

- 843I Hearing Amplification II**  
Spring. 3(3-0) P:M: (ASC 843C)  
Advanced theoretical and clinical strategies for evaluating and fitting contemporary hearing aids. Assistive-listening devices, classroom amplification, hearing-aid dispensing, and contemporary clinical and research issues in amplification.
- 843J Manual Communication for Clinical Settings**  
Summer. 3(3-0) P:M: (ASC 344)  
Introduction to the use of manually coded English sign systems and Pidgin Sign English in diagnostic and treatment sessions.
- 890 Independent Study**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to M.A. students in Audiology and Speech Sciences. Approval of department.  
Individualized study under faculty direction.
- 894A Clinical Practicum in Speech-Language Pathology**  
Fall, Spring, Summer. 1 credit. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in Audiology and Speech Sciences. Approval of department.  
Supervised clinical experience in the management of clients with speech-language disorders.
- 894B Clinical Practicum in Audiology**  
Fall, Spring, Summer. 1 credit. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in Audiology and Speech Sciences. Approval of department.  
Supervised clinical experience in the management of clients with hearing disorders.
- 899 Master's Thesis Research**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in Audiology and Speech Sciences. Approval of department.  
Master's thesis research.
- 914A Speech Production**  
Spring of even years. 4(3-2)  
Issues in speech production. Reference to human communication and its disorders.
- 914B Speech Perception**  
Spring of odd years. 4(3-2)  
Issues in speech perception. Reference to human communication and its disorders.
- 990 Independent Study**  
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 16 credits in all enrollments for this course. R: Open only to Ph.D. students. Approval of department.  
Individualized study under faculty direction.
- 991 Special Topics in Communication Sciences and Disorders**  
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 Audiology and Speech Sciences or approval of department.  
Selected topics in human communication and its disorders.

- 992 Seminar in Communication Sciences and Disorders**  
Fall, Spring, Summer. 3(3-0) A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in Audiology and Speech Sciences.  
Topical themes in human communication and its disorders.
- 994 Research Practicum in Communication Sciences and Disorders**  
Fall, Spring, Summer. 1 credit. A student may earn a maximum of 12 credits in all enrollments for this course. RB: (ASC 803 or concurrently) R: Approval of department.  
Individual research under faculty supervision.
- 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 Ph.D. students in Audiology and Speech Sciences. Approval of department.  
Doctoral dissertation research.

- 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.

## BIOCHEMISTRY AND MOLECULAR BIOLOGY

BMB

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

- 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.

## Biochemistry and Molecular Biology—BMB

- 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) 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.
- 825 Cell Structure and Function**  
Spring. 3(3-0) Interdepartmental with Microbiology and Molecular Genetics; Physiology. 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.
- 831 Physiological Biochemistry**  
Spring of even years. 4(4-0) RB: 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 Plant Biology; Crop and Soil Sciences. Administered by Department of Plant Biology. RB: (ZOL 341) SA: BOT 856  
Recent advances in genetics and molecular biology of higher plants.
- 864 Plant Biochemistry**  
Spring. 3(3-0) Interdepartmental with Plant 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 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 36 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 120 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; Plant Biology; 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.