

**BIOLOGICAL SCIENCE**

**111. Cells and Molecules**  
 Fall, Spring. 4(3-3)  
 P: CEM 141 or CEM 151.  
 Cell structure and function; macromolecular synthesis; energy metabolism; molecular aspects of development; principles of genetics.

**BIOMECHANICS BIM**

**590\*. Special Problems in Biomechanics**  
 Fall, Spring, Summer. 1(01-00) May reenroll for a maximum of 22 credits.  
 R: Not open to freshmen and sophomores.  
 Approval of department.  
 Each student works under faculty direction on an experimental, theoretical, or applied problem.  
 QP: DEPT.APP QA: BIM 590

**601\*. Osteopathic Manipulative Medicine Clerkship**  
 Fall, Spring, Summer. 4 to 12 credits in increments of 2 credits.  
 P: Units I and II. R: Open only to graduate-professional students in the College of Osteopathic Medicine.  
 Advanced training in the diagnosis of musculoskeletal dysfunction and application of osteopathic manipulative techniques.  
 QA: BIM 601

**620\*. Directed Studies**  
 Fall, Spring, Summer. 2 to 10 credits in increments of 2 credits. May reenroll for a maximum of 10 credits.  
 R: Open only to students in the College of Osteopathic Medicine. Approval of department.  
 Individual or group work on special problems related primarily to the biomechanics of the musculoskeletal system.  
 QA: BIM 620

**800\*. Special Topics**  
 Fall, Spring, Summer. 1(01-00) May reenroll for a maximum of 3 credits.  
 R: Open only to graduate students. Approval of department.  
 Directed study in topics of biomechanics.  
 QP: DEPT.APP QA: BIM 800

**810\*. Tissue Biomechanics**  
 Fall. 3(02-02)  
 R: Open only to Biomechanics graduate students.  
 Integrate concepts of tissue mechanics and microstructure, develop experimental methods to study connective tissue mechanics using engineering principles.  
 QA: BIM 812 BIM 871

**811\*. Biomechanical Analysis**  
 Fall. 2(02-00)  
 R: Open only to Biomechanics graduate students.  
 Methods for analysis of biokinematic and biokinetic data.  
 QA: BIM 805

**812\*. Experimental and Analytical Biodynamics**  
 Spring. 3(02-02)  
 P: BIM 811.  
 Experimental and analytical methods to measure and interpret biodynamics of musculoskeletal system.  
 QP: BIM 805 QA: BIM 811 BIM 873

**813\*. Biokinematics**  
 Spring. 3(02-02)  
 P: BIM 811.  
 Size, position, and mobility of the human body as a mechanical linkage system. Detailed study of body joints and kinematic models.  
 QP: BIM 805 QA: BIM 810 BIM 872

**840\*. Therapy of Connective Tissue Mechanics**  
 Fall. 3(03-00)  
 P: BIM 810.  
 Mechanical properties, chemical content, and anatomical structure in connective tissues.  
 QP: BIM 812 QA: BIM 812

**841\*. Theory of Neuromuscular Mechanics**  
 Fall. 3(03-00)  
 R: Open only to Biomechanics graduate students.  
 Neurological control of joint mechanics.  
 QA: BIM 810 BIM 805

**842\*. Theory of Joint Mechanics**  
 Fall. 3(03-00)  
 P: BIM 813.  
 Motion and force transmission, and their relationship to anatomical structure and tissue function in joints.  
 QP: BIM 810 QA: BIM 810 BIM 805

**860\*. Occupational Biomechanics**  
 Fall. 3(03-00)  
 P: BIM 813.  
 Applications of biomechanics in ergonomics with emphasis on the whole body.  
 QP: BIM 810 QA: BIM 810

**861\*. Clinical Biomechanics**  
 Fall. 3(03-00)  
 R: Open only to Biomechanics graduate students.  
 Application of biomechanics to medicine.

**890\*. Independent Study**  
 Fall, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 22 credits.  
 R: Open only to graduate students in Biomechanics. Approval of department.  
 Individual or group work related to biomechanics and/or neuromuscular system.  
 QP: P

**895\*. Experimental Research Methods**  
 Fall. 1(00-02)  
 R: Open only to Biomechanics graduate students.  
 Methods of experimental research in biomechanics.  
 QA: BIM 871 BIM 872 BIM 873

**899\*. Master's Thesis Research**  
 Fall, Spring, Summer. 1 to 25 credits. May reenroll for a maximum of 25 credits.  
 R: Open only to Biomechanics graduate students. Approval of department.  
 QP: DEPT.APP QA: BIM 899

**BIOMEDICAL ENGINEERING BME**

**311\*. Introduction to Biomedical Engineering**  
 Fall. 3(3-0) Interdepartmental with the Department(s) of Metallurgy, Mechanics, and Materials Science, Chemical Engineering, Mechanical Engineering, Electrical Engineering, Metallurgy, Mechanics, and Materials Science.  
 P: MTH 235, PHY 184, BS 210  
 Physical and mechanical properties of soft and hard tissues. Biomaterials. Biocompatibility. Biochemical processes, biological transport and thermodynamics. Bioelectronics and instrumentation.  
 QP: MTH 310 PHY 289BS 210

**405\*. Biomedical Electronics**  
 Fall of even-numbered years. 3(3-0)  
 Interdepartmental with the Department(s) of Electrical Engineering.  
 P: MTH 132, PHY 184.  
 Electronic components and circuits. Physiological measurements, transduction of physiological events to electrical signals. Ultrasonic techniques, biomedical applications of lasers, x-ray and magnetic resonance imaging.  
 QP: MTH 112 PHY 238 QA: BME 410

**424\*. Biomaterials and Biocompatibility**  
 Spring of even-numbered years. 3(3-0)  
 Interdepartmental with the Department(s) of Metallurgy, Mechanics, and Materials Science, Metallurgy, Mechanics, and Materials Science.  
 P: BME 311, PSL 245  
 Materials science of human implantable materials. Design requirements imposed by the body's milieu and the need to protect it.  
 QP: PSL 240 ORPSL 430 QA: BME 424

**431\*. Biological Transport Mechanisms**  
 Fall of odd-numbered years. 3(3-0)  
 Interdepartmental with the Department(s) of Chemical Engineering, Mechanical Engineering.  
 P: BME 311 and MTH 235  
 Mechanisms which govern transport of momentum, heat and mass. Application to the mathematical description of transport processes in biological systems and to solution of biomedical problems.  
 QP: MTH 215 QA: BME 431

**441\*. Tissue Mechanics**  
 Spring of odd-numbered years. 3(3-0)  
 Interdepartmental with the Department(s) of Metallurgy, Mechanics, and Materials Science, Metallurgy, Mechanics, and Materials Science.  
 P: BME 311.  
 Application of solid mechanics to understanding mechanical responses of biological tissues. Microstructure and biological function for soft and hard connective tissues and muscle.  
 QP: ANT 316 QA: BME 481

**491\*. Special Topics (MTC)**  
 Fall, Spring. 3 to 12 credits. May reenroll for a maximum of 12 credits.  
 P: BME 311.  
 Special topics in biomedical engineering or bioengineering such as biochemical design, occupational biomechanics, biological surface science, or low temperature biotechnology.  
 QP: APPROVAL QA: BME 499

**491A\*. Biomechanical Design**  
 . 3(3-0)  
 P: BME 311, MMM 211, MMM 306.  
 Special topics in biomedical engineering or bioengineering of current interest and importance.  
 QP: APPROVAL QA: BME 499

**491B\*. Occupational Biomechanics**  
 . 3(3-0)  
 P: BME 311.  
 Special topics in biomedical engineering or bioengineering of current interest and importance.  
 QP: APPROVAL QA: BME 499

**491C\*. Biological Surface Science**  
 . 3(3-0)  
 P: BME 311.  
 Special topics in biomedical engineering or bioengineering of current interest and importance.  
 QP: APPROVAL QA: BME 499