

Focus Areas

Biomaterials: For students interested in tissue engineering and nanomedicine for the development of constructs with polymers and stem cells for tissue regeneration (heart, chronic wounds, bone, central nervous system) or nanoparticles for treating several types of cancer and atherosclerosis. Emphasis is placed on the selection of biomaterials and cell types to optimize tissue regeneration, diseased tissue targeting and treatment.

Advising faculty: Dr. Tarun Goswami, Dr. Jaime Ramirez-Vick

Medical Devices: For students interested in medical devices, such as design and manufacturing of orthopedic implants, biomechanics and modeling, or human factors of medical instrumentation and devices. Emphasis is placed on the biomaterials, biomechanics, and biocompatibilities of devices that aim to improve the quality of life of patients with conditions such as trauma, degenerative disease, fractures, and joint arthritis, with the goal to restore functionality and mobility and reduce pain, while considering patient safety and product usability.

Advising faculty: Dr. Caroline Cao, Dr. Tarun Goswami, Dr. Jaime Ramirez-Vick, Dr. Ulas Sunar

Medical Imaging: For students interested in designing medical imaging equipment and in extracting diagnostic information from medical images and signals. Emphasis is placed on optical imaging, particularly diffuse optical imaging, as well as magnetic resonance and ultrasound imaging. Medical imaging applications include neuroimaging, particularly monitoring brain function during resting state and neuromodulation, as well as cancer imaging, particularly noninvasive diagnostic imaging biomarkers, image-guided interventions and predicting the intervention response.

Advising faculty: Dr. Ulas Sunar

Neuroengineering: For students interested in neuroergonomics and human engineering. Provides courses related to principles, computational methods, and technologies in the area of neuroengineering. Emphasis is placed on using engineering techniques to understand, design, and analyze the neural-system interface.

Advising faculty: Dr. Caroline Cao, Dr. Sherif Elbasiouny, Dr. Subhashini Ganapathy, Dr. Ulas Sunar

Biomedical Systems Engineering: For students who want to follow a more generalized degree path.

Advising faculty: Dr. Jaime Ramirez-Vick

Focus Area Required Courses

Sem Cr Hr

Biomaterials			
BME 6440	Biomaterials	F	4
			4

Medical Devices			
BME 7370	Medical Devices*	F	3
BME 7371	Failure Analysis of Medical Devices	S	3
			6

Medical Imaging			
BME 6703	Medical Imaging	F	4
BME 6720	Biomedical Optics	S	3
			7

Neuroengineering			
BME 7380	From Neurons to Behavior in Health & Disease	S	3
BME 6350	Computational Neuroergonomics*	F	3
			6

Biomedical Systems			
For students who wish to follow a more generalized degree path. Students will choose 6+ credits of required coursework from one other focus area and fulfill MSBME program of study requirements as approved by the advisor.			

MSBME program of study requirements (all focus areas)			
30 credit hours total, to include:			
18 credits BME specific coursework (6000- or 7000-level)			
12 credits 7000-level BIE Department coursework			
6 credits applied math and computations coursework			
4 credits max. independent study			
8 credits max. thesis			

* = offered in class and online

B = Biomaterials

D = Medical Devices

I = Medical Imaging

N = Neuroengineering

R = Required in focus area

o = preferred option in focus area

** = effective Fall 2020, students who completed ISE 3221 may not take IHE 6150.

Electives

Sem Cr Hr

Applied Math and Computations (6 cr required)				B	D	I	N
BME 7110	Biomedical Signals	TBA	3		o	o	o
BME 7521	Advanced Biotransport	F	3	o			o
CS 5260	Numerical Methods for Computational Science	F (o)	3			o	
CS 6900	Applied Deep Learning	S	3			o	o
CS 7900	Deep Learning	F	3			o	o
EE 6000	Linear Systems II	F	3		o	o	o
EE 6360	Digital Signal Processing	F	3			o	o
EE 7150	Digital Image Processing	F	3			o	o
IHE 6150**	Probability & Statistics*	F	3	o	o	o	o
IHE 7050	Design & Analysis of Egr Experiments*	F	3	o	o	o	o
IHE 7300	Research Methods in HFE*	S	3	o	o	o	o
IHE 7510	Data Mining*	F	3	o	o	o	o
STT 6300	Biostatistics	F	3			o	

Other Electives				B	D	I	N
BME 6310	Ergonomics*	F	3		o		o
BME 6350	Computational Neuroergonomics* (not offered F21)	F	3		o		R
BME 6421	Biotransport	S	3	o	o	o	o
BME 6440	Biomaterials	F	4	R	o		
BME 6450	Tissue Egr & Regenerative Medicine	S	3	o	o		
BME 6460	Nanomedicine Fundamentals	S	3	o	o		
BME 6550	Bioinstrumentation	F	4		o		
BME 6703	Medical Imaging	F	4				R o
BME 6710	Optical Imaging (not offered F21)	F	3		o	o	
BME 6720	Biomedical Optics	S	3		o	R	
BME 6730	Neurophotonics & Optical Brain Mapping	S	3			o	o
BME 6980	Design of Medical Devices	TBA	3	o	o	o	o
BME 7112	Processing of Medical Images	S	3			o	o
BME 7131	Medical Ultrasonics	TBA	3				o
BME 7132	Computed Tomography	TBA	3			o	
BME 7210	Orthopaedic & Prosthetic Egr (not offered F21)	F	3	o	o		o
BME 7220	Experimental Orthopaedic Egr (not offered S22)	S	3	o	o		o
BME 7370	Medical Devices*	F	3	o	R		o
BME 7371	Failure Analysis of Med Devices (not offered S22)	S	3	o	R		o
BME 7380	From Neurons to Behavior in Health & Disease	S	3				R
BME 7850	Lean Process Improvement for Engineers*	S	3		o		
BME 7930	Non-thesis Research	F/S/R	1-4	o	o	o	o
BME 7980	Special Topics	TBA	3	o	o	o	o
BME 6990/7990	Independent Study in BME (max 4 cr)	F/S/R	1-4	o	o	o	o
IHE 6300	Fundamentals of HFE*	F	3		o	o	o
IHE 6320	Human-System Interaction & Usability Egr*	S	3		o		
IHE 6510	Computer Applications in IHE*	S	3		o		
IHE 7020	Systems Engineering & Analysis*	S	3	o	o	o	o
IHE 7340	HFE in Mobile Computing*	F or R	3		o		
IHE 7360	Cognitive Systems Engineering* (not offered S22)	S	3				o