BIOCHEMISTRY (BCHM)

Courses

BCHM 1020 (1) A Path to Success: Introduction to the Biochemistry Major
This course will help students navigate their first year of college and develop the skills needed for academic success as Biochemistry majors. Students will improve academic strategies (i.e. time management, problem-solving and study skills), identify available campus resources, learn how to get involved in clubs and gain research experience, and explore career opportunities as a biochemistry graduate. This is a first-year elective course specifically designed for first year and other students exploring their educational and career opportunities.
Recommended: New BCHM majors.

BCHM 1041 (3) Biotechnology and Society
Covers recent advances in biotechnology and how those impact society. Content and discussion will focus on both the science behind technological advances, their impact on society, and the ethical issues raised by new technologies. Topics change each semester but can include: GMO crops, genome editing, drug discovery and development, stem cell therapies, development and use of new cancer treatments, human genome sequencing and its impact on diagnosis and treatments, human microbiome, neurodegenerative diseases. Formerly CHEM 1041.
Requisites: Restricted to students with 0-56 credits (Freshmen or Sophomore) only.
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 1701 (1) Biochemistry Program for Research Exploration and Planning
Biochem PREP is focused on developing first and second year student interest and engagement in undergraduate research. The program is designed to present participants with mentorship and opportunities to identify whether research is an opportunity students wish to participate in, and if so, get students connected to potential research opportunities. Participants will be provided with a cohort of their peers to explore and plan for research together through preparation workshops, research information sessions, and mentorship. The ultimate goal of the program is for participants to understand their research interests, possess the necessary skills to identify and obtain a research opportunity, and develop community with their peers and the Department of Biochemistry at large.
Requisites: Restricted to Biochemistry (BCHM) majors and minors only.

BCHM 2700 (4) Foundations of Biochemistry
Covers chemistry of aqueous solutions; energetics in biology; structure of proteins, nucleic acids, carbohydrates, and membranes; protein evolution; macromolecular interactions; enzyme kinetics, mechanism and regulation. Will be taught from a strong chemical perspective and mastery of basic concepts of general and organic chemistry will be required. Familiarity with basic concepts of molecular and cellular biology encouraged.
Requisites: Requires prerequisite course of CHEM 3311 or CHEM 3451 (minimum grade C-). Restricted to Biochemistry (BCHM) majors and minors only.

BCHM 3100 (2) Engineering RNA Aptamers
Provides laboratory experience working on an RNA sensor research project. Students will generate libraries of RNA aptamers and select and isolate aptamers that bind a novel ligand of interest. Topics covered include principles of RNA molecular recognition, polymerase chain reaction and molecular cloning, bacterial transformation, fluorescence reporter assays and high throughput screening.
Requisites: Requires prerequisite or corequisite course of BCHM 2700 or BCHM 4611 (minimum grade C-).

BCHM 3110 (1) Literature-based Co-seminar for BCHM 3100 CURE Laboratory Course
This course involves reading and discussion of primary literature. Each week students will read a scientific research article, and engage in a class discussion about the significance and impact, the scientific merits, the underlying premise of the research question and experimental plan, and whether data support conclusions of the paper. Papers will be focused on RNA structure and function, RNA molecular recognition, RNA aptamers, RNA engineering, RNA as a drug target, and fluorescent probes for RNA. Students will be responsible for reading each paper, one student will prepare a powerpoint and lead a class discussion each week, and all students are expected to participate in the discussion.
Requisites: Requires corequisite course of BCHM 3100. Requires prerequisite or corequisite course of BCHM 2700 or BCHM 4611 (minimum grade C-).

BCHM 3300 (3) Genetic Engineering: Science, Technology, and Society
This course explores the frontiers of genetic engineering, starting with a brief historical perspective and moving forward through time to current and future technologies. Students will learn how CRISPR-Cas and other gene editing methodologies are used to engineer proteins, bacteria, viruses, fungi, plants, animals, and humans. The course includes critical analysis of social, environmental, and economic implications of genetic engineering, including discussions on bioethics, regulatory frameworks, and sustainability. Students will gain a nuanced understanding of how this technology shapes our world and will emerge prepared to engage in the ongoing dialogue about its impact on society and our environment.
Requisites: Prerequisite course of: MCDB 2150, MCDB 2222, or EBIO 2070 (minimum grade C-).

BCHM 3400 (3) Mechanisms of Cancer
This course is devoted to the mechanisms that drive cancer, with an emphasis on how the biochemistry of normal cells teaches us how regulation goes awry in cancer cells. The course will include an analysis of historical and current developments in cancer biology. Topics covered: principles of transformation, viral and cellular oncogenes, tumor suppressor genes, signal transduction, cell cycle, cell death, DNA damage and repair, cancer genetics, cancer genomics, cancer risk factors, carcinogens, chemotherapies, targeted therapies, drug resistance, modern technologies in cancer research.
Requisites: Requires prerequisite course of MCDB 2150 or MCDB 2222 or EBIO 2070 or BCHM 4740 (all minimum grade C-).
Grading Basis: Letter Grade
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 3450 (3) Principles of Pharmacology and Toxicology
This is an introductory course presenting the fundamentals of Pharmacology and Toxicology. This course will be divided into four sections. Section I introduces the mechanisms of drug action, their cellular targets, their absorption and distribution, and elimination pharmacokinetics. Section II will discuss the interaction of drugs with physiological systems via the role of chemical mediators and how this affects major organ systems. This will introduce broad principles of pharmacology, pharmacokinetics, pharmacodynamics, toxicology, membrane transporters, metabolism, cell signaling, and an introduction to pharmacogenetics. Section III will focus on specific cases of drugs used for the treatment of cancer, antibacterials, and antifungals. Section IV will discuss the harmful nature of drugs, their use in lifestyle and in sports.
Requisites: Requires prerequisite course of CHEM 1133 or CHEM 1400 (minimum grade C-).
Grading Basis: Letter Grade

BCHM 3491 (4) Organic Chemistry 2 for Biochemistry Majors
Covers amines, alkylation reactions, additions to unsaturated C-C bonds, aromaticity and aromatic reactivity, organic materials, biomolecules, nomenclature of organic compounds, reaction mechanism. Department enforced corerquisite: CHEM 3341 or CHEM 3381. Formerly CHEM 3491.
Equivalent - Duplicate Degree Credit Not Granted: CHEM 3471 and CHEM 3331
Requisites: Requires prerequisite courses of CHEM 3451 and CHEM 3321 or CHEM 3361 (all minimum grade C-). Restricted to Chemistry (CHEM) or Biochemistry (BCHM) majors only.
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 4312 (3) Quantitative Optical Imaging
Explores the fundamentals of optical imaging in biology, especially molecular and cellular biology. Covered topics include an introduction to optics and microscopes, fluorescence microscopy and image analysis, and biological applications. MATLAB will be taught at the beginning of the course and used throughout for image processing. Prior experience with MATLAB (or Python) is highly recommended but not required.
Equivalent - Duplicate Degree Credit Not Granted: MCDB 4312, MCDB 5312 and BCHM 5312
Grading Basis: Letter Grade

BCHM 4400 (4) Core Concepts in Physical Chemistry for Biochemists
Introduces thermodynamics, kinetics and spectroscopy, emphasizing macromolecule and biochemical applications. Includes thermodynamics, chemical and physical equilibriums, solution chemistry, rates of chemical and biochemical reactions, chemical bonds and principles and selected examples of spectroscopies applied to biological systems. Department enforced prerequisite or corequisite: PHYS 1120 or PHYS 2020. Formerly CHEM 4411.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 5400 CHEM 4511
Requisites: Requires prerequisite courses BCHM 2700 or BCHM 4611 and PHYS 1110 or PHYS 2010 and MATH 2300 or APPM 1360 (all minimum grade C-).
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 4491 (3) Modern Biophysical Methods
Covers the basic theory of biophysical methods widely employed in biochemistry and biology, including: electrophoresis, mass spec, calorimetry, evanescent waves, plasmon resonance, Xray diffraction, absorbance and fluorescence spectroscopy, magnetic resonance, electron and optical microscopy and single molecule methods. Discusses ways to maximize rigor and reproducibility in biophysical studies. Department enforced prerequisites: undergraduate chemistry (general, organic physical); physics; calculus. Formerly CHEM 4491.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 5491
Requisites: Requires prerequisite courses of PHYS 1110 or PHYS 2010 and MATH 2300 or APPM 1360 and BCHM 2700 or BCHM 4611 (all minimum grade C-).
Recommended: Prerequisite or corequisite BCHM 4400 or CHEM 4531.
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 4611 (3) Principles of Biochemistry
One-semester overview of the main themes of modern biochemistry: biomolecular structure/function, metabolism, biosynthesis, DNA from genome to proteome and cellular signaling. For biology and engineering majors and others wanting an overview of biochemistry. Formerly CHEM 4611.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 5611
Requisites: Requires prerequisite course of CHEM 3311 or CHEM 3451 (minimum grade C-).
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 4631 (3) Computational Genomics Lab
Designed as an inquiry based computational genomics laboratory course. Students will learn fundamental principles of BASH, R, NEXTFLOW, GIT and more by applying these skills to publicly available genomic data. The course aims to mimic a real world genomics research project. Overall this course aims to provide students with key skills needed for future research and career opportunities.
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 4720 (4) Metabolic Pathways and Human Disease
Covers energy metabolism and anabolic/catabolic pathways; metabolism of carbohydrates, lipids, amino acids, and nucleic acids; photosynthesis; special topics on human diseases with pathologies and metabolic pathways. Formerly CHEM 4720.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 5720
Requisites: Requires prerequisite courses of BCHM 2700 and CHEM 3331 or CHEM 3471 or BCHM 3491 (all minimum grade C-).
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 4740 (4) Biochemistry of Gene Transmission, Expression and Regulation
Covers biosynthesis and function of macromolecules including DNA, RNA and proteins; molecular basis of replication, transcription and translation; biochemistry of subcellular systems; signaling and regulation of gene expression in eukaryotes; and special topics. Formerly CHEM 4740.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 5740
Requisites: Requires a prerequisite course of BCHM 2700 (minimum grade C-).
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 4751 (3) Current Topics in Biochemical Research
Lec. Covers current topics in modern biochemical research through lectures, reading recent research articles, critical thinking and class discussion. Topics include protein and nucleic acid structure and function, biomolecular interactions, enzyme function and cellular signaling and regulation. Formerly CHEM 4751.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 5751
Requisites: Requires prerequisite courses of MCDB 3135 or BCHM 4700 or BCHM 2700 and BCHM 4740 (all minimum grade C-).
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 4761 (3) Biochemistry Laboratory
Two 4-hour periods per week. Introduction to modern biochemical techniques. Topics include enzymology, spectrophotometry, electrophoresis, multi-step protein purification, recombinant DNA techniques and molecular cloning. Formerly CHEM 4761.
Requisites: Requires prerequisite courses of BCHM 2700 or CHEM 4700 and CHEM 3341 or 3381 (all minimum grade C-). Restricted to Chemistry (CHEM) or Biochemistry (BCHM) majors only.
Additional Information: Arts Sci Gen Ed: Distribution-Natural Sci Lab Arts Sci Gen Ed: Distribution-Natural Sciences

BCHM 4850 (3) Therapeutic and Diagnostic Nucleic Acids
A comprehensive course in topics of the application of nucleic acids to the advancement of human health. Topics will include an introduction to the basic principles of pharmacology and drug development, action of small molecule therapeutics based upon nucleosides and nucleotides, antisense oligonucleotides and emerging CRISPR-based therapeutics, gene therapy, application of nucleic acids in commonly used diagnostics and emerging applications of nucleic acids.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 5850
Requisites: Requires prerequisite course of BCHM 2700 or BCHM 4611 (minimum grade C-).
Grading Basis: Letter Grade

BCHM 4901 (1-6) Independent Study in Biochemistry
For undergraduate study. Department consent required.
Repeatable: Repeatable for up to 8.00 total credit hours.

BCHM 4906 (1-3) Internship in Biochemistry
Provides an opportunity for Biochemistry majors to gain real world experience by performing research in a company or institute outside of the CU Boulder academic environment. May be repeated for 6 total credit hours.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to Biochemistry (BCHM) majors only.

BCHM 5312 (3) Quantitative Optical Imaging
Explores the fundamentals of optical imaging in biology, especially molecular and cellular biology. Covered topics include an introduction to optics and microscopes, fluorescence microscopy and image analysis, and biological applications. MATLAB will be taught at the beginning of the course and used throughout for image processing. Prior experience with MATLAB (or Python) is highly recommended but not required.
Equivalent - Duplicate Degree Credit Not Granted: MCDB 5312, MCDB 4312 and BCHM 4312
Grading Basis: Letter Grade

BCHM 5341 (3) Chemical Biology and Drug Design
Develop knowledge base and skills in the interdisciplinary field of chemical biology, including aspects of chemistry and biology, and integrating both with respect to hierarchical levels of structure (atomic, molecular, cellular). Students will receive training that helps to develop their careers in biotech, pharmaceutical and other research-oriented industries as well as in academia. Department enforced prerequisites: introductory organic chemistry and general biochemistry. Formerly CHEM 5341.
Requisites: Restricted to graduate students only.

BCHM 5400 (4) Core Concepts in Physical Chemistry for Biochemists
Introduces thermodynamics, kinetics and spectroscopy, emphasizing macromolecule and biochemical applications. Includes thermodynamics, chemical and physical equilibriums, solution chemistry, rates of chemical and biochemical reactions, chemical bonds and principles and selected examples of spectroscopies applied to biological systems. Formerly CHEM 5400.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 4400 CHEM 4511
Requisites: Restricted to graduate students only.

BCHM 5491 (3) Modern Biophysical Methods
Covers the basic theory of biophysical methods widely employed in biochemistry and biology, including: electrophoresis, mass spec, calorimetry, evanescent waves, plasmon resonance, Xray diffraction, absorbance and fluorescence spectroscopy, magnetic resonance, electron and optical microscopy and single molecule methods. Discusses ways to maximize rigor and reproducibility in biophysical studies. Department enforced prerequisites: undergraduate chemistry (general, organic, physical), biochemistry, physics, calculus.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 4491
Requisites: Restricted to graduate students only.
Grading Basis: Letter Grade

BCHM 5611 (3) Principles of Biochemistry
One-semester overview of the main themes of modern biochemistry: biomolecular structure/function, metabolism, biosynthesis, DNA from genome to proteome and cellular signaling. For biology and engineering majors and others wanting an overview of biochemistry.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 4611
Requisites: Restricted to graduate students only.

BCHM 5631 (3) Computational Genomics Lab
Designed as an inquiry based computational genomics laboratory course. Students will learn fundamental principles of BASH, R, NEXTFLOW, GIT and more by applying these skills to publicly available genomic data. The course aims to mimic a real world genomics research project. Overall this course aims to provide students with key skills needed for future research and career opportunities.
Requisites: Restricted to graduate students only.

BCHM 5661 (3) Advances in Molecular Biophysics
Discuss recent literature concerning biophysical studies of macromolecular structure and mechanism, including DNA, RNA, proteins, and their interactions.
Recommended: Prerequisites one year of physical chemistry or quantum mechanics, one year of biology, graduate standing, or instructor consent.

BCHM 5720 (4) Metabolic Pathways and Human Disease
Covers energy metabolism and anabolic/catabolic pathways; metabolism of carbohydrates, lipids, amino acids, and nucleic acids; photosynthesis; special topics on human diseases with pathologies and metabolic pathways. Formerly CHEM 5720.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 4720
Requisites: Restricted to graduate students only.

BCHM 5740 (4) Biochemistry of Gene Transmission, Expression and Regulation
Covers biosynthesis and function of macromolecules including DNA, RNA and proteins; molecular basis of replication, transcription and translation; biochemistry of subcellular systems; signaling and regulation of gene expression in eukaryotes; and special topics. Formerly CHEM 5740.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 4740
Requisites: Restricted to graduate students only.

BCHM 5751 (3) Current Topics in Biochemical Research
Lec. Covers current topics in modern biochemical research through lectures, reading recent research articles, critical thinking and class discussion. Topics include protein and nucleic acid structure and function, biomolecular interactions, enzyme function and cellular signaling and regulation. Department consent required. Formerly CHEM 5751.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 4751
Requisites: Restricted to graduate students only.

BCHM 5770 (3) Fundamentals of Biochemistry I
Introduction to conducting research in Biochemistry, including covering foundational topics in Biochemistry that include concepts such as protein structure and function, experimental approaches to study biochemical processes, and analysis and interpretation of data. Topics will be taught through the perspective of the scientific literature with an emphasis on critical analysis of research. Additional subject areas will include discussions of aspects of conducting biochemical research in academic and industrial settings. Intended for entering Biochemistry graduate students. Formerly CHEM 5770.
Requisites: Restricted to graduate students only.
Grading Basis: Letter Grade

BCHM 5771 (5) Advanced General Biochemistry 1
Lect. In-depth analysis of DNA structure and replication, RNA synthesis and processing, protein synthesis, enzyme function and mechanism, protein structure, protein dynamics, and physical chemistry of macromolecules. Intended as a comprehensive treatment of areas central to modern biochemistry for entering graduate students. Formerly CHEM 5771.

BCHM 5772 (1) Quantitative Reasoning in Biochemistry
An introduction to quantitative reasoning used by Biochemists. Intended for entering Biochemistry graduate students.
Requisites: Restricted to graduate students only.
Grading Basis: Letter Grade

BCHM 5774 (1) Introduction to your Biochemistry PhD
This course provides an introduction to various aspects of the Biochemistry Ph.D. program. Students will be introduced to various research programs conducted by Biochemistry faculty in preparation to choose a Ph.D. dissertation research laboratory and mentor. Various topics related to successful navigation of the graduate program and career pathways after graduation will be discussed.
Requisites: Restricted to graduate students only.
Grading Basis: Letter Grade

BCHM 5776 (1) Scientific Ethics and Responsible Conduct in Research
Lect. Advanced discussion of topics in scientific ethics, including requirements for responsible conduct of research, case histories of fraud, research misconduct, ethical misconduct and development of professional values and ethical standards.
Equivalent - Duplicate Degree Credit Not Granted: MCDB 5776
Requisites: Requires prerequisite course of BCHM 5771 or CHEM 5271 (minimum grade B-). Restricted to graduate students only.

BCHM 5780 (3) Fundamentals of Biochemistry II
Analysis of topics in biochemistry including protein structure, methods of structure determination and prediction, protein folding, and protein dynamics. Intended as a comprehensive treatment of areas central to modern biochemistry for entering graduate students. Lectures concurrent with CHEM 5781, covering the same topics except for the requirement of a written research proposal. Formerly CHEM 5780.
Requisites: Requires prerequisite course of BCHM 5770 (minimum grade B-). Restricted to graduate students only.

BCHM 5781 (5) Advanced General Biochemistry 2
Detailed consideration of contemporary topics in biochemistry. Formerly CHEM 5781.
Requisites: Requires prerequisite course of BCHM 5770 or BCHM 5771 (minimum grade B-). Restricted to graduate students only.
Grading Basis: Letter Grade

BCHM 5801 (3) Advanced Signal Transduction and Cell Cycle Regulation
Lect. Advanced discussion of current research and literature in signal transduction, including ligands, receptors, and intracellular signaling pathways, as well as control on transcription, chromatin structure, DNA replication, mitosis, and cell cycle progression. Formerly CHEM 5801.
Requisites: Restricted to graduate students only.
Recommended: Prerequisites CHEM 5771 and CHEM 5781 and MCDB 5210 or MCDB 5220.

BCHM 5811 (3) Advanced Methods in Protein Sequencing and Analysis
Lect. Advanced discussion of current methods in protein sequencing, sequence analysis, and posttranslational modifications, emphasizing techniques of mass spectrometry, use of protein databases, sequence alignment and motifs, structure prediction, and modeling of signaling pathways. Department consent required. Formerly CHEM 5811.
Requisites: Restricted to graduate students only.
Recommended: Prerequisites CHEM 5771 and CHEM 5781 and MCDB 5210.

BCHM 5821 (1) Special Topics in Signaling and Cell Regulation
Lect. Reviews and evaluates literature on subjects of current interest in signal transduction transcription, cell cycle progression, and cell regulation. Primarily for graduate level presentation of special topics by students, faculty, and research staff. Department consent required. Formerly CHEM 5821.
Repeatable: Repeatable for up to 5.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 5830 (1) Scientific Communication in Biochemistry
This course focuses on the development and writing of NIH- and NSF-style grant proposals in the field of Biochemistry and the oral communication of scientific ideas and results before fellow scientists.
Requisites: Requires prerequisite courses of BCHM 5770 and BCHM 5772 and BCHM 5781 (all minimum grade C-). Restricted to graduate students only.
Grading Basis: Letter Grade

BCHM 5850 (3) Therapeutic and Diagnostic Nucleic Acids
A comprehensive course in topics of the application of nucleic acids to the advancement of human health. Topics will include an introduction to the basic principles of pharmacology and drug development, action of small molecule therapeutics based upon nucleosides and nucleotides, antisense oligonucleotides and emerging CRISPR-based therapeutics, gene therapy, application of nucleic acids in commonly used diagnostics and emerging applications of nucleic acids.
Equivalent - Duplicate Degree Credit Not Granted: BCHM 4850
Requisites: Restricted to graduate students only.
Grading Basis: Letter Grade

BCHM 6601 (1) Biophysics Seminar
Restricted to and required for all currently funded NIH/CU Biophysics trainees and current NIH/CU Biophysics affiliates. Credit is deferred until presentation of satisfactory seminar. Formerly CHEM 6601.
Requisites: Restricted to graduate students only.

BCHM 6711 (3-6) Advanced Topics in Biochemistry
Detailed study of current literature relative to one main topic is undertaken each semester. Topics covered on a rotating basis include enzyme kinetics and mechanisms; lipids and lipoproteins; chemistry and enzymology of nucleic acids; biochemistry of nucleic acids in eukaryotic cells; protein chemistry. Presentations include faculty lectures and student reports. Department enforced prerequisite: one year of biochemistry courses. Department consent required. Formerly CHEM 6711.
Repeatable: Repeatable for up to 12.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 6731 (3-6) Advanced Topics in Biochemistry
Detailed study of current literature relative to one main topic is undertaken each semester. Topics covered on a rotating basis include enzyme kinetics and mechanisms; lipids and lipoproteins; chemistry and enzymology of nucleic acids; biochemistry of nucleic acids in eukaryotic cells; protein chemistry. Presentations include faculty lectures and student reports. Department enforced prerequisite: one year of biochemistry courses. Department consent required. Formerly CHEM 6731.
Repeatable: Repeatable for up to 12.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 6901 (1-6) Research in Biochemistry
Repeatable: Repeatable for up to 15.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 6941 (1) Master's Candidate for Degree
Students are not admitted for the master's degree but may be transferred to the MS plan if they are unable to meet the demands of the PhD program.
Requisites: Restricted to graduate students only.

BCHM 6951 (1-6) Master's Thesis
Students are not admitted for the master's degree but may be transferred to the MS plan if they are unable to meet the demands of the PhD program.
Requisites: Restricted to graduate students only.

BCHM 7601 (2) Seminar: Nucleic Acid Chemistry
Topics in various aspects of current research; emphasizes student readings and presentations. Department consent required.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 7611 (1) Seminar: Structures and Dynamics of Biopolymers in Solution
Discussion of experimental and theoretical approaches for probing structures and dynamics of proteins, peptides, and nucleic acids; and computations in molecular dynamics simulation, modeling, and geometry. Department consent required. Formerly CHEM 7611.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 7621 (1) Seminar: Biochemistry and Molecular Biology of Signal Transduction
Discusses and reviews the current literature and experimental results in signal transduction, cell cycle and tumor suppressor gene regulation. Emphasizes the understandings of molecular and biochemical mechanisms of the origin of human tumor cells. Formerly CHEM 7621.
Requisites: Restricted to graduate students only.

BCHM 7651 (2) Seminar: Environmental Biochemistry
Topics in various aspects of current biochemical and environmental research. Department consent required. Formerly CHEM 7651.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 7661 (1) Structure/Function of Human Mediator Transcription Complexes
Study of the mechanisms of eukaryotic gene expression with an emphasis on the structure and function of human mediator transcription complexes. Formerly CHEM 7661.
Requisites: Restricted to graduate students only.

BCHM 7671 (1) Seminar: Topics in Designing Probes for Signaling Reactions
Discussion of advances and developments in biomolecular dynamics, with emphasis on experimental studies via ultrafast laser spectroscopy. The connection of protein dynamics with function will also be considered. Formerly CHEM 7671.
Requisites: Restricted to graduate students only.

BCHM 7691 (1) Seminar: Protein Dynamics and the Mechanism of Sensory Proteins
Discusses recent results and current literature in the areas of the mechanism of sensory proteins, internal motions of proteins, and protein folding. Department consent required. Formerly CHEM 7691.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 7701 (1) Seminar: Enzyme Mechanisms and Kinetics
Studies experimental approaches to understand the mechanisms of enzymic catalysis. Techniques include steady-state and pre-steady-state kinetics, isotope trapping and partitioning, inhibition by substrate analogues, and covalent modification of proteins. Department consent required. Formerly CHEM 7701.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 7711 (1) RNA Mediated Inorganic and Organic Reactions
Discussion of advances and developments in biomolecular dynamics, with emphasis on experimentalstudies via ultrafast laser spectroscopy. The connection of protein dynamics with function will also be considered. Formerly CHEM 7711.
Requisites: Restricted to graduate students only.

BCHM 7741 (1) Seminar: Signal Transduction and Protein Phosphorylation
Devoted to experimental methods for understanding mechanisms of signal transduction in mammalian cells through pathways involving regulation of protein phosphorylation. Department consent required. Formerly CHEM 7741.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 7751 (1) Seminar: Protein Structure and Folding
Studies structure and folding of proteins and protein complexes using biophysical methods, including nuclear magnetic resonance (NMR), circular dichroism, and fluorescence spectroscopies. Department consent required. Formerly CHEM 7751.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 7761 (1) Seminar: Eukaryotic Transcriptional Regulation
Studies the regulation of transcription by RNA Polymerase II from human promoters. Department consent required. Formerly CHEM 7761.
Repeatable: Repeatable for up to 6.00 total credit hours.
Requisites: Restricted to graduate students only.

BCHM 7781 (1) Seminar: Topics in Structural Biology
Discussion of advances and developments in structural biology with emphasis on new methods for protein expression, purification and crystallization; and structure solution implementation. Formerly CHEM 7781.
Requisites: Restricted to graduate students only.

BCHM 7791 (1) Seminar: Topics in Ribonucleoprotein Assemblies
Studies aspects of the biochemical and structural analysis of ribonucleic acid (RNA) and its interactions with proteins and assemblies into functional ribonucleoprotein (RNP) enzymes. Techniques focus on x-ray crystallography, spectroscopic methods, and biochemical probing. Formerly CHEM 7791.
Requisites: Restricted to graduate students only.

BCHM 8991 (1-10) Doctoral Dissertation
All doctoral students must register for 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School section.
Repeatable: Repeatable for up to 30.00 total credit hours.
Requisites: Restricted to graduate students only.