

DEPARTMENT OF BIOCHEMISTRY AND BIOPHYSICS

The Department of Biochemistry and Biophysics in the UNC School of Medicine offers a number of courses to undergraduate students, but offers only advanced degrees and not a B.A. or B.S. degree. Undergraduate students interested in these areas should take relevant courses in the biochemical division of the Department of Chemistry and the Department of Physics. The department serves undergraduate students who are interested in biochemical research or health-related careers. It offers a series of undergraduate biochemistry classes, research opportunities, and counseling to students taking premedical, predoctoral, prenursing, prepharmacy, or public health curricula.

Graduate Programs

- M.S. in Biochemistry and Biophysics (<https://catalog.unc.edu/graduate/schools-departments/biochemistry-biophysics/>)
- Ph.D. in Biochemistry and Biophysics (<https://catalog.unc.edu/graduate/schools-departments/biochemistry-biophysics/>)

BIOC–Biochemistry Undergraduate-level Courses

BIOC 107. Introduction to Biochemistry. 4 Credits.

Recommended preparation, one year of high school chemistry. Designed for students who desire a background in biochemistry as it relates to the human body, such as premed, prenursing, predoctoral hygiene, and allied health. Brief review of inorganic and organic chemistry, followed by a survey of biochemistry (survey continues in BIOC 108).

Rules & Requirements

Making Connections Gen Ed: PX.

Grading Status: Letter grade.

BIOC 108. Introduction to Biochemistry. 4 Credits.

Designed for premed, prenursing, predoctoral hygiene, allied health, and all students who desire a background in biochemistry as it relates to the human body. One year of high school chemistry required. Continuation of BIOC 107; covers basic and clinically relevant aspects of biochemistry. Online lecture (asynchronous) with an optional in person meeting once per week. One online lab session per week.

Rules & Requirements

Making Connections Gen Ed: PX.

Grading Status: Letter grade.

Advanced Undergraduate and Graduate-level Courses

BIOC 601. Enzyme Properties, Mechanisms, and Regulation. 3 Credits.

Focuses on enzyme architecture to illustrate how the shapes of enzymes are designed to optimize the catalytic step and become allosterically modified to regulate the rate of catalysis.

Rules & Requirements

Requisites: Prerequisite, CHEM 430; permission of the instructor for students lacking the prerequisite.

Grading Status: Letter grade.

BIOC 603. MiBio Seminar. 2 Credits.

This class is designed to 1) enhance students' ability to present scientific material to their peers in a comprehensive, cohesive manner, 2) familiarize students with scientific concepts and technologies used in multiple disciplines, 3) expose students to cutting edge research, 4) prepare students to gain substantial meaning from seminars and to ask questions, and 5) enhance students' ability to evaluate scientific papers and seminars.

Rules & Requirements

Grading Status: Letter grade.

Same as: BIOL 603, CBPH 603, GNET 603.

BIOC 631. Advanced Molecular Biology. 4 Credits.

This course explores cutting edge research in molecular biology – the investigation at molecule-scale of the mechanisms behind life. We briefly review core-principles in molecular biology, then investigate more recent research that extends or overturns these core principles.

Rules & Requirements

Requisites: Prerequisites, BIOL 202, or BIOL 220, or CHEM 430, and permission of the course director.

Grading Status: Letter grade.

Same as: GNET 631, BIOL 631, MCRO 631.

BIOC 632. Advanced Molecular Biology II. 3 Credits.

Required preparation for undergraduates, at least one undergraduate course in both biochemistry and genetics. The purpose of this course is to provide historical, basic, and current information about the flow and regulation of genetic information from DNA to RNA in a variety of biological systems. Three lecture hours a week.

Rules & Requirements

Grading Status: Letter grade.

Same as: GNET 632, BIOL 632, MCRO 632.

BIOC 649. Mathematics and Macromolecules. 1.5 Credits.

This course focuses on the application of mathematics to topics important in biophysics, such as thermodynamics and electrostatics. The unit is designed to help students perform more efficiently in BIOC 650, 651, and 652.

Rules & Requirements

Grading Status: Letter grade.

BIOC 650. Macromolecular Thermodynamics and Binding. 1 Credits.

Required preparation, two semesters of physical chemistry or permission of the instructor. Basic molecular models and their use in developing statistical descriptions of macromolecular function. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisite, CHEM 430.

Grading Status: Letter grade.

BIOC 651. Macromolecular Interactions and Forces. 1 Credits.

Required preparation, two semesters of physical chemistry or permission of the instructor. Macromolecules as viewed with modern computational methods. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisite, CHEM 430.

Grading Status: Letter grade.

BIOC 652. Macromolecular Dynamics. 1 Credits.

Required preparation, two semesters of physical chemistry or permission of the instructor. Stability of macromolecules and their complexes with other molecules. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisite, CHEM 430.

Grading Status: Letter grade.

BIOC 655. Case Studies in Structural Molecular Biology. 3 Credits.

Principles of macromolecular structure and function with emphasis on proteins, molecular assemblies, enzyme mechanisms, and ATP enzymology.

Rules & Requirements

Requisites: Prerequisite, CHEM 430; permission of the instructor for students lacking the prerequisite.

Grading Status: Letter grade.

BIOC 660. Introduction to Light Microscopy. 1 Credits.

Fundamentals of optics and light microscope design for the novice student.

Rules & Requirements

Requisites: Prerequisites, BIOC 650, 651, and 652 or permission of the course director.

Grading Status: Letter grade.

BIOC 662. Macromolecular Interactions. 1 Credits.

Theory and practice of biophysical methods used in the study of interactions between macromolecules and their ligands, including surface plasmon resonance, analytical ultracentrifugation, and calorimetry.

Rules & Requirements

Requisites: Prerequisites, BIOC 650, 651, and 652; permission of the instructor for students lacking the prerequisites.

Grading Status: Letter grade.

BIOC 663A. Macromolecular NMR. 1 Credits.

Principles and practice of nuclear magnetic resonance spectroscopy: applications to biological macromolecule structure and dynamics in solution. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisites, BIOC 650, 651, and 652; permission of the instructor for students lacking the prerequisites.

Grading Status: Letter grade.

BIOC 663B. Macromolecular NMR Practice. 1 Credits.

Lab section for BIOC 663A. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisite, BIOC 664; permission of the instructor for students lacking the prerequisite.

Grading Status: Letter grade.

BIOC 664. Macromolecular Spectroscopy. 1 Credits.

Required preparation, two semesters of physical chemistry or permission of the instructor. Principles of UV, IR, Raman, fluorescence, and spin resonance spectroscopies; applications to the study of macromolecules and membranes. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisite, CHEM 430.

Grading Status: Letter grade.

BIOC 665. Advanced NMR Spectroscopy Course. 1 Credits.

Advanced NMR Spectroscopy

Rules & Requirements

Grading Status: Pass/Fail.

BIOC 666. X Ray Crystallography of Macromolecules. 1 Credits.

Principles of protein crystallography, characterization of crystals, theory of diffraction, phasing of macromolecular crystals and structure refinement. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisites, BIOC 650, 651, and 652; permission of the instructor for students lacking the prerequisites.

Grading Status: Letter grade.

BIOC 667. Macromolecular Crystallographic Methods. 2 Credits.

A combined lecture/laboratory workshop for serious students of protein crystallography. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisite, permission of the instructor.

Grading Status: Letter grade.

Same as: PHCO 667.

BIOC 668. Principles of and Simulation of Macromolecular Dynamics. 1 Credits.

A combined lecture/computer lab treatment of the principles of macromolecular dynamics and structure as approached using the tools of molecular dynamics simulations. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisites, BIOC 650, 651, and 652; permission of the instructor for students lacking the prerequisites.

Grading Status: Letter grade.

BIOC 669. Macromolecular Crystallographic Methods II. 2 Credits.

BIOC 667 is recommended for crystallography students. Permission of the instructor for students lacking the prerequisite. A combined lecture/laboratory workshop for serious students of protein crystallography or cryo-electron microscopy, addressing experimental model building, refinement, and analysis. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisite, Prerequisite, BIOC 666 or BIOC 675.

Grading Status: Letter grade.

Same as: PHCO 669.

BIOC 670. Structural Bioinformatics. 1 Credits.

A combined lecture/computer lab course introducing the methods and principles of biological data management as this relates to macromolecular sequence analysis. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisites, BIOC 650, 651, and 652; permission of the instructor for students lacking the prerequisites.

Grading Status: Letter grade.

Same as: BCB 670.

BIOC 671. Summer Research in Biophysics. 3 Credits.

This class is a 10-week summer course in biophysics.

Rules & Requirements

Grading Status: Letter grade.

BIOC 673. Proteomics, Protein Identification and Characterization by Mass Spectrometry. 1 Credits.

A lecture module that introduces students to mass spectrometry-based proteomics in new biology discovery and precision medicine. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisites, BIOC 650, 651, and 652, or one semester of physical chemistry; permission of the instructor for students lacking the prerequisites.

Grading Status: Letter grade.

BIOC 674. Ion Channels Transporters. 1 Credits.

Ion Channels Transporters

Rules & Requirements

Grading Status: Pass/Fail.

BIOC 675. Fundamentals of Cryo-Electron Microscopy. 1 Credits.

This course will provide a survey of biological applications of cryo-EM, with a particular emphasis on single particle techniques used to determine high-resolution structures of macromolecules. Students will have a basic understanding of cryo-EM theory, the methodology for creating samples and collecting data, and strategies for reconstructing 3D models of macromolecules. Course previously offered as BIOC 708.

Rules & Requirements

Grading Status: Letter grade.

BIOC 678. Electrical Signals from Macromolecular Assemblages. 2 Credits.

An intensive, six-hour per week introduction to the fundamentals of ion channel biophysics, including laboratory sessions to demonstrate principles and methods. Course intended primarily for graduate students.

Rules & Requirements

Requisites: Prerequisites, BIOC 650, 651, and 652; permission of the instructor for students lacking the prerequisite.

Grading Status: Letter grade.

BIOC 690. Special Topics in Biochemistry. 1-3 Credits.

Special topics course. Content and topics will vary each semester.

Rules & Requirements

Grading Status: Letter grade.

Contact Information

Department of Biochemistry and Biophysics

Visit Program Website (<http://www.med.unc.edu/biochem/>)

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Chair

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