



Volgenau School of Engineering

BIOENGINEERING, B.S.

2016 - 2017

Bioengineering, or biomedical engineering, is the use of engineering techniques to solve problems in biology and medicine. Bioengineers design instruments, processes, and systems that assist in diagnosis of disease, aid individuals with disabilities, and monitor the infirm either at home or at a healthcare facility. They also conduct research, often in collaboration with life scientists, to learn about the basic causes of, and potential remedies for, medical conditions.

Medical practice today is unimaginable without technologies that diagnose through noninvasive imaging rather than cutting, allow performing surgery through small holes in the skin, enable active life in spite of heart disease, and rehabilitate those who lost an arm or their hearing. "Personalized medicine", envisioned to be based on the genomic analysis of individuals, relies on new computational approaches. Bioengineers play a major role in developing such technologies. Bioengineers have been involved in innovations such as pacemakers, orthopedic implants, diagnostic imaging techniques, cochlear implants, artificial pancreas, cartilage regeneration and prediction of drug effects.

Because of their interdisciplinary training, bioengineers play an increasing role in attacking some of the most pressing current health issues in the country. Bioengineers become part of the solution of these issues by developing devices, computational systems, technical aids, diagnostic tests, and therapies that are appropriate, effective, and affordable. The need for bioengineers has been projected to grow 23 percent from 2014 to 2024 (www.bls.gov). Among the prominent reasons is the increased role of technology in biological discovery, increased role of technology in medicine, and need to contain healthcare costs which is a vital part of the national economy.

The bioengineering program focuses on technologies: measurements, signal processing, computer science, and systems. It offers three concentrations: **Biomedical Signals and Systems**, **Health Care Informatics** and **Prehealth**. The program will prepare students for employment in industry and government as well as for advanced studies. Some bioengineers will seek admission to medical school; acceptance rate for them is higher than for most other disciplines. Career opportunities exist in the areas of basic research, product design, project engineering, engineering management and consultancy, technical sales, medicine and many others. The website <http://jobboard.bmes.org/jobs> gives a good description of careers in bioengineering.

The curriculum provides a strong background in the biological and engineering fundamentals of bioengineering as well as senior level courses in the emerging areas of biomedical system modeling, control of biomedical systems, and health care informatics. The curriculum includes twelve hours of senior technical electives and a Senior Design Project which may be used for further specialization.

Admission Requirements

Admission to George Mason is competitive; the number of qualified candidates generally exceeds the number of new students who can be accommodated. An offer of admission is valid only for the semester for which the student applied. Application for undergraduate admission can be made online at George Mason's website <http://admissions.gmu.edu>. The Office of Admissions can also provide forms upon request.

Freshman Requirements

The following factors are considered when reviewing applications for admission:

- Cumulative high school grade point average for course work completed in grades 9 through 12.
- Level of difficulty of course work elected throughout the high school years particularly in English, mathematics, laboratory science, and foreign language.
- Scores from the Scholastic Aptitude Test (SAT) and/or American College Test (ACT), and Test of English as a Foreign Language (TOEFL) if appropriate.

Transfer Requirements

The university accepts qualified students who wish to transfer from other colleges. A transfer applicant who has completed at least 30 semester hours of transferable credit must submit two copies of official transcripts from each collegiate institution attended. Transfer applicants with fewer than 30 semester hours of transferable credit must also submit a copy of their secondary school record, as well as SAT or ACT scores.

Degree Requirements

The curriculum requires 120 total credit hours, which can be completed within eight semesters. At least 45 semester hours of the degree requirements must be at the 300 level or above. Students may wish to consider an extra semester or two for the purpose

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of lightening the course load (particularly for those with part-time employment); participating in Cooperative Education (with local industry); pursuing a double major (for example with mathematics, computer science, or systems engineering); adding a minor (such as mechanical engineering, business, computer science or math); or adding extra courses to deepen their knowledge in engineering and/or the basic sciences.

Sample Schedule for Bioengineering majors

First Semester		Second Semester	
CS 112 Intro to Computer Programming	4	MATH 114 Analytic Geometry and Calculus II	4
MATH 113 Analytic Geometry and Calculus I	4	BENG 101 Intro to Bioengineering	3
ENGH 101 Composition	3	PHYS 160 University Physics I	3
ENGR 107 Intro to Engineering	2	PHYS 161 University Physics I Lab	1
ECON 103 Contemp. Microecon. Principles	3	Literature Elective ³	3
Total Hours	16	Total Hours	14
Third Semester		Fourth Semester	
MATH 213 Analytic geometry and Calculus III	3	MATH 214 Elementary Differential Equations	3
MATH 203 Linear Algebra ¹	3	BENG 220 Physical Bases of Biomedical Systems	3
PHYS 260 University Physics II	3	BIOL 213 Cell Structure and Function	4
PHYS 261 University Physics II Lab	1	PHYS 262 University Physics III ²	3
CHEM 251 General Chemistry for Engineers ²	4	PHYS 263 University Physics III Lab ²	1
Global Understanding Elective ³	3	Total Hours	14
Total Hours	17		
Fifth Semester		Sixth Semester	
BENG 320 Bioengineering Signals & Systems	3	STAT 344 Probability & Statistics for Engineers	3
BENG 380 Intro to Circuits and Electronics	3	BENG 301 Bioengineering Measurements	3
BENG 381 Circuits and Electronics Lab	1	BENG 302 Bioengineering Measurements Lab	1
BENG 313 Physiology for Engineers	3	BENG 304 Modeling & Control of Physiol. Syst.	3
CS 222 Comp. Prog. for Engineers OR CS 211 Obj. Oriented Programming	3	ECE 301 Digital Electronics	3
Fine Arts Elective ³	3	COMM 100 Public Speaking	3
Total Hours	16	Total Hours	16
Seventh Semester		Eighth Semester	
BENG 491 Bioengineering Senior Seminar I	1	BENG 495 Bioengineering Senior Seminar II	1
BENG 492 Senior Advanced Design Project I	2	BENG 493 Senior Advanced Design Project II	2
BENG 420 Bioinformatics for Engineers	3	Technical Elective ⁴	3
Technical Elective ⁴	3	Technical Elective ⁴	3
Technical Elective ⁴	3	HIST 100 History of Western Civilization	3
ENGH 302 Advanced Composition	3	OR HIST 125 Intro to World History	
Total Hours	15	Total Hours	12

¹ All bioengineers will be required to register for a specific section of MATH 203 including a 1-hour recitation with practical applications.

² Students interested in Medical School (or other Professional health schools) may substitute CHEM 211 and CHEM 213 (or CHEM 211H + lab) and CHEM 212 and CHEM 214 (or CHEM 212H + lab) for PHYS 262, PHYS 263, and CHEM 251.

³ Students select from lists of general education courses ([Mason Core](#)), which are university approved to fulfill requirements in literature, global education, and fine arts.

⁴ Students choose from a list of approved technical electives, including one of the Technical Electives from an approved life science course.

We invite requests for additional information. Please contact:

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