

BIOCHEMISTRY AND MOLECULAR BIOLOGY

Courses

BIOC 1113 Drugs, Medications and Human Well-Being (N)

Description: Influence of medications and illegal drugs on our health. Explores the medications used to treat cancers, diabetes, microbial infections, heart and mental diseases. Abused drugs, such as alcohol, caffeine, opioids and cannabis and their effects are also covered. Course is designed for non-majors.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

General Education and other Course Attributes: Natural Sciences

BIOC 1990 Freshman Research in Biochemistry and Molecular Biology

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 Contact: 2

Levels: Undergraduate

Schedule types: Lab

Department/School: Biochem & Molecular Biology

BIOC 2101 The Experiments Behind the Facts of Real Science

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111) and CHEM 1515.

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

Credit hours: 1

Contact hours: Lecture: 1 Contact: 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 Contact: 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 Contact: 4 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 Contact: 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 Contact: 6

Levels: Undergraduate

Schedule types: Lab

Department/School: Biochem & Molecular Biology

BIOC 3153 Synthetic Biology

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111) and (CHEM 3013 or CHEM 3053).

Description: Engineering of living systems at the molecular, cellular, and organismal levels: Origin of cellular life; reading and writing DNA; enzyme evolution; metabolic engineering. Applications to current and future biotechnologies in agriculture and medicine: Food and drug synthesis; biofuels; vaccines. This course is designed for both majors and non-majors of biochemistry and molecular.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

BIOC 3223 Physical Chemistry for Biologists

Prerequisites: CHEM 1515, (MATH 2123 or MATH 2144), and (PHYS 1114 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 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

BIOC 3523 Biochemistry of Disease at the Cellular Level

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. Explores the cell and molecular, and biochemical mechanisms of intracellular protein trafficking, cytoskeleton, cell adhesion, mitosis, cell cycle, cytokinesis, cellular stress responses, and apoptosis and in a variety of diseases including cancers, progeria (premature aging), Alzheimer's, Amyotrophic lateral sclerosis (ALS), high cholesterol, and diabetes. May not be used for Degree Credit with BIOC 5523. Previously offered as BIOC 4523.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

BIOC 3653 Survey of Biochemistry

Prerequisites: CHEM 3013 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 Contact: 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 Contact: 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 Contact: 7

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 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

BIOC 4013 Biotechnology Development and Implementation

Prerequisites: BIOC 3653 or BIOC 3713 or consent of instructor.

Description: An overview of emerging biotechnology in medicine and agriculture including gene therapy, immunotherapy, antibody-drug conjugates, and genome-editing technologies. Also includes an introduction to the global biotechnology industry, idea generation, intellectual property protection, finance, and regulation and policies within the industry. May not be used for degree credit with BIOC 5013.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

BIOC 4023 Molecular Biology and Stress Response of Plants

Prerequisites: MICR 2123 and (BIOC 3713 or BIOC 3653 or PLNT 3554).

Description: Topics cover the cutting-edge research areas including second messengers, phytohormones, signal transduction, microbiome, plant-microbe interactions, plant responses to climate change with focus on plant molecular biology and plant responses to biotic and abiotic stresses and their application in solving agricultural problems.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 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. May not be used for Degree Credit with BIOC 5113.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

BIOC 4213 Disease and Metabolism

Prerequisites: BIOC 3653 or BIOC 3713.

Description: Introduction to the causes, preventions and treatments for human diseases including obesity, diabetes, atherosclerosis, cancer and aging. Emphasis on the pathogenesis and the cross-talks between metabolic pathways at system level. May not be used for degree credit with BIOC 5213.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

BIOC 4723 Introduction to Bioinformatics

Prerequisites: BIOL 1114 or (BIOL 1113 and BIOL 1111) 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. May not be used for Degree Credit with BIOC 5723.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Undergraduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

BIOC 4883 Senior Seminar in Biochemistry

Prerequisites: BIOC 3813 or concurrent enrollment 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 Contact: 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: Contact: 1-6 Other: 1-6

Levels: 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: Contact: 1-6 Other: 1-6

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 Contact: 2

Levels: Graduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

BIOC 5013 Biotechnology Development and Implementation

Prerequisites: (BIOC 3653 or BIOC 3713) and BIOL 3023 or consent of instructor.

Description: An overview of emerging biotechnology in medicine and agriculture including gene therapy, immunotherapy, antibody-drug conjugates, and genome-editing technologies. Also includes an introduction to the global biotechnology industry, idea generation, intellectual property protection, finance, and regulation and policies within this industry. May not be used for degree credit with BIOC 4013.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

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 Contact: 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 Contact: 2

Levels: Graduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology

BIOC 5113 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. May not be used for degree credit with BIOC 4113.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

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. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.**Credit hours:** 1-6**Contact hours:** Lecture: 1-6 Contact: 1-6**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 5213 Disease and Metabolism****Prerequisites:** Graduate standing.**Description:** Introduction to the causes, preventions and treatments for human diseases including obesity, diabetes, atherosclerosis, cancer and aging. Emphasis on the pathogenesis and the cross-talks between metabolic pathways at system level. May not be used for degree credit with BIOC 4213.**Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 3**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 5523 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. May not be used for degree credit with BIOC 4523.**Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 3**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 Contact: 3**Levels:** Graduate**Schedule types:** Lecture**Department/School:** Biochem & Molecular Biology**BIOC 5723 Introduction to Bioinformatics****Prerequisites:** BIOL 1114 or (BIOL 1113 and BIOL 1111) 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. May not be used for degree credit with BIOC 4723.**Credit hours:** 3**Contact hours:** Lecture: 3 Contact: 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 Contact: 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.**Credit hours:** 4**Contact hours:** Lab: 8 Contact: 8**Levels:** Graduate**Schedule types:** Lab**Department/School:** Biochem & Molecular Biology**Additional Fees:** Biochem Consumable Mat fee of \$50 applies.**BIOC 5853 Molecular and Integrative 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 Contact: 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:** Contact: 1-4 Other: 1-4**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:** Contact: 1-15 Other: 1-15**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: Contact: 1-2 Other: 1-2

Levels: Graduate

Schedule types: Independent Study

Department/School: Biochem & Molecular Biology

BIOC 6663 Molecular Plant-Microbe Interactions

Prerequisites: PLP 3343 and BIOC 3653.

Description: Focused on the biochemistry, molecular biology and molecular genetics of pathogenic and symbiotic interactions between microbes and plants to explain the mechanisms by which microbe's infection and activation of plant immunity and symbiosis signaling pathways. Same course as PLP 5723.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

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 Contact: 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 Contact: 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: Contact: 1-2 Other: 1-2

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 Contact: 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 Contact: 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 Contact: 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 Contact: 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 Contact: 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: Contact: 1-3 Other: 1-3

Levels: Graduate

Schedule types: Independent Study

Department/School: Biochem & Molecular Biology

BIOC 6823 Quantitative Methods in Omics

Prerequisites: BIOC 1114 and MATH 1513.

Description: Statistical, computational and algorithmic components applied in genomics technologies including theories in quantitative genetics in QTL mapping and Genome-wide Association studies (GWAS), differential analysis based on read-count information and multi-dimensional module/network analysis, graph theories, hidden Markov Models and deep learning.

Credit hours: 3

Contact hours: Lecture: 3 Contact: 3

Levels: Graduate

Schedule types: Lecture

Department/School: Biochem & Molecular Biology