D. ADVANCED AUDEOLOGICAL EVALUATION
Winter. 4(3-1)
Theory, administration and evaluation of selected tests including Bekesy, EDR, EEG, and advanced speech-audiometric tests.

E. PEDIATRIC AUDEOLOGY
Winter. 4(2-2)
Evaluative procedures including play audiometry, language assessment, and case studies as aids to the differential diagnosis of auditory disorders in children; habituation procedures for the acoustically handicapped child.

853. SPEECH PERCEPTION: THEORY AND MEASUREMENT
Spring. 4(4-0) Approval of department.
Evaluation and analysis of various theories of speech perception and their implications for research in speech and language pathology.

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.

490. SEMINAR IN AUDEOLOGY AND SPEECH SCIENCES
Spring, Summer. 4(2-0) May re-enroll for a maximum of 12 credits.

990. SPECIAL PROBLEMS IN AUDEOLOGY 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

800. INTRODUCTION TO BIOCHEMISTRY
Winter, Summer. 5(5-0) Credit may not be earned in both 300 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.

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

400H. HONORS WORK
Fall, Winter, Spring. Variable credit. Approval of department. Assigned reading and experimentation.

401. BASIC BIOCHEMISTRY
Spring. 5(5-0) Credit may not be earned in both 300 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.

402. 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.

Biochemistry — Descriptions of Courses

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
Fall, Winter. 3(0-0) One year organic chemistry, or CEM 242. Fall: Osteopathic Medicine students; Winter: Human Medicine students. Others: approval of department.

Basic biochemical principles and terminology of importance in medical biology.

501. Biochemical Research Methods
Fall. 1(0-2) 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.

504. 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.

505. Advanced Biochemistry Laboratory
Winter. 3(1-6) 504; 811 concurrently. Experiments to be selected from a representative group illustrating modern biochemical research.

506. Advanced Biochemistry Laboratory
Spring. 3(4-0) 805; 811 concurrently. Special experiments in advanced laboratory techniques.

511. 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 replisomes of living organisms.

512. Advanced Biochemistry
Winter. 4(4-0) 811. Continuation of 811.

513. Advanced Biochemistry
Spring. 4(4-0) 812. Continuation of 812.

555. Special Problems
Fall, Winter, Spring, Summer. Variable credit. May re-enroll for a maximum of 12 credits. Approval of department. Consideration of current problems.

599. Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.
593. Plant Physiology and Biochemistry I
Winter of even-numbered years. 3(3-0)
Approval of department. Interdepartmental with the Botany and Plant Pathology Department.
Selected topics concerning photosynthesis and related processes.

595. Plant Physiology and Biochemistry II
Winter of odd-numbered years. 3(3-0)
Approval of department. Interdepartmental with the Botany and Plant Pathology Department.
Metabolic pathways of unique significance to plants.

596. Selected Topics in Biochemistry
Fall, Winter, Spring. 3(3-0) 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, immunobiochemistry, hormones, control mechanisms and structure of biological macromolecules.

597. 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.

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

BIOLICAL SCIENCE

College of Natural Science

200. Studies in Contemporary Biological Science
Spring. 4(3-3) 12 credits in a Department of Natural Science sequence.
Biological topics impacting contemporary, American and world society are studied in the context of major biological themes and individual laboratory investigation of a self-chosen topic.

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 243.
Concepts relating to basic attributes and diversity of living things.

221. General Biology
Fall, Winter. 4(4-2) CRM 130 or high school chemistry. Not open to students with credit in LBC 141.
The structure and behavior of cells and their subdivisions, interactions of tissues, genetics, and the development, history and relations of organisms.

222. 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. 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 and abiotic components, 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.
Further determination of distribution and abundance. Interrelationships of plants, animals, and environment. Intensive field investigations of several types of terrestrial communities in light of current theory.

420. Seminar in Recent Advances in Biological Science
Fall, Winter, Spring. 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 through 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) 450.
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) 451.
Continuation of 431. Implementation of the techniques learned in 431 into the school program.

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 inservice teachers, grades 4 through 12.

599. Research
Fall, Winter, Spring. Variable credit. M.S. degree in biological science.

College of Osteopathic Medicine

580. Introduction to Athletic Medicine
Fall, Winter. 3(3-0) Approval of department.
Health care of student athletes. Examination and evaluation of physical training sequences for high school athletes. Analyze functional role of musculoskeletal systems illustrated in various high school sports.

581. Athletic Medical Systems
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 prevention, emergency medicine and rehabilitation stressed.

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, neuromuscoskeletal system primarily.

865. Advanced Neurobiology
Winter of odd-numbered years. 3(3-0)
BRY 865. 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.

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