

**BIOCHEMISTRY  
AND MOLECULAR  
BIOLOGY**

**BMB**

**Department of Biochemistry and  
Molecular Biology  
College of Natural Science**

**101 Frontiers in Biochemistry**  
Fall. 1(1-0) R: Open to freshmen or sophomores. SA: BCH 101, BMB 100  
Topics in biochemistry research.

**200 Introduction to Biochemistry**  
Fall. 4(4-0) P: CEM 143 or ((CEM 252 or concurrently) or (CEM 352 or concurrently)) SA: BCH 200

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

**400 Introduction to Bioinformatics**  
Spring. 3(2-2) Interdepartmental with Microbiology and Molecular Genetics and Plant Biology. Administered by Plant Biology. P: (STT 200 or STT 201 or STT 231 or STT 421) and (PLB 203 or MMG 201 or BMB 200) RB: An introductory biology course covering basic genetics, macromolecules, evolution, energy metabolism, genetic materials, and signal transduction is recommended for non-biology majors. A statistic course covering random variable, distributions, and ba Not open to students with credit in MMG 433.

Bioinformatic theory and practice. How to manage and analyze sequences, structures, gene expression, and other types of biological data.

**401 Basic Biochemistry**  
Spring. 4(4-0) P: CEM 252 or CEM 352 RB: BS 111 or LB 145 or BS 149H R: Not open to students in the Biochemistry and Molecular Biology/Biotechnology major or in the Biochemistry and Molecular Biology major. SA: BCH 401 Not open to students with credit in BMB 461.

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

**461 Biochemistry I**  
Fall, Spring. 3(3-0) P: (CEM 251 or CEM 351) and (BS 110 or LB 144 or BS 148H) and (MTH 124 or MTH 132 or MTH 152H or LB 118) and (BS 111 or LB 145 or BS 149H) and ((CEM 252 or concurrently) or (CEM 352 or concurrently)) SA: BCH 461 Not open to students with credit in BMB 401.

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

**462 Biochemistry II**  
Fall, Spring. 3(3-0) P: BMB 461 or BMB 401 SA: BCH 462

Continuation of BMB 461. Metabolic regulation and nucleic acid structure. Replication and protein synthesis.

**471 Biochemistry Laboratory (W)**  
Spring. 3(0-9) P: BMB 461 and (CSE 101 or CSE 131 or CSE 231 or LB 126) and CEM 262 and Completion of Tier I Writing Requirement R: Open to students in the Biochemistry and Molecular Biology/Biotechnology major or in the Biochemistry and Molecular Biology major or approval of department. 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: CEM 262 and BMB 461 RB: BMB 462 R: Open to students in the Biochemistry and Molecular Biology/Biotechnology major or in the Biochemistry and Molecular Biology major or approval of department. SA: BCH 472

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

**473 Biochemistry and Molecular Biology Laboratory**  
Summer. 6(0-18) P: (BMB 461 and BMB 462) and (CSE 101 or CSE 131 or CSE 231 or LB 126) and CEM 262 and Completion of Tier I Writing Requirement RB: BS 111L and CEM 352 and CEM 356 R: Open to students in the Biochemistry and Molecular Biology/Biotechnology major or in the Biochemistry and Molecular Biology major or approval of department. Not open to students with credit in BMB 471 or BMB 472.

Biochemical methods and principles used in the study of enzymes (proteins), carbohydrates, lipids, and cell organelles. 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: 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: Open only to students in the College of Human Medicine and the College of Osteopathic Medicine. 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.

**523 Genetics for Medical Practice**  
Summer. 1(1-0) Interdepartmental with Pediatrics and Human Development. Administered by Pediatrics and Human Development. R: Open only to graduate-professional students in the 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. Administered by Biochemistry and Molecular Biology. R: Open only to students in the College of Human Medicine or the College of Osteopathic Medicine. 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 Human Anatomy and Physiology. Administered by 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 Human Anatomy and Physiology. Administered by 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) RB: 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) RB: 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) RB: 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) RB: (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.

## Biochemistry and Molecular Biology—BMB

- 810 Theories and Practices in Bioinformatics**  
Spring. 3(2-2) Interdepartmental with Microbiology and Molecular Genetics and Plant Biology. Administered by Plant Biology. RB: Basic genetics, macromolecules, evolution, energy metabolism, genetic materials, and signal transduction is recommended for non-biology majors. A statistic course covering random variable, distributions, and basic probability theory is recommended for biology majors. Not open to students with credit in MMG 433.

Introduction of the theories and algorithms behind widely used bioinformatics tools. Basic tool development by writing scripts in the Python programming language for data analysis.

**816 Integrative Toxicology: Mechanisms, Pathology and Regulation**

Fall of odd years. 3(3-0) Interdepartmental with Animal Science and Pathobiology and Diagnostic Investigation and Pharmacology and Toxicology. Administered by Pharmacology and Toxicology. P: PHM 819

Biochemical, molecular, and physiological mechanisms of toxicology. Functional and pathological responses of major organ systems to chemical insult. Mechanisms of mutagenesis, carcinogenesis, and reproductive toxicology. Concepts in risk and safety assessment.

**825 Cell Structure and Function**

Spring. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics and Physiology. Administered by Biochemistry and Molecular Biology. RB: 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) RB: BMB 462 or concurrently SA: BCH 829

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

**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 Crop and Soil Sciences and Plant Biology. Administered by Plant Biology. RB: ZOL 341 SA: BOT 856

Recent advances in genetics and molecular biology of higher plants.

**864 Plant Biochemistry**

Fall of even years. 3(3-0) Interdepartmental with Plant Biology. Administered by Biochemistry and Molecular Biology. RB: 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 the Department of Biochemistry and Molecular Biology. 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 36 credits in all enrollments for this course. R: Open only to master's students in the Department of Biochemistry and Molecular Biology. 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 the Department of Biochemistry and Molecular Biology 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 and Molecular Biology. 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 the Department of Biochemistry and Molecular Biology. 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 120 credits in all enrollments for this course. R: Open only to doctoral students in the Department of Biochemistry and Molecular Biology. SA: BCH 999

Doctoral dissertation research.