BIOMEDICAL ENGINEERING (4800)

4800:101. Tools for Biomedical Engineering. (3 Credits) Corequisite: 3450:149. Introduction to Biomedical Engineering. Personal computers, word processing, spreadsheets, mathematical computational software and computer aided drafting.

4800:111. Introduction to Biomedical Engineering Design. (3 Credits) Prerequisites: 4800:101 or permission. Students will be introduced to the interdisciplinary nature of Biomedical Engineering research and design through the use of lectures, discussions, homework and design projects.

4800:201. Biomedical Engineering Sophomore Seminar. (1 Credit) Prerequisites: 4800:101, sophomore standing or above. A seminar format to allow students to learn about current research and careers in Biomedical Engineering. Topics in technical communications will also be covered.


4800:305. Introduction to Biophysical Measurements. (4 Credits) Prerequisites: 4800:101 and [4400:231 or 4400:307] and admission to the College of Engineering. Corequisite: 3100:202. Biomedical Engineering involves measurement of Physiological processes in living organisms. An understanding of the variety of instruments used and the limitations are introduced.

4800:310. Modeling & Simulation of Biomedical Systems. (3 Credits) Prerequisites: 3450:335 and admission to the College of Engineering. Modeling and simulation of physiological systems and their interactions with therapeutic devices, such as the artificial kidney.

4800:325. Design of Medical Devices. (3 Credits) Prerequisites: Junior/senior standing in the College of Engineering, the College of Polymer Science and Engineering or the College of Arts and Sciences. Design of Medical Devices, design criteria, human factors, patient care and monitoring devices, surgical devices, bench testing and legal liability.


4800:362. Transport Fundamentals for Biomedical Engineering. (3 Credits) Prerequisite: 3450:335, 4600:203 and admission to the College of Engineering. Introductory topics in fluid, heat, and mass transfer including both integral and differential analysis as it applies to biological and biomedical systems.

4800:365. Mechanics of Biological Tissues. (3 Credits) Prerequisites: 3450:335, 4300:202 and admission to the College of Engineering. The mechanical properties of musculoskeletal tissues are presented along with modeling techniques and testing procedures. Tendons, ligaments, muscles, cartilage and bone will be addressed.

4800:370. Biomechanics of Human Movement. (3 Credits) Prerequisites: 3100:202 and 4600:203. The application of engineering mechanics and anatomy to study and analyze human movement. Lectures and in-class labs will introduce students to experimental and theoretical techniques.

4800:400. Biomaterials. (3 Credits) Prerequisite: Admission to the College of Engineering. Properties of Materials used in medicine and their interaction with biological materials will be discussed. Biocompatibility issues, material degradation, biomaterials testing will also be discussed.

4800:401. Introduction to Biomaterials Laboratory. (2 Credits) Prerequisites: Admittance into the Biomedical Engineering - Biomaterials and Tissue Engineering or the Biomedical Engineering - Biomaterials and Tissue Engineering / Cooperative Education program and 4800:101. Prerequisite or Corequisite: 4800:400. Laboratory to explore techniques in biomaterials and tissue engineering and evaluate experimental outcomes. Biomaterials and Tissue Engineering Track students only.

4800:409. Introduction to Biomedical Engineering Research. (3 Credits) Application of engineering principles to local area medical research. Includes biomaterials, orthopedics, artificial organs, biostereometrics, biometrics, biological signal and image analysis, biomechanics and computers in medicine.

4800:420. Biomedical Signal & Image Processing. (3 Credits) Prerequisites: 4400:340, 4450:220, and admission to the College of Engineering. Introduction to the basic problems associated with biological signal and image processing applications, and appropriate approaches to dealing with them.

4800:422. Physiological Control Systems. (3 Credits) Prerequisites: 3100:202, 3450:335. The basic techniques employed in control theory, systems analysis and model identification as they apply to physiological systems.

4800:430. Design of Medical Imaging Systems. (3 Credits) Prerequisites: 3100:200, 3650:292, 4400:340, 4400:353, 4800:305 and admission to the College of Engineering or permission of instructor. Physical principles and engineering design of medical imaging systems, with emphasis on digital radiography, computed tomography, nuclear medicine, ultrasound and magnetic resonance.

4800:435. Image Science. (3 Credits) Prerequisites: 3100:200, 3650:292, 4400:343 or by permission of instructor. Principles of image science, image performance parameters and image assessment techniques of medical imaging systems, with emphasis on digital radiography, tomographic imaging, ultrasound and magnetic resonance.


4800:440. Advanced Biomaterials. (3 Credits) Prerequisites: 4800:400 and admission to the College of Engineering. The interactions between biomaterials and medical devices will be analyzed with respect to their potential fractionation of biological mechanisms.

4800:445. Experimental Techniques in Biomaterials Tissue Engineering. (3 Credits) Prerequisite: 4800:440. Laboratory experience that applies engineering concepts and practices to the analysis of biomaterials and tissue engineering.
4800:450. Tissue Engineering. (3 Credits)
Prerequisites: 4800:400, 4800:365, 4800:362, and [4800:360 or 4200:321].
This course will explore topics to successfully design tissue engineered devices. For advanced engineering students with a background in materials, mechanics, and transport phenomena.

4800:455. Biotransport. (3 Credits)
Prerequisites: 3100:202, 4800:220, and [4800:362 or 4200:321]. With the foundations of fluid, heat and mass transfer established, this course focuses on specific biological examples of transport phenomena.

4800:460. Experimental Techniques in Biomechanics. (3 Credits)
Prerequisites: 3150:153, 3450:335, 3650:292, 4600:203 and admission to the College of Engineering or by permission of instructor. Principles of testing and measuring devices commonly used for biofluid and biosolid mechanics studies. Laboratories for demonstration and hands-on experience.

4800:464. Microfluidics for Biomedical Engineering. (3 Credits)
Prerequisites: 4800:362 or 4200:321 or 4800:360. This course will discuss fundamental principles of single and two phase flow of biofluids in microfluidic devices, and present the applications of lab-on-a-chip systems in BME.

4800:470. Human Factors Engineering. (3 Credits)
Prerequisite: Admission to the College of Engineering. Reliability and human capabilities and limitations, crew protection, display systems, controls and controlling actions, interface design principles, risk management, Safety and accident prevention.

4800:485. Special Topics in Biomedical Engineering. (1-3 Credits)
Prerequisite: Permission of advisor. Directed individual or group research or study in the student's field of interest. Topic subject to approval of advisor.

4800:491. Biomedical Engineering Design I. (2 Credits)
Prerequisite: 4800:111 and admission to the College of Engineering. Corequisite: 4800:305. The design process will be further discussed utilizing case studies and detailed biomedical engineering design projects.

4800:492. Biomedical Engineering Design II. (2 Credits)
Prerequisites: 4800:491 and admission to the College of Engineering. The design process will be further discussed utilizing detailed biomedical engineering design projects. Projects will be required to be interdisciplinary in nature.

4800:498. Introduction to BME Research. (2 Credits)
Prerequisites: Permission of instructor. Directed individual or group study in research in biomedical engineering. Course is credit/no credit. May not be repeated.

4800:499. BME Research Project. (1-3 Credits)
Prerequisites: 4800:498, permission of instructor. Directed individual or group study in research in biomedical engineering. May be repeated.