BIOCHEMISTRY (BIOC)

Explanation of Course Numbers

- Courses in the 1000s are primarily introductory undergraduate courses
- Those in the 2000s to 4000s are upper-level undergraduate courses that can also be taken for graduate credit with permission and additional work assigned
- Those in the 6000s and 8000s are for master's, doctoral, and professional-level students
- The 6000s are open to advanced undergraduate students with approval of the instructor and the dean or advising office

BIOC 1099. Variable Topics. 1-36 Credits.

BIOC 3099. Variable Topics. 1-12 Credits.

BIOC 3261. Introductory Medical Biochemistry. 4 Credits.
Introduction to structures of biological macromolecules, enzyme catalysis, cellular bioenergetics, and metabolism. Prerequisite: CHEM 2151 and CHEM 2152. Same As: BISC 3261.

BIOC 3262. Biochemistry Laboratory. 2 Credits.
Study of common experimental techniques used in life science laboratories to separate and characterize biological macromolecules. Laboratory fee. Same as BISC 3262 and CHEM 3262. Prerequisites: BIOC 3261 or BISC 3261.

BIOC 3263. Special Topics in Biochemistry. 2 Credits.
In-depth discussion of current biochemically relevant topics, including cancer and HIV chemotherapy, immune response, photosynthesis, signal transduction, hormone regulation and nutrition. Prerequisites: BIOC 3261 or BISC 3261. (Same as BISC 3263)

BIOC 3263W. Special Topics in Biochemistry. 2 Credits.
Includes a significant engagement in writing as a form of critical inquiry and scholarly expression to satisfy the WID requirement.

BIOC 3560. Diet, Health, and Longevity. 3 Credits.
Biochemical and molecular explanations of how calorie intake affects health; scientific principles of dieting. Prerequisites: BISC 1005 or BIOC 3261.

BIOC 3564. Lipid Biotechnology. 2 Credits.
Same as BISC 3564 and CHEM 3564. Laboratory fee. Prerequisites: BIOC 3261 or BISC 3261.

BIOC 3820. Bioinformatics and Computational Biochemistry. 2 Credits.
How biomedical researchers integrate information from molecular biology resources for analysis and testing of hypotheses. Prerequisites: BISC 1111 and STAT 1127.

BIOC 3821. Projects in Biomedical Informatics. 1-2 Credits.
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BIOC 4195. Undergraduate Research. 1-4 Credits.
Provides students with hands-on laboratory experience. Research must be conducted under a mentor in the Department of Biochemistry and Molecular Medicine. Permission of the instructor is required prior to enrollment. Prerequisites: BIOC 3261, or BIOC 3262, or CHEM 4161, or equivalent, prior research laboratory experience may serve as the prerequisite.

BIOC 5099. Variable Topics. 1-99 Credits.

BIOC 6201. Medical Biochemistry. 7 Credits.
Required for medical students. Lecture and laboratory; emphasis on basic principles and their relation to medicine.

BIOC 6209. Research Elective in Medical Biochemistry. 1-12 Credits.

BIOC 6211. Biochemistry-Health Science Students. 3,4 Credits.
Basic concepts of biochemistry and their relation to health sciences.

BIOC 6221. Proteins, Pathways, and Human Health. 4 Credits.
A comprehensive course in general biochemistry for graduate students in biomedical sciences. Prerequisites: CHEM 2152 and CHEM 2154.

BIOC 6222. Biochemical Genetics and Medicine. 3 Credits.
Continuation of BIOC 6221. A comprehensive course in general biochemistry for graduate students in biomedical sciences. Prerequisites: CHEM 2152 and CHEM 2154.

BIOC 6223. Bioinformatics. 2 Credits.
The application of bioinformatics concepts and methods through the use of molecular biology databases and tools, covering molecular evolution, and protein sequence, structural, functional analysis. Recommended background: Prior completion of an undergraduate course in biochemistry.

BIOC 6224. Molecular Biology and Protein Methods. 3 Credits.
Common laboratory techniques used in life science laboratories to separate and characterize proteins, including chromatography, gel electrophoresis, immunoassays, spectroscopy, and centrifugation. Corequisite: BIOC 6221. Laboratory fee.

BIOC 6225. Artificial Intelligence and Machine Learning in Biomedical Research. 2 Credits.
AI and ML applications in biomedical research. Students learn key concepts, including large language models, predictive modeling, and omics data integration, through lectures, demos, and hands-on practice. Open to all skill levels. Recommended background: Prior completion of a computer science-related course would be useful but is not essential.

BIOC 6227. Biochemistry Seminar. 1 Credit.
Current literature in biochemistry. Cannot be repeated for credit. Restricted to graduate students in the biochemistry and molecular medicine program.

BIOC 6228. Research Essentials and Bioscience Careers. 1 Credit.
A variety of topics essential to helping graduate students become successful scientists, including scientific research and ethics guidelines, principles for writing manuscripts, and career information and advice.

BIOC 6230. New Technologies in Scientific Research. 2 Credits.
New technologies for conducting meaningful scientific inquiry and research. How such technologies have evolved and become essential to investigative research.

BIOC 6234. Biochemical and Bioinformatic Approaches to Protein Structure and Function. 3 Credits.
Molecular biological, biophysical, chemical, and bioinformatic approaches to understanding protein structure and function. Protein folding, interactions, and ligand binding.

BIOC 6235. Seminar in Genomics, Proteomics, and Bioinformatics. 1 Credit.

BIOC 6236. Medical Genomics. 2 Credits.
The structure and function of genes and genomes; genomic theories, methods, and data analysis including bioinformatics and database mining. BIOC 6221 and BIOC 6222 may be taken as corequisites. Prerequisites: BIOC 6221 and BIOC 6222.

BIOC 6237. Proteomics and Biomarkers. 2 Credits.
Experimental proteomics, protein/proteome analysis, bioinformatics of proteomics, systems biology and structural genomics.

BIOC 6238. Experimental Genomics Lab. 3 Credits.
Research applications of knowledge in genomics and proteomics. Prerequisite: BIOC 6236. Laboratory fee.

BIOC 6240. Next Generation Sequencing. 2 Credits.

BIOC 6241. Single Cell Genomics Data Analysis. 2 Credits.
The principles of single cell genomic (SCG) sequencing and theoretical knowledge of research and clinical applications. Recommended background: Basic knowledge of R-environment and R-studio; the ability to use command line and work on Linux-based environment systems; prior completion of BIOC 6240.

BIOC 6242. Bioscience Big Data Statistics. 2 Credits.
Modern bioscience big data from generation to analysis and interpretation; data structures and data types and objects; and challenges in big data storage, access, and computation.

BIOC 6243. Applied Bioinformatics. 2 Credits.
Practical, hands-on experience in implementing -omics data analysis pipelines with a focus on data access, processing, and knowledge discovery.

BIOC 6246. Advanced Genomic Data Analysis. 3 Credits.
Theoretical and practical training in high-throughput genomic data analysis, focusing on single-cell genomics. Hands-on sessions and real-world projects provide essential skills in bioinformatics tools and workflows for analyzing complex datasets. Recommended background: Basic knowledge on R-environment, R-studio, the ability to use command line and work on Linux-based environment systems.

BIOC 6250. Molecular Biology. 3 Credits.
Content includes the organization and replication of genetic material, transcriptional and translational machinery, regulation of eukaryotic gene expression, and other special topics. BIOC 6221 and BIOC 6222 may be taken as corequisites. Prerequisites: BIOC 6221 and BIOC 6222.

BIOC 6252. Current Laboratory Methods in Molecular Biology. 3 Credits.
Corequisite: BIOC 6221. Laboratory fee.

BIOC 6254. Fundamentals of Molecular Biology. 3 Credits.
An intermediate-level molecular biology survey course. Prerequisite: BIOC 6221.

BIOC 6260. Analytic Methods for Lipids and Carbohydrates. 3 Credits.
Basic techniques in the biotechnology of lipids and carbohydrates. Prerequisite: BIOC 6221.

BIOC 6262. Genes, Diets, and Aging. 3 Credits.
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BIOC 6264. Membrane-Associated Complex Lipids. 1 Credit.
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BIOC 6281. Topics. 1,2 Credit.
Directed readings in biochemistry, molecular biology, and genetics. May be repeated for credit. Restricted to graduate students in the biochemistry and molecular medicine program.

BIOC 6290. Extramural Biochemistry Elective. 1-12 Credits.

BIOC 6291. Extramural Biochemistry Elective. 1-12 Credits.

BIOC 6295. Research. 1-12 Credits.
Participation in a project under investigation or in a field suggested by the student and approved by the staff. May be repeated for credit. Laboratory fee.

BIOC 6298. Advanced Reading. 1-6 Credits.
Advanced reading in biochemistry. Restricted to students in the MS in molecular biochemistry and bioinformatics program.

BIOC 6999. Thesis Research. 2 Credits.
Development of a thesis project and accompanying research.

BIOC 8225. Metabolism. 4 Credits.
Metabolic pathways and integration of metabolic processes. Limited to PhD students in the Institute for Biomedical Sciences.

BIOC 8231. Biochemical Basis of Human Diseases. 3 Credits.
Biochemical perspectives on disorders involving metabolic alterations, immunological dysregulation, problems of environmental/toxicological etiology, genetic/epigenetic dysfunction, neglected tropical diseases. Prerequisites: BMSC 8210 and BMSC 8212.

BIOC 8232. Molecular and Cellular Signaling. 3 Credits.
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BIOC 8501. Issues in Clinical Nutrition. 3 Credits.

BIOC 8502. Molecular Biology of Oncogenes. 1-12 Credits.

BIOC 8503. Readings in Immunology. 3 Credits.

BIOC 8800. Summer Remedial Biochemistry. 8 Credits.