Master of Science in Biomedical Engineering (BME)
Department of Biomedical, Industrial & Human Factors Engineering, Wright State University

**MSBME 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. *Advisors: Dr. Tarun Goswami, Dr. Jaime Ramirez-Vick*

**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. *Advisors: Dr. Ulas Sunar, Dr. Nasser Kashou*

**Biomedical Systems Engineering**: For students who want to follow a more generalized degree path. *Advisor: Dr. Jaime Ramirez-Vick*

**Medical Devices**: For students interested in medical devices, such as design and manufacturing of orthopaedic 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. *Advisors: Dr. Caroline Cao, Dr. Tarun Goswami, Dr. Jaime Ramirez-Vick, 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. *Advisors: Dr. Caroline Cao, Dr. Sherif Elbasiouny, Dr. Subhashini Ganapathy, Dr. Nasser Kashou, Dr. Ulas Sunar*

**MSBME Degree Requirements**

- 30 semester credit hours (thesis optional)
- 18 credit hours of BME courses (6000- or 7000-level)
- 12 credit hours of 7000+-level BIE Department courses
- 6 credit hours of approved courses with math/statistics content
- BME/IHE 6010 Ethics in Engineering Research & Practice (1 cr)
- maximum of 4 credit hours of independent study
- Non-thesis research option: max 6 credit hours of non-thesis research
- Thesis option: max of 8 credit hours of thesis research
- Students must have an approved Program of Study before the end of the first semester. Students can combine focus areas to customize a program of study to suit individual interests. Additionally, full-time or part-time study, evening and distance education classes are available. Graduate teaching and research assistantships are awarded on a competitive basis for qualified students.

**Prerequisite coursework**: Students should expect to be prepared for their program with knowledge of topics such as calculus, differential equations, linear algebra, statistics, calculus-based physics, chemistry, computations/programming, statics, circuits, linear systems, anatomy, physiology, and/or other core engineering courses, depending on the student’s chosen focus area.

6/25/18
## 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 math-intensive coursework
- 4 credits max. independent study
- 8 credits max. thesis OR 6 credits max. non-thesis research

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.

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### Biomaterials

**Required Courses**  
- BME 6010 Ethics*  
- BME 6440 Biomedical  
- BME 7521 Advanced Biotransport* (m)  
- EGR 7050 Design & Analysis of Eg/Experiments* (m)  
- IHE 6150 Probability & Statistics* (m)  
- IHE 7300 Research Methods in HFE* (m)  
- IHE 7510 Data Mining* (m)  

**Focus Area Electives**  
- BME 6421 Biotransport*  
- BME 6450 Tissue Eg/Regenerative Medicine*  
- BME 6460 Nanomedicine Fundamentals*  
- BME 7210 Orthopaedic & Prosthetic Engineering  
- BME 7220 Experimental Orthopaedic Engineering  
- BME 7370 Medical Devices  
- BME 7371 Failure Analysis of Medical Devices  
- BME 7930 Non-thesis Research (max 6 cr)  
- BME 7980 Special Topics  
- BME 6990/7990 Independent Study in BME (max 4 cr)  
- EGR 7020 Systems Engineering & Analysis*  

Or as approved by the advisor  

- 18-19 Cr Hr

### Medical Imaging

**Required Courses**  
- BME 6010 Ethics*  
- BME 6703 Medical Imaging  
- BME 6710 Optical Imaging  
- BME 7110 Biomedical Signals (m)  
- BME 7112 Processing of Medical Images  
- BME 7170 Medical Imaging  
- CS 5260 Numerical Methods for Computational Science  
- EGR 7050 Design & Analysis of Eg/Experiments* (m)  
- IHE 6150 Probability & Statistics* (m)  
- IHE 7510 Data Mining* (m)  

**Focus Area Electives**  
- BME 6720 Biomedical Optics  
- BME 7131 Medical Ultrasonics  
- BME 7132 Medical Imaging  
- BME 7930 Non-thesis Research (max 6 cr)  
- BME 7980 Neurophotonsics & Optical Brain Mapping  
- BME 7980 Research Seminar in Biomedical Imaging  
- BME 7980 Special Topics  
- BME 6990/7990 Independent Study in BME (max 4 cr)  
- EE 7150 Digital Image Processing  
- EGR 7020 Systems Engineering & Analysis*  

Or as approved by the advisor  

- 12-13 Cr Hr

### Neuroengineering

**Required Courses**  
- BME 6010 Ethics*  
- BME 7380 From Neurons to Behavior in Health & Disease  
- IHE 6350 Computational Neuroergonomics*  
- BME 7110 Biomedical Signals (m)  
- BME 7210 Orthopaedic & Prosthetic Engineering  
- BME 7220 Experimental Orthopaedic Engineering  
- BME 7850 Lean Process Improvement for Engineers*  
- BME 7930 Non-thesis Research (max 6 cr)  
- BME 7980 Neurophotonsics & Optical Brain Mapping  
- BME 7980 Independent Study in BME (max 4 cr)  
- EGR 7050 Design & Analysis of Eg/Experiments* (m)  
- IHE 6150 Probability & Statistics* (m)  
- IHE 7300 Research Methods in HFE* (m)  
- IHE 7510 Data Mining* (m)  

**Focus Area Electives**  
- BME 6310 Ergonomics*  
- BME 6421 Biotransport*  
- BME 6450 Tissue Eg/Regenerative Medicine*  
- BME 6460 Nanomedicine Fundamentals*  
- BME 6550 Biomonitoring  
- BME 6710 Optical Imaging  
- BME 6720 Biomedical Optics  
- BME 7210 Orthopaedic & Prosthetic Engineering  
- BME 7220 Experimental Orthopaedic Engineering  
- BME 7850 Lean Process Improvement for Engineers*  
- BME 7930 Non-thesis Research (max 6 cr)  
- BME 7980 Neurophotonsics & Optical Brain Mapping  

Or as approved by the advisor  

- 16-17 Cr Hr

### Biomedical Systems

**Required Courses**  
- BME 6010 Ethics*  
- BME 6450 Tissue Eg/Regenerative Medicine*  
- BME 6460 Nanomedicine Fundamentals*  
- BME 6710 Medical Devices  
- BME 6720 Orthopaedic & Prosthetic Engineering  
- BME 7110 Orthopaedic & Prosthetic Engineering  
- BME 7170 Orthopaedic & Prosthetic Engineering  
- BME 7910 Biomedical Signals (m)  
- BME 7920 Special Topics  
- BME 6990/7990 Independent Study in BME (max 4 cr)  
- EGR 7050 Design & Analysis of Eg/Experiments* (m)  
- IHE 6150 Probability & Statistics* (m)  
- IHE 7300 Research Methods in HFE* (m)  
- IHE 7510 Data Mining* (m)  

**Focus Area Electives**  
- BME 6310 Ergonomics*  
- BME 6421 Biotransport*  
- BME 6450 Tissue Eg/Regenerative Medicine*  
- BME 6460 Nanomedicine Fundamentals*  
- BME 6550 Biomonitoring  
- BME 6710 Optical Imaging  
- BME 6720 Biomedical Optics  
- BME 7210 Orthopaedic & Prosthetic Engineering  
- BME 7220 Experimental Orthopaedic Engineering  
- BME 7370 Medical Devices  
- BME 7371 Failure Analysis of Medical Devices  
- BME 7930 Non-thesis Research (max 6 cr)  
- BME 7980 Optical Imaging  
- BME 6990/7990 Independent Study in BME (max 4 cr)  

Or as approved by the advisor  

- 16-17 Cr Hr

* = offered in class and via distance education; (m) = approved departmental math-intensive course