IDC. Biological Membranes

For course description, see Interdisciplinary Courses.

499. Research

Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 12 credits. Approval of department.

A course designed to give qualified undergraduate students an opportunity to gain experience in biochemical research.

501. Medical Biochemistry

Winter, Summer. 3(3-0) or 5(5-0) May enroll for a maximum of 5 credits in BCH 501 and BCH 502 combined. Winter: College of Human Medicine students; Summer: College of Osteopathic Medicine students.

Basic biochemical principles and terminology of importance in medical biology.

502. Medical Biochemistry

Fall. 2(2-0) Three credits in BCH 501. Not open to students with five credits in BCH 501.

A continuation of BCH 501.

801. Biochemical Research Methods

Fall. 1(0-3) One year of organic chemistry or CEM 242; BCH 451 or BCH 811, or concurrently.

Discussions and demonstrations of selected experiemental techniques of wide application in biochemistry.

804. Advanced Biochemistry Laboratory

Fall. 3(0-8) Analytical chemistry; BCH 801 and BCH 811, or concurrently; biochemistry majors or approval of department.

Experiments to be selected from a representative group illustrating modern biochemical research.

805. Advanced Biochemistry Laboratory

Winter. 3(0-8) BCH 804; BCH 812 or concurrently; biochemistry majors or approval of department.

Experiments to be selected from a representative group illustrating modern biochemical research.

806. Advanced Biochemistry Laboratory

Spring. 3(0-8) BCH 805; BCH 813 or concurrently; biochemistry majors or approval of department.

Special experiments in advanced laboratory techniques.

811. Advanced Biochemistry

Fall. 4(4-0) One year of organic chemistry, one year of physical chemistry, one term of introductory biochemistry, BCH 801 taken previously or concurrently, or approval of department. Limited to graduate students in biochemistry or other students needing a similar professional preparation.

The structure and function of biomolecules, energy transformations and chemical reactions in living cells, regulation of cell reactions, and the replication of living organisms.

812. Advanced Biochemistry

Winter. 4(4-0) BCH 811.

Continuation of BCH 811.

813. Advanced Biochemistry

Spring. 4(4-0) BCH 812.

Continuation of BCH 812.

821. Biochemical Mechanism and Structure I

Fall. 2(2-0) BCH 401, one year of organic chemistry and physical chemistry or concurently; or approval of department.

Structures, methods of structural analysis, synthesis, and reactions mechanisms of biological substances including protein, carbohydrates, lipids, porphyrens, phosphate esters, enzymes and coenzymes.

822. Biochemical Mechanism and Structure II

Winter. 2(2-0) BCH 821 or approval of department.

Continuation of BCH 821.

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. Variable credit. May reenroll for a maximum of 12 credits. Approval of department.

Consideration of current problems.

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.

899. Master's Thesis Research

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

960. Selected Topics in Biochemistry

Fall, Winter, Spring, Summer. 1(1-0) or 2(2-0) May reenroll for a maximum of 6 credits if a different topic is 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, Summer. 1(1-0) or 2(2-0) May reenroll for a maximum of 6 credits if a different topic is 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. 0 or 1(1-0).

Presentation and discussion of reports by graduate students on biochemical topics of current interest.

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, 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.

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.

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

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 B S 211.

---

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.

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.

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

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.

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 reenroll for a maximum of 9 credits when new topics are given. Teaching experience or approval of department. B S 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.

451. *Outdoor Environmental Studies: Laboratory*

Summer. 2 to 5 credits. May reenroll for a maximum of 15 credits when new topics are given. Teaching experience, B S 450. Given at W. K. Kellogg Biological Station.

Testing instructional materials and strategies developed in B S 450 with elementary and middle school children in an outdoor environmental education program.

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. Variable credit. B.S. degree in biological Science.

999. *Doctoral Dissertation 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

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.

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.

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 reenroll 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 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.

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
College of Osteopathic Medicine

400H. *Honors Work in Biophysics*

Fall, Winter, Spring, Summer. 3 to 6 credits. May reenroll for a maximum of 6 credits. Approval of department.

Independent study and investigation under the direction of a faculty member.

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.

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; BPY 402 recommended.

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