BIOCHEMISTRY AND BMB
MOLECULAR BIOLOGY

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 251 or CEM 351 RB: CEM 252 or CEM 352 SA: BCH 200
Introductions to the major classes of biomolecules and the metabolism of these molecules.

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 PLB 301 or MMB 201 or MMB 200) AB: 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 basic probability theory is recommended for biology majors.
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 BS 145 or BS 149H R: Not open to students in the Biochemistry and Molecular Biology major or the 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 BS 145H) and (MTH 124 or MTH 132 or MTH 152H or LB 118) and (BS 111 or BS 145 or BS 149H) or (CEM 252 or concurrently) (CEM 352 or concurrently) SA: BCH 461 Not open to students with credit in BMB 401.
Protein structure and function, enzymeology, 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(1-0) P: BMB 461 and (CSE 101 or CSE 131 or CSE 231 or CSE 233 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 in the Lyman Briggs Biochemistry/Molecular Biology Major or in the Lyman Briggs Biochemistry/Biotechnology Coordination Major or approval of department. SA: BCH 471 Not open to students with credit in BMB 473.
Biochemical methods and principles used in the study of enzymes (proteins), carbohydrates, lipids, and cell organelles.

472 Biochemistry Laboratory
Fall. 3(0-6) 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 in the Lyman Briggs Biochemistry/Biotechnology Coordination Major or approval of department. SA: BCH 472 Not open to students with credit in BMB 473.
Methods of molecular biology and the underlying principles on which these methods are based.

473 Biochemistry and Molecular Biology Laboratory (W)
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 473.
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/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. A student may earn a maximum of 12 credits BMB 490 and BMB 499 R: Open to juniors or seniors. 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. Administration 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 Biotechnology/Biotechnology. 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 signaling 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.
Biochemistry and Molecular Biology—BMB

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.

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. Theories and algorithms behind 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: BMB 819 Biochemical, molecular, and physiological mechanisms of toxicity. Functional and pathological responses of major organ systems to chemical insult. Mechanisms of mutagenesis, carcinogenesis, and reproductive toxicity. 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 and Omic 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 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. 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.