BIOLOGICAL SCIENCE B S

College of Natural Science

The content of courses 400, 405, 420, 440, 450 and 451, as well as the research and problems courses 499, 800 and 999, may vary from term to term. Brochures giving detailed information about individual courses are available in the Science and Mathematics Teaching Center and the Office of the Assistant Dean for Lifelong Education. These courses are primarily designed for in-service teachers and interested adults and are offered in off-campus locations.

200. *Studies in Contemporary Biological Science*

Spring. 3(3-0) 12 credits in a Department of Natural Science sequence.

Biological topics relating directly to contemporary problems of world society are presented after an introduction to the uses and limitations of science and to the world of biology.

200L. *Contemporary Biology Laboratory*

Spring. 1(0-3) 200 or concurrently.

Students practice processes and procedures of science in the laboratory, design and carry out a self-selected laboratory investigation of a biological topic, report and evaluate reports of scientific work.

202. *Biological Science for Elementary Teachers*

Fall, Winter, Spring. 4(3-3)

Fundamental principles of biology which provide background appropriate for preparation for elementary education teaching.

*210. *General Biology*

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

Concepts relating to basic attributes and diversity of living things.

*211. *General Biology*

Fall, Winter. 4(4-2) CEM 130 or high school chemistry. Not open to students with credit in LBC 242.

The structure and behavior of cells and their subunits, interactions of tissues, genetics, and the development, history and relations of organisms.

*212. *General Biology*

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

Continuation of 211.

400. *Biological Science for Teachers*

Fall, Winter, Spring, Summer. 3 to 4 credits. May re-enroll 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 re-enroll 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.

*For prerequisite purposes, the introductory biology sequence in Lyman Briggs College, LBC, 140, 141, 242, may be used instead of this sequence.

408. *Freshwater Ecology*

(413.) Summer. 6 credits. 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.

410. *Terrestrial Ecology*

Summer. 6 credits. 212 or approval of department. Given at W. K. Kellogg Biological Station. Interdepartmental with the departments of Botany and Plant Pathology and Zoology.

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.

420. *Seminar in Recent Advances in Biological Science*

Fall, Winter, Spring, Summer. 1 to 3 credits. May re-enroll 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.

430. *Introduction to Environmental Science*

Fall, Winter. 3(3-0)

Environmental approaches appropriate for teaching kindergarten – 12. Course will not emphasize teaching specific technical skills, but will cover many areas of environmental sciences. awareness, understanding and implementation will be stressed with classroom applications. *Approved through Winter term 1978.*

431. *Environmental Science for Teachers I*

Winter, Spring. 4(3-3) 430.

Techniques of using equipment to collect data about the environment such as air, water and soil samples. Also the scientific methods used by professional environmental scientists. *Approved through Spring term 1978.*

432. *Environmental Science for Teachers II*

Fall, Spring. 4(3-3) 431.

Continuation of 431. Implementation of the techniques learned in 431 into the school program. *Approved through Fall term 1978.*

440. *Man and Environment Workshop for Teachers*

Summer. 3 Credits. Approval of department. Given at W. K. Kellogg Biological Station.

Discussions and practical work sessions concerning the development of ideas and activities for environmental studies in and outside the classroom. Designed for intermediate and secondary inservice teachers.

450. *Outdoor Environmental Studies*

Summer. 3 credits. May re-enroll for a maximum of 9 credits when new topics are given. Teaching experience or approval of department. 451 must be taken same summer. Given at W. K. Kellogg Biological Station.

Emphasis on environmental understanding. Planning and developing interdisciplinary program for elementary and intermediate children.

*For prerequisite purposes, the introductory biology sequence in Lyman Briggs College, LBC, 140, 141, 242, may be used instead of this sequence.

451. *Outdoor Environmental Studies: Laboratory*

Summer. 5 credits. May re-enroll for a maximum of 15 credits when new topics are given. Teaching experience, 450. Given at W. K. Kellogg Biological Station.

Perfecting lesson plans and materials developed in 450, while interacting with elementary and intermediate children in four week outdoor activity oriented programs. Emphasis on environmental understanding.

499. *Research*

Fall, Winter, Spring. 2 to 4 credits. May re-enroll 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. Variable credit. B.S. degree in biological science.

999. *Research*

Fall, Winter, Spring. Variable credit. M.S. degree in biological science or equivalent.

Research in some phase of biological science, data to form the basis for the thesis required for the doctoral degree in biological science.

BIOMECHANICS BIM

College of Osteopathic Medicine

580. *Introduction to Athletic Medicine*

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

Health care of student athlete. Examination and evaluation of physical training sequences for high school athletes. Analyze functional role of musculoskeletal systems; illustrated in various high school sports.

590. *Special Problems in Biomechanics*

Fall, Winter, Spring, Summer. 1 to 8 credits. May re-enroll 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.

620. *Directed Studies*

Fall, Winter, Spring, Summer. 1 to 6 credits. May re-enroll for a maximum of 24 credits. Approval of department.

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

865. *Advanced Neurobiology*

Spring. 3(3-0) BPY 825. Interdepartmental with the departments of Biophysics, Physiology, Psychology and Zoology.

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

880. *Athletic Medical Systems*

(581.) Fall, Spring. 3(3-0) Bachelor's degree and involvement with secondary school athletics.

Health care systems for athletes in growth years. Physiological and psychological concepts applied to human development, training and care. Injury preventions, emergency medicine and rehabilitation stressed.

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.