# College of Engineering (Dean's Office) Courses

## Courses

**BME 5101. Research Seminar I.**
Involves formal presentations and discussion by MS students in the program or Ph.D. students in their first year.

- 1 Credit Hour
- 1 Total Contact Hour
- 0 Lab Hour
- 1 Lecture Hour
- 0 Other Hour

**BME 5102. Research Seminar II.**
Involves formal presentations and discussion by MS students in the program or Ph.D. students in their first year.

- 1 Credit Hour
- 1 Total Contact Hour
- 0 Lab Hour
- 1 Lecture Hour
- 0 Other Hour

**BME 5192. Clinical Rotations for Eng.**
This course facilitates the recognition of the importance of designing medical devices and biologics with the end-user in mind. Each rotation will include background in terms of theory and clinical application provided by a physician, including selected case studies, followed by "hands-on" experience (whenever possible) with technical personnel. Clinical rotations will be at the Foster School of Medicine, the William Beaumont Army Medical Center, and the US-Mexico Border Health Association.

- 1 Credit Hour
- 3 Total Contact Hour
- 0 Lab Hour
- 0 Lecture Hour
- 3 Other Hour

**Prerequisite(s):** (BIOL 6304 w/C or better ) AND (DRSC 5495 w/C or better ) AND (BME 5301 w/C or better ) OR (BME 6301 w/C or better)

**BME 5193. Graduate Clinical Research.**
The student is matched with a research clinician and will "shadow" the clinician throughout the course. The following activities are conducted: direct observation of procedures (diagnostic and interventional), development of Institutional Review Board protocols, clinical data analysis, and interaction with the company sponsoring a device/drug trial.

- 1 Credit Hour
- 3 Total Contact Hour
- 0 Lab Hour
- 0 Lecture Hour
- 3 Other Hour

**Prerequisite(s):** (BIOL 6304 w/C or better ) AND (DRSC 5495 w/C or better ) AND (BME 5301 w/C or better ) OR (BME 6301 w/C or better)

**BME 5194. Graduate Research.**
Graduate Research.

- 1 Credit Hour
- 1 Total Contact Hour
- 0 Lab Hour
- 0 Lecture Hour
- 1 Other Hour
BME 5196. Medical Device Practicum.
The use of structured techniques for client needs identification will be taught. Student teams will follow a structured process for the concept generation design of a biomedical device. Students will consult experts, perform patent searches, and conduct competitive benchmarking as part of external searches for solutions.

1 Credit Hour
3 Total Contact Hour
0 Lab Hour
0 Lecture Hour
3 Other Hour

Prerequisite(s): (BME 5192 w/C or better ) OR (BME 6192 w/C or better ) AND (MGMT 5314 w/C or better)

BME 5294. Graduate Research.
Graduate Research.
2 Credit Hours
2 Total Contact Hours
0 Lab Hours
0 Lecture Hours
2 Other Hours

BME 5301. BME for Global Health.
Graduate level course that provides an overview of the role of engineering technological advances to improve human health. The following points will be emphasized throughout the semester, What are the challenges in healthcare delivery in remote locations; How are we paying for healthcare delivery? What is the role of engineering to solve healthcare problems; and how do new healthcare technologies move from the lab to the bedside.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

BME 5302. Telemedicine & Imaging Info..
This course focuses on applications of point-of-care diagnostics for chronic disease management. It also introduces basic concepts in telemedicine. Students will gain the knowledge, understanding and practical preparation needed to implement a program to diagnose and treat patients in remote areas.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

BME 5303. Research & Lab Methods.
An introduction to biomedical engineering research laboratory principles and procedures involving living systems with emphasis on lab safety, experimental design, data collection, analysis, and interpretation; and ethical issues including scientific integrity and the use of human and animal subjects in research experiments.

3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours

BME 5304. BME Device Design & Regulation.
This course introduces the regulatory requirements for the design, testing, and clinical implementation of medical devices and biologics. The first part covers the FDA regulatory process. The second part covers key legal and policy issues involved in a clinical organization: Health Insurance Portability and Accountability Act and Joint Commission on the Accreditation of Health Care Organizations rules on risk management, standards, regulations, compliance and ethics.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (BME 5301 w/C or better ) OR (BME 6301 w/C or better ) AND (BME 5302 w/C or better ) OR (BME 6302 w/C or better)
BME 5310. Biomaterials.
This course discusses various aspects pertaining to the selection, processing, testing (in vitro and in vivo) and performance of hard and soft biomaterials, orthopedic devices, and cardiovascular, ophthalmologic and dental applications. The biocompatibility and surgical applicability of metallic, polymeric and ceramic implants and prosthetic devices are discussed. The physicochemical interactions between the implant material and the physiological environment will be described. Biomaterials in maxillofacial, orthopedic, dental, ophthalmic and neuromuscular applications will be emphasized.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

BME 5312. Tissue Biomechanics.
Tissue-level mechanical properties and engineering methodology of stress analysis in biological tissues, including analytical models of hard and soft tissue mechanics, soft tissue viscoelasticity, Wolff's law and bone remodeling, bone fatigue and microfracture, and functional relationships from tissue microstructure to macrostructure.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

BME 5313. Tissue Engineering.
Principles and practices of bioartificial organ and tissue development; cellular/material interaction and translation of information from two-dimensional surfaces to three-dimensional scaffolds; selection and processing of bio-materials to form tissue scaffolds; analysis of tissue engineered devices, standards, and regulation. Topics include: material selection and processing, mechanisms and kinetics of material degradation, cell-material interaction and interfaces, effect of construct architecture on tissue growth, and transport through engineered tissues. Examples of engineering tissues for replacing cartilage, bone, tendons, ligaments, skin and liver will be presented.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (BME 5310 w/C or better)

BME 5320. Musculoskeletal Biomechanics.
The interrelationship between force and motion will be emphasized as related to anatomic structure and function. The student will learn the concepts of kinematics and mechanics as they apply to the fields of biomechanics. Topics covered include bone mechanics, joint mechanics, gait kinematics, instrumentation and measurement of biomechanical phenomena, and modeling and analysis of the musculoskeletal system.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

BME 5321. Biomechatronics.
This course will offer an introduction to rehabilitation engineering, i.e. mechanics of gait/locomotion, muscle mechanics, electromyography, musculoskeletal anatomy, hand functions, soft tissue mechanics, amputation surgery, upper and lower extremity prosthetics, upper and lower extremity orthotics, seating and positioning, and assistive devices.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
This course will teach the student the human machine interface design process. Included will be tools for user needs analyses including user characterization, task characterization, and characterization of the situation under which the user performs a task. User needs analyses will then be followed by function allocation decision making. Human interactions with automated devices are mediated mainly through displays and controls. Various types of displays and control devices will be reviewed along with guidelines and principles for display-control compatibility issues. The course will end with newer methods for display designs such as Ecological Interface Design.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

BME 5350. Bioelectromagnetism Fundmtls.
Principles of bioelectricity and biomagnetism, intended to impart a solid background on a wide variety of biological phenomena to students with a concentration in Biomedical Engineering.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

BME 5351. Physiological Measurements.
A unified and systems-approach of the functions of the human body. Origin and processing of biomedical signals to extract clinical information. (Same course as EE 5351).
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (BME 5301 w/C or better ) OR (BME 6301 w/C or better)

Principles, methods and algorithms for processing biomedical signals. Application of advanced DSP techniques to a number of problems in biomedical research and clinical medicine. Topics include biomedical data acquisition, filtering, feature extraction, modeling, and imaging, with examples from cardiology, neuro-physiology, muscle physiology, and medical imaging (same as course EE 5353).
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

BME 5390. Special Topics in BME.
Advanced topics of contemporary interest in metallurgical and materials engineering. May be repeated for credit when topic varies.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

BME 5394. Graduate Research.
Graduate Research.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours
BME 5395. Project or Internship.
Project with BME faculty or internship in a company.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

Graduate Thesis.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

BME 5399. Thesis.
Graduate Thesis.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

Prerequisite(s): (BME 5398 w/P or better)

BME 5494. Graduate Research.
Graduate Research.
4 Credit Hours
4 Total Contact Hours
0 Lab Hours
0 Lecture Hours
4 Other Hours

BME 5594. Graduate Research.
Graduate Research.
5 Credit Hours
5 Total Contact Hours
0 Lab Hours
0 Lecture Hours
5 Other Hours

BME 5694. Graduate Research.
Graduate Research.
6 Credit Hours
6 Total Contact Hours
0 Lab Hours
0 Lecture Hours
6 Other Hours

BME 6101. Doctoral Research Symposium I.
Involves formal presentations and discussion by MS students in the program or Ph.D. students.
1 Credit Hour
1 Total Contact Hour
0 Lab Hour
1 Lecture Hour
0 Other Hour
BME 6102. Doctoral Research Symposium II.
Involves formal presentations and discussion by MS students in the program or Ph.D. students.
1 Credit Hour
1 Total Contact Hour
0 Lab Hour
1 Lecture Hour
0 Other Hour

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1 Credit Hour
3 Total Contact Hour
0 Lab Hour
0 Lecture Hour
3 Other Hour

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BME 6193. Doctoral Clinical Research.
The PhD student is matched with a research clinician and will "shadow" the clinician throughout the course. The following activities are conducted: direct observation of procedures (diagnostic and interventional), development of Institutional Review Board protocols, clinical data analysis, and interaction with the company sponsoring a device/drug trial.
1 Credit Hour
3 Total Contact Hour
0 Lab Hour
0 Lecture Hour
3 Other Hour

Prerequisite(s): (BIOL 6304 w/C or better ) AND (DRSC 5495 w/C or better ) AND (BME 5301 w/C or better ) OR (BME 6301 w/C or better)

BME 6194. Doctoral Research.
Graduate Research.
1 Credit Hour
1 Total Contact Hour
0 Lab Hour
0 Lecture Hour
1 Other Hour

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3 Total Contact Hour
0 Lab Hour
0 Lecture Hour
3 Other Hour

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BME 6294. Doctoral Research.
Graduate Research.
2 Credit Hours
2 Total Contact Hours
0 Lab Hours
0 Lecture Hours
2 Other Hours
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3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

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0 Lab Hours
3 Lecture Hours
0 Other Hours

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This course introduces the regulatory requirements for the design, testing, and clinical implementation of medical devices and biologics. The first part covers the FDA regulatory process. The second part covers key legal and policy issues involved in a clinical organization: Health Insurance Portability and Accountability Act and Joint Commission on the Accreditation of Health Care Organizations rules on risk management, standards, regulations, compliance and ethics.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (BME 6301 w/C or better ) OR (BME 5301 w/C or better ) AND (BME 6302 w/C or better ) OR (BME 5302 w/C or better)

BME 6391. Individual Studies.
Independent studies in Biomedical Engineering.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

BME 6394. Doctoral Research.
Graduate Research.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

PhD dissertation.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours
BME 6399. Dissertation.
PhD dissertation.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

Prerequisite(s): (BME 6398 w/P or better)

BME 6494. Doctoral Research.
Graduate Research.
4 Credit Hours
4 Total Contact Hours
0 Lab Hours
0 Lecture Hours
4 Other Hours

BME 6594. Doctoral Research.
Graduate Research.
5 Credit Hours
5 Total Contact Hours
0 Lab Hours
0 Lecture Hours
5 Other Hours

BME 6694. Doctoral Research.
Graduate Research.
6 Credit Hours
6 Total Contact Hours
0 Lab Hours
0 Lecture Hours
6 Other Hours