# BIOCHEM + MOLE BIOLOGY-BC (BC)

## Courses

**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] (0-0-0)
- **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.
- **Prerequisite:** (BZ 110 or BZ 120 or LIFE 102) and (CHEM 241 or 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 360 Responsible Conduct in Biochemical Research**
- **Credit:** 1 (1-0-0)
- **Course Description:** Research ethics and the responsible conduct of research.
- **Prerequisite:** LIFE 212.
- **Registration Information:** Sophomore standing. Biochemistry majors only. This is a partial semester course.
- **Terms Offered:** Fall, Spring.
- **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.
- **Prerequisite:** (CHEM 245 or CHEM 343, may be taken concurrently or CHEM 346, may be taken concurrently) and (MATH 155 or MATH 160).
- **Registration Information:** Sophomore standing. Sections may be offered: Online.
- **Terms Offered:** Fall, Spring.
- **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.
- **Registration Information:** Sophomore standing. Sections may be offered: Online.
- **Terms Offered:** Fall, 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.
- **Prerequisite:** (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.

**BC 405 Comprehensive Biochemistry II--Honors Recitation**
- **Credit:** 1 (0-0-0)
- **Course Description:** Read and discuss current literature related to material presented in BC 403.
- **Prerequisite:** None.
- **Registration Information:** Must have concurrent registration in BC 403. For students participating in the Honors program.
- **Term Offered:** Spring.
- **Grade Mode:** Traditional.
- **Special Course Fee:** No.

**BC 406A Investigative Biochemistry: Protein Biochemistry**
- **Credits:** 2 (0-4-0)
- **Course Description:** Advanced inquiry-based protein chemistry and molecular biology lab.
- **Prerequisite:** BC 404.
- **Registration Information:** This is a partial semester course.
- **Terms Offered:** Fall, Spring.
- **Grade Mode:** Traditional.
- **Special Course Fee:** Yes.

**BC 406B Investigative Biochemistry: Molecular Genetics**
- **Credits:** 2 (1-3-0)
- **Course Description:** Advanced biochemical and molecular biological techniques and a problem-solving approach to molecular genetics.
- **Prerequisite:** BC 404.
- **Registration Information:** Must register for lecture and laboratory.
- **Terms Offered:** Fall, Spring.
- **Grade Mode:** Traditional.
- **Special Course Fee:** No.
BC 406C Investigative Biochemistry: Cellular Biochemistry Credits: 2 (1-3-0)
Course Description: Advanced biochemical and molecular biological techniques and a problem-solving approach to cellular biochemistry.
Prerequisite: BC 404.
Registration Information: Must register for lecture and laboratory.
Terms Offered: Fall, 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.
Prerequisite: (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.
Prerequisite: (BC 401 with a minimum grade of C, may be taken concurrently or BC 351 with a minimum grade of C) and (LIFE 201B with a minimum grade of C or BZ 350 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.
Prerequisite: (LIFE 201B) and (BC 351, may be taken concurrently or BC 401, may be taken concurrently).
Registration Information: Must have concurrent registration in BC 463.
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.
Prerequisite: (LIFE 210) and (BC 403, may be taken concurrently or BC 351).
Registration Information: Sections may be offered: Online. Credit not allowed for both BC 465 and BC 565.
Terms Offered: Spring, Summer.
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: Must have concurrent registration in BC 465.
Terms 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. Maximum of 9 credits allowed in course.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: No.

BC 484 Supervised College Teaching Credits: Var[1-18] (0-0-0)
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] (0-0-0)
Course Description: Work experience with an approved preceptor outside of a university laboratory environment.
Prerequisite: 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] (0-0-0)
Course Description: Research in foreign host laboratory in contact with CSU mentor.
Prerequisite: 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.
Grade Mode: Instructor Option.
Special Course Fee: No.

BC 494  Independent Study  Credits: Var[1-18] (0-0-0)
Course Description: Faculty-directed exploration of areas of special interest in biochemistry and molecular biology.
Prerequisite: None.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

BC 495  Group Study  Credits: Var[1-18] (0-0-0)
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 496  Research  Credits: Var[1-6] (0-0-0)
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 497  Thesis - Literature-based in Biochemistry  Credits: 3 (0-0-3)
Course Description: Thesis - Literature-based in Biochemistry.
Prerequisite: BC 493.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Traditional.
Special Course Fee: No.

BC 498  Research  Credits: Var[1-6] (0-0-0)
Course Description: Faculty-directed exploration of areas of special interest 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 General Biochemistry.
Prerequisite: BC 493.
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.
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.
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: 3 (0-0-0)
Course Description: Structural principles of biological macromolecules and techniques of structural analysis.
Prerequisite: BC 401, may be taken concurrently.
Terms Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

BC 512  Principles of Macromolecular Structure  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 513  Enzymology  Credit: 1 (1-0-0)
Course Description: Design and regulation of metabolic pathways.
Prerequisite: BC 351 and BC 403.
Term Offered: 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 522  Principles of Chemical Biology II  Credits: 3 (3-0-0)
Also Offered As: CHEM 522.
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 522 and CHEM 522.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

BC 523  Principles of Chemical Biology III  Credits: 3 (3-0-0)
Also Offered As: CHEM 523.
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 523 and CHEM 523.
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.
Prerequisite: BC 401 and LIFE 201B.
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.
Prerequisite: (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 566 Advanced Topics in Mitotic Processes Credit: 1 (1-0-0)
Course Description: Mitotic spindle, microtubules, kinetochores, and molecular motors, specifically during cell division.
Prerequisite: BC 465 or BC 565.
Restriction:.
Registration Information: Written consent of instructor.
Terms Offered: Fall, 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. (Even years).
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: Modern 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: Microoscopic 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] (0-0-0)
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] (0-0-0)
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] (0-0-0)
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 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.
Prerequisite: (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:
Prerequisite: 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:
Prerequisite: 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:
Prerequisite: 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:
Prerequisite: 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:
Prerequisite: 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:
Prerequisite: 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: Traditional.
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 774  Supervised College Teaching Credits: Var[1-3] (0-0-0)
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] (0-0-0)
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] (0-0-0)
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] (0-0-0)
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] (0-0-0)
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.