

**Descriptions — Audiology and Speech Sciences of Courses**

**854. Psychophysics and Theories of Audition**  
Summer. 4(3-0)

Nature of auditory stimuli and the results of psychophysical experimentation in audition.

**874. Speech and Hearing Problems in Public Schools**  
Summer. 4(3-0) May re-enroll for a maximum of 16 credits.

Graduate seminar in speech and hearing involving problems that arise in relation to speech and hearing therapy in the public schools.

**875A. Clinical Practicum in Speech and Language Pathology**

Fall, Winter, Spring, Summer. 1 credit. 474. May re-enroll for a maximum of 8 credits.

Directed diagnostic, therapeutic, and prognostic experience in speech and language pathology.

**875B. Clinical Practicum in Audiology**  
Fall, Winter, Spring, Summer. 1 credit. 454. May re-enroll for a maximum of 8 credits.

Directed diagnostic, therapeutic and prognostic experience in audiology in various clinical settings.

**876. Communication Disorders: Neuroanatomy-Neurophysiology**  
Fall. 4(3-1) Approval of department.

Neuroanatomical and neurophysiological correlates of speech, language, and hearing.

**880A. Algorithms for Speech and Hearing Sciences**  
Fall. 4(4-0)

A discussion of useful algorithms applicable to quantification of phenomena related to audiology and speech sciences.

**880B. Acoustic Phonetics**

Winter. 4(2-2) 880A or approval of department.

An analytic study of the acoustics of speech.

**880C. Instruments and Electronics for Audiology and Speech Sciences**

Spring. 4(3-3) 880B or approval of department.

A discussion of the electronic principles and instruments necessary to measure parameters related to hearing and speech processes.

**880D. Experimental Phonetics**

Summer. 4(4-0) 880C or approval of department.

Critical review of the literature in experimental phonetics. Selected papers on acoustic and physiological phonetics and related fields are presented in seminar fashion.

**899. Research**

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

**940. Seminar in Audiology and Speech Sciences**

Spring, Summer. 4(2-0) May re-enroll for maximum of 16 credits.

**990. Special Problems in Audiology and Speech Sciences**

Fall, Winter, Spring, Summer. 1 to 6 credits.

Special projects in audiology and speech sciences.

**999. Research**

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

**BIOCHEMISTRY**

**BCH**

**College of Agriculture and Natural Resources**

**College of Human Medicine**

**College of Natural Science**

**College of Osteopathic Medicine**

**200. Introduction to Biochemistry**

Winter, Summer. 5(5-0) Credit may not be earned in both 200 and 401. General chemistry; one term organic chemistry. Not acceptable for a B.S. degree in biochemistry. Survey of biochemistry emphasizing the major metabolic activities of living organisms.

**363. Clinical Biochemistry**

Spring. 3(2-3) 401; CEM 162. Medical Technology majors. Not acceptable for a B.S. degree in biochemistry. Others: approval of department.

Quantitative clinical laboratory methods.

**400H. Honors Work**

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

Assigned reading and experimentation.

**401. Basic Biochemistry**

Fall, Spring. 5(5-0) Credit may not be earned in both 200 and 401. One year organic chemistry or CEM 242; not open to biochemistry majors.

A one-term presentation of biochemistry emphasizing structure and function of major biomolecules, metabolism and regulation. Examples used for illustrative purposes will emphasize the mammalian organism.

**404. General Biochemistry Laboratory**

Winter, Spring. 3(1-6) Analytical chemistry; 401 or 451.

Experimental aspects of biochemistry.

**451. Biochemistry**

Fall. 4(4-0) Credit may not be earned in both 401 and 451. One year organic chemistry or CEM 242.

A comprehensive presentation of biochemistry designed for undergraduate biochemistry majors, students of medicine, and other students desiring an intensive treatment of the subject.

**452. Biochemistry**

Winter. 4(4-0) 451.

Continuation of 451.

**IDC. Biological Membranes**

For course description, see Interdisciplinary Courses.

**499. Research**

Fall, Winter, Spring, Summer. 1 to 4 credits. May re-enroll 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 501 and 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 501. Not open to students with five credits in 501. A continuation of 501.

**801. Biochemical Research Methods**

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

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

**804. Advanced Biochemistry Laboratory**

Fall. 3(1-6) Analytical chemistry; 801 and 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(1-6) 804; 812 concurrently.

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

**806. Advanced Biochemistry Laboratory**

Spring. 3(1-6) 805; 813 concurrently.

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, 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) 811

Continuation of 811.

**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

**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.

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

**\*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.

**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. 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.

**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.

**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.

**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.

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

**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.

**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.

**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.

\*Established July 1, 1972.