

## Descriptions — Biochemistry

of

### Courses

#### 831. *Physiological Biochemistry I*

Winter. 3(3-0) BCH 401.

Physiological biochemistry, with emphasis on metabolic interpretation of normal and altered physiological states of the human organism and appropriate animal models.

#### 832. *Physiological Biochemistry II*

Spring. 3(3-0) BCH 831.

Continuation of BCH 831.

#### 855. *Special Problems*

Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 12 credits. Approval of department.

Consideration of current problems.

#### 856. *Plant Genetics and Molecular Biology*

Spring of even-numbered years. 3(3-0)

Approval of department and a course in introductory genetics. Interdepartmental with Genetics and the Department of Botany and Plant Pathology. Administered by the Department of Botany and Plant Pathology.

Recent advances in genetics and molecular biology of higher plants.

#### 864. *Plant Biochemistry*

Spring. 4(4-0) BCH 401, BOT 301 or approval of department. Interdepartmental with the Department of Botany and Plant Pathology.

Metabolism of nitrogen-compounds, carbohydrates, and lipids unique to plants' cell organelles; photosynthesis; photorespiration; dark respiration; cell walls; lectins; nitrogen cycle including nitrogen fixation; sulfur cycle.

#### 888. *Laboratory Rotation*

Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 15 credits. Graduate student majors; approval of department.

Participation in research laboratories to learn experimental techniques and research approaches, broaden research experience, and assess research interests prior to selecting a thesis adviser.

#### 899. *Master's Thesis Research*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

#### 960. *Selected Topics in Biochemistry*

Fall, Winter, Spring. 1 to 3 credits. May reenroll for a maximum of 10 credits if different topics are taken. Approval of department.

Topics will be selected from the areas of biochemical genetics, biochemistry of development, biochemical evolution, complex proteins, lipid metabolism, immunochemistry, hormones, control mechanisms and structure of biological macromolecules.

#### 961. *Selected Topics in Biochemistry*

Fall, Winter, Spring. 1 to 3 credits. May reenroll for a maximum of 10 credits if different topics are taken. Approval of department.

Topics will be selected from the areas of bioenergetics, bioinstrumentation, complex carbohydrates, mechanisms of enzyme action, natural products, carbohydrate metabolism, mass spectrometry and biochemistry of isoprenoid compounds.

#### 978. *Seminar in Biochemistry*

Fall, Winter, Spring. 1(1-0). May reenroll for a maximum of 8 credits. Approval of department.

#### 999. *Doctoral Dissertation Research*

Fall, Winter, Spring, Summer. Variable credit. Approval of department.

## BIOLOGICAL SCIENCE B S

### College of Natural Science

The content of courses 400, 405, and 420, as well as the research and problems courses 499, 800 and 899, may vary from term to term. Brochures giving detailed information about individual courses are available in the Office of the Assistant Dean for Lifelong Education in the College of Natural Science. These courses are primarily designed for in-service teachers and interested adults and are offered in off-campus locations.

#### 202. *Introductory Biology for Non-Science Majors*

Fall, Winter, Spring, Summer. 4(3-3) 12 credits in general education natural science courses.

Concepts, procedures, and perspectives appropriate to developing a basic literacy in biology with emphasis on fundamental biological principles and their relation to world society. Appropriate preparation for pre-service elementary teachers.

#### 210. *General Biology*

Fall, Spring. 4(4-2) Not open to students with credit in LBS 141.

Principles of biological organization: scientific method, biochemistry, cell biology, and evolution.

#### 211. *General Biology*

Fall, Winter, Summer. 4(4-2) CEM 140 or high school chemistry. Not open to students with credit in LBS 242.

Principles of biological regulation and integration: genetics, development, and selected physiological topics.

#### 212. *General Biology*

Winter, Spring, Summer. 4(4-2) Not open to students with credit in LBS 140.

Principles of biological diversity: taxonomy and systematics, comparative physiology, and ecology.

#### 400. *Biological Science for Teachers*

Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 12 credits. Teacher certification with science major or minor.

A course for in-service teachers, topics will be selected from actual classroom problems of the participants. Stress will be placed on field, laboratory and inquiry teaching.

#### 405. *Topics in Biological Science*

Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 8 credits if different topic is taken. Approval of department.

Presentation of single topics from the biological sciences by senior faculty and guest lecturers. Topics are selected to facilitate development of strong biological science programs in schools.

#### 418. *Field Biology for Teachers*

Fall, Winter, Spring, Summer. 4 credits. Biology course or approval of department.

Field investigation and interpretation of prairie, dune, forest and wetland communities. An ecosystem approach to ecological concepts. Natural history and identification of key species. Field trips required.

#### 420. *Seminar in Recent Advances in Biological Science*

Fall, Winter, Spring, Summer. 1 to 3 credits. May reenroll for a maximum of 6 credits if different topic is taken. Approval of department.

A series of lectures by senior faculty of topics on the history, development, the most recent advances and the possible future and limits of the Biological Sciences.

#### 460. *Ornithology for Teachers*

Summer. 3 credits. A course in biology or approval of department. Not open to Zoology majors. Given at W. K. Kellogg Biological Station. Interdepartmental with and administered by the Department of Zoology.

Distribution, breeding cycles, migration, food and feeding habits, voice and other important areas of avian biology. Emphasis on field identification and natural history.

#### 499. *Research*

Fall, Winter, Spring. 2 to 4 credits. May reenroll for a maximum of 12 credits. Approval of director of biological science program and student's adviser.

Undergraduates are invited on an individual basis into research laboratories of faculty in biological departments of the college. After three terms of research, a presentation in thesis form is produced and defended.

#### 800. *Problems in Biological Science*

Fall, Winter, Spring. 1 to 6 credits. May reenroll for a maximum of 18 credits. B.S. degree in biological science.

#### 805. *Outdoor Environmental Studies*

Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 9 credits if different topics are taken. B S 418 or ZOL 460 or approval of department.

Emphasis on environmental understanding. Development of educational materials through team research and testing. Trials of materials with elementary, middle, secondary school or college students.

#### 899. *Master's Thesis Research*

Fall, Winter, Spring. Variable credit. Approval of department.

## BIOMECHANICS BIM

### College of Osteopathic Medicine

#### 500. *Basic Concepts in Biomechanics*

Winter. 2(2-0) Admission to a college of medicine or approval of department. Interdepartmental with the College of Osteopathic Medicine.

Basic concepts of biomechanics and their relationship to functional anatomy and osteopathic manipulative therapy.

**561. Clinical Craniosacral Manipulative Therapy**  
Spring. 1 to 3 credits. Approval of department.

Basic concepts of the craniosacral system, clinical applications.

**590. Special Problems in Biomechanics**  
Fall, Winter, Spring, Summer. 1 to 8 credits. May reenroll for a maximum of 32 credits. Approval of department.

Each student will work under direction of a faculty member on an experimental, theoretical or applied problem.

**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.

**800. Special Topics**

Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 9 credits. Approval of department.

Independent study in topics of biomechanics.

**810. Biokinematics**

Fall. 3(3-0) Approval of department.

Motion of the human body including detailed studies of body joint and linkage motion.

**811. Biokinetics**

Winter. 3(3-0) BIM 810.

Application of Newtonian mechanics to problems of force transmission and related motions in the muscular-skeletal system.

**812. Theory of Tissue Mechanics**

Spring. 3(3-0) Approval of department.

Introduces the concepts of stress and strain in tissue and the dependency of mechanical parameters on biological factors.

**850. Research Seminar**

Fall, Winter, Spring. 1(1-0) May reenroll for a maximum of 3 credits. Approval of department.

Discussion of current research topics in biomechanics with strong clinical application.

**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.

**899. Master's Thesis Research**

Fall, Winter, Spring, Summer. Variable credit. May reenroll for a maximum of 12 credits. Approval of department.

Conduct research for master's thesis.

## **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. Sub-threshold 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.

**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.

## **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 Paleocology**

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.