



*The University of Texas at San Antonio and The University of Texas Health Science Center at San Antonio
Joint Graduate Program in Biomedical Engineering*

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Master of Science in Biomedical Engineering

The Master of Science in Biomedical Engineering is intended to be a terminal degree that can be completed in 3 semesters. Employment opportunities for graduates with a M.S. in Biomedical Engineering are usually found in medical centers, biomedical industries, government agencies, health care groups, or computer application groups. Primary research areas include bioimaging, tissue engineering and regenerative medicine, biomedical implants and devices.

Admission to the M.S. in Biomedical Engineering program requires the student to have earned a bachelor's degree in a field of engineering. Consideration for admission will also be given to students with undergraduate degrees in the physical sciences, life sciences, or mathematics. However, these students will be required to demonstrate competence in areas of engineering typically found in an undergraduate engineering curriculum. In some cases, preparatory courses in engineering may be required as a condition of admission, with specific recommendations made by the Committee on Graduate Studies (COGS) for BME. To be considered for admission, students are required to submit a formal application, letters of recommendation, an official report on their results on the GRE, and transcripts from their undergraduate institution. International students will be required to also submit their official TOEFL scores.

Program requirements include the following:

In general, all students enrolled in the M.S. in Biomedical Engineering program must complete at least 24.5 hours of graduate coursework beyond the Bachelor's degree. This includes 18.5 hours for core courses, three 1-hour BME seminar courses, and one 3-hour electives. The Program Director and the COGS (along with the student's research advisor) will work with the student on an individualized curriculum to ensure each student obtains the proper coursework to successfully complete the program and meet any personal or professional goals.

In addition to the 24.5 hours of graduate coursework, M.S. students in the program are required to register for at least 6 semester hours of Master's Research Thesis and successfully defend their thesis to their research thesis committee. These students are also expected to present their research at the student seminar series or other suitable public forum, either at UTSA or UTHSCSA.

Admission to MS Candidacy:

Prior to registering for the MS Research Thesis, students will be required to seek approval from the COGS for the selection of their research thesis committee. Members of the research thesis committee will comprise of the chair (usually the student mentor), and 4 other members, of which two members have to be from UTSA and the other two members have to be from UTHSCSA. Students must successfully defended their proposal and be recommended by their research committee for admission to MS candidacy. The recommendation will be reviewed by the COGS and the COGS reserves the right to approve or deny the student's admission to MS candidacy based on the student's academics and defense of the proposal.

Core Courses

EGR 5093 Special Topics in Engineering Analysis

(3-0) 3 SCH. Prerequisite: MAT 3253 or an equivalent, or consent of instructor. A comprehensive treatment of advanced methods of applied mathematics needed for the study of advanced courses in biomedical engineering.

BME 5903 Biomaterials

(3-0) 3 SCH. Prerequisite: Graduate standing.

Natural and synthetic biomaterials, including polymers, ceramics, metals, and composites will be discussed. The properties and applications of these materials will be addressed. Particular emphasis will be placed on biomaterials used in the orthopaedic, dental, and cardiovascular arenas.

BME 5803 Biomechanics

(3-0) 3 SCH. Prerequisite: Graduate standing.

Theories and experiments of continuum mechanics principles of hard and soft tissues will be addressed. The mechanical behavior of bone, cartilage, tendon, ligament and muscle (including cardiac tissue) will be discussed in terms of the tissues' structure-function relationships.

BME 5703 Biomedical Imaging I

(3-0) 3 SCH. Prerequisite: Graduate standing.

Imaging and stimulation techniques such as MRI, PET, and TMS will be discussed. Relevant electronic and computational systems for these techniques will be addressed. (Same as RAD1 5015 - Physics of Diagnostic Imaging. Credit cannot be earned for both BME 5703 and RAD1 5015)

BME 5023 Physiology for Engineers

(3-0) 3 SCH. Prerequisite: Graduate standing.

Lecture instruction in the basic concepts of cell and organ function and in the integrated function of mammalian organ systems is presented. The physiology of the nervous system is included.

ORTO 5004 Biology for Bioengineers

(3-0) 3 SCH. Prerequisite: Graduate standing.

This course provides a broad background in biological concepts with specific attention given to biological processes important in bioengineering. Topics will include biochemistry, genetics, molecular biology, cell biology, and physiology. Applications will emphasize understanding cellular processes important in bioengineering, such as gene therapy and tissue repair and regeneration.

INTD 6002 Ethics in Research

0.5 SCH. Prerequisite: Graduate Standing

History of medical and research ethics, problem-solving in ethics, and federal and institutional requirements related to the conduct of research using human subjects or animals.

Other Required BME Courses

BME 5011 Research Seminar

(1-0) 1 SCH. Prerequisite: Graduate Standing. Required of all students for a minimum of 3 semesters. Students will hear presentations from outside speakers, BME faculty, as well as their peers. May be repeated for a maximum credit of 5 hours. The grade report for the course is either "CR" (satisfactory performance) or "NC" (unsatisfactory performance).

BME 5973,6 Master's Research Thesis

3 or 6 SCH. Prerequisite: Graduate standing and consent of Research Advisor.

Electives

BME 5893 Topics in Biomechanics: Cardio

(3-0) 3 SCH Prerequisite: Consent of instructor.

Advance topics in biomechanics with emphasis on cardiovascular applications.

BME 5052 Independent Study in BME

(3-0) 3 SCH Prerequisite: Prerequisite: Graduate standing and consent of Research Advisor.

Independent study of specific BME topics.

BME 5923 Tissue Engineering

3-0) 3 hours credit. Prerequisite: Graduate standing. Basic principles of tissue engineering will be introduced. The three main approaches consisting of 1) use of host cells capable of differentiating into tissues; 2) the development of bioactive factors to induce cells to differentiate into tissues, and 3) the development of delivery scaffolds for the cells and/or bioactive factors will be covered.

BME 5993 Tissue Biomaterial Interaction

3-0) 3 hours credit. Prerequisite: Graduate standing and consent of instructor. An overview of implant biocompatibility including tissue histopathology, histology of implant response and the regulatory process for medical devices.

BME 5053 Critical Thinking and Writing for BME

(3-0) 3 SCH Prerequisite: Completion of Core Courses or consent of instructor.

Students will be introduced to the writing and critiquing of research proposals, manuscripts, abstracts, and presentations.

EGR 5613 New and Emerging Technologies

(3-0) 3 SCH Prerequisite: Graduate standing.

Examines entrepreneurial and managerial perspectives on the process of technology innovation. Design is the organizing concept used to study the continuum from idea to sale of products and services that are spawned by innovators using new and emerging technologies. Seminar format, case-study preparation, presentation, and cooperative learning are defining characteristics of this course.

EGR 5623 Issues in Engineering Management

(3-0) 3 SCH Prerequisite: Graduate standing.

Examines issues facing managers of technology in terms of their implications for people. The context is the cycle from conception to use/disposal of products and services. The framework for analysis and synthesis is ecological, historical and institutional. Seminar format, issue paper preparation and presentation, and cooperative learning are defining characteristics of this course.

MOT 5053 Marketing Innovations (UTSA)

(3-0) 3 SCH Prerequisite: MKT 5023 or consent of instructor.

An analysis of the role of technology and innovation in modern business practice. Emphasis is on managing technological change to develop business opportunities and competitive advantage.

MOT 5173 Technology Transfer: The Theory and Practice of Knowledge Utilization (UTSA)

(3-0) SCH Prerequisite: MKT 5053 or consent of instructor.

Technology transfer or diffusion may be defined as the utilization or application of knowledge. The course examines the organizational, behavioral, and communication challenges involved in transferring technology from the research lab to the marketplace in a cost-effective and timely manner.

ORTO 5005 Biomaterials Surface Science

(3-0) 3 SCH Prerequisite: undergraduate Physical Chemistry and Biochemistry, Graduate Standing and consent of instructor.

This course provides an introduction to surface science as it is applied in the research, development and design of biomaterial surfaces. Topics include basic concepts of surface science: surface properties, morphological, chemical and electrical characterization methods as well as processes and interactions on/with surfaces, including corrosion and protein adhesion. Applications will emphasize cardiovascular implant issues but the principles are applicable to all biomaterials.

Any courses offered as Prescribed Electives or Electives by the UTSA/UTHSCSA Joint Doctoral Program in Biomedical Engineering can also be used as Electives for this MS degree program.