



MS Biomedical Engineering Curriculum

Program Requirements *Advisor approval required for electives.*

		Term Taken	Advisor initials (for electives)
Core Requirements	BIO 624 Foundations of Biomedical Physiology (3 credits)		
	BME 553 Cell and Tissue Biology (3 credits)		
	BME 570 Biomedical Signal Processing (3 credits)		
	Key Elective (select one) <ul style="list-style-type: none"> • Biomaterials (BME 655, 3 credits)_____ • Medical Imaging (BME 659, 3 credits) _____ • Biomechanics (BME 651, 3 credits)_____ 		
Thesis Track (30 credits total)	Elective 1 (3 credits) _____		
	Elective 2 (3 credits) _____		
	Elective 3 (3 credits) _____		
	Thesis credits (BME 699, 9 credits total):		
Design Track (33 credits total)	BME 658 Medical Device Design (3 credits)		
	BME 674 Biomedical Design Project I (3 credits)		
	BME 675 Biomedical Design Project II (3 credits)		
	MGT 543 Entrepreneurship (3 credits).		
	Elective 1 (3 credits) _____		
	Elective 2 (3 credits) _____		
	Elective 3 (3 credits)* _____		
Course Track (36 credits total)	BME 580 Biomedical Instrumentation (3 credits)		
	ESC 720 Research Communications or elective (3 credits)		
	BME 758 Medical Device (2 credits) or BME 658 (3 credits)		
	Elective 1 (3 credits)		
	Elective 2 (3 credits)		
	Elective 3 (3 credits)		
	Elective 4 (3 credits)		
	Elective 5 (3 credits)*		

Recommended schedule for full-time students

		Design Track (33 credits)	Thesis Track (30 credits)
Year 1	Fall	BME 553 Cell and Tissue Biology BME 570 Biomedical Signal Processing Elective 1 or Key Elective – 3 credits	BME 553 Cell and Tissue Biology BME 570 Biomedical Signal Processing Elective 1 or Key Elective – 3 credits
	Spring	BIO 624 Biomedical Physiology BME 658 Medical Device Design Elective 1 or Key Elective – 3 credits	BIO 624 Biomedical Physiology Elective 1 or Key Elective – 3 credits Thesis – 3 credits
	Summer	Project or internship (optional)	Thesis research
Year 2	Fall	BME 674 Biomedical Design Project I Elective 2 – 3 credits Elective 3 – 3 credits*	Elective 2 – 3 credits Elective 3 - 3 credits Thesis - 3 credits
	Spring	BME 675 Biomedical Design Project II MGT 543 Entrepreneurship	Thesis – 3 credits

* BUS 615 Entrepreneurship Tool Kit can substitute for one elective if completing the Entrepreneurship Certificate

(see other side→)

MS Biomedical Engineering Electives. Electives must be selected from either the list of graduate BME courses, or selected from the list shown below. Electives must be selected with advisor approval. It is recommended that students take a course sequence in a specific area in order to build depth of knowledge. Elective courses outside of this list must be approved by petition to the faculty of the ChBME Department.

- *Signal, Image, and Data Analysis:* BME 659 Medical Imaging, PHY 565 Image Processing, PHY 530 Introduction to Medical Physics, PHY 550 Optics, PHY 660 Electronics
- *Biomechanics:* BME 651 Biomechanics, MCE 695 Biomechanics and Control of Human Movement, MCE 695 Control of Prosthetics, MCE 593 Solid Biomechanics, CVE 512 Finite Element Analysis I, CVE 612 Finite Element Analysis II, CVE 513 Advanced Strength of Materials, CVE 604/ESC 794 Elasticity, BME 692 Internship
- *Tissue Engineering:* BME 655 Biomaterials, BME 651 Biomechanics, CHE 586 Fundamentals of Polymers, BME 635 Tissue Engineering, BME 692 Internship
- *Materials synthesis/characterization/nanotechnology:* BME 655 Biomaterials, CHE 586 Fundamentals of Polymers, EEC 514 Nanotechnology, CHE 570 Characterization and Selection of Solid Materials, CHE 544 Colloidal and Interfacial Phenomena, CHE 606 Rheology, CHE 620 Carbon Nanotubes: Properties, Processing, and Applications, CHE 644 Colloidal Hydrodynamics, BME 692 Internship
- *Bioprocessing:* BME 615 Drug Design and Development, BME 625 Pharmaceutical Assay Development, BME 640 Protein Design, CHE 566 Biochemical Engineering, CHE 504 Advanced Chemical Reactor Design, CHE 506 Advanced Transport Phenomena, CHE 508 Advanced Separation Processes, CHE 603 Fundamentals of Adsorption, CHE 606 Advanced Mass Transfer, BME 692 Internship
- *Instrumentation/Sensors/MEMs devices/Controls:* BME 580 Biomedical Instrumentation, EEC 515 Biosensors, Bioelectronics, BioMEMS, EEC 514 Nanotechnology, EEC 530 Digital Signal Processing, PHY 660 Electronics, EEC 645 Intelligent Control Systems, BME 692 Internship
- *Software Engineering:* EEC 525 Data Mining, EEC 517 Embedded Systems, BME 692 Internship

Preparatory Program

Students who have an undergraduate background in a field other than engineering are required to have completed additional undergraduate coursework, including calculus through differential equations (ESC 250 or MTH 286) and multivariable calculus (MTH 283), one year of calculus-based physics (PHY 241 and 242), one semester of general chemistry with laboratory (CHM 261/266), and at least 9 credits of undergraduate engineering courses, selected from the following five options*.

Field of Specialization	Courses
Biomaterials and Tissue Engineering (11 credits)	ESC 270 Materials Science & Engineering, ESC 201 Statics, ESC 211 Strength of Materials, CVE 310 Strength of Materials Lab
Biomechanics (9 credits)	ESC 202 Dynamics ¹ , ESC 211 Strength of Materials ¹ , MCE 260 Kinematics
Mechanical Design² (9 credits)	ESC 201 Statics, ESC 211 Strength of Materials, MCE 260 Kinematics
Imaging³ (14 credits)	EEC 310 and 311 (Electric Circuits I and II), EEC 383 Digital Systems, EEC 430 Digital Signal Processing
General (14 credits)	ESC 301 Fluid Mechanics, ESC 315 Electrical Engineering Concepts, CHE 306 Transport Phenomena, CHE 300 Chemical Engineering Principles

Students may be admitted into the program prior to their completing these requirements. Students will only be permitted to enroll in graduate courses for which they have completed the prerequisites. These undergraduate credits will not count towards the 30-36 graduate hours required for the degree. A grade of B or better must be earned in each of the preparatory program courses. *ESC 152 (Matlab), MCE 180, 181 (CAE I/II) and ESC 350 (Linear Algebra) are strongly recommended in addition to the required preparatory coursework. These courses do not count towards the minimum 9 required credits of undergraduate engineering coursework. ¹These courses have ESC 201 as pre-requisite; in the absence of ESC 201, student must have completed PHY 241 (calculus-based) and additional study of the topic. ²MCE 180 and 181 strongly recommended for the Mechanical Design track. ³ESC 152 and ESC 350 strongly recommended for the Imaging track.