

BACHELOR OF SCIENCE IN BIOMEDICAL ENGINEERING: CELL AND TISSUE ENGINEERING TRACK

Cell and Tissue Engineering

This area involves the more recent attempts to understand and attack biomedical problems at the microscopic level and to use such knowledge to begin to “engineer” replacement tissues and organs from individual cells. Knowledge of anatomy, biochemistry, and the mechanics of cellular and sub-cellular structures is necessary in order to understand disease processes and to be able to intervene at very specific sites. With such knowledge a number of approaches have been or are being developed. These range from the development of miniature devices to deliver compounds that can stimulate or inhibit cellular processes at precise target locations in order to promote healing or inhibit disease formation and progression to the newer techniques that have produced replacement skin and one day will produce heart valves, coronary vessels, and even whole hearts. This area also includes the development of artificial materials used for implantation. Understanding the properties and behavior of living material is vital in the design of implant materials. The placement of materials in the human body for healing or repair has been practiced for over 100 years, but it remains one of the most difficult tasks faced by the biomedical engineer. Certain metal alloys, ceramics, polymers, and composites have been used as implantable materials. Bio-materials must not only function normally over the lifespan of the recipient but also be nontoxic, non-carcinogenic, chemically inert, stable, and sufficiently strong to withstand the repeated forces of a lifetime. Few materials meet all such specifications. Newer bio-materials are being developed which incorporate proteins or living cells in order to provide a truer biological and mechanical match for the living tissue.

Required Courses

Code	Title	Credit Hours
Biomedical Engineering Core Requirements		(27)
BME 100	Introduction to the Profession	2
BME 310	Biomaterials	3
BME 315	Instrumentation and Measurement Laboratory	2
BME 320	Fluids Laboratory	1
BME 405	Physiology Laboratory	2
BME 419	Introduction to Design Concepts in Biomedical Engineering	2
BME 420	Design Concepts in Biomedical Engineering	3
BME 422	Mathematical Methods for Biomedical Engineers	3
BME 433	Biomedical Engineering Applications of Statistics	3
BME 453	Quantitative Physiology	3
ECE 308	Signals and Systems	3
Cell and Tissue Engineering Requirements		(39-40)
CS 104	Introduction to Computer Programming for Engineers	2
ECE 211	Circuit Analysis I	3
MMAE 202	Mechanics of Solids	3
CHEM 235	Organic Chemistry I-Lecture	3-4
or CHEM 237	Organic Chemistry I	
CHE 202	Material Energy Balances	3
BIOL 403	Biochemistry	4
BME 301	Bio-Fluid Mechanics	3
BME 335	Thermodynamics of Living Systems	3
BME 418	Reaction Kinetics for BME	3
BME 424	Quantitative Aspects of Cell and Tissue Engineering	3
BME 482	Mass Transport for Biomedical Engineers	3
Select two BME electives ¹		6
Mathematics Requirements		(18)
MATH 151	Calculus I	5
MATH 152	Calculus II	5
MATH 251	Multivariate and Vector Calculus	4

MATH 252	Introduction to Differential Equations	4
Physics Requirements		(8)
PHYS 123	General Physics I: Mechanics	4
PHYS 221	General Physics II: Electricity and Magnetism	4
Chemistry Requirements		(8)
CHEM 124	Principles of Chemistry I with Laboratory	4
CHEM 125	Principles of Chemistry II with Laboratory	4
Biology Requirements		(4)
BIOL 115	Human Biology	3
BIOL 117	Human Biology Laboratory	1
Interprofessional Projects (IPRO)		(6)
See Illinois Tech Core Curriculum, section E		6
Humanities and Social Science Requirements		(21)
See Illinois Tech Core Curriculum, sections B and C		21
Total Credit Hours		131-132

¹ BME elective must be chosen from the approved list of 300+ level engineering courses in BME, ECE, CHE, MMAE, CAE, or CS. ENGR 497 will apply.

Bachelor of Science in Biomedical Engineering: Cell and Tissue Engineering Track Curriculum

		Year 1	
Semester 1	Credit Hours	Semester 2	Credit Hours
BME 100	2	CHEM 125	4
CHEM 124	4	MATH 152	5
CS 104	2	PHYS 123	4
MATH 151	5	Social Sciences Elective	3
Humanities 200-level Course	3		
		16	16
		Year 2	
Semester 1	Credit Hours	Semester 2	Credit Hours
CHEM 235 or 237	3-4	BIOL 115	3
ECE 211	3	BIOL 117	1
MATH 252	4	BME 315	2
MMAE 202	3	MATH 251	4
		PHYS 221	4
		Social Sciences Elective (300+)	3
		13-14	17
		Year 3	
Semester 1	Credit Hours	Semester 2	Credit Hours
BME 405	2	BIOL 403	4
BME 422	3	BME 301	3
BME 453	3	BME 310	3
CHE 202	3	BME 320	1
ECE 308	3	BME 335	3
Social Sciences Elective (300+)	3	I PRO Elective I	3
		17	17
		Year 4	
Semester 1	Credit Hours	Semester 2	Credit Hours
BME 418	3	BME 420	3
BME 419	2	BME 424	3
BME 433	3	BME Elective ¹	3
BME 482	3	I PRO Elective II	3
BME Elective ¹	3	Humanities Elective (300+)	3
Humanities Elective (300+)	3	Humanities or Social Science Elective	3
		17	18

Total Credit Hours: 131-132

¹ BME elective must be chosen from the approved list of 300+ level engineering courses in BME, ECE, CHE, MMAE, CAE, or CS. ENGR 497 will apply.

This program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).