

**Descriptions — Biomechanics  
of  
Courses**

**890. Independent Study**  
Fall, Winter, Spring, Summer. 1 to 8 credits. May re-enroll for a maximum of 32 credits. Approval of department.  
Individual or group work related to biomechanics and/or neuromusculoskeletal system.

**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. 4(4-0) MTH 215, 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.

**424. Materials in Biomedical Engineering**  
Winter. 3(3-0) PSL 331 or approval of department.

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

**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.

**BIOPHYSICS BPY**

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

**402. Introductory Biophysics: Molecular and Thermal**

Winter. 3(3-0) One year organic chemistry or biochemistry; 1 year biology, PHY 239, 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**  
Spring. 3(3-0) One year organic chemistry or biochemistry, PHY 239, 259; MTH 113 or approval of department.

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

**IDC. Biological Membranes**  
For course description, see Interdisciplinary Courses.

**480. Special Topics in Biophysics**  
Fall, Winter, Spring, Summer. 2 to 4 credits. Approval of department; 402 recommended.

Special topics within five areas of biophysics: structure-function correlation, neurobiophysics, membrane biophysics, molecular biophysics, or theoretical biophysics.

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

Undergraduate research under one of our faculty.

**821. Molecular Biophysics**  
Winter. 5(3-4) 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.

**822. Charge Transport and Solid State Processes**  
Spring of even-numbered years. 4(3-2) Approval of department.

Fundamental electrical properties, dielectric properties and photoconductivity effects and their relevance to the biological functioning of these molecules.

**824. Membrane Biophysics**  
Fall of even-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 bimolecular lipid membrane (BLM) techniques.

**825. Basic Neurobiology**  
Winter of odd-numbered years. 4(3-2) Approval of department.

A comparative survey of fundamental principles of nervous organization will be undertaken in lectures. Laboratory will emphasize examination of prepared neuroanatomical material and a demonstration of important neurophysiological phenomena.

**826. Cellular Biophysics**  
Spring of odd-numbered years. 4(3-2) 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 re-enroll 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.

**865. Advanced Neurobiology**  
Spring. 3(3-0) 825. Interdepartmental with the departments of Biomechanics, Physiology, Psychology and Zoology and administered by the Department of Biomechanics.

Basic organization, structure and function of neural networks comprising sensory, motor, and autonomic systems including examples from invertebrates and vertebrates.

**880. Special Topics in Biophysics**  
Fall, Winter, Spring, Summer. Variable credit. May re-enroll 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.

**885. Vertebrate Neural Systems I**  
Fall of odd-numbered years. 5(3-4) Approval of department: ANT 815 and BPY 825 recommended. Interdepartmental with the departments of Zoology, Physiology and Psychology and administered by the Department of Psychology.

Structure and function of major component systems of vertebrate brains, their evolution, ontogeny and comparative analysis in mammals, birds, reptiles, amphibians and fish. Interrelation of behavioral, anatomical and physiological studies.

**886. Vertebrate Neural Systems II**  
Winter of even-numbered years. 5(3-4) PSY 885. Interdepartmental with the departments of Psychology, Physiology and Zoology and administered by the Department of Zoology.  
Continuation of 885. Major component systems of vertebrate brains, their evolution, ontogeny, and comparative analysis in mammals, birds, reptiles, amphibians and fish. Interrelation of behavioral, anatomical, and physiological studies.

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

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

**899. Research**  
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

**922. Thermal Biophysics**  
Spring of odd-numbered years. 3(3-0) Approval of department.

Applications of thermodynamics and statistical mechanics to biology. Absolute theory of rate processes. Thermal denaturation of biomacromolecules. Thermal death of viruses, unicellular organisms and poikilotherms. Aging and death in mammals.

**990. Biophysics Seminar**  
Fall, Winter, Spring, Summer. 1 credit. May re-enroll for a maximum of 3 credits. Approval of department.

999. **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

- 1DC. **Resource Ecology and Man**  
For course description, see Interdisciplinary Courses.

201. **Plants, Man and the Environment**  
Winter, Spring. 3(3-0)

Relevance of plants to modern society on issues such as food production, environmental quality, drug use and abuse, and the exploitation of plants in natural areas for commercial purposes.

205. **Plant Biology**  
Winter. 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**  
Fall, Spring. 4(2-4) CEM 131 or 141; 161; BOT 205 or B S 210 or LBC 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) 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 Paleogeology**

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) 318 and/or 302.

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 re-enroll for a maximum of 16 credits. 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**  
Winter. 4(2-6) B S 212 or LBC 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) 302 or B S 212 or approval of department. Students may not receive credit in both 405 and 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) 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) 301; 302; 318 or FOR 204. Students may not receive credit in both 405 and 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 and 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.

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.

Factors determining distribution and abundance. Interrelationship of plants, animals, and environment. Extensive field investigations of several types of terrestrial communities in light of current theory.

411. **Systematic Botany**  
Summer. 4(2-6) B S 212 or approval of department.

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 LBC 141 or BOT 205.

Major topics include plant soil-water relationships and gas exchange. Mineral nutrition, energy budgets, and stress physiology will be discussed briefly.

414. **Plant Physiology: Metabolism**  
Winter, Summer of odd-numbered years. 5(3-4) CEM 241; B S 210 or LBC 141 or BOT 205; 301 or 413.

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) 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.

427. **Cell Biology**  
Winter, Summer of odd-numbered years. 4(4-0) BCH 200 and one year of general botany or general zoology.

Cell organization and distribution of standard inclusions. Structure and function of the nucleus and other cytoplasmic organelles.

431. **Histological Techniques**  
Winter. 4(2-6) 302.

Preparation of plant materials for microscopic study. Special emphasis on the many variations in microtechnique, including paraffin and celloidion embedding, freezing microtomy and ultrathin sectioning for electron microscopy.

434. **Plant Anatomy**  
Fall, Summer of even-numbered years. 4(2-4) 302.

Principles underlying the differentiation and growth of vegetative plant structures with special emphasis upon their functional and developmental genetic relationships.

441. **Phytogeography**  
Winter. 3(3-0) 302.

Distribution of plants over the earth, with special reference to North America. Geological history and environmental factors which influence distribution.

447. **Fresh Water Algae**  
Spring. 4(2-4) One year botany or zoology. Primarily for students in Fisheries Biology, Wildlife Management and Sanitary Engineering.

Identification of fresh water algae, especially those forms concerned with fish food problems, water contamination and limnology. Methods for making analyses of samples for biological survey work on lakes and streams. Economic aspects and life histories of the algae.

450. **Ecology**  
Spring. 4(2-4) 318; 301 or 414  
Interrelationship of plants and environment. Factors which govern their distribution.