880C. Instruments and Electronics for Audiology and Speech Sciences
Spring. 4(3-3) ASC 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) ASC 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. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

900. Seminar in Audiology and Speech Sciences
Spring, Summer. 4(2-0) May reenroll for a maximum of 16 credits.

999. Doctoral Dissertation Research
Fall, Winter, Spring, Summer. 1 to 6 credits. Special projects in audiology and speech sciences.

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 BCH 200 and BCH 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.

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 BCH 200 and BCH 401. One year organic chemistry or CEM 242; not open to biochemistry majors. A one-semester 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; BCH 401 or BCH 451. Experimental aspects of biochemistry.

405. Biochemistry Laboratory
Fall, Spring. 3(0-9) BCH 453 or concurrently; BCH 404; undergraduate biochemistry majors or approval of department. Advanced undergraduate laboratory to illustrate modern biochemical methods and techniques.

412. Clinical Biochemistry

413. Biochemistry
Fall. 3(3-0) Credit may not be earned in both BCH 401 and BCH 451. One year organic chemistry or CEM 242. A comprehensive survey of biochemistry with emphasis on the properties and functions of biomolecules, energy-yielding and energy requiring processes, and the transfer of genetic information.

451. Biochemistry
Fall. 3(3-0) Credit may not be earned in both BCH 401 and BCH 451. One year organic chemistry or CEM 242. A comprehensive survey of biochemistry with emphasis on the properties and functions of biomolecules, energy-yielding and energy requiring processes, and the transfer of genetic information.

452. Biochemistry
Winter. 3(3-0) BCH 451. Continuation of BCH 451.

453. Biochemistry
Spring. 3(3-0) BCH 452. Continuation of BCH 452.

454. Biochemistry
Spring. 3(3-0) BCH 454. Continuation of BCH 454.

455. Biochemistry
Spring. 3(3-0) BCH 455. Continuation of BCH 455.

456. Biochemistry
Spring. 3(3-0) BCH 456. Continuation of BCH 456.

457. Biochemistry
Spring. 3(3-0) BCH 457. Continuation of BCH 457.

458. Biochemistry
Spring. 3(3-0) BCH 458. Continuation of BCH 458.

459. Biochemistry
Spring. 3(3-0) BCH 459. Continuation of BCH 459.

460. Biochemistry
Spring. 3(3-0) BCH 460. Continuation of BCH 460.

461. Biochemistry
Spring. 3(3-0) BCH 461. Continuation of BCH 461.

462. Biochemistry
Spring. 3(3-0) BCH 462. Continuation of BCH 462.

463. Biochemistry
Spring. 3(3-0) BCH 463. Continuation of BCH 463.

464. Biochemistry
Spring. 3(3-0) BCH 464. Continuation of BCH 464.

465. Biochemistry
Spring. 3(3-0) BCH 465. Continuation of BCH 465.

466. Biochemistry
Spring. 3(3-0) BCH 466. Continuation of BCH 466.

467. Biochemistry
Spring. 3(3-0) BCH 467. Continuation of BCH 467.

468. Biochemistry
Spring. 3(3-0) BCH 468. Continuation of BCH 468.

469. Biochemistry
Spring. 3(3-0) BCH 469. Continuation of BCH 469.

501. Medical Biochemistry
Summer. 3(3-0) Open only to students in the professional programs in the College of Human Medicine and the College of Osteopathic Medicine. Basic biochemical principles and terminology of importance in medical biology.

502. Medical Biochemistry
Fall. 3(3-0) BCH 501 or approval of department. A continuation of BCH 501.

503. Cell Biology
Fall. 5(5-0) Admission to the College of Human Medicine. Interdepartmental with the departments of Microbiology and Public Health, Physiology, and Pharmacology and Toxicology. Administered by the Department of Microbiology and Public Health. Principles of cell biology for medical students.

511. Medical Biochemistry I
Fall. 3(3-0) One year of organic chemistry. Open only to students in the professional programs in the College of Human Medicine and the College of Osteopathic Medicine. Basic biochemical principles and terminology with emphasis on metabolism, synthesis, and reactions of biomolecules of importance in medical biology.
832. Physiological Biochemistry II
Continuation of BCH 831.

835. Special Problems
Fall, Winter, Spring, Summer. Consideration of current problems. Approval of department.

844. Plant Biochemistry
Consideration of current problems. 12 credits. Approval of department.

899. Master's Thesis Research
Variable credit. Approval of department.

960. Selected Topics in Biochemistry
Topics will be selected from the areas of biochemistry, genetics, biochemical evolution, complex proteins, lipid metabolism, immunchemistry, hormones, control mechanisms, and structure of biological macromolecules.

961. Selected Topics in Biochemistry
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
Presentation and discussion of reports by graduate students on biochemical topics of current interest.

999. Doctoral Dissertation Research
Variable credit. Approval of department.

BIOLOGICAL SCIENCE BS

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
Full, Winter, Spring. 4(3-3) 12 credits. Concepts, procedures, and perspectives appropriate to developing a basic literacy in biology with emphasis on fundamental biological principles and their relationship to world society. Appropriate preparation for pre-service elementary teachers. For prerequisite purposes, the introductory biology sequence may be used instead of this sequence.

210. General Biology
Fall, Spring. Not open to students with credit in LBC 141. Concepts relating to basic attributes and diversity of living things.

211. General Biology
Spring, 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.

400. Biological Science for Teachers
Fall, Winter, Spring. 3 to 4 credits. 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. 1 to 3 credits. May reenroll for a maximum of 6 credits. 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. The ecology of freshwater ecosystems, their biotic structure, and the functional interrelationships of environmental variables regulate productivity and community structure. Extensive field investigations.

410. Terrestrial Ecology
Summer. 6 credits. B.S. 212 or approval of department. Factors determining distribution and abundance 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 reenroll for a maximum of 6 credits if different topic is taken. 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. Design for intermediate and secondary inservice teachers.

451. Outdoor Environmental Studies: Laboratory
Summer. 2 to 3 credits. May reenroll for a maximum of 12 credits. 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 advisor. 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.