

# BCHM - BIOCHEMISTRY

## BCHM461 Biochemistry I (3 Credits)

First semester of a comprehensive introduction to modern biochemistry. Structure, chemical properties, and function of proteins and enzymes, carbohydrates, lipids, and nucleic acids. Basic enzyme kinetics and catalytic mechanisms.

**Prerequisite:** Minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277; and minimum grade of C- in (CHEM241 and CHEM242) or CHEM247.

**Credit Only Granted for:** BCHM461 or BCHM463.

## BCHM462 Biochemistry II (3 Credits)

A continuation of BCHM 461. Metabolic pathways and metabolic regulation, energy transduction in biological systems, enzyme catalytic mechanisms.

**Prerequisite:** Minimum grade of C- in BCHM461.

**Credit Only Granted for:** BCHM462 or BCHM463.

## BCHM463 Biochemistry of Physiology (3 Credits)

A one-semester introduction to general biochemistry. A study of protein structure, enzyme catalysis, metabolism, and metabolic regulation with respect to their relationship to physiology.

**Prerequisite:** Minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277; and minimum grade of C- in (CHEM241 and CHEM242) or CHEM247.

**Credit Only Granted for:** BCHM461, BCHM462 or BCHM463.

## BCHM464 Biochemistry Laboratory (3 Credits)

Biochemical and genetic methods for studying protein function. Site-directed mutagenesis and molecular cloning, protein purification, enzyme activity assays, computer modeling of protein structure.

**Prerequisite:** BCHM461 or BCHM463; and a grade of C- or better in the prerequisite is required for all College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.

**Corequisite:** BCHM465.

**Restriction:** BCHM, CHEM, and Nutritional Sciences majors have first priority, followed by other life science majors.

## BCHM465 Biochemistry III (3 Credits)

CORE Capstone (CS) Course. An advanced course in biochemistry. Biochemical approach to cellular information processing. DNA and RNA structure. DNA replication, transcription, and repair. Translation of mRNA to make proteins.

**Prerequisite:** BCHM461 or BCHM463; and a grade of C- or better in the prerequisite is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.

**Recommended:** BCHM462.

## BCHM477 Biomolecular Measurement and Data Analysis (3 Credits)

Covers a range of classic and modern biochemical assays and techniques as well as introducing data science approaches to "omics" data. Upon successful completion of this course, students should have the necessary preparation and experience to collaborate productively with research scientists in industrial, clinical or academic contexts.

**Prerequisite:** CHEM271 or CHEM276; and (CHEM277 or CHEM272).

**Restriction:** Must be in the Chemistry or Biochemistry major.

## BCHM485 Physical Biochemistry (3 Credits)

Physical Chemistry with applications to biological systems. Principal topics: quantum chemistry, spectroscopy, structural methods for biological macromolecules, statistical thermodynamics, transport processes in liquid phase, chemical and biochemical kinetics, modeling and simulation, polymer dynamics.

**Prerequisite:** Minimum grade of C- in CHEM135; or minimum grade of C- in (CHEM271 or CHEM276) and in (CHEM272 or CHEM277); and minimum grade of C- in MATH141; and minimum grade of C- in (PHYS260 and PHYS261) or C- in PHYS142.

**Recommended:** MATH241.

**Restriction:** Must be in Biochemistry program; or permission of instructor.

**Credit Only Granted for:** CHEM482 or BCHM485.

## BCHM661 Nucleic Acids I (2 Credits)

Topics covered: Chemistry and structure of DNA and RNA, from nucleotides to chromatin, chromosomes, and genomes, and some methods for studying, synthesizing, sequencing and manipulating nucleic acids. Rudimentary genomics and bioinformatics. DNA Biology: selected aspects of the biochemistry and regulation of DNA replication, repair, and recombination, and how these processes interact with each other.

**Prerequisite:** BSCI410 and BCHM465.

## BCHM662 Nucleic Acids II (2 Credits)

Topics covered: Interactions between nucleic acids and ligands such as cations, drugs, and especially proteins. Sources of binding affinity and specificity. Selection-amplification methods. Description of several classes of protein-nucleic acids complexes. DNA/RNA catalysis, the origin of life, mobile genetic elements.

**Prerequisite:** BCHM661.

## BCHM668 Special Problems in Biochemistry (2-4 Credits)

**Prerequisite:** BCHM464; or students who have taken courses with comparable content may contact the department.

## BCHM669 Special Topics in Biochemistry (1-3 Credits)

**Prerequisite:** BCHM462; or students who have taken courses with comparable content may contact the department.

## BCHM671 Protein Chemistry and Enzymic Catalysis (3 Credits)

Principles of protein structure, folding, and function, experimental characterization of structure, active sites, enzyme mechanisms and kinetics.

**Prerequisite:** BCHM461; or students who have taken courses with comparable content may contact the department.

## BCHM675 Biophysical Chemistry (3 Credits)

Conformation, shape, structure, conformational changes, dynamics and interactions of biological macromolecules and complexes or arrays of macromolecules. Physical techniques for studying properties of biological macromolecules.

**Prerequisite:** CHEM481 and BCHM461; or students who have taken courses with comparable content may contact the department.

## BCHM676 Biological Mass Spectrometry (3 Credits)

Fundamentals of modern mass spectrometry and use with biochemical techniques to provide unique analyses of drug metabolites, lipids, carbohydrates, nucleotides and proteins. The interface with bioinformatics will be examined, which provides the foundation of proteomics.

**Prerequisite:** BCHM461 or BCHM463.

**Formerly:** BCHM669B.

**BCHM677 Computational Tools in Biochemistry (1 Credit)**

A practical, hands-on introduction to the application of computational tools that support biochemistry research. Selected topics may include: efficient use of scientific literature databases and the preparation of professional bibliographies; proteomics and mass spectrometry; bioinformatics and genomics programs and database resources; molecular structure visualization and modeling; quantitative data fitting and error analysis; and laboratory research ethics.

**Prerequisite:** BCHM674 or BCHM671; or permission of instructor.

**Restriction:** Must be in one of the following programs (Biochemistry (Master's); Biochemistry (Doctoral)) ; or permission of instructor.

**BCHM698 Literature Seminar in Biochemistry (2 Credits)**

Students will prepare and present a departmental seminar based on a topic in the current biochemical research literature.

**Repeatable to:** 2 credits if content differs.

**BCHM699 Special Problems in Biochemistry (1-6 Credits)**

Laboratory experience in a research environment.

**Restriction:** Must be a first-year student in the Biochemistry Ph.D. program; or must be a student in the Biochemistry non-thesis M.S. option.

**Repeatable to:** 10 credits.

**BCHM799 Master's Thesis Research (1-6 Credits)**

**BCHM889 Seminar (1-3 Credits)**

**BCHM898 Pre-Candidacy Research (1-8 Credits)**

**BCHM899 Doctoral Dissertation Research (1-8 Credits)**