3507C Signals Syst Bioengineers (3)
- BME 3XXXC Biological Performance of Materials (3)
- BME 4211C Biomechanics (3)
- BME 4503C Biomedical Instrumentation (3)
- BME 4632C Biotransport Phenomena (3)
- BME 4722 Health Care Engineering (3)
- BME 4800C Bioengineering Product Design (3)
- BME 4884 Bioengineering Sr Design I (2)
- BME 4885 Bioengineering Sr Design II (2)
- BME 4XXXC Bioengineering Data Acquisition and Control (3)
- EGN 3333C Mechanics of Materials (3)
- EGN 3433C Design for Manufacturing (32)
- XXX XXXX Technical Restricted Elective (34)*
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Select one of the following:
- BME 4332C Cellular & Tissue Engineering (3)
- BME 4504C Bioelectricity (3)

* The Technical Electives must total a minimum of 6 credit hours, and can include BME 4332C Cellular & Tissue Engineering, BME 4504C Bioelectricity, or other selected courses be as approved by the Academic Advisor for engineering in consultation with the faculty and together must total a minimum of 6 credit hours.

* The Restricted Electives must total a minimum of 6 credit hours, are typically 2000, 3000 or 4000 level, and can include any of the following or other selected courses as approved by the Academic Advisor for engineering in consultation with the faculty (assuming all course prerequisites are fulfilled). Restricted electives in general should provide increased depth in engineering, science, business and entrepreneurship, mathematics or another area that is pertinent to a career served by the B.S. Bioengineering degree.

For depth in engineering and bioengineering—

- BME 4332C Cellular and Tissue Engineering (3)
- BME 4504C Bioelectricity (3)
- BME 4930 Bioengineering Special Topics (1 to 3)
- EGN 3342C Thermodynamics (3)
For depth in biology and biotechnology –
- PCB 2336 Human Genetics (3)
- PCB 3023C Cell Biology (3)
- PCB 3063C Genetics (3)
- PCB 4233C Immunology (3)
- MCB 2010C Microbiology with Lab (4)
- MCB 3020C General Microbiology (4)

For depth in chemistry and biochemistry –
- BCH 3023C Biochemistry (3)
- CHM 2211C Organic Chemistry with Lab II (4)
- CHM 3120C Analytical Chemistry (4)

For depth in mathematics, modeling and computation –
- MAA 4211 Vector Analysis (3)
- MAD 3107 Discrete Mathematics (3)
- MAD 4401 Numerical Analysis (3)
- MAP 2161 Math for Science & Engineering (4)
- MAS 3105 Linear Algebra (3)
- MHF 2191 Mathematical Foundations (3)
- STA 2023 Statistical Methods (2)
- STA 2037 Statistics with Calculus (2)

For depth in business and entrepreneurship –
- MAN 3025 Principles of Management (3)
- MAN 3103 Entrepreneurship & Creativity (3)
- MAN 3046 Team & Group Processes (3)
- MAN 3600 International Business (3)
- MAN 3781 Sustainable Business (3)
- MAR 3023 Introduction to Marketing (3) (junior standing required)

Pre-med and other health professions students should typically take –
- BCH 3023C Biochemistry (3)
- CHM 2211C Organic Chemistry with Lab II (4)

5+ University Requirements (3 hrs)
- IDS 3920 University Colloquium (3)

TOTAL SEMESTER HOURS REQUIRED: 129 HRS

Additional Graduation Requirements

- A minimum of 129 credit hours.
- At least 48 of the 129 hours at the upper division (3000 and higher) level.
A minimum of 32 of the last 60 credit hours to be taken at FGCU, including 12 credit hours in the major. Also, BME 4884 and BME 4885 must be taken at FGCU.

A cumulative GPA of 2.0 for all coursework attempted at FGCU.

A minimum grade of C for each course used to satisfy the following: ENC 1101 and ENC 1102, common prerequisites, required courses in the major and technical electives in the major.

Satisfaction of Communication and Computation Skills and foreign language entrance requirements.

Satisfaction of the Service Learning requirement. See www.fgcu.edu/connect/

Transfer Notes and Acceptable Substitutes

The following substitutions are acceptable for common prerequisites and must be completed with a grade of C or higher:

- MAC 2311: may substitute MAC X311* (4)
- MAC 2312: may substitute MAC X312* (4)
- MAC 2313: may substitute MAC X313* (4)
- MAP 2302: may substitute MAP X302 (3)
- CHM 1045C: may substitute CHM X045C or CHM X045** (3) and CHM X045L**(1) or CHS X440 (4) or CHM X095/X095L (4)
- CHM 1046C: may substitute CHM X046C or CHM X046 (3) and CHM 046L (1) or CHM X096/X096L (4)
- PHY 2048C: may substitute PHY X048C or PHY X048 (3) and PHY X048L (1) or PHY X064L (1)
- PHY 2049C: may substitute PHYX049C (4) or PHY X049 (3) and PHY X049L (1) or PHY X064L (1)
- CHM 2210C: may substitute CHM X210C (4) or CHM X210 (3) and CHM X210L (1)
- BSC 1010C: may substitute BSC X010C (4) or BSC 1010 (3) and BSC X010L (1) or BSC X044L (1)

* OR MACX281, MACX282, MACX283

For All Majors: Students are strongly encouraged to select required lower division electives that will enhance their general education coursework and that will support their intended baccalaureate degree program. Students should consult with an academic advisor in their major degree area.

Transfer credit will normally be accepted from regionally accredited institutions. Transfer credit received by The Office of Admissions will be evaluated for appropriate credit toward specific requirements in the student's degree program. Registration assistance will be provided at transfer orientation based on the evaluation of official transcripts and degree applicable transfer credit. Admitted students may view transfer credit and access a Degree Evaluation Audit in the Student Records section of the Gulfline Accounts. Degree evaluation Audit instructions may be found at this url: http://www.fgcu.edu/GCU/appstudenthelp on the Office of Academic and Curriculum Support website.