Division of Engineering

Biomedical Engineering Program
B.S. in Biomedical Engineering

Collaborating Departments: Department of Biological Sciences, Department of Physical Sciences, Department of Kinesiology.

The Biomedical Engineering B.S. degree program offers students a series of multidisciplinary courses which emphasize both understanding and integrated applications of scientific, technological, engineering and mathematical (STEM) concepts in biology, medicine, dentistry, or pharmacy/pharmacology. The program is designed to prepare students either for immediate entry into the workforce as hospital support engineers or for possible pursuit of Master's, Ph.D., medical or pharmacy degrees The curriculum provides a broad foundation for such disciplines along with an education which embraces a Christian worldview.

In addition to taking core courses in mathematics, physics, chemistry, and computer information systems, students will study the foundational engineering principles of statics, dynamics, mechanics of materials, electrical circuit analysis, biology and physiology, incorporating sound research and development standards and ethical responsibility. Throughout the course of their studies, all students will select a focus biomedical area of study and complete a design project that integrates the principles of research process and analysis as applied to biomedical engineering. Some of the projects will result in developing new patent application, publishing conference and/or journal papers and initiating start-up.

Since it is necessary for potential biomedical engineering students to have adequate high school preparation for this program, it is highly recommended that they take high school physics, chemistry, and four years of mathematics in preparation for pursuit of this degree. Mathematical proficiency is essential to engineering and placement tests are given to all incoming freshmen, and those who do not qualify to begin Calculus I will be required to take additional leveling mathematics courses.

Mission Statement for Biomedical Engineering

The Howard Payne University Biomedical Engineering Program prepares students to serve God and humanity in a Christ-centered manner by producing graduates with the knowledge and skills; personal and professional integrity; and intellectual inquisitiveness to affect the world through a regulated engineering profession.

Program Goal

Biomedical Engineering graduates will be equipped for success in the career path of their choosing and be capable of pursuing an advanced degree and/or a career where they may attain job satisfaction and professional growth while serving God and humanity.

Program Educational Objectives (PEOs)

PEO-1 **Professionalism**. Graduates will become practicing professionals or pursue a graduate degree in the Biomedical Engineering or a related field.

PEO-2 **Continuous Learning**. Graduates will demonstrate the importance of maintaining and enhancing their professional skills through life-long learning.

PEO-3 **Engagement in Society**. Graduates, in service to God and community, will act with economical, ethical and societal awareness expected of practicing engineering professionals.

For the Biomedical Engineering program, the desired student competencies are as follows:

1. An ability to identify, formulate, and solve biomedical engineering problems by applying principles of science (including biomedical sciences), technology, engineering, and mathematics in medicine, dentistry, or pharmacy/pharmacology.
2. An ability to apply both analysis and synthesis in the biomedical engineering design process, resulting in designs that meet desired needs.
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
4. An ability to communicate effectively with a range of audiences.
5. An ability to recognize ethical and professional responsibilities in biomedical engineering situations and make informed judgments, which must consider the impact of biomedical engineering solutions in global, economic, environmental, and societal contexts.
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this

knowledge appropriately.

7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

GENERAL EDUCATION (Bachelor of Science) see page 46 .....43 hours
MAT 2451 Calculus I or above should be chosen for the mathematics requirement CHE 1479 should be chosen for the lab science requirement
ADDITIONAL DEGREE REQUIREMENTS (Bachelor of Science) .....14 hours
Specific courses required are noted below under "Additional Degree Requirements"
TECHNOLOGY COMPONENT..... .3 hours MAJOR - Biomedical Engineering .....74 hours

Division of Engineering

Total Hours in Degree Program 134 hours

GENERAL EDUCATION Requirements ..... 43 hours

ADDITIONAL DEGREE REQUIREMENTS ..... 14 hours

MAT 2461 Calculus II ..... 4 hours
MAT 3302 Linear Algebra (Fall) ..... 3 hours
MAT 3361 Calculus III (Fall) ..... 3 hours
PHY 2439 University Physics I (Fall) ..... 4 hours

TECHNOLOGY COMPONENT ..... 3 hours

CIS 1339 Introduction to Information Technology ..... 3 hours

MAJOR - BIOMEDICAL ENGINEERING ..... 74 hours

Core STEM Requirements ..... 15 hours

MAT 4371 Numerical Analysis (Spring, even years) ..... 3 hours
MAT 3451 Differential Equations (Spring) ..... 4 hours
MAT 4441 Applied Probability and Statistics (Spring) ..... 4 hours
PHY 2449 University Physics II (Spring) ..... 4 hours

Additional Miscellaneous Requirements ..... 4 hours

BIO 1459 General Biology I ..... 4 hours

Core Biomedical Engineering Course Requirements ..... 41 hours

ENS 1101 Introduction to Engineering (Fall) ..... 1 hour
ENS 1305 Engineering CAD Systems (Fall) ..... 3 hours
ENS 1379 Engineering Principles and Practice (Spring) ..... 3 hours
ENS 2301 Statics (Spring) ..... 3 hours
ENS 2302 Dynamics (Fall) ..... 3 hours
ENS 3339 Mechanics of Materials (Fall, even years) ..... 3 hours
BIO 1469 General Biology II (Spring) ..... 4 hours
BIO 2489 Human Anatomy and Physiology I (Fall) ..... 4 hours
BIO 2499 Human Anatomy and Physiology II (Spring) ..... 3 hours
ENS 3351 Engineering Ethics (Fall, even years) ..... 3 hours
ENS 4109 Engineering Design Project Lab Proposal (Spring) ..... 1 hour
ENS 4309 Electric Circuits Theory (Fall) ..... 3 hours
ENS 4369 Engineering Design Project + Lab I (Fall) ..... 3 hours
ENS 4379 Engineering Design Project + Lab II (Spring) ..... 3 hours

Directed Elective Requirements ..... 14 hours

CIS 2389 Object Oriented Programming I (Fall) ..... 3 hours
CIS 3309 Object Oriented Programming II (Spring, odd years) OR
CIS 3329 Visual Programming (Spring, even years) ..... 3 hours
ENS 2104 STEM Internship (Fall, Spring, Summer) ..... 1 hour
ENS 2204 STEM Internship (Fall Spring, Summer) ..... 2 hours
ENS 2304 STEM Internship (Fall Spring, Summer) ..... 3 hours
CIS 2399 3-D Printing (Spring) ..... 3 hours
ENS 3104 Special Topics in Engineering Applications ..... 1 hour
CIS 1359 Programming Logic (Fall, Spring) ..... 3 hours
SEN 2301 Computer Architecture (Spring) ..... 3 hours
ENS 4344 Advanced Engineering Research & Development ..... 3 hours
SEN 3301 Microprocessors (Fall) ..... 3 hours
SEN 3302 Embedded Systems (Spring) ..... 3 hours

Total Hours in Degree Program 134 hours

ENS 2104, 2204, or 2304 may be repeated but only six hours of engineering internship may apply toward the engineering degree requirements.

The Biomedical Engineering degree contains 30 hours of engineering science courses and 18 hours of Biology/Chemistry courses, which includes 22 hours of advanced engineering science courses described above. The degree also includes a minimum of 35 hours of science and mathematics, which includes a minimum of 10 hours of advanced mathematics.

All prerequisites must carry a grade of “C” or better, and Biomedical Engineering majors must carry a grade of “C” or better in all ENS and BIO courses.