BIOCHEMISTRY, MOLECULAR AND CELLULAR BIOLOGY (BMCB)

The field of biochemistry, molecular and cellular biology (BMCB) encompasses a wide range of life sciences, from biophysics and biochemistry to applied biology and medicine. The B.S. in biochemistry, molecular and cellular biology is designed for students to gain a solid foundation in biology, chemistry, physics, and mathematics, along with advanced knowledge in molecular biology, biochemistry, cell biology, and genetics. BMCB students have exposure to cutting-edge techniques and frontier research topics through inquiry-based learning and hands-on research opportunities. The program offers research opportunities with program faculty in the areas of structural biology, cell signaling pathways, cancer biology, gene regulation, neurobiology, cellular structure and function, and proteomics. Graduates are "profession-ready" and well-prepared for entry-level positions in biomedical research or in the biotechnology and pharmaceutical industries, for graduate education, or for post-baccalaureate professional programs (e.g., medical school, veterinary school, dental school, etc.).

The curriculum provides most of the required and recommended courses for students seeking admission to graduate schools and to professional schools in medicine, dentistry, veterinary medicine, or pharmacy. Students obtaining a B.S. in BMCB enjoy excellent job prospects immediately upon graduation, due to high demand for skilled research technicians in biotech and pharmaceutical companies, government agencies, academic research laboratories, and medical diagnostic laboratories. Graduates also have knowledge and skills that are valuable in the fields of management, sales, marketing, regulatory affairs, technical writing, and science journalism. Students who major in BMCB can also use their training in conjunction with advanced degrees in law and business. With additional courses in education, the B.S. degree in BMCB also qualifies graduates to teach at the elementary, junior high, or high school levels.

Faculty participating in the BMCB major combine a passion for teaching and student advising with strong expertise and achievements in their research areas. BMCB faculty are committed to providing independent research experiences for undergraduate students, and most faculty have active and well-funded research programs utilizing state-of-the-art techniques and instruments. On-campus facilities that students can use to enhance their research experience include the Hubbard Center for Genome Studies, the University Instrumentation Center, and the Center of Integrated Biomedical and Bioengineering Research.

Pre-Professional Health Programs

Students interested in postgraduate education in healthcare occupations (e.g., medical, dental, physician assistant, pharmacy, etc.) should visit the UNH Pre-Professional Health Programs Advising Office. Students interested in veterinary medicine should consult the Pre-Veterinary Medicine Program. While many of the prerequisite courses required by professional schools are also requirements of the BMCB major, students should consult with their faculty adviser to create a plan of study that best prepares them for pursuing a career in the health professions.

https://colsa.unh.edu/molecular-cellular-biomedical-sciences

Programs

- Biochemistry, Molecular and Cellular Biology Major (B.S.)
- Biochemistry, Molecular and Cellular Biology Minor

Courses

Biochemistry, Molecular & Cellular Biology (BMCB)

BMCB 501 - Biological Chemistry
Credits: 4
Survey of the molecular basis of life with a focus on the mechanisms of biochemical reactions in metabolic pathways, beginning with an overview of functional groups and organic reactions relevant for living organisms. Bioenergetics of carbohydrate, lipid, and nitrogen metabolic pathways.
Prerequisite(s): (CHEM 403 with a minimum grade of D- and (CHEM 404 with a minimum grade of D- or CHEM 404H with a minimum grade of D-)) or CHEM 411 with a minimum grade of D-.
Mutual Exclusion: No credit for students who have taken BMCB 658, BMCB 751, BMCB 752.
Grade Mode: Letter Grading

BMCB 605 - Principles of Cell Biology
Credits: 4
Cell and developmental biology of multicellular eukaryotic organisms. Structure and function of major cellular compartments; mechanisms of cellular communication and dynamics; embryonic development. Special topics: subcellular organization and function; membrane biogenesis; signal transduction; mitogenesis; apoptosis; autophagy; tumor suppressors and cell cycle regulation; cytokinesis; cytoskeletal dynamics; cellular shape and motility; stem cell biology; organogenesis; morphogenesis and patterning.
Prerequisite(s): (BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BMS 507 with a minimum grade of D- or BIOL 413 with a minimum grade of D-) and ((CHEM 403 with a minimum grade of D- and (CHEM 404 with a minimum grade of D- or CHEM 404H with a minimum grade of D-)) or CHEM 405 with a minimum grade of D-).
Equivalent(s): BIOL 605, BSCI 735
Grade Mode: Letter Grading

BMCB 658 - General Biochemistry
Credits: 3
Comprehensive, introductory course emphasizing the cellular metabolism and the structure and function of proteins, nucleic acids, carbohydrates, and lipids.
Co-requisite: BMCB 659
Prerequisite(s): (BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BIOL 413 with a minimum grade of D- or BMS 507 with a minimum grade of D-) and ((CHEM 545 with a minimum grade of D- and CHEM 546 with a minimum grade of D-) or (CHEM 547 with a minimum grade of D- and CHEM 548 with a minimum grade of D-) or (CHEM 651 with a minimum grade of D- and CHEM 652 with a minimum grade of D-)).
Equivalent(s): BMCB 658A
Mutual Exclusion: No credit for students who have taken BMCB 501.
Grade Mode: Letter Grading

BMCB 658A - General Biochemistry
Credits: 3
Comprehensive, introductory course emphasizing the cellular metabolism and the structure and function of proteins, nucleic acids, carbohydrates, and lipids. This course is intended for programs that do not require a biochemistry laboratory.
Prerequisite(s): (BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BIOL 413 with a minimum grade of D- or BMS 507 with a minimum grade of D-) and ((CHEM 545 with a minimum grade of D- and CHEM 546 with a minimum grade of D-) or (CHEM 547 with a minimum grade of D- and CHEM 548 with a minimum grade of D-) or (CHEM 651 with a minimum grade of D- and CHEM 652 with a minimum grade of D-)).
Equivalent(s): BMCB 658
Mutual Exclusion: No credit for students who have taken BMCB 501.
Grade Mode: Letter Grading

BMCB 659 - General Biochemistry Lab
Credits: 2
Structured laboratory experiments that provide training in analytical and preparative techniques fundamental to modern biochemistry and molecular biology.
Co-requisite: BMCB 658
Equivalent(s): BCHM 659, BMCB 659W
Grade Mode: Letter Grading
Special Fee: Yes

BMCB 659W - General Biochemistry Lab
Credits: 2
Structured laboratory experiments that provide training in analytical and preparative techniques fundamental to modern biochemistry and molecular biology.
Co-requisite: BMCB 658
Attributes: Writing Intensive Course
Equivalent(s): BCHM 659, BMCB 659
Grade Mode: Letter Grading
Special Fee: Yes

BMCB 750 - Physical Biochemistry
Credits: 3
Structure, interactions, and physical-chemical properties of biomolecules. Thermodynamic, kinetic, and spectroscopic methods for the study of proteins and nucleic acids.
Prerequisite(s): ((CHEM 545 with a minimum grade of D- and CHEM 546 with a minimum grade of D-) or (CHEM 547 with a minimum grade of D- and CHEM 548 with a minimum grade of D-) or (CHEM 651 with a minimum grade of D- and CHEM 652 with a minimum grade of D-)) and (MATH 424B with a minimum grade of D- or MATH 425 with a minimum grade of D-).
Equivalent(s): BCHM 750
Grade Mode: Letter Grading

BMCB 751 - Principles of Biochemistry I
Credits: 4
In-depth survey of biochemistry: macromolecular structure; structure and function of proteins, nucleic acids, carbohydrates, and lipids; introduction to metabolic pathways.
Prerequisite(s): (CHEM 547 with a minimum grade of D- and CHEM 548 with a minimum grade of D-) or (CHEM 651 with a minimum grade of D- and CHEM 652 with a minimum grade of D-).
Equivalent(s): BCHM 751
Mutual Exclusion: No credit for students who have taken BMCB 501.
Grade Mode: Letter Grading

BMCB 752 - Principles of Biochemistry II
Credits: 4
In-depth survey of biochemistry: metabolism of amino acids, nucleotides, carbohydrates and lipids; synthesis and regulation of macromolecules; molecular biology of the eukaryotic cell.
Prerequisite(s): BMCB 751 with a minimum grade of D-.
Equivalent(s): BCHM 752
Mutual Exclusion: No credit for students who have taken BMCB 501.
Grade Mode: Letter Grading

BMCB 753 - Cell Culture
Credits: 5
Principles and technical skills fundamental to the culture of animal and plant cells, tissues, and organs. Introduction to the techniques of sub-culturing, establishing primary cultures, karyotyping, serum testing, cloning, growth curves, cryopreservation, hybridoma formation and monoclonal antibody production, and organ cultures. Application of cell culture to contemporary research in the biological sciences. Lab.
Prerequisite(s): BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.
Equivalent(s): ANSC 751, MICR 751, PBIO 751
Grade Mode: Letter Grading
Special Fee: Yes

BMCB 754 - Molecular Biology Research Methods
Credits: 5
Theory and application of current technologies to manipulate DNA. Hands-on research experience that includes DNA isolation and quantitation methods, cloning, PCR, DNA sequencing, and analysis of gene products. Lab.
Attributes: Writing Intensive Course
Prerequisite(s): GEN 604 with a minimum grade of D-.
Equivalent(s): BCHM 754, BSCI 765, GEN 754, PBIO 754
Grade Mode: Letter Grading
Special Fee: Yes

BMCB 755 - Protein Biochemistry Laboratory
Credits: 5
Application of modern approaches to the characterization and purification of proteins. Emphasis on recombinant protein production and purification, analytical techniques for characterization of proteins, enzyme kinetics, and molecular visualization of protein structure.
Attributes: Writing Intensive Course
Prerequisite(s): BMCB 658 with a minimum grade of D- or BMCB 751 with a minimum grade of D-.
Grade Mode: Letter Grading
Special Fee: Yes

BMCB 760 - Pharmacology
Credits: 4
Introduction to the basic principles and fundamental concepts of pharmacology, with a focus on molecular mechanisms and pathological basis of therapeutics and their curative effects. Topics include: foundations of pharmacology including pharmacodynamics and pharmacogenomics; drugs affecting other systems; chemotherapeutic drugs.
Prerequisite(s): BMCB 658 with a minimum grade of D- or BMCB 751 with a minimum grade of D-.
Mutual Exclusion: No credit for students who have taken BSCI 680.
Grade Mode: Letter Grading

BMCB 763 - Biochemistry of Cancer
Credits: 4
Evaluation of the hallmarks of cancer, including molecular mechanisms of carcinogenesis, roles of oncogenes and dysregulated cell development, function and metabolism, tumor immunology, and the biological basis of cancer therapy.
Prerequisite(s): (BMCB 658 with a minimum grade of D- or BMCB 751 with a minimum grade of D-) and BMCB 605 with a minimum grade of D-.
Equivalent(s): BCHM 763
Grade Mode: Letter Grading

BMCB 790 - Undergraduate Teaching Experience
Credits: 1-4
Provide academic support to graduate teaching assistants or faculty in preparing, presenting, and executing Biochemistry, Molecular and Cellular Biology lectures or labs.
Repeat Rule: May be repeated for a maximum of 4 credits.
Grade Mode: Letter Grading

BMCB 794 - Protein Structure and Function
Credits: 4
Analysis of how the three-dimensional architecture of soluble and membrane proteins contributes to their biochemical function; methods for determining the structure of proteins; protein folding; protein targeting; mechanisms of enzyme catalysis. Computer resources used for protein modeling and structural prediction.
Prerequisite(s): BMCB 658 with a minimum grade of D- or BMCB 751 with a minimum grade of D- or BMCB 658A with a minimum grade of D-.
Grade Mode: Letter Grading

BMCB 795 - Investigations in Molecular and Cellular Biology
Credits: 1-4
Advanced research or scholarly projects developed and conducted under the supervision of a faculty member. Provides the opportunity to apply advanced knowledge and techniques of the major to a specific problem or question.
Repeat Rule: May be repeated for a maximum of 8 credits.
Equivalent(s): BCHM 795, BCHM 795W, BMCB 795W
Grade Mode: Letter Grading

BMCB 795W - Investigations in Molecular and Cellular Biology
Credits: 1-4
Advanced research or scholarly projects developed and conducted under the supervision of a faculty member. Provides the opportunity to apply advanced knowledge and techniques of the major to a specific problem or question.
Attributes: Writing Intensive Course
Repeat Rule: May be repeated for a maximum of 8 credits.
Equivalent(s): BCHM 795, BCHM 795W, BMCB 795
Grade Mode: Letter Grading

BMCB 799 - Senior Thesis
Credits: 1-4
Independent research project under the direction of a faculty sponsor for seniors in biochemistry, molecular and cellular biology. Final product is a written thesis. One or two semesters.
Attributes: Writing Intensive Course
Repeat Rule: May be repeated for a maximum of 8 credits.
Equivalent(s): BCHM 699, BCHM 799, BCHM 799H, BMCB 799H
Grade Mode: Letter Grading

BMCB 799H - Honors Senior Thesis
Credits: 1-4
Independent research project under the direction of a faculty sponsor for seniors in biochemistry, molecular and cellular biology and in the Honors Program. Final product is a written thesis. One or two semesters.
Attributes: Honors course; Writing Intensive Course
Repeat Rule: May be repeated for a maximum of 8 credits.
Equivalent(s): BCHM 799, BCHM 799H, BMCB 799
Grade Mode: Letter Grading

Faculty

BMCB affiliated faculty.