

# BIOCHEMISTRY (BIOC)

## BIOC 1990 Freshman Research in Biochemistry

**Description:** An introduction to biochemical research through guided work on a relevant experimental problem. Offered for variable credit, 1-2 credits, max 2.

**Credit hours:** 1

**Contact hours:** Lab: 2

**Levels:** Undergraduate

**Schedule types:** Lab

**Department/School:** Biochem & Molecular Biology

## BIOC 2101 The Experiments Behind the Facts of Real Science

**Prerequisites:** BIOL 1114 and CHEM 1515.

**Description:** Introduction to research through the study of primary research papers.

**Credit hours:** 1

**Contact hours:** Lecture: 1

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

## BIOC 2202 Medicine and Molecules

**Description:** Examination of specific diseases at all scales, from the biology of the causal agent to global impacts. The molecular biology of the agent, interactions with the human body, and the etiology, epidemiology, history and current state of the disease, ethical considerations, and prospects and cures.

**Credit hours:** 2

**Contact hours:** Lecture: 2

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

## BIOC 2344 Chemistry and Applications of Biomolecules

**Prerequisites:** CHEM 1225 or CHEM 1515.

**Description:** A descriptive survey of organic functional groups and biomolecules. Mode of formation and function of these molecules in microorganisms, plants and animals as they relate to biotechnology, environmental sciences and health related issues. A terminal course for students in applied biological science education. Not recommended for pre-professional students or students planning graduate study in biological sciences.

**Credit hours:** 4

**Contact hours:** Lecture: 3 Other: 1

**Levels:** Undergraduate

**Schedule types:** Discussion, Combined lecture & discussion, Lecture

**Department/School:** Biochem & Molecular Biology

## BIOC 2352 Fundamental Biochemistry

**Prerequisites:** BIOC 1114 and CHEM 1515.

**Description:** Connect knowledge of organic chemistry to biochemistry to better understand and appreciate the chemical principles in forming bimolecular structures and functions.

**Credit hours:** 2

**Contact hours:** Lecture: 2

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

## BIOC 3003 Hypothesis-Driven Undergraduate Research

**Prerequisites:** Consent of instructor.

**Description:** Directed research projects with faculty members in biochemistry and molecular biology. Identify a research question, develop a hypothesis, experimental approach, perform the experiments, and summarize their results in oral and written forms.

**Credit hours:** 3

**Contact hours:** Lab: 6

**Levels:** Undergraduate

**Schedule types:** Lab

**Department/School:** Biochem & Molecular Biology

## BIOC 3223 Physical Chemistry for Biologists

**Prerequisites:** CHEM 1515, MATH 2144, PHYS 1214 or PHYS 2014 or consent of instructor.

**Description:** Classical and statistical thermodynamics with applications to pure systems, solutions and electrochemistry; transport; chemical and enzyme kinetics, quantum chemistry of structure and chemical bond; and spectroscopy all with emphasis on biological applications. Previously offered as BIOC 4224 and BIOC 3224.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

## BIOC 3653 Survey of Biochemistry

**Prerequisites:** CHEM 3015 or CHEM 3053.

**Description:** An introduction to the chemistry of living systems. Chemical properties of the constituents of living organisms. Modes of formation, reactions and function of these compounds in microorganisms, plants and animals. Intended for non-majors.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

## BIOC 3713 Biochemistry I

**Prerequisites:** CHEM 3053.

**Description:** Biochemistry of nucleic acids, proteins, amino acids, carbohydrates, and lipids with an emphasis on the kinetics, thermodynamics, catalytic and regulatory strategies of biochemical reactions and bioenergetics. Designed for biochemistry majors.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Undergraduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

## BIOC 3723 Biochemistry and Molecular Biology Laboratory

**Prerequisites:** BIOC 3653 or BIOC 3713 or concurrent enrollment.

**Description:** Integrated lecture-laboratory course on fundamental theories and techniques in biochemical, forensic, and clinical research. Hands-on experience in mass spectrometry, DNA analysis, metabolic assays, kinetic assays, and protein purification. Previously offered as BIOC 3720.

**Credit hours:** 3

**Contact hours:** Lecture: 1 Lab: 6

**Levels:** Undergraduate

**Schedule types:** Lab, Lecture, Combined lecture and lab

**Department/School:** Biochem & Molecular Biology

**BIOC 3813 Biochemistry II****Prerequisites:** BIOC 3713.**Description:** Continuation of Biochemistry I with focus on metabolic pathways, cycles, and control mechanisms. This course will cover bioenergetics and metabolism of carbohydrates, lipids, amino acids and nucleotides. Designed for biochemistry majors.**Credit hours:** 3**Contact hours:** Lecture: 3**Levels:** Undergraduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 4113 Molecular Biology****Prerequisites:** BIOC 3653 or BIOC 3713 and BIOL 3023 or ANSI 3423 or PLNT 3554.**Description:** Applications of biochemistry, molecular biology and genetic engineering with emphasis on protein structure and function, regulation of cell function, metabolism and disease processes.**Credit hours:** 3**Contact hours:** Lecture: 3**Levels:** Graduate, Undergraduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 4523 Biochemistry of the Cell****Prerequisites:** BIOC 3653 or BIOC 3713 and MICR 3033 and BIOL 3023 or ANSI 3423 or PLNT 3554 or consent of instructor.**Description:** The biochemistry of fundamental processes in normal and disease states of eukaryotic cells. Primary literature based experimental approaches to the mechanisms of intracellular protein trafficking, cytoskeleton, cell adhesion, mitosis, cell cycle, cytokinesis, and apoptosis.**Credit hours:** 3**Contact hours:** Lecture: 3**Levels:** Graduate, Undergraduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 4723 Introduction to Bioinformatics****Prerequisites:** BIOL 1114 and MATH 1513.**Description:** Providing an introduction to programming for those intending to work with large biological datasets. This course covers the basics of Shell programming, scripting languages and examples of using software and packages.**Credit hours:** 3**Contact hours:** Lecture: 3**Levels:** Graduate, Undergraduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 4883 Senior Seminar in Biochemistry****Prerequisites:** BIOC 3813 or consent of instructor and senior standing.**Description:** A senior capstone course for the development of scientific verbal and written communications and assessment of cumulative abilities. Focus is on problem solving, group discussion, primary literature review, oral presentation, and writing.**Credit hours:** 3**Contact hours:** Lecture: 3**Levels:** Undergraduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 4990 Undergraduate Research****Description:** Training in independent work, study of relevant literature and experimental investigation of an assigned problem. Offered for variable credit, 1-6 credit hours, maximum of 10 credit hours.**Credit hours:** 1-6**Contact hours:** Other: 1**Levels:** Graduate, Undergraduate**Schedule types:** Independent Study**Department/School:** Biochem & Molecular Biology**BIOC 5000 Research****Description:** For MS thesis. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.**Credit hours:** 1-6**Contact hours:** Other: 1**Levels:** Graduate**Schedule types:** Independent Study**Department/School:** Biochem & Molecular Biology**BIOC 5002 Research Compliance and Biochemistry Graduate Colloquium****Prerequisites:** Graduate standing.**Description:** Introduction to graduate research. Policies for laboratory safety, research compliance, and ethical conduct of scientific research are presented.**Credit hours:** 2**Contact hours:** Lecture: 2**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 5102 Molecular Genetics****Prerequisites:** BIOC 3653 or MICR 3033 and one course in genetics or consent of instructor.**Description:** An introduction to molecular genetics on the graduate level. Same course as GENE 5102.**Credit hours:** 2**Contact hours:** Lecture: 2**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 5112 Articulation of Research Logic****Prerequisites:** BIOC 5753 or equivalent or permission of instructor.**Description:** Techniques for effective communication of scientific reasoning, logic, and critical thinking. Explanation of rationale, hypotheses, and experimental design. Public presentations as logical arguments. The course focuses on biomolecular systems.**Credit hours:** 2**Contact hours:** Lecture: 2**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 5120 Biochemistry and Molecular Biology Graduate Research Colloquium****Prerequisites:** Graduate standing.**Description:** Students will provide presentations to demonstrate their mastery of research literature, new research results, explanations for research roadblocks, and their ability to synthesize new knowledge and draw conclusions.**Credit hours:** 1-6**Contact hours:** Lecture: 1**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology

**BIOC 5553 Agricultural Biochemistry**

**Prerequisites:** CHEM 3153 or equivalent.

**Description:** Organism function at the biochemical level and how this relates to the more complex biological systems of plants and animals.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

**BIOC 5753 Biochemical Principles**

**Prerequisites:** CHEM 3153 or equivalent.

**Description:** Chemistry of cellular constituents; introduction to the chemical processes in living systems. The first in a series of courses for graduate students in biochemistry and related fields.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

**BIOC 5824 Biochemical Laboratory Methods**

**Prerequisites:** BIOC 4113 or BIOC 5753.

**Description:** Lecture and laboratory course in basic biochemistry and molecular biology methods for separation and analysis of biological materials, including chromatography, electrophoresis, centrifugation, use of radioisotopes, molecular cloning and DNA sequencing. Additional flat fee of \$50.00 applies.

**Credit hours:** 4

**Contact hours:** Lab: 8

**Levels:** Graduate

**Schedule types:** Lab

**Department/School:** Biochem & Molecular Biology

**BIOC 5853 Metabolism**

**Prerequisites:** BIOC 5753 or BIOC 4113.

**Description:** Reaction sequences and cycles in the enzymatic transformations of fats, proteins and carbohydrates; energy transfer, biosynthesis and integration in the metabolic pathways.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

**BIOC 5930 Advanced Biochemical Techniques**

**Prerequisites:** BIOC 5753, BIOC 5824 or concurrent registration, and consent of instructor.

**Description:** Lecture and laboratory course in advanced research techniques, designed to supplement BIOC 5824. In subsequent semesters, individual research problems pursued in laboratories of department faculty for six weeks and one credit hour each. Offered for variable credit, 1-4 credit hours, maximum of 10 credit hours.

**Credit hours:** 1-4

**Contact hours:** Other: 1

**Levels:** Graduate

**Schedule types:** Independent Study

**Department/School:** Biochem & Molecular Biology

**BIOC 6000 Research**

**Description:** For PhD dissertation. Offered for variable credit, 1-15 credit hours, maximum of 60 credit hours.

**Credit hours:** 1-15

**Contact hours:** Other: 1

**Levels:** Graduate

**Schedule types:** Independent Study

**Department/School:** Biochem & Molecular Biology

**BIOC 6110 Seminar**

**Description:** Maximum 2 for PhD or 1 for MS candidates. Offered for variable credit, 1-2 credit hours, maximum of 2 credit hours.

**Credit hours:** 1-2

**Contact hours:** Other: 1

**Levels:** Graduate

**Schedule types:** Independent Study

**Department/School:** Biochem & Molecular Biology

**BIOC 6723 Signal Transduction**

**Description:** Classical signal transduction mechanisms including MAP kinase signaling cascades, Protein kinase A, Protein kinase C pathways, JAK/STAT pathways, calcium signaling, the cell cycle, programmed cell death, and cell signaling in cancer. Strong focus on the primary literature and experimental strategies used in modern cell biology.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

**BIOC 6733 Functional Genomics**

**Prerequisites:** BIOC 3653 or BIOC 3713 and BIOC 3813 or BIOC 5753 or consent of instructor.

**Description:** Principles and techniques of genomics technologies and their applications in basic science and applied animal and plant research. Genome sequencing, variation detection, transcriptomics, proteomics, metabolomics, metagenomics, systems biology, forward and reverse genetics.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

**BIOC 6740 Physical Biochemistry**

**Prerequisites:** One semester each of biochemistry, calculus and physical chemistry.

**Description:** Two independent modules dealing with applications of physical chemistry and math to biological phenomena: 1) numerical analyses and selected spectroscopic methods, and 2) thermodynamics and transport properties. Modules may be taken together as two credits or individually for one credit. Offered for variable credit, 1-2 credit hours, maximum of 2 credit hours.

**Credit hours:** 1-2

**Contact hours:** Other: 1

**Levels:** Graduate

**Schedule types:** Independent Study

**Department/School:** Biochem & Molecular Biology

**BIOC 6753 Epigenetics**

**Prerequisites:** BIOC 5102 or BIOC 5753 or consent of instructor.

**Description:** Principles underlying heritable changes in gene expression caused by mechanisms other than changes in the DNA sequence. The roles of chromatin structure, DNA and histone modification, and small RNAs in plant and animal development and disease. Applications of epigenetic-based therapeutics and the use of RNA interference in plants and animals.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

**BIOC 6763 Nucleic Acids and Protein Synthesis**

**Prerequisites:** BIOC 4113 or BIOC 5753.

**Description:** Structure and biological function of nucleic acid containing structures with emphasis on recombinant DNA methodologies, information content, nucleic acid-protein interaction, regulation and rearrangement.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

**BIOC 6773 Protein Structure and Enzyme Function**

**Prerequisites:** BIOC 4113 or BIOC 5753.

**Description:** Theory of and methods for studying the physical and chemical basis of protein structure and function; and the enzyme catalysis, including kinetics, chemical modification and model studies. Examples from current literature.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

**BIOC 6783 Biomembranes and Bioenergetics**

**Prerequisites:** BIOC 5853 or consent of instructor.

**Description:** Components, organization and biosynthesis of plasma, mitochondrial and photosynthetic membranes, emphasizing structure-function relationships. Mechanism of metabolites, protons and electrons transport. Energy conservation in bioenergetic apparatus such as mitochondria, chloroplasts or bacterial chromatophores.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

**BIOC 6793 Plant Biochemistry**

**Prerequisites:** BIOC 4113 or BIOC 5753.

**Description:** Biochemistry of processes and structures of special importance to plants, such as photosynthesis, cell walls, nitrogen fixation, secondary metabolites and storage proteins. Previously offered as BIOC 6792.

**Credit hours:** 3

**Contact hours:** Lecture: 3

**Levels:** Graduate

**Schedule types:** Lecture

**Department/School:** Biochem & Molecular Biology

**BIOC 6820 Selected Topics in Biochemistry**

**Prerequisites:** BIOC 5853.

**Description:** Recent developments in biochemistry. Subject matter varies from semester to semester; students should inquire at the department office before enrolling. Same course as ITOX 6820. Offered for variable credit, 1-3 credit hours, maximum of 15 credit hours.

**Credit hours:** 1-3

**Contact hours:** Other: 1

**Levels:** Graduate

**Schedule types:** Independent Study

**Department/School:** Biochem & Molecular Biology