

**Descriptions — Biochemistry
of
Courses**

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.

400. Biological Science for Teachers
Fall, Winter, Spring, Summer, 3 to 4 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 3 credits. May reenroll for a maximum of 6 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.

408. Freshwater Ecology
Summer, 6 credits. B S 212 or approval of department. Given at W. K. Kellogg Biological Station. Interdepartmental with the departments of Zoology, and Botany and Plant Pathology.
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. Approved through Spring 1985.

410. Terrestrial Ecology
Summer, 6 credits. B S 212 or approval of department. Given at W. K. Kellogg Biological Station. Interdepartmental with the departments of Botany and Plant Pathology, and Zoology.
Extensive field investigations of several types of terrestrial communities. Interrelationship of plants, animals, and environment. Factors determining distribution and abundance. Approved through Spring 1985.

418. Field Biology for Teachers
Summer, 4(2-5) Biology course or approval of department. Given at the W. K. Kellogg Biological Station.
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
(451.) 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. Given at W. K. Kellogg Biological Station.
Emphasis on environmental understanding. Development of educational materials through team research and testing. Interaction with elementary and middle school children in two-week outdoor oriented workshop.

899. Master's Thesis Research
Fall, Winter, Spring, 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, 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, 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, 4(4-2) Not open to students with credit in LBS 140.
Principles of biological diversity: taxonomy and systematics, comparative physiology, and ecology.

BIOMECHANICS BIM

College of Osteopathic Medicine

500. Basic Concepts in Biomechanics
Fall, 2(2-0) Admission to a college of medicine or approval of department. Interdepartmental with and administered by the College of Osteopathic Medicine.
Basic concepts of biomechanics and their relationship to functional anatomy and osteopathic manipulative therapy.

560. Acupuncture and Other Peripheral Stimulation Therapy
Winter, 1 to 3 credits. Approval of department.
Clinical application of traditional Chinese acupuncture and related peripheral stimulation therapies.

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 4 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.

BIOPHYSICS BPY

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

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
Approved through Summer 1985.

990. Biophysics Seminar
Fall, Winter, Spring, Summer. 1 credit. May reenroll for a maximum of 3 credits. Approval of department.
Approved through Summer 1985.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
Approved through Summer 1985.

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.