### BIOCHEMISTRY

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
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<tr>
<td>BCH 301</td>
<td>Biochemistry I</td>
<td>Fall, Spring. 3(3-0) BCH 401. One year organic chemistry or CEM 242. One year of physical chemistry or CEM 244. Directed diagnostic, therapeutic, and prognostic experience in audiology in various clinical settings.</td>
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<tr>
<td>BCH 302</td>
<td>Biochemistry II</td>
<td>Winter. 3(3-0) BCH 451. Continuation of BCH 453, with emphasis on intermediary metabolism.</td>
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<tr>
<td>BCH 303</td>
<td>Biochemistry III</td>
<td>Spring. 4(4-0) BCH 452. Continuation of BCH 453, with emphasis on the replication and expression of genetic information.</td>
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<tr>
<td>BCH 401</td>
<td>Biochemistry Laboratory</td>
<td>Fall, Spring. 5(5-0) Credit may not be earned in both BCH 401 and BCH 451. One year organic chemistry or CEM 242. Directed diagnostic, therapeutic, and prognostic experience in audiology in various clinical settings.</td>
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<tr>
<td>BCH 402</td>
<td>Research</td>
<td>Fall, Winter, Spring, Summer. 1 to 4 credits. May reenroll for a maximum of 12 credits. Undergraduate: approval of department. Participation in research projects.</td>
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<tr>
<td>BCH 403</td>
<td>Medical Biochemistry</td>
<td>Fall. 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.</td>
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<tr>
<td>BCH 404</td>
<td>Medical Biochemistry</td>
<td>Winter. 3(3-0) BCH 501 or approval of department. A continuation of BCH 501.</td>
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### INTRODUCTION TO MEDICAL BIOLOGY

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

### NUCLEIC ACID STRUCTURE AND FUNCTION

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

### MECHANISM AND STRUCTURE

Fall. 4(4-0) BCH 811. Protein structure and function, relationships, macromolecular interactions, enzyme kinetics and principles of methods used in enzymology.

### METABOLISM AND ITS REGULATION

Spring. 4(4-0) BCH 812. Molecular basis of metabolic regulation, compartmentation and interrelationships of metabolic cycles involving carbohydrates, proteins and lipids.
Descriptions — Biochemistry

of Courses

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. 1 to 6 credits. May reenroll for a maximum of 12 credits. Approval of department. Consideration of current problems.

856. Plant Genetics and Molecular Biology
Spring of even-numbered years. 3(3-0) Approval of department and a course in introductory genetics. Interdepartmental with Genetics and the Department of Botany and Plant Pathology. Administered by the Department of Botany and Plant Pathology. Recent advances in genetics and molecular biology of higher plants.

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; photoregulation; cell wall; lectin; nitrogen cycle including nitrogen fixation; sulfur cycle.

888. Laboratory Rotation
Fall, Winter, Spring, Summer. 1 to 6 credits. May reenroll for a maximum of 15 credits. Graduate student majors; approval of department. Participation in research laboratories to learn experimental techniques and research approaches, broaden research experience, and assess research interests prior to selecting a thesis adviser.

899. Master's Thesis Research
Fall, Winter, Spring, Summer. Variable credit. Approval of department.

960. Selected Topics in Biochemistry
Fall, Winter, Spring. 1 to 3 credits. May reenroll for a maximum of 10 credits if different topics are taken. Approval of department. Topics will be selected from the areas of biochemical genetics, biochemistry of development, biochemical evolution, complex carbohydrates, lipid metabolism, immunohistochemistry, hormones, control mechanisms and structure of biological macromolecules.

961. Selected Topics in Biochemistry
Fall, Winter, Spring. 1 to 3 credits. May reenroll for a maximum of 10 credits if different topics are taken. Approval of department. Topics will be selected from the areas of bioenergetics, biochemical genetics, enzymology, carbohydrate metabolism, mass spectrometry and biochemistry of inorganic compounds.

975. Seminar in Biochemistry
Fall, Winter, Spring. 1(1–0). May reenroll for a maximum of 8 credits. Approval of department.

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, and 420, as well as the research and problems courses 499, 800 and 899, may vary from term to term. Brochures giving detailed information about individual courses are available in the Office of the Assistant Dean for Lifelong Education in the College of Natural Sciences. 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, Summer. 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.

210. General Biology
Fall, Spring, 4(4-2) Not open to students with credit in LBS 141. Principles of biological organization: scientific method, biochemistry, cell biology, and evolution.

211. General Biology
Fall, Winter, Summer. 4(4-2) CEM 140 or high school chemistry. Not open to students with credit in LBS 242. Principles of biological regulation and integration: genetics, development, and selected physiological topics.

212. General Biology
Winter, Spring, Summer. 4(4-2) Not open to students with credit in LBS 140. Principles of biological diversity: taxonomy and systematics, comparative physiology, and ecology.

400. Biological Science for Teachers
Fall, Winter, Spring, Summer. 1 to 6 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 4 credits. May reenroll for a maximum of 8 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.

418. Field Biology for Teachers
Fall, Winter, Spring, Summer. 4 credits. Field course or approval of department. Field investigations concerning the scientific basis of field natural history and identification of key species. Field trips required.

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 on topics of research interest, the most recent advances in the field and future directions of the Biological Sciences.

460. Ornithology for Teachers
Summer, 3 credits. A course in biology or approval of department. Not open to zoology majors. Given at W. K. Kellogg Biological Station, Interdepartmental with and administered by the Department of Zoology. Distribution, breeding cycles, migration, food and feeding habits, voice and other important areas of avian biology. Emphasis on field identification and natural history.

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. 1 to 6 credits. May reenroll for a maximum of 18 credits. B.S. degree in biological science.

805. Outdoor Environmental Studies
Fall, Winter, Spring. 1 to 4 credits. May reenroll for a maximum of 5 credits if different topics taken. B S 418 or ZOL 460 or approval of department. Emphasis on environmental understanding. Development of educational materials through team research and teaching. Trials of materials with elementary, middle, secondary school or college students.

899. Master's Thesis Research
Fall, Winter, Spring. Variable credit. Approval of department.

BIOMECHANICS BIM

College of Osteopathic Medicine

506. Basic Concepts in Biomechanics
Winter, 3(2–0) Admission to a college of medicine or approval of department. Interdepartmental with the College of Osteopathic Medicine. Basic concepts of biomechanics and their relationship to functional anatomy and osteopathic manipulative therapy.