BIOMEDICAL ENGINEERING, BS

Department Chair

Shikha Nangia
329F Link Hall
315-443-1931; fax: 315-443-9175

Faculty

Christian Aponte-Rivera, Jesse Q. Bond, Michael Blatchley, Katie D. Cadwell, Ruth Chen, Julie M. Hasenwinkel, James H. Henderson, Era Jain, Andrea Joseph, Zhen Ma, Shikha Nangia, Ashok Sangani, Cindy Smith, Pranav Soman, Radhakrishna Sureshkumar, Theodore Walker, Yaoying Wu, Pun To Yung, Jialiu Zeng, Yi Zheng

Adjunct/Research Faculty

Eric Finkelstein, Kent Ogden, David Quinn, Katherine Tsokas, Lin Lin, Dacheng Ren

Affiliate Faculty

Samuel Herberg, Juntao Luo, Liviu Movileau, Davoud Mozhdehi, Alison Patteson, Rachel Steinhardt

Emeritus Faculty

Gustav Engbretson, John Heydweiller, George Martin, Philip Rice, Klaus Schroder, Robert L. Smith, Lawrence L. Tavlarides

Undergraduate Biomedical Engineering Program Director

Pun To Yung
361 Link Hall
315-443-4848
ptyung@syr.edu

The mission of the Department of Biomedical and Chemical Engineering is to provide students with mentoring, curricular experience, and extracurricular opportunities consistent with their individual career objectives in order to

- prepare them to apply science, mathematics, and engineering knowledge to serve the needs of society;
- instill in them a deep sense of respect for others and a strong foundation in professional and social ethics; and
- develop in them the understanding that continued education will further their professional and leadership skills.

Program Educational Objectives

Biomedical engineering integrates principles from engineering, mathematics, and science to address challenges in healthcare and biological systems while communicating and collaborating across professional disciplines. Our program aims to produce well-rounded graduates prepared for diverse career paths in industry, academia, or healthcare. We emphasize ethical and sustainable application of technical expertise to make meaningful contributions that benefit both society and individuals.

The program educational objectives of the Bachelor of Science in Biomedical Engineering in the Department of Biomedical and Chemical Engineering at Syracuse University describe what graduates of the program are expected to attain within a few years of graduation.

- Graduates will apply interdisciplinary training in engineering and biology to address a range of technical and societal challenges.
- Graduates will demonstrate a sustained commitment to lifelong learning and professional development, equipping them to adapt to the evolving landscape of biomedical engineering or related fields across various sectors such as industry, academia, or clinical practice.
- Graduates will consider and account for the social, environmental, ethical, and sustainability impact of their professional activities and decisions, including considerations of justice, equity, diversity, and inclusion.

The Biomedical Engineering curriculum at Syracuse provides a strong foundation in mathematics, chemistry, physics, engineering, and biology in preparation for engineering applications in medicine and biology such as biomedical instrument design, medical device design, orthopedic prosthesis design, or engineering support for healthcare services. Engineering design is an important part of the curriculum, introduced in the student's first semester and culminating in the senior year with a capstone project. In consultation with a faculty advisor, students can specialize their curriculum to emphasize preparation for industry, research, or premedical studies. This curriculum shares several courses with the chemical engineering program. These courses provide our students with a strong background in the engineering sciences so they can explore emerging topics at the interface of the two fields. Students interested in research with the possibility of continued study in graduate school are encouraged to elect one or more independent study projects and a graduate-level course in an area of research interest.

With the careful planning, a student can meet the entrance requirements established by the Association of American Medical Colleges.

This program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Student Learning Outcomes

Graduates from the program in biomedical engineering must achieve the following student outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics;
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors;
3. an ability to communicate effectively with a range of audiences;
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions;

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies;
8. an understanding of biology and physiology, and the capability to make measurements on living system and solve associated bioengineering problems.

Biomedical Engineering Course Requirements

Year 1		
Fall		**Credits**
CHE 106	General Chemistry Lecture I	3
CHE 107	General Chemistry Laboratory I	1
ECS 101	Introduction to Engineering and Computer Science	3
MAT 295	Calculus I	4
WRT 105	Studio 1: Practices of Academic Writing	3
FYS 101	First Year Seminar	1
Social Science/Humanities elective		3
	Credits	**18**
Spring		
CHE 116	General Chemistry Lecture II	3
CHE 117	General Chemistry Laboratory II	1
ECS 104	Engineering Computational Tools	3
MAT 296	Calculus II	2-4
PHY 211	General Physics I	3
PHY 221	General Physics Laboratory I	1
	Credits	**13-15**
Year 2		
Fall		
BEN 201	Biological Principles for Engineers	4
BEN 231	Bioengineering Fundamentals	3
CHE 275	Organic Chemistry I	3
MAT 397	Calculus III	4
PHY 212	General Physics II	3
PHY 222	General Physics Laboratory II	1
	Credits	**18**
Spring		
BEN 212	Experimental Methods in Chemical Engineering and Bioengineering	3
ECS 221	Statics	3
ELE 231	Electrical Engineering Fundamentals	3
ELE 291	Electrical Engineering Laboratory I	1
MAT 485	Differential Equations and Matrix Algebra for Engineers	3
WRT 205	Studio 2: Critical Research and Writing	3
	Credits	**16**
Year 3		
Fall		
BEN 333	Fluid Transport	3
BEN 481	Bioinstrumentation	3
ECS 326	Engineering Materials, Properties, and Processing	3
Social Science/Humanities electives		9
	Credits	**18**
Spring		
BEN 341	Fundamentals of Heat and Mass Transfer	3
BEN 364	Quantitative Physiology	3
BEN 375	Biomedical Systems, Signals, & Control	3
BEN 385	Bioengineering Laboratory I	3
BEN 568	Biomaterials & Medical Devices	3
	Credits	**15**
Year 4		
Fall		
BEN 565	Biomechanics	3
BEN 485	Bioengineering Laboratory II	3
BEN 486	Bioengineering Capstone Design I	1
Biological elective		3
Technical elective		3
Biomedical Engineering Elective		3
	Credits	**16**
Spring		
BEN 487	Bioengineering Capstone Design II	3
Social Science/Humanities elective		6
Technical electives		6
	Credits	**15**
	Total Credits	**129-131**

Total: 131 credits