

- 813. Advanced Biochemistry**
Spring. 4(4-0) 812.
Continuation of 812.
- 855. Special Problems**
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 12 credits. Approval of department.
Consideration of current problems.
- 899. Research**
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
- 952. Plant Physiology and Biochemistry I**
Winter of odd-numbered years. 3(3-0)
Approval of department. Interdepartmental with the Botany and Plant Pathology Department.
Selected topics concerning photosynthesis and related processes.
- 955. Plant Physiology and Biochemistry II**
Winter of even-numbered years. 3(3-0)
Approval of department. Interdepartmental with the Botany and Plant Pathology Department.
Metabolic pathways of unique significance to plants.
- 960. Selected Topics in Biochemistry**
Fall, Winter, Spring, Summer. 1(1-0) or 2(2-0) May re-enroll 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 re-enroll 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. Research**
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

BIOLOGICAL SCIENCE B S

College of Natural Science

- 202. Foundations of Biological Science**
Fall, Winter, Spring. 4(3-3) N S 183 or 193.
Fundamental principles of biology which provide background appropriate for preparation for elementary education teaching.
- 210. General Biology**
Fall, Winter. 4(4-2)
Concepts relating to basic attributes and diversity of living things.

- 211. General Biology**
Winter, Spring. 4(4-2) CEM 130 or high school chemistry. Not open to students with credit in LBC 140.
The structure and behavior of cells and their subunits, interactions of tissues, genetics, and the development, history and relations of organisms.
- 212. General Biology**
Fall, Spring. 4(4-2) Not open to students with credit in LBC 141.
Continuation of 211.
- 401. Biological Science for Teachers**
Fall. 4(3-3) Bachelor's degree.
Designed to show the nature of biological science in both its empirical and conceptual aspects. Emphasis is placed on life processes. The theories of the gene and of evolution are stressed. Macromorphology and micromorphology are covered as well as the topics of reproduction, metabolism, physiology, nutrition, enzymes, taxonomy and ecology. Quantitative developments are included whenever possible.
- 402. Biological Science for Teachers**
Fall, Winter. 4(3-3) 401.
Continuation of 401.
- 403. Biological Science for Teachers**
Spring. 4(3-3) 402.
Continuation of 402.
- 410. Biotic and Environmental Relationships**
Summer. 6 credits. Approval of department. Given at W. K. Kellogg Biological Station.
Interrelationship of the biota with its environment. Factors determining distribution and abundance. Interaction of organisms.
- 420. Seminar in Recent Advances in Biological Science**
Fall, Winter, Spring, Summer. 3(3-0) 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.
- 421. Seminar on Man, "The Human Organism"**
Fall, Winter, Spring, Summer. 3(3-0)
Approval of department.
The importance of new discoveries in biology for our understanding of the human organism with emphasis from the fields of genetics, molecular biology, behavior, developmental biology, physiology, and ecology.
- 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.

BIOPHYSICS BPY

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

- 402. Introduction to Biophysics**
Spring. 5(5-0) PHY 259, MTH 113,
1 year organic chemistry and 1 year biology.

Salient features of biophysics, methods and principles. Structure and organization of biological materials, bioenergetics, radiation biophysics, bioelectric phenomena, biomechanics and psychophysics.

- 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.
- 804. Experimental Biophysics**
Fall of odd-numbered years. 3 credits. Approval of department.
Neuro-electric properties of cells, organs and animals, and methods of processing information in humans.
- 805. Experimental Biophysics**
Winter of even-numbered years. 3 credits. Approval of department.
Electrical and physical properties of significant biological molecules and structures.
- 806. Experimental Biophysics**
Spring of even-numbered years. 3 credits. Approval of department.
Interaction of protons and high energy particles with biological molecules and structures.
- 821. Molecular Biophysics**
Fall of odd-numbered years. 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**
Winter 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.
- 823. Radiation Biophysics**
Spring of even-numbered years. 3(2-2)
Approval of department.
Effects of various types of ionizing radiation and ultraviolet and visible light on proteins, nucleic acids, viruses and plant and animal cells. Damage and repair mechanisms at the molecular level.
- 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. Biophysics of Perception and Learning**
Spring. 4(3-2) Approval of department.
Lectures will consider sensory systems, including transduction, coding and information processing. Muscle contraction, muscle control, learned and unlearned behavior will be considered. Laboratory will include neural recording and behavioral observations.