

**Descriptions - Biomechanics  
of  
Courses**

**601. Osteopathic Manipulative Medicine Clerkship**  
Fall, Winter, Spring, Summer. 6 credits. May reenroll for a maximum of 12 credits. Grade P in all courses offered in terms 1 through 8.

Advanced training in the diagnosis of musculoskeletal dysfunctions and application of osteopathic manipulative techniques in patient care.

**620. Directed Studies**  
Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 24 credits. Approval of department.

Individual or group work on special problems related to biomechanics, neuromusculoskeletal system primarily.

**890. Independent Study**  
Fall, Winter, Spring, Summer. 1 to 8 credits. May reenroll for a maximum of 32 credits. Approval of department.

Individual or group work related to biomechanics and/or neuromusculoskeletal system.

**431. Biological Transport Mechanisms**  
Spring. 3(3-0) MTH 215.

Mechanisms which govern transport or momentum, heat and mass. Application to mathematical description of transport processes in biological systems and to solution of biomedical problems.

**481. Tissue Biomechanics**  
Fall. 3(3-0) ANT 316 or approval of department.

Fundamentals of continuum mechanics in relation to morphological classification of tissue. Mechanical properties of connective and muscle tissue.

**499. Independent Study**  
Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 9 credits. Approval of instructor.

Individual reading and research under the supervision of a member of the Biomedical Engineering Committee.

**804B. Neuroscience Laboratory II**  
Spring. 4(2-4) PSY 804A. Interdepartmental with the departments of Physiology, Psychology, and Zoology. Administered by the Department of Psychology.  
Continuation of BPY 804A.

**821. Molecular Biophysics**  
Winter of even-numbered years. 4(4-0) Approval of department.

Theoretical/experimental methods for determination of electronic structure, excited states and spectroscopy of biological systems. Biological energy transfer. Quantum processes in photosynthesis. Exciton effects in photoreceptors and pigments. Conformational changes.

**824. Membrane Biophysics**  
Winter of odd-numbered years. 4(3-2) Approval of department.

Membrane Biophysics will cover interfacial phenomena in biology and chemistry; structure and function, theoretical and experimental models for biological membranes; membrane biochemistry. Labs will emphasize biomolecular lipid membrane (BLM) techniques.

**826. Cellular Biophysics**  
Spring of odd-numbered years. 4(4-0) Approval of department.

Basic cell structure and function at the molecular level. Emphasis will be on genetic and molecular controls of cellular systems.

**834. Membranes: Natural and Artificial**  
Spring of odd-numbered years. 2 to 3 credits. May reenroll for a maximum of 3 credits. Approval of department.

Emphasis is placed on the biophysical and biochemical characterization of biological membranes and their theoretical and experimental models. Presentation and discussion by students and staff of recent advances in membrane research.

**850. Simpler Systems Approaches to Learning and Memory**  
Winter of odd-numbered years. 4(4-0) BPY 450 or BPY 827.

Simpler invertebrate and vertebrate, nervous systems which have been or could be useful for electrophysiological and molecular approaches to learning and memory.

**865. Advanced Neurobiology**  
(BIM 865.) Spring. 4(4-0) BPY 827. Interdepartmental with the departments of Anatomy, Physiology, Psychology, and Zoology. Administered by the Department of Anatomy.  
Basic organization structure and function of neural networks comprising sensory, motor, and autonomic systems including examples from invertebrates and vertebrates. Attendance at neuroscience seminar is required.

**880. Special Topics in Biophysics**  
Fall, Winter, Spring, Summer. Variable credit. May reenroll for a maximum of 15 credits.

Special topics within the five subdivisions of biophysics; structure, organization and function of biological phenomena, sensory perception, and psychophysics and biomechanics.

**890. Readings in Biophysics**  
Fall, Winter, Spring, Summer. 3 to 6 credits. Approval of department.

Reading course in special topics adapted to the individual preparation and needs of the student.

**BIOPHYSICS BPY**

**College of Human Medicine  
College of Natural Science**

**402. Introductory Biophysics: Molecular and Thermal**  
Spring. 3(3-0) One year organic chemistry or biochemistry; 1 year biology, PHY 239, PHY 259, MTH 113, or approval of department.

Salient features of biophysics; principles and methods. Structure, function, and organization of biologic molecules; molecular biophysics; thermal biophysics; bioenergetics and photobiology.

**403. Introductory Biophysics: Membranes and Electrical**  
Fall. 3(3-0) One year organic chemistry or biochemistry, PHY 239, PHY 259; MTH 113 or approval of department.

Salient features of biophysics, principles and methods; radiation biophysics; membrane biophysics; bioelectric phenomena; neurobiology; and psychophysics.

**450. Introduction to the Nervous System**  
Spring of even-numbered years. 3(3-0) B S 211, B S 212.

Nervous structure and function from protozoa (aneural) to mammals normal and abnormal innate and learned behavior in animals and humans from the cellular level to the intact organism; emergence of mind and consciousness.

**499. Independent Study**  
Fall, Winter, Spring, Summer. 1 to 5 credits. May reenroll for a maximum of 15 credits. Approval of department.

Undergraduate research under one of our faculty.

**804A. Neuroscience Laboratory I**  
Winter. 4(2-4) Approval of instructor. Interdepartmental with the departments of Physiology, Psychology, and Zoology. Administered by the Department of Psychology.

Development of skills in the methods, techniques and instrumentation necessary for research in a variety of areas concerned with neuroscience.

**BIOMEDICAL ENGINEERING BME**

**College of Engineering**

**410. Electronic Instrumentation in Biology and Medicine**  
Fall. 4(4-0) MTH 112, PHY 238 or approval of instructor.

Electronic components and circuits. Physiological measurements. Transduction of physiological events to electrical signals. Detection of physiological events by electrical impedance measurements. Ultrasonic techniques in biomedical systems. Biomedical applications of lasers.

**411. Electric Theory of Nerves**  
Winter of odd-numbered years. 4(4-0) MTH 310; PHY 288.

Neurophysiology: basic organization, structure, function and electrical activity of neurons. Subthreshold membrane phenomena: Nernst-Planck equations, constant field membrane model, electrotonus. Membrane action potentials; voltage clamp experiments, Hodgkin-Huxley equations, computer simulation.

**414. Clinical Instrumentation**  
Winter of even-numbered years. 3(3-0) BME 410.

Ultrasound theory and applications in medicine. Photoelectric, piezoelectric and temperature transducers. Detection of physiological events by impedance measurements. Radiology and x-ray techniques. Isotopes and nuclear medicine. Lasers in medicine. Field trips required.

**424. Materials in Biomedical Engineering**  
Winter. 3(3-0) PSL 240 or PSL 431 or approval of department.

Basics of materials science. Biocompatibility of metals, polymers and ceramics. Internal and external prosthetic materials.

- 899. Master's Thesis Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- 990. Biophysics Seminar**  
Fall, Winter, Spring, Summer. 1 credit. May reenroll for a maximum of 3 credits. Approval of department.
- 999. Doctoral Dissertation Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

**BOTANY AND  
PLANT PATHOLOGY      BOT**

**College of Agriculture and Natural Resources  
College of Natural Science**

- 201. Plants, People and the Environment (N)**  
Fall, Spring. 3(3-0)  
Relevance of plants to modern society. Basic botanical concepts and socially significant groups of plants. Natural resource exploitation. Plants as they relate to human population growth, food production, and energy resource depletion.
- 205. Plant Biology**  
Fall. 3(3-0) High school chemistry and high school algebra.  
An introduction to plant science for students seeking a general knowledge of the principles of plant biology as well as for prospective plant science majors.
- 301. Introductory Plant Physiology**  
Winter, Spring. 4(2-4) CEM 141 or CEM 151; CEM 161; BOT 205 or B S 210 or LBS 141. Introductory organic chemistry recommended.  
General principles of plant physiology relating plant structure to function. Topics include cell physiology, water relations, effects of light and temperature, respiration, photosynthesis, mineral nutrition, and hormone action.
- 302. Introductory Morphology**  
Fall, Winter. 4(2-4) B S 212 or approval of department.  
Structures and life cycles of representative plant groups showing progressive evolutionary developments.
- 318. Introductory Plant Systematics**  
Spring. 4(2-3) BOT 302 or B S 212 or approval of department.  
Plant diversity with emphasis on identification, classification, nomenclature, and evolutionary relationships of vascular plants.

- 335. Fossil Plants, Their History and Paleoecology**  
Spring. 3(3-0) One course in geology or botany or biology or approval of department. Interdepartmental with and administered by the Department of Geology.  
History of plants through geologic time; their form and evolution; how and where found, identified and reconstructed; their use in determining ancient geographic patterns, paleoenvironments, paleoclimates and community structure. Field trip.

- 336. Economic Plants**  
Spring. 3(3-0)  
Histories, characteristics, and origins of plants used in industrial processes, drug manufacture, and agriculture. Nontechnical to broaden student's cultural interest in plants.

- 400. Aquatic Plants**  
Fall. 3(2-3) BOT 318 or BOT 302. Students may not receive credit in both BOT 400 and BOT 423.  
Aquatic plants, their classification, ecology and economic importance. Relationships to problems in fisheries, in wildlife management, and to role in limnology. Experience for student in plant ecology, aquatic biology, and water sanitation.

- 400H. Honors Work**  
Fall, Winter, Spring. 3(0-6) Approval of department; Seniors.

- 401. Special Problems**  
Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 16 credits. BOT 302, Seniors, approval of department.  
Students with special ability may carry on laboratory research or study of published literature on a selected topic.

- 402. Introductory Mycology**  
Fall. 4(2-6) B S 212 or LBS 140 or approval of department.  
Survey of the fungi including characteristics, habits and diversity. Background course for biology students or those expecting to specialize in microbiology, mycology, plant pathology, or other fields involving fungi.

- 405. Introductory Plant Pathology**  
Fall. 4(2-4) BOT 302 or B S 212 or approval of department. Students may not receive credit in both BOT 405 and BOT 407.  
General principles of plant pathology including detailed study of selected diseases as examples of important groups.

- 406. Medical Mycology**  
Fall, Spring. 4(2-6) BOT 402 or approval of department. Interdepartmental with the Department of Microbiology and Public Health.  
Characteristics, habits, and laboratory identification of fungus diseases infecting humans. Emphasis on laboratory techniques and morphological characteristics of the various mycoses.

- 407. Diseases of Forest and Shade Trees**  
Spring. 4(3-2) BOT 301; BOT 302; BOT 318 or FOR 204. Students may not receive credit in both BOT 405 and BOT 407.  
Diseases which affect trees in forests, parks, suburbs and nurseries, and methods of control.

- 408. Freshwater Ecology**  
Summer. 6 credits. B S 212 or approval of department. Given at W. K. Kellogg Biological Station. Interdepartmental with Biological Science and the Department of Zoology. Administered by Biological Science.  
The ecology of freshwater ecosystems, their biotic structure, and the functional interrelationships of environmental variables regulating population dynamics, productivity and community structure. Extensive field investigations.

- 409. Plant Disease Control**  
(883.) Winter of odd-numbered years. 3(3-0) BOT 405.

Principals and methods in controlling plant diseases. Considerable emphasis is placed on the chemistry of fungicides, and their role in controlling plant diseases. Other factors affecting disease epidemiology are covered.

- 410. Terrestrial Ecology**  
Summer. 6 credits. B S 212 or approval of department. Given at W. K. Kellogg Biological Station. Interdepartmental with Biological Science and the Department of Zoology and administered by Biological Science.  
Extensive field investigations of several types of terrestrial communities. Interrelationship of plants, animals, and environment. Factors determining distribution and abundance.

- 411. Systematic Botany**  
Summer. 4(2-6) B S 212 or approval of department. Students may not receive credit in both BOT 411 and BOT 425.  
Taxonomy, identification, and evolutionary relationships of vascular plants, illustrated by the local flora; extensive field studies.

- 413. Environmental Plant Physiology**  
Fall. 3(3-0) B S 210 or LBS 141 or BOT 205.  
Major topics include plant-soil-water relationships, gas exchange, and stress physiology. Minor topics include mineral nutrition and energy budgets.

- 414. Plant Physiology: Metabolism**  
Fall. 5(3-4) CEM 241; B S 210 or LBS 141 or BOT 205; BOT 301.  
General principles underlying plant metabolic processes. Nutrient requirements, photosynthesis, translocation, respiration, nitrogen metabolism, and structures associated with these processes.

- 415. Plant Physiology: Growth and Development**  
Spring. Summer of even-numbered years. 5(3-4) BOT 414 or approval of department.  
Growth and development in plants. Topics include the chemistry and effects of hormones, tropisms, thermoperiodicity, reproduction, vernalization and photoperiodism, photomorphogenesis, dormancy, and biological clocks.

- 421. Field Studies of Freshwater Algae**  
Summer. 3 credits. Students may not receive credit in both BOT 421 and BOT 447. One year of botany or zoology or approval of department. Given at W. K. Kellogg Biological Station.  
An ecological approach to the study of freshwater algae. Algal taxonomy, morphology, life histories and distribution. Emphasis on 'ecological indicator' groups. Extensive field collections. Methods of collection, preservation, and enumeration.

- 423. Introduction to Aquatic and Wetland Plants**  
Summer. 3 credits. Students may not receive credit in both BOT 423 and BOT 400. One year of botany or approval of department. Given at W. K. Kellogg Biological Station.  
Extensive exposure to plants in aquatic environments. Emphasis on systematics, morphology, evolution and community relations. Survey of diverse wetland and aquatic habitats with numerous field trips.