

**BIOCHEMISTRY
AND MOLECULAR
BIOLOGY**

BMB

**Department of Biochemistry
and Molecular Biology
College of Human Medicine
College of Natural Science
College of Osteopathic Medicine**

100 Current Issues in Biochemistry
Spring. 1(1-0) R: Open only to freshmen or sophomores. SA: BCH 100 Not open to students with credit in BMB 101.

Contemporary biochemistry: its impact on environmental, medical, and social sciences.

101 Frontiers in Biochemistry
Fall. 1(1-0) R: Open only to freshmen or sophomores. SA: BCH 101 Not open to students with credit in BMB 100.

Description of topics in biochemistry research.

200 Introduction to Biochemistry
Fall. 4(4-0) P:M: (CEM 143) SA: BCH 200 Not open to students with credit in BMB 401 or BMB 461.

Basic structures of major classes of biologically important molecules and metabolic activities of major importance in living organisms.

401 Basic Biochemistry
Fall, Spring. 4(4-0) P:M: (CEM 252 or CEM 352) R: Not open to students in the Biochemistry or in the Biochemistry/Biotechnology major. SA: BCH 401 Not open to students with credit in BMB 200 or BMB 461.

Structure and function of major biomolecules, metabolism, and regulation. Examples emphasize the mammalian organism.

461 Biochemistry I
Fall. 3(4-0) P:M: (CEM 252 or CEM 352) and (BS 110) and (MTH 124 or MTH 132 or MTH 152H or LBS 118) and (BS 111L or LBS 145 or LBS 158H or LBS 159H) SA: BCH 461 Not open to students with credit in BMB 200 or BMB 401.

Protein structure and function, enzymology, bioenergetics, and intermediary metabolism.

462 Biochemistry II
Spring. 3(4-0) P:M: (BMB 461) SA: BCH 462

Continuation of BMB 461 with emphasis on metabolic regulation and nucleic acid structure, replication and protein synthesis.

471 Biochemistry Laboratory (W)
Spring. 3(0-9) P:M: (BMB 401 or BMB 461) and (BS 110 and CEM 262 and CEM 356 and CSE 101) and (MTH 124 or MTH 132 or MTH 152H or LBS 118) and (BS 111L or LBS 145 or LBS 158H or LBS 159H) and completion of Tier I writing requirement. SA: BCH 471

Biochemical methods and principles used in the study of enzymes (proteins), carbohydrates, lipids, and cell organelles.

472 Biochemistry Laboratory
Fall. 3(0-9) P:M: (BMB 462) and (CEM 262) R: Open only to Biochemistry or Biochemistry/Biotechnology majors or approval of department. SA: BCH 472

Methods of molecular biology and the underlying principles on which these methods are based.

490 Biochemistry Research
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Total credits in BMB 490 and BMB 499 may not exceed 8. Approval of department. SA: BCH 490

Participation in laboratory or library research projects.

495 Undergraduate Seminar
Spring. 2(2-0) P:M: (BMB 462 or concurrently) R: Open only to students in the Biochemistry or Biochemistry/Biotechnology majors. SA: BCH 495

Extension and synthesis of concepts of biochemistry. Relationships to societal issues.

499 Senior Thesis
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to students in the Biochemistry or the Biochemistry/Biotechnology major. Total credits in BMB 490 and BMB 499 may not exceed 8. Approval of department. SA: BCH 499

Laboratory research culminating in a thesis.

514 Medical Biochemistry
Fall. 3 credits. R: Restricted to students enrolled in M.D. (CHM) or D.O. (COM) programs. SA: BCH 514 Not open to students with credit in BMB 521.

Basic biochemical principles and terminology; metabolism and function of biomolecules of importance in medical biology and human pathophysiology.

521 Medical Biochemistry
Fall. 5(5-0) R: Graduate-professional students in colleges of Human and Osteopathic Medicine. SA: BCH 521

Basic biochemical principles and terminology; metabolism and function of biomolecules of importance in medical biology and processes pertinent to human pathophysiology.

523 Genetics for Medical Practice
Summer. 1(1-0) Interdepartmental with Pediatrics and Human Development. Administered by Department of Pediatrics and Human Development. R: Graduate-professional students in colleges of Human and Osteopathic Medicine. SA: BCH 523

Basic principles of genetics for medical students.

526 Molecular Biology and Medical Genetics
Fall. 2 credits. Interdepartmental with Pediatrics and Human Development. R: Restricted to students enrolled in the M.D. (CHM) or D.O. (COM) programs. SA: BCH 526 Not open to students with credit in PHD 523.

Basic principles of human medical genetics; storage and expression of genetic information; transmission of genetic information to progeny.

534 Cell Biology and Physiology I
Fall. 3 credits. Interdepartmental with Physiology; Human Anatomy. Administered by Department of Physiology. R: Open only to graduate-professional students in the College of Human Medicine or College of Osteopathic Medicine.

Modern concepts of cell biology as a basis for understanding the physiology of human tissues and organ systems in health and disease.

535 Cell Biology and Physiology II
Spring. 4 credits. Interdepartmental with Physiology; Human Anatomy. Administered by Department of Physiology. R: Open only to graduate-professional students in the College of Human Medicine or the College of Osteopathic Medicine.

Modern concepts of cell biology as a basis for understanding the physiology of human tissues and organ systems in health and disease. Continuation of PSL 534.

801 Molecular Biology
Fall. 3(3-0) P:NM: BMB 462, CEM 383. SA: BCH 801 Not open to students with credit in BMB 897A or BMB 897A.

Organization of genes. Regulation of gene expression, replication, and recombination.

802 Metabolic Regulation and Signal Transduction
Spring. 3(3-0) P:NM: BMB 801. SA: BCH 802

Molecular basis for metabolic regulation. Molecular signalling mechanisms and mechanisms for allosteric and covalent protein modifications.

803 Protein Structure and Function
Fall. 2(2-0) P:NM: BMB 462, CEM 383 SA: BCH 803

Protein structure and relationship of function to structure. Applications of kinetic methods to elucidation of enzyme mechanisms and regulation.

804 Biochemical Mechanisms and Structure
Spring. 3(3-0) P:NM: (BMB 462 or concurrently and CEM 383 or concurrently) SA: BCH 804

Structures, methods of structural analysis, synthesis, and reaction mechanisms of biological substances including proteins, carbohydrates, lipids, porphyrins, phosphate esters, enzymes, and coenzymes.

825 Cell Structure and Function
Spring. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics; Physiology. P:NM: BMB 401 or BMB 461. SA: BCH 825

Molecular basis of structure and function. Cell properties: reproduction, dynamic organization, integration, programmed and integrative information transfer. Original investigations in all five kingdoms.

829 Methods of Macromolecular Analysis and Synthesis
Fall. 2(2-0) P:NM: (BMB 462 or concurrently) SA: BCH 829

Techniques of isolation and characterization of macromolecules. Computer use in structure-function analysis of macromolecules.

831 Physiological Biochemistry
Spring & even years. 4(4-0) P:NM: BMB 401 or BMB 462. SA: BCH 831

Mammalian physiological biochemistry. Metabolic interpretation of normal and altered physiological states of humans and other mammals.

855 Special Problems

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Approval of department. SA: BCH 855

Laboratory or library research on special problems in biochemistry.

856 Plant Molecular Biology

Spring. 3(3-0) Interdepartmental with Botany and Plant Pathology. Administered by Department of Botany and Plant Pathology. P:NM: (ZOL 341)

Recent advances in genetics and molecular biology of higher plants.

864 Plant Biochemistry

Spring. 3(3-0) Interdepartmental with Botany and Plant Pathology. P:NM: BMB 401 or BMB 462. SA: BCH 864

Biochemistry unique to photosynthetic organisms. Photosynthetic and respiratory electron transport, nitrogen fixation, carbon dioxide fixation, lipid metabolism, carbon partitioning, cell walls, biosynthesis of plant hormones.

888 Laboratory Rotation

Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in Biochemistry. SA: BCH 888

Participation in research laboratories to learn experimental techniques and approaches, broaden research experience, and assess research interests prior to selecting a thesis or dissertation adviser.

899 Master's Thesis Research

Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to master's students in Biochemistry. SA: BCH 899

Master's thesis research.

960 Selected Topics in Biochemistry I

Fall, Spring. 1 to 2 credits. A student may earn a maximum of 7 credits in all enrollments for this course. R: Open only to graduate students in Biochemistry or approval of department. SA: BCH 960

Contemporary biochemical research topics in such areas as biochemical genetics, biochemistry of development, biochemical evolution, complex proteins, or lipid metabolism.

961 Selected Topics in Biochemistry II

Fall, Spring. 1 to 3 credits. A student may earn a maximum of 7 credits in all enrollments for this course. R: Open only to graduate students in the Department of Biochemistry. SA: BCH 961

Contemporary biochemical research topics in such areas as bioenergetics, bioinstrumentation, complex carbohydrates, mass spectrometry, biomolecular spectroscopy or computer-based modeling and analysis of DNA and protein sequences and structures.

978 Seminar in Biochemistry

Fall, Spring. 1(1-0) A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to graduate students in Biochemistry. SA: BCH 978

Seminars on biochemistry research mainly with visiting scientists.

999 Doctoral Dissertation Research

Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in Biochemistry. SA: BCH 999

Doctoral dissertation research.

BIOLOGICAL SCIENCE

BS

College of Natural Science

110 Organisms and Populations

Fall, Spring. 4(3-3) Not open to students with credit in LBS 144 or LBS 148H.

Biological diversity and organismal biology. Principles of evolution, population biology, and community structure.

111 Cells and Molecules

Fall, Spring, Summer. 3(3-0) P:M: (CEM 141 or CEM 151 or LBS 171 or CEM 181H) Not open to students with credit in LBS 145 or LBS 149H.

Macromolecular synthesis; energy metabolism; molecular aspects of development; principles of genetics.

111L Cell and Molecular Biology Laboratory

Fall, Spring, Summer. 2(1-3) Interdepartmental with Microbiology and Molecular Genetics; Botany and Plant Pathology; Zoology. P:M: (BS111 or concurrently) Not open to students with credit in LBS 159H.

Principles and applications of common techniques used in cell and molecular biology.

148H Honors Organismal Biology

Fall. 3(3-0) Interdepartmental with Lyman Briggs School. Administered by Lyman Briggs School. R: Honors College student or approval of school. Not open to students with credit in BS 110 or LBS 144.

Diversity and basic properties of organisms, with emphasis on genetic principles, ecological interactions, and the evolutionary process. Historical approach to knowledge discovery.

149H Honors Cell and Molecular Biology

Spring. 3(3-0) Interdepartmental with Lyman Briggs School. Administered by Lyman Briggs School. P:M: (CEM 141 or concurrently or CEM 151 or concurrently or CEM 181H or concurrently or LBS 171 or concurrently) R: Honors College student or approval of school. Not open to students with credit in BS 111 or LBS 145.

Exploration of the physicochemical and molecular organization of cells as the unifying framework for genetics, evolution, and the social relevance of biology.

158H Honors Organismal Biology Laboratory

Fall. 2(1-3) Interdepartmental with Lyman Briggs School. Administered by Lyman Briggs School. Not open to students with credit in BS 110 or LBS 144. C: LBS 148H concurrently.

Basic procedures used by organismal biologists, including experimental design and statistical methods. Development and implementation of research projects to test hypotheses in genetics, ecology, and evolution.

159H Honors Cell and Molecular Biology Laboratory

Spring. 2(1-3) Interdepartmental with Lyman Briggs School. Administered by Lyman Briggs School. Not open to students with credit in BS 111L or LBS 145. C: LBS 149H concurrently.

Basic techniques of cellular and molecular biology including experimental design and hypothesis formulation. Student-initiated projects to test hypothesis-driven projects in biochemistry, molecular biology or genetics.

BIOMEDICAL ENGINEERING

BME

Department of Materials Science and Mechanics College of Engineering

424 Biomaterials and Biocompatibility

Spring of even years. 3(3-0) Interdepartmental with Materials Science and Mechanics. Administered by Department of Materials Science and Mechanics. P:M: (PSL 250 and MSM 250)

Materials science of human implants. Design requirements imposed by the body's milieu and the need to protect the body.

441 Tissue Mechanics

Spring of odd years. 3(3-0) Interdepartmental with Materials Science and Mechanics. Administered by Department of Materials Science and Mechanics. P:M: (MSM 211)

Application of solid mechanics to understanding mechanical responses of biological tissues. Microstructure and biological function for soft and hard connective tissues and muscle.

442 Biodynamics

Fall. 3(2-2) Interdepartmental with Materials Science and Mechanics. Administered by Department of Materials Science and Mechanics. P:M: (MSM 306) R: Open only to students in the Engineering Mechanics major.

Fundamentals of motion analysis of human movement and its application to the study of function and dysfunction of the musculoskeletal system. Solution methods of the inverse dynamics problem.