Department of Biochemistry and Molecular Biology

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Professor P. Shing Ho, Chair
Dr. Aaron Sholders, Undergraduate Coordinator
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Undergraduate Majors
- Major in Biochemistry
  - General Biochemistry Concentration
  - Health and Medical Sciences Concentration
  - Pre-Pharmacy Concentration

Minors
- Minor in Biochemistry

Graduate

Graduate Programs in Biochemistry
The department offers graduate programs leading to Master of Science and Doctor of Philosophy degrees. Students interested in graduate work should refer to the Graduate and Professional Bulletin, and the department’s website (http://www.bmb.colostate.edu/graduates).

Master Programs
- Master of Science in Biochemistry, Plan A*
- Master of Science in Biochemistry, Plan B*

Ph.D.
- Ph.D. in Biochemistry*

* Please see department for program of study.

Courses

Biochemistry and Molecular Biology (BC)

BC 192 Biochemistry Freshman Seminar
Credits: 2 (1-0-1)
Course Description: Introduction to curriculum and career options for biochemistry majors.
Prerequisite: None.
Registration Information: Must register for lecture and recitation.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

BC 295 Introductory Independent Study
Credits: Var[1-3]
Course Description: Apply principles and knowledge being learned in first and second year life sciences and chemistry courses.
Prerequisite: LIFE 102 or CHEM 112, may be taken concurrently.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

BC 351 Principles of Biochemistry
Credits: 4 (4-0-0)
Course Description: Structure and function of biological molecules; biocatalysis; metabolism and energy transduction; gene expression.
Prerequisites: (BZ 110 or BZ 120 or LIFE 102) and (CHEM 245 or CHEM 341 or CHEM 345).
Registration Information: For majors in biological sciences, engineering, and preprofessional students in the health sciences. Sections may be offered: Online.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: No.

BC 353 Pre-Health Genetics
Credits: 4 (4-0-0)
Course Description: Applies and extends the biochemical concepts learned in BC 351 to macromolecules and molecular processes based on nucleic acids.
Prerequisite: BC 351.
Registration Information: Sections may be offered: Online.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: No.

BC 401 Comprehensive Biochemistry I
Credits: 3 (3-0-0)
Course Description: Macromolecular structure and dynamics; membranes; enzymes; bioenergetics.
Prerequisites: (CHEM 245 or CHEM 343, may be taken concurrently or CHEM 346, may be taken concurrently) and (MATH 155 or MATH 160).
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

BC 403 Comprehensive Biochemistry II
Credits: 3 (3-0-0)
Course Description: Metabolic pathways and their regulation; cellular biochemistry.
Prerequisite: CHEM 245 or CHEM 341 or CHEM 345.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.
BC 404 Comprehensive Biochemistry Laboratory Credits: 2 (0-6-0)
Course Description: Experimental approaches to studying macromolecules, metabolism, and gene expressions.
Prerequisites: (BC 401, may be taken concurrently) and (CHEM 246 or CHEM 344 or CHEM 346) and (LIFE 212 and LIFE 203).
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.
Registration Information: Credit not allowed for both BC 464 and BC 384 and 484 courses are counted towards graduation requirements.

BC 405 Comprehensive Biochemistry II-Honors Recitation Credit: 1 (0-0-1)
Course Description: Read and discuss current literature related to material presented in BC 403.
Prerequisite: BC 403, may be taken concurrently.
Registration Information: For students participating in the Honors program.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 411 Physical Biochemistry Credits: 4 (3-0-1)
Course Description: Thermodynamics; reaction rates; quantum chemistry; spectroscopy; macromolecular folding and interactions; ligand binding; enzyme kinetics; membranes.
Prerequisites: (BC 351 with a minimum grade of B or BC 401) and (CHEM 113) and (MATH 161 or MATH 255).
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

BC 441 3D Molecular Models for Biochemistry Credit: 1 (0-1.5-.5)
Course Description: Computer instruction to construct 3D models of proteins and nucleic acids using leading software.
Prerequisite: BC 401, may be taken concurrently.
Registration Information: Must register for laboratory and recitation.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

BC 463 Molecular Genetics Credits: 3 (3-0-0)
Course Description: Molecular basis of gene structure, replication, repair, recombination, and expression.
Prerequisites: (BC 401 with a minimum grade of C, may be taken concurrently or BC 351 with a minimum grade of C) and (LIFE 210B with a minimum grade of C or BC 351 with a minimum grade of C).
Registration Information: Credit not allowed for both BC 463 and BC 563.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

BC 464 Molecular Genetics Recitation Credit: 1 (0-0-1)
Course Description: Methods used to study the molecular basis of gene structure, replication, repair, recombination, and expression.
Prerequisites: (LIFE 210B) and (BC 351, may be taken concurrently or BC 401, may be taken concurrently).
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

BC 465 Molecular Regulation of Cell Function Credits: 3 (3-0-0)
Course Description: Molecular regulation of cell organization, membrane formation, organelle biogenesis, cell communication, shape and motility, growth, aging, and death.
Prerequisites: (LIFE 210) and (BC 403, may be taken concurrently or BC 351).
Registration Information: Credit not allowed for both BC 465 and BC 565.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 466 Molecular Regulation of Cell Function-Honors Credit: 1 (0-0-1)
Course Description: Discussions of current articles in cell biology including methods and molecular mechanisms that explain cell behavior in health and disease.
Prerequisite: None.
Registration Information: Concurrent registration in BC 465.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 467 Biochemistry of Disease Credits: 3 (3-0-0)
Course Description: Biochemical basis of specific human diseases.
Prerequisite: BC 401.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 475 Mentored Research Credits: 3 (0-6-1)
Course Description: Plan and conduct mentored research with weekly discussion of progress, presentation at all-university symposium, and submission of written report.
Prerequisite: BC 404.
Registration Information: Must register for laboratory and recitation.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: No.

BC 484 Supervised College Teaching Credits: Var[1-18]
Course Description: Assist in teaching selected courses in biochemistry and molecular biology.
Prerequisite: None.
Registration Information: A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

BC 487A Internship Credits: Var[1-18]
Course Description: Work experience with an approved preceptor outside of a university laboratory environment.
Prerequisites: BC 401 and BC 403 and BC 404.
Registration Information: Written consent of instructor. Minimum GPA of 2.0.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.
**BC 487B Internship: International Credits: Var[1-18]**
**Course Description:** Research in foreign host laboratory in contact with CSU mentor.
**Prerequisites:** BC 401 and BC 463 and BC 495 - at least 1 credit.
**Registration Information:** Selection by departmental committee. BC 495 (one credit in lab of CSU mentor).
**Terms Offered:** Fall, Spring, Summer.
**Grade Mode:** Instructor Option.
**Special Course Fee:** No.

**BC 493 Senior Seminar Credit: 1 (0-0-1)**
**Course Description:** Critical analysis of selected literature in biochemistry and molecular biology.
**Prerequisite:** None.
**Registration Information:** BC 401 or concurrent registration.
**Terms Offered:** Fall, Spring, Summer.
**Grade Mode:** Instructor Option.
**Special Course Fee:** No.

**BC 495 Independent Study Credits: Var[1-18]**
**Course Description:** Faculty-directed exploration of areas of special interest in biochemistry and molecular biology.
**Prerequisite:** None.
**Registration Information:** Minimum cumulative GPA of 3.0.
**Terms Offered:** Fall, Spring, Summer.
**Grade Mode:** Instructor Option.
**Special Course Fee:** No.

**BC 496 Group Study Credits: Var[1-18]**
**Course Description:** Supervised laboratory research in biochemistry and molecular biology.
**Prerequisite:** None.
**Terms Offered:** Fall, Spring, Summer.
**Grade Mode:** Instructor Option.
**Special Course Fee:** No.

**BC 498 Research Credits: Var[1-6]**
**Course Description:** Supervised laboratory research in biochemistry and molecular biology.
**Prerequisite:** None.
**Terms Offered:** Fall, Spring, Summer.
**Grade Mode:** Instructor Option.
**Special Course Fee:** No.

**BC 499A Thesis: Laboratory Research-Based Credits: 3 (0-0-3)**
**Course Description:** Laboratory-based research thesis.
**Prerequisite:** None.
**Terms Offered:** Fall, Spring, Summer.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

**BC 499B Thesis: Literature Based Credits: 3 (0-0-3)**
**Course Description:** Thesis - Literature-based in Gen. Biochemistry.
**Prerequisite:** BC 493, may be taken concurrently.
**Terms Offered:** Fall, Spring, Summer.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

**BC 499C Thesis: Literature-based in Health and Med Sci Credits: 3 (0-0-3)**
**Course Description:** Thesis - Literature-based in Health and Med. Sci.
**Prerequisite:** BC 493, may be taken concurrently.
**Terms Offered:** Fall, Spring, Summer.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

**BC 499D Thesis: Literature-based in Pre-Pharmacy Credits: 3 (0-0-3)**
**Course Description:** Thesis - Literature-based in Pre-Pharmacy.
**Prerequisite:** BC 493, may be taken concurrently.
**Terms Offered:** Fall, Spring, Summer.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

**BC 499E Thesis: Literature-based in Neurobiochemistry Credits: 3 (0-0-3)**
**Course Description:** Thesis - Literature-based in Neurobiochemistry.
**Prerequisite:** BC 493, may be taken concurrently.
**Terms Offered:** Fall, Spring, Summer.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

**BC 511 Structural Biology I Credits: 4 (3-0-1)**
**Course Description:** Structural principles of biological macromolecules and techniques of structural analysis.
**Prerequisite:** BC 401, may be taken concurrently.
**Registration Information:** Must register for lecture and recitation.
**Term Offered:** Fall.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

**BC 512 Principles of Macromolecular Structure Credit: 1 (1-0-0)**
**Course Description:** Physical interactions controlling folding and solution behavior of biological macromolecules, including proteins, nucleic acids, and membranes.
**Prerequisite:** BC 411, may be taken concurrently.
**Term Offered:** Fall.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

**BC 513 Enzymology Credit: 1 (1-0-0)**
**Course Description:** Kinetic methods, mechanism, and regulation of enzyme catalysis.
**Prerequisite:** BC 403.
**Term Offered:** Spring.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

**BC 517 Metabolism Credits: 2 (2-0-0)**
**Course Description:** Design and regulation of metabolic pathways.
**Prerequisites:** BC 351 and BC 403.
**Terms Offered:** Fall, Spring.
**Grade Mode:** Traditional.
**Special Course Fee:** No.

**BC 521 Principles of Chemical Biology Credits: 3 (3-0-0)**
**Also Offered As:** CHEM 521.
**Course Description:** Principles of chemical biology. Chemical methods for understanding and controlling the structure and function of biopolymers.
**Prerequisite:** CHEM 245 or CHEM 343 or CHEM 346.
**Registration Information:** Credit not allowed for both BC 521 and CHEM 521.
**Term Offered:** Fall.
**Grade Mode:** Traditional.
**Special Course Fee:** No.
**BC 563** Molecular Genetics Credits: 4 (3-0-1)

**Course Description:** Mechanisms of replication, transcription, processing, translation, and packaging of genetic material, emphasizing original literature and methods.

**Prerequisites:** BC 401 and LIFE 210.

**Registration Information:** Must register for lecture and recitation. Credit not allowed for both BC 563 and BC 463.

**Term Offered:** Fall.

**Grade Mode:** Traditional.

**Special Course Fee:** No.

**BC 565** Molecular Regulation of Cell Function Credits: 4 (3-0-1)

**Course Description:** Molecular regulation of cell organization, membrane formation, organelle biogenesis, cell communication, shape and motility, growth, aging, and death.

**Prerequisites:** (LIFE 210) and (BC 351 or BC 403, may be taken concurrently).

**Registration Information:** Credit not allowed for both BC 565 and BC 465. Must register for lecture and recitation.

**Term Offered:** Spring.

**Grade Mode:** Traditional.

**Special Course Fee:** No.

**BC 571** Quantitative Biochemistry Credit: 1 (1-0-0)

**Course Description:** Introduction to statistics, error analysis, and curve fitting of biochemical data with a focus on practical examples.

**Prerequisite:** BC 511, may be taken concurrently.

**Term Offered:** Spring.

**Grade Mode:** Traditional.

**Special Course Fee:** No.

**BC 589** Current Trends in Molecular Biosciences Credits: 2 (1-2-0)

**Course Description:** Biochemical and molecular biological foundations of molecular genetics/genetic engineering; molecular analysis of genes.

**Prerequisite:** None.

**Registration Information:** B.S. or B.A. in biology or chemistry; secondary school teaching certification required. Offered as an online course only.

**Term Offered:** Summer.

**Grade Modes:** S/U within Student Option, Trad within Student Option.

**Special Course Fee:** No.

**BC 601** Responsible Conduct in Biochemistry Credit: 1 (1-0-0)

**Course Description:** Design of experiments; error and fraud, publishing/grant application submission, scientific misconduct, classic examples of fraud, case studies.

**Prerequisite:** None.

**Restriction:** Must be a: Graduate, Professional.

**Term Offered:** Spring.

**Grade Mode:** Traditional.

**Special Course Fee:** No.

**BC 611** Structural Biology II Credits: 2 (2-0-0)

**Course Description:** Structure and interactions of biological macromolecules related to function.

**Prerequisite:** BC 511.

**Restriction:** Must be a: Graduate, Professional.

**Term Offered:** Spring.

**Grade Mode:** Traditional.

**Special Course Fee:** No.

**BC 663** Gene Expression Credits: 2 (2-0-0)

**Course Description:** Eukaryotic transcription mechanisms with emphasis on methods of study and regulatory mechanisms.

**Prerequisite:** BC 563.

**Restriction:** Must be a: Graduate, Professional.

**Term Offered:** Spring.

**Grade Mode:** Traditional.

**Special Course Fee:** No.

**BC 665A** Advanced Topics in Cell Regulation: Microscopic Methods Credits: 2 (2-0-0)

**Course Description:** Analysis of cell behavior, function and regulation.

**Prerequisite:** BC 565.

**Restriction:** Must be a: Graduate, Professional.

**Terms Offered:** Fall, Spring.

**Grade Mode:** Traditional.

**Special Course Fee:** No.

**BC 665B** Advanced Topics in Cell Regulation: Modern Methods Credits: 2 (2-0-0)

**Course Description:** Modern methods in cell biology.

**Prerequisite:** BC 565.

**Restriction:** Must be a: Graduate, Professional.

**Terms Offered:** Fall, Spring.

**Grade Mode:** Traditional.

**Special Course Fee:** No.

**BC 695** Independent Study Credits: Var[1-18]

**Course Description:**

**Prerequisite:** None.

**Restriction:** Must be a: Graduate, Professional.

**Terms Offered:** Fall, Spring, Summer.

**Grade Mode:** S/U Sat/Unsat Only.

**Special Course Fee:** No.

**BC 698** Research Credits: Var[1-18]

**Course Description:**

**Prerequisite:** None.

**Restriction:** Must be a: Graduate, Professional.

**Terms Offered:** Fall, Spring, Summer.

**Grade Mode:** S/U Sat/Unsat Only.

**Special Course Fee:** No.

**BC 699** Thesis Credits: Var[1-18]

**Course Description:**

**Prerequisite:** BC 565.

**Restriction:** Must be a: Graduate, Professional.

**Terms Offered:** Fall, Spring, Summer.

**Grade Mode:** S/U Sat/Unsat Only.

**Special Course Fee:** No.

**BC 701** Grant Proposal Writing and Reviewing Credit: 1 (1-0-0)

**Course Description:** Didactic and hands-on experience with locating funding sources, writing effective grant proposals, and the review process in the bio-molecular sciences.

**Prerequisites:** (BC 403) and (BC 511, may be taken concurrently) and (BC 563, may be taken concurrently).

**Restriction:** Must be a: Graduate, Professional.

**Term Offered:** Fall.

**Grade Mode:** Instructor Option.

**Special Course Fee:** No.
BC 711A  Advanced Topics in Structural Biology: Protein Structure and Function  Credit: 1 (1-0-0)  
Course Description:
Prerequisites: BC 511 and BC 611.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 711B  Advanced Topics in Structural Biology: Membrane Proteins  Credit: 1 (1-0-0)  
Course Description:
Prerequisites: BC 511 and BC 611.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 711C  Advanced Topics in Structural Biology: Protein-DNA Interactions  Credit: 1 (1-0-0)  
Course Description:
Prerequisites: BC 511 and BC 611.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 711D  Advanced Topics in Structural Biology: Biomolecular Spectroscopy  Credit: 1 (1-0-0)  
Course Description:
Prerequisites: BC 511 and BC 611.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 711E  Advanced Topics in Structural Biology: Biomolecular NMR  Credit: 1 (1-0-0)  
Course Description:
Prerequisites: BC 511 and BC 611.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 711F  Advanced Topics in Structural Biology: Macromolecular X-ray Crystallography  Credit: 1 (1-0-0)  
Course Description:
Prerequisites: BC 511 and BC 611.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 763A  Advanced Molecular Genetics Topics: Chromatin and Transcription  Credit: 1 (1-0-0)  
Course Description:
Prerequisite: BC 663, may be taken concurrently.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

BC 763B  Advanced Molecular Genetics Topics: Transcriptional Control - Co-Activators and Corepressors  Credit: 1 (1-0-0)  
Course Description:
Prerequisite: BC 663, may be taken concurrently.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 763C  Advanced Molecular Genetics Topics: Concepts and Techniques of Genetic Analysis  Credit: 1 (1-0-0)  
Course Description:
Prerequisite: BC 663, may be taken concurrently.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 784  Supervised College Teaching  Credits: Var[1-3]  
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

BC 793  Seminar  Credit: 1 (0-0-1)  
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Instructor Option.
Special Course Fee: No.

BC 795  Independent Study  Credits: Var[1-18]  
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

BC 796  Group Study  Credits: Var[1-5]  
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

BC 798  Research  Credits: Var[1-18]  
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

BC 799  Dissertation  Credits: Var[1-18]  
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.