

# Biomedical Engineering - B.S.

## Curriculum

**Effective May 17, 2024 FYS1020 and CAR0010 will no longer be requirements in our undergraduate programs.**

The Biomedical Engineering degree program is an interdisciplinary degree program that combines the knowledge core of engineering disciplines with scientific inquiry to solve problems encountered in living systems. Through coursework in engineering, mathematics and the sciences, students focus on finding solutions to engineering problems. By applying the principles, analytical tools, and problem-solving techniques of engineering, integrated with knowledge of the life sciences, students utilize their skills to design innovative instruments, devices and/or software for a biomedical application. This program is for students who are interested in designing instruments, devices, new procedures and/or software to create diagnostic and therapeutic tools as well as students interested in working in research.

Students who are interested in designing instruments, devices, new procedures and/or software to create diagnostic and therapeutic tools, as well as students interested in working in research, find a wide range of career opportunities when they graduate. Graduates are uniquely prepared to influence and improve human health in a variety of ways, finding opportunities in manufacturing settings, health science companies, hospitals and research entities working in medical equipment design, bioinstrumentation, biomaterials, biomechanics, scientific research, medical imaging and rehabilitation engineering.

Upon completion of the program, graduates are expected to:

- Apply knowledge of mathematics, science, engineering and technology as required by the field of biomedical engineering.
- Use math, science and engineering processes to analyze problems, formulate solutions, conduct experiments and interpret data.
- Communicate engineering and scientific information using oral and written arguments and visual presentation.
- Recognize and evaluate ethical, global and social impacts of biomedical innovation.
- Integrate scientific knowledge, problem-solving skills and engineering tools to design a model for a biomedical engineering application.

## Biomedical Engineering

A four-year program leading to the bachelor of science degree

### Engineering Foundations

ENGN1015	Introduction to Engineering	3
ENGN2001	Digital Logic Design	4
ENGN2009	C Programming for Engineering	4

### Major Courses

BIO1011 & BIO1016	General Biology - Cellular and General Biology Laboratory - Cellular	4
BME3010	Biomaterials	3
BME3020	Biomechanics	3
BME4010	Medical Imaging Modalities	3
BME4020	Interventional Physiology - Medical Device Innovation	3
BME4030	Biomedical Engineering Design	3
ENGN2025	Mechanics I: Statics	3
ENGN2101	Linear Circuit Theory	3
ENGN2102	Linear Circuit Theory Lab	1
ENGN3005	Operational Amplifiers and Linear Circuits	3
ENGN3025	Mechanics II: Dynamics	3
ENGN3077	Fluid Mechanics	3
ENGN3100	Parametric Engineering Design	3
ENGN3302	Robotics	3
SCI2031	Anatomy and Physiology	3

### Applied/Experiential Learning

Choose 6 credits from the following:		6
DEE3999	Directed Experiential Education <sup>D</sup>	
TECX4099	College of Engineering & Design Internship <sup>IC</sup>	
TECX4190	Technical Solutions Design Project	

### Related Professional Studies

CAR0010	Career Management	1
FYS1020	First-Year Seminar	1

MATH3040	Calculus III	3
Choose one of the following:		4
PHY1011 & PHY1016	General Physics I and General Physics I Laboratory	
PHY2011 & PHY2016	Physics I and Physics I Laboratory	
Choose one of the following:		4
PHY1022 & PHY1026	General Physics II and General Physics II Laboratory	
PHY2022 & PHY2026	Physics II and Physics II Laboratory	
<b>A&amp;S Core Experience</b>		
Communications Foundation Courses		9
ENG1020	Rhetoric & Composition I	
ENG1021	Rhetoric & Composition II	
ENG1030	Communication Skills	
Integrative Learning		6
Two ILS courses, one at the 2000 level, and one at the 4000 level		
Arts & Humanities		6
PHIL3240	Ethics: A Global Perspective	
One course from ART, HIST, HUM, LIT, or REL		
Mathematics		6
MATH1040	Calculus I (or higher, based on student's placement) *	
MATH2010	Introduction to Biostatistics	
Science		4
CHM1000 & CHM1006	Foundations in Chemistry and Foundations in Chemistry Laboratory	
Social Sciences		6
Two courses from different disciplines: ANTH, ECON, GEND, LEAD, PSCI, PSYC, RES or SOC		
A&S Electives		6
MATH2040	Calculus II	
MATH2043	Ordinary Differential Equations	
<b>Free Electives #</b>		
6 credits selected from 1000-4999 numbered offerings within the university		6
<b>Total Credits</b>		<b>123.0</b>

\* Students that do not place in MATH1040 Calculus I, will need to take an extra course(s), MATH1020 Fundamentals of Algebra, and/or MATH1030 Precalculus, as prerequisite(s). If needed one, or both, will count as a free elective(s).

<sup>D</sup> Directed Experiential Education (DEE) opportunities are based on project availability with community partners and student eligibility. For more information, visit Experiential Education & Career Services (EE&CS).

<sup>IC</sup> Typically, internships require a minimum of six credits. Students interested in a 9 or 12-credit internship can apply additional experiential learning and free elective credits, if available. Students are strongly encouraged to contact a faculty advisor before scheduling internship and free elective credits.

# In addition to classes, free elective credits may be applied to a number of options such as internship, study abroad, Directed Experiential Education courses and courses in a specialization or minor as relevant. For students who qualify for the J2 program, up to four graduate courses may apply. Students are strongly encouraged to contact a faculty advisor before scheduling free elective credits.

Note: Students must pass MATH0010 Pre-Algebra or have equivalent placement scores to enroll in required math courses.

Note: Students must pass ENG0001 Writing Workshop or have equivalent placement scores to enroll in ILS 2000-level courses.

In collaboration with academic colleges across all JWU campuses, JWU Global Study Abroad programs offer a variety of international, domestic, and digital options for major, minor, free electives, experiential learning, and transferable courses. There are many affordable options for students during a semester, winter session, spring and/or summer breaks. Faculty-led, exchange, affiliate, and direct-enroll programs range in duration from one week to a full semester or full year. Financial aid may be applied, and some partners offer external scholarships. Premiere programs do not qualify for JWU scholarships or grants; however federal aid is available. Visit the study abroad website for

information, program descriptions and online applications. Where will you go? Wherever you decide, make the best of your educational journey!

## Accelerated Program Options

### J2 Program

The JWU J2 program allows qualified students enrolled in a matriculating undergraduate program to take graduate level courses at JWU. Students interested in pursuing this option should meet with their academic advisor to discuss their interest, qualifications, and plans. The undergraduate student may take up to four graduate courses (maximum 12 credits) and are limited to 6 credits a semester and 3 credits per session (Fall Session I and Fall Session II).

The completion of graduate credits to fulfill undergraduate program requirements does not guarantee acceptance into the graduate program after completion of the baccalaureate degree. Matriculating undergraduate students who wish to formally enroll in a graduate program, must fulfill all requirements for entrance into the intended graduate program and complete a graduate program application.

**Note:** Not all graduate courses are included as part of this policy. Courses offered as part of the Masters of Arts in Teaching, Masters of Education, Masters of Science in Physician Assistant Studies and doctoral courses are excluded from this policy and are restricted to program majors only. Additional courses and/or programs as determined by individual colleges may also have restricted access.

### Eligibility Criteria:

To be eligible to enroll in graduate level courses (excludes: Masters of Arts in Teaching, Masters of Education, Masters of Science in Physician Assistant Studies, doctoral courses and other programs as outlined by the colleges).

Undergraduate students must meet the following criteria:

- Undergraduate cumulative GPA of 3.00 or higher
- Completed & registered undergraduate credits at least 90 credits
- Meet the individual course prerequisites

**Appeal to Eligibility Criteria:** College Dean or designee will receive a copy of the Petition Form, Student's GPS and email requesting appeal if the student requests to appeal the GPA or earned/registered credit criteria. College Dean / designee will review and determine approval.

These courses carry graduate credit and will replace undergraduate degree requirements when applicable, traditionally free-electives (maximum of 12 credits). The course will be applied to the undergraduate degree in the order in which they are taken (if required) and will also be applied towards both the students undergraduate and graduate GPA.

Students should maintain enrollment in at least 12 credits of undergraduate coursework to maintain full-time status; graduate course enrollment is not calculated into undergraduate full-time status. For students already attending full-time as undergraduates (12 credits or more) and paying the full-time tuition, the graduate credits will be included in full-time tuition fee. Students attending part-time (11 credits or less) will pay the cost per-credit undergraduate tuition for the graduate course.

Course registration will be based on space availability and students enrolled in graduate level courses will be required to maintain good academic standing at the undergraduate and graduate level.