BICH - BIOCHEMISTRY

BICH 602 Fundamentals of Biochemistry II

Credits 3. 3 Lecture Hours. Major metabolic pathways for carbohydrates, lipids, amino acids, proteins and nucleic acids, emphasizing oxidative processes and the biosynthesis of RNA, DNA and protein; regulation of cellular metabolism. **Prerequisite:** BICH 601.

BICH 603 Principles of Biochemistry & Biophysics

Credits 3. 3 Lecture Hours. Principles of Biochemistry & Biophysics. A modern quantitative, analytical and model-building-based approach to expand knowledge of the biochemical and biophysical properties of macromolecules found in living matter, including proteins, lipids, carbohydrates and nucleic acids. **Prerequisites:** BICH 410 or BICH 601; CHEM 228 and CHEM 323; or approval of the instructor.

BICH 606 Foundations of Biochemistry

Credits 3. 3 Lecture Hours. Exploration of the broad scope of fundamental biochemistry, including structure and function of major biomolecules, organization and regulation of major metabolic pathways and biosynthesis of nucleic acids; emphasis on quantitative approaches and analyses. **Prerequisite:** CHEM 227 and CHEM 228; or approval of instructor.

BICH 608 Critical Analysis of the Biochemical Literature

Credits 2. 2 Lecture Hours. Reading and presentation of original articles in biochemistry and related fields to enhance understanding of experimental logic and scientific communication. **Prerequisite:** Graduate classification in biochemistry or approval of instructor.

BICH 610 Written Communication in Biochemical Research

Credits 2. 2 Lecture Hours. Examination of research literature to define a scientific problem, critical barrier to progress, or hypothesis of significance; development of experimental and/or theoretical projects (Specific Aims) designed to address or test the scientific problem, barrier to progress, or hypothesis; learning grantsmanship by analyzing and critiquing National Institutes of Health grant proposals; formulation, presentation, evaluation, and defending of Specific Aims. **Prerequisites:** BICH 603 or approval of instructor; graduate classification in biochemistry or biochemistry and molecular biophysics.

BICH 611 Oral Communication in Biochemical Research

Credit 1. 1 Lecture Hour. Oral communication techniques necessary to convey biochemical information effectively and to prepare for the oral presentation as part of the preliminary exam; biochemistry specific techniques that relate to the scientific method, significance and biochemical literature, the presentation of specific aims, and the description of experimental strategies or results. **Prerequisites:** BICH 603 and BICH 631/GENE 631; graduate classification in biochemistry or biochemistry and molecular biophysics.

BICH 613 Biomolecular Nuclear Magnetic Resonance Spectroscopy Theory and Practice

Credit 1. 1 Lecture Hour. Theoretical and practical applications of biomolecular NMR spectroscopy. **Prerequisites:** BICH 603 or approval of instructor; graduate classification in biochemistry or biochemistry and molecular biophysics.

BICH 614 Cellular Biophysics

Credit 1. 1 Lecture Hour. Exploration of a range of current topics in physical biology and systems biology including diffusion and network motifs. **Prerequisites:** BICH 603 or approval of instructor; graduate classification in biochemistry or biochemistry and molecular biophysics.

BICH 616/GENE 616 Mechanisms of Cell Division

Credit 1. 1 Lecture Hour. Mitotic cell cycle; progression of biochemical and morphological phases and events; duplication of cellular constituents and segregation into daughter cells. **Prerequisites:** Graduate classification in biochemistry, biochemistry and molecular biophysics, genetics, genetics and genomics, or approval of instructor. **Cross Listing:** GENE 616/BICH 616.

BICH 628/CSCE 628 Computational Biology

Credits 3. 3 Lecture Hours. Introduction to computational biology; formulations of biology problems as computational problems; computational approaches to solve problems in genomics and proteomics. **Prerequisite:** Graduate classification or approval of instructor. **Cross Listing:** CSCE 628/BICH 628.

BICH 629 Optical Spectroscopy

Credit 1. 1 Lecture Hour. Overview of major optical spectroscopy techniques, including absorption, fluorescence, infrared and Raman spectroscopy; special emphasis on fundamental physical principles of these techniques and their applications in biology. **Prerequisites:** BICH 603 or approval of instructor; graduate classification in biochemistry or biochemistry and molecular biophysics.

BICH 631/GENE 631 Biochemical Genetics

Credits 3. 3 Lecture Hours. Genetic control of cellular metabolism; mechanism of gene action; gene-enzyme relationships; regulation of gene expression; structure and organization of genomes; biochemical manipulation and characterization of genetic molecules. **Prerequisites:** BICH 431/GENE 431 or GENE 431/BICH 431; BICH 603. **Cross Listing:** GENE 631/BICH 631.

BICH 637 Advanced Topics in Metabolism

Credit 1. 1 Lecture Hour. Advanced topics in metabolism; including evaluation of modern scientific literature and historical context; emphasis on critical analysis of scientific literature, experimental design and written and oral science communication. **Prerequisites:** BICH 603 or approval of instructor; graduate classification in biochemistry or biochemistry and molecular biophysics.

BICH 650/BIOL 650 Genomics

Credits 3. 3 Lecture Hours. Modern genomics as a tool for understanding biological systems; review of gene structure and organization and the history of sequencing technologies; focus on transcriptional, translational and functional genomics. **Prerequisite:** Graduate classification or approval of instructor. **Cross Listing:** BIOL 650/BICH 650.

BICH 654 Structural Biochemistry

Credits 3. 3 Lecture Hours. Basic physics of X-ray diffraction, crystal structure methods, introduction to structural data bases, molecular geometry and molecular modeling. **Prerequisite:** Approval of instructor.

BICH 655 Crystallography Methods

Credits 3. 2 Lecture Hours. 3 Lab Hours. The practice of x-ray diffraction in the study of biomolecules; solving protein crystal structures. **Prerequisite:** Graduate classification.

BICH 656 RNA World

Credits 3. 3 Lecture Hours. Emphasis on newly discovered RNA-mediated processes and regulation; range of topics in modern RNA biology include RNA silencing; RNA-guided epigenetic regulation, CRISPR/Cas immunity and genome editing, telomerase biogenesis, riboswitches, exosome and editosome; application of RNA biology in medicine and biotechnology. **Prerequisites:** BICH 301 and BICH 302.

BICH 657 Introduction to Structural Biology

Credit 1. 1 Lecture Hour. Protein expression, purification, characterization, crystallization and structural determination by X-ray crystallography; includes an eight-hour workshop on crystallography. **Prerequisite:** BICH 603 or approval of instructor; graduate classification in biochemistry or biochemistry and molecular biophysics.

BICH 658 Application of Scientific Values in Daily Research Practice

Credit 1. 1 Lecture Hour. Core scientific values motivated by professional research culture in Biochemistry and related fields; exploration of the core values of science; application of values to responsibly, effectively and efficiently navigate daily research practice. **Prerequisite:** Graduate classification and approval of instructor.

BICH 661 Advanced Genome Annotation with Ontologies

Credit 1. 2 Lab Hours. Advanced topics in functional annotation using ontologies; usage issues and quality control for ontologies and annotations; mentoring annotation activities from BICH 460 and evaluation of annotations. May be taken three times for credit. **Prerequisite:** Graduate classification or approval of instructor.

BICH 665 Biochemical Kinetics

Credit 1. 1 Lecture Hour. Theoretical principles and practical approaches to analysis of chemical kinetics with specific examples of applications to biochemistry and biochemical investigations. **Prerequisite:** Graduate classification.

BICH 671/MCMD 671 Macromolecular Folding and Design

Credit 1. 1 Lecture Hour. The Macromolecular Folding and Design Journal Club is to serve as a mechanism for oral dissemination of current knowledge regarding the structure and function of biological macromolecules. **Prerequisite:** Graduate classification. **Cross Listing:** MCMD 671/BICH 671.

BICH 672/MCMD 672 Biological Membranes

Credit 1. 1 Lecture Hour. Seminar-based course examining recent discoveries in the structure, function and assembly of biological membranes; oral presentation by students on current literature in molecular biology and biochemistry. **Prerequisite:** Approval of instructor. **Cross Listing:** MCMD 672/BICH 672.

BICH 673/GENE 673 Gene Expression

Credit 1. 1 Lecture Hour. Oral presentations and discussions related to the biochemistry and molecular biology of gene expression in animal, plant and microbial systems. May be repeated for credit up to 12 times. **Prerequisite:** Graduate classification in biochemistry or genetics or approval of instructor. **Cross Listing:** GENE 673/BICH 673.

BICH 674/MCMD 674 Protein Folding and Stability

Credit 1. 1 Lecture Hour. Selected topics from recent literature in the general areas of protein folding, structure, and stability. **Prerequisite:** Approval of instructor. **Cross Listing:** MCMD 674/BICH 674.

BICH 675 Plant Biochemistry and Genomics

Credit 1. 1 Lecture Hour. Overview of current literature dealing with plant biochemistry/genomics; biochemistry topics will include the function of protein-protein interactions related to plant specific processes such as plant-pathogen interactions; genomics topics will focus on current analysis of plant genomes and how the derived information is being utilized to elucidate biochemical pathways. **Prerequisite:** Graduate classification.

BICH 676 Bacteriophage Biology

Credit 1. 1 Lecture Hour. Oral presentation and discussion in the general area of the viruses of microbes and bacteria; literature review with a broad scope, from basic molecular biology of phages to practical applications of microbial virus technology. May be taken 12 times for credit. **Prerequisite:** Approval of instructor.

BICH 677 Chemical Genetics and Drug Discovery

Credit 1. 1 Lecture Hour. Review, discuss and present scientific literature studies based on the usage of small molecules to alter protein function. May be repeated for credit. **Prerequisite:** Graduate classification.

BICH 678 Metal Ions

Credit 1. 1 Lecture Hour. Understanding the roles of metals in biological systems and the methods used in biochemical and cell biological processes; reading primary research literature critically, critiquing research designs in terms of innovation, significance and logic, and uncovering both strengths and weaknesses of the discussed articles. **Prerequisites:** CHEM 628 or approval of instructor.

BICH 679 Building Scientific Relationships

Credit 1. 1 Lecture Hour. Addressing aspects of human element of scientific research; emotional and cultural intelligence, resiliency, team dynamics, leadership, effective communication with others, strategies for conflict resolution and best practices for mentoring undergraduates. **Prerequisites:** Successful completion of one year of graduate study and affiliation with a research laboratory in the life sciences.

BICH 681 Seminar

Credit 1. 1 Lecture Hour. Original articles in biochemistry and related fields designed to broaden understanding of problems in the field and to stimulate research.

BICH 685 Directed Studies

Credits 1 to 12. 1 to 12 Other Hours. Biochemical laboratory procedures; preparations and instrumentation; problems assigned according to experience, interests and needs of individual student. **Prerequisite:** Approval of instructor.

BICH 689 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours. Selected topics in an identified area of biochemistry. May be repeated for credit. **Prerequisite:** Approval of instructor.

BICH 690 Theory of Biochemical Research

Credits 2. 2 Lecture Hours. State-of-the-art examination of modern trends in various subfields of modern biochemistry concentrating on the design of experiments, evaluation of research results and discussion of the current literature. May be repeated for credit.

BICH 691 Research

Credits 1 to 23. 1 to 23 Other Hours. Research for thesis or dissertation. Laboratory facilities available for original investigations in various phases of biochemistry. **Prerequisite:** Approval of major advisor.

BICH 697 Methods in Teaching Biochemistry Laboratory

Credit 1. 1 Lecture Hour. Theory and practical aspects of teaching Biochemistry labs, with emphasis on content, grading, instructional methods and practical aspects of biochemistry labs. May be repeated for credit. **Prerequisite:** Graduate classification in biochemistry.