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 plenty of 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, proteomics and glycomics, and lipid metabolism. 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 (https://colsa.unh.edu/academics/pre-professional-health-advising) website or in person (Rudman Hall, Room G02). Students interested in veterinary medicine should consult the Pre-Veterinary Medicine Program (https://colsa.unh.edu/molecular-cellular-biomedical-sciences/pre-veterinary-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 one of these health professions.

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

Programs


Courses

Biochemistry, Molecular & Cellular Biology (BMCB)

BMCB 401 - Professional Perspectives in Biochemistry, Molecular and Cellular Biology
Credits: 1
Introduction to the fields of biochemistry, molecular and cellular biology. Explores professional opportunities for BMCB majors. Guest speakers from on- and off-campus present seminars and lead discussions on contemporary issues in subject area. Development of strategies for achieving professional goals. Cr/F.

BMCB 405 - Biotechnology Research Internship
Credits: 2
A 4-week (minimum) experiential learning internship in which students conduct independent laboratory-based research in an area of shared interest with a faculty mentor in the College of Life Sciences and Agriculture. Students gain first-hand experience conducting original research, incorporating direct observation, reflection, evaluation, and discussion. Permission required. Open to high school students only.

BMCB 501 - Biological Chemistry
Credits: 5
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. Prereq: CHEM 403 and CHEM 404, or CHEM 411. No credit earned if credit received for BMCB 658, or BMCB 751 and BMCB 752. Equivalent(s): BMCB 658, BMCB 751, BMCB 752

BMCB 600 - Field Experience
Credits: 1-4
A supervised experience providing the opportunity to apply academic experience in settings associated with future professional employment and/or related graduate opportunities. Must be approved by a faculty advisor selected by the student. Permission required. Cr/F.
Repeat Rule: May be repeated for a maximum of 8 credits.
Equivalent(s): BCHM 600, BCHM 600W, BMCB 600W
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. Prereq: BIOL 411 and BIOL 412; CHEM 403 and CHEM 404.
Equivalent(s): BIOL 605, BSCI 735

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. Prereq: BIOL 411; CHEM 545 and CHEM 546, or CHEM 547 and CHEM 548, or CHEM 651 and CHEM 652. Coreq: BMCB 659.
Co-requisite: BMCB 659
Equivalent(s): BCHM 602, BCHM 656, BCHM 658

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. Coreq: BMCB 658. Special fee.
Co-requisite: BMCB 659
Equivalent(s): BCHM 659, BCHM 659W

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. Coreq: BMCB 658. Special fee. UNHM only. Writing intensive.
Co-requisite: BMCB 659
Attributes: Writing Intensive Course
Equivalent(s): BCHM 659, BCHM 659

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. Prereq: CHEM 547 and CHEM 549 and CHEM 548 and CHEM 550 or equivalent; MATH 424B or equivalent; or permission.
Equivalent(s): BCHM 750

BMCB 751 - Principles of Biochemistry
Credits: 4
In-depth survey of biochemistry: macromolecular structure; structure and function of proteins, nucleic acids, carbohydrates, and lipids; introduction to metabolic pathways. Prereq: CHEM 547 and CHEM 548, or CHEM 651 and CHEM 652; or permission.
Equivalent(s): BCHM 751

BMCB 752 - Principles of Biochemistry
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. Prereq: BMCB 751 or permission.
Equivalent(s): BCHM 752

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. Prereq: BMS 503 and 504. Special fee. Lab.
Equivalent(s): ANSC 751, MICR 751, PBIO 751

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. Prereq: GEN 604. Special fee. Lab. Writing intensive.
Attributes: Writing Intensive Course
Equivalent(s): BCHM 754, BSCI #765, GEN 754, PBIO 754

BMCB 755 - Laboratory in Biochemistry and Molecular Biology
Credits: 5
Application of modern techniques to the characterization and purification of biomolecules, with an emphasis on proteins and nucleic acids. Analysis of enzyme kinetics and basic techniques used in molecular biology. Prereq: BMCB 751 or permission. Special fee. Writing intensive.
Attributes: Writing Intensive Course
Equivalent(s): BCHM 755, BSCI #765

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. No credit if credit earned for BSCI 680. Prereq: BMCB 658 or BMCB 751, or permission.
Equivalent(s): BSCI 680

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. Prereq: BMCB 658 or BMCB 751 or permission.
Equivalent(s): BSCI 763

BMCB #783 - Proteomics for Biological Discoveries
Credits: 4
Large-scale, high throughput study of proteins; characterization of entire set of proteins in a biological sample (proteome); quantification of changes in protein composition, interactions and post-translational modifications; major technology platforms; pharmaceutical and biomedical applications. Develop skills in processing samples from research projects; analysis of mass spectrometric data. Prereq: BMCB 658 or BMCB 751 or permission.
Equivalent(s): BCHM 763

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. Permission required.
Repeat Rule: May be repeated for a maximum of 4 credits.
**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. Prereq: BMCB 658 or BMCB 751 or permission.

**Equivalent(s):** BCHM 794

**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. Permission required.

**Repeat Rule:** May be repeated for a maximum of 8 credits.

**Equivalent(s):** BCHM 795, BCHM 795W, BMCB 795W

**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. Permission required.

**Attributes:** Writing Intensive Course

**Repeat Rule:** May be repeated for a maximum of 8 credits.

**Equivalent(s):** BCHM 795, BCHM 795W, BMCB 795

**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. Permission required.

**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

**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. Permission required.

**Attributes:** Writing Intensive Course

**Repeat Rule:** May be repeated for a maximum of 8 credits.

**Equivalent(s):** BCHM 799, BCHM 799H, BMCB 799

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**Faculty**

For a list of BMCB affiliated faculty, click here (https://colsa.unh.edu/molecular-cellular-biomedical-sciences/program/bs/biochemistry-molecular-cellular-biology-major), scroll down to Explore Program Details, and view Faculty Directory.