Biochemistry and Molecular Biology Courses (BMB)

BMB Courses

This is a list of courses with the subject code BMB. For more information, see Biochemistry and Molecular Biology (Carver College of Medicine) in the Catalog.

BMB:3110 Biochemistry 3 s.h.
One-semester survey of basic concepts in modern biochemistry and molecular biology; emphasis on application of biochemical concepts to human metabolism; appropriate for students who plan to pursue a career in health care or want an overview of biochemistry as a discipline. Requirements: one year each of college-level biology and chemistry. Recommendations: one semester of organic chemistry.

BMB:3120 Biochemistry and Molecular Biology I 3 s.h.
Physical and chemical foundations of biochemistry, structure of biological molecules, catalysis, transport, and oxidative reactions in biology; first of two-semester sequence that concludes with BMB:3130. Requirements: two semesters of general chemistry and one of organic chemistry. Recommendations: BIOL:1411, BIOL:1412, and an additional organic chemistry course.

BMB:3130 Biochemistry and Molecular Biology II 3 s.h.
Molecular principles of photosynthesis and biosignaling; metabolism of lipids, amino acids, and nucleic acids; DNA replication, transcription, and protein translation; team-taught, didactic lecture style; second of a two-semester comprehensive biochemistry sequence. Prerequisites: BMB:3120 with a minimum grade of C-.

BMB:3140 Experimental Biochemistry 2 s.h.
Use of modern instruments and techniques to fractionate, identify, and characterize constituents of biochemical systems. Prerequisites: BMB:3120 with a minimum grade of C-. Requirements: two semesters of general chemistry and one semester of organic chemistry.

BMB:3150 Development of Senior Research Project 2 s.h.
Preparation for biochemistry majors pursuing a senior research project in BMB:4999; communicating technical information through writing and speaking; presenting scientific journal articles and writing experimental protocols; developing detailed proposal for one-year senior research project. Prerequisites: BMB:3120 or BMB:3140 or BMB:3130. Requirements: biochemistry major and junior or senior standing.

BMB:3310 Practical Data Science and Bioinformatics 3 s.h.
Understanding how to access large biological data sets and use them to answer biological questions is an important skill for researchers; immersive introduction to computational handling of data; how to access and analyze publicly available data; critically evaluate data quality and analysis in context of measuring gene expression; basic coding in R/RStudio, plotting and data display, fitting and regression, statistical inference, statistical models, downloading and data wrangling; basic introduction to machine learning (clustering); for students with no computational background. Prerequisites: BIOL:1411 with a minimum grade of C- and BIOL:1412 with a minimum grade of C-. Requirements: college algebra. Recommendations: BMB:3110, or BMB:3120 and BMB:3130, or other upper-level life sciences courses. Same as CBIO:3310, MMED:3310.

BMB:3800 Biochemistry Teaching Practicum arr.
Training for qualified junior or senior undergraduates majoring in biochemistry or a related field to contribute to undergraduate courses; interns may hold review sessions, offer regular office hours, draft questions for homework or exams, assist in proctoring exams, assist students in a laboratory setting, and help with course implementation; guidance from the faculty director and instructor of each course; interns are expected to work approximately three hours per week for each semester hour of credit earned. Requirements: completion of a course covering the same or equivalent material with a grade of B or higher, and must arrange for a short interview with the appropriate course director prior to registration.

BMB:3993 Undergraduate Biochemistry Research arr.
Preparation for BMB:4999; directed research with a biochemistry faculty member; experience in an active biochemistry research lab, learning and performing experiments relevant to current projects in that lab, including exposure to scientific literature; arranged in advance by student and biochemistry faculty member.

BMB:4240 Biophysics and Advanced Biochemistry 3 s.h.
Principles and experimental approaches used to study macromolecular structure, stability, and function; ligand binding and macromolecular interactions; enzyme kinetics and mechanisms; X-ray crystallography and NMR spectroscopy; single molecule and other biophysical approaches. Prerequisites: BMB:3120 and BMB:3130 with a minimum grade of C-. Requirements: one year of biochemistry. Recommendations: physical chemistry course and one semester of calculus.

BMB:4241 Biophysical Chemistry I 3 s.h.
Principles and experimental approaches used to study structure and function of biological macromolecules; protein structure, stability, and dynamics; macromolecular interactions; common biophysical methods. Prerequisites: BMB:3120 with a minimum grade of C- and BMB:3130 with a minimum grade of C-. Requirements: one year of biochemistry. Recommendations: physical chemistry course and one semester of calculus.

BMB:4242 Biophysical Chemistry II 3 s.h.
Principles and experimental approaches used to study structure and function of biological macromolecules; ligand binding and enzyme catalysis; X-ray crystallography; NMR spectroscopy. Prerequisites: BMB:3120 with a minimum grade of C- and BMB:3130 with a minimum grade of C-. Requirements: one year of biochemistry. Recommendations: physical chemistry course and one semester of calculus.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
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</thead>
<tbody>
<tr>
<td>BMB:4310</td>
<td>Computational Biochemistry</td>
<td>3 s.h.</td>
<td>Basic chemistry courses.</td>
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<tr>
<td>BMB:4999</td>
<td>Advanced Undergraduate Biochemistry</td>
<td>arr.</td>
<td>Advanced directed research with a biochemistry faculty member; work on an individualized research project relevant to research goals of that lab; learning related scientific literature and presentation of research results; arranged in advance by student and biochemistry faculty member and taken after completion of core biochemistry curriculum.</td>
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<tr>
<td>BMB:5215</td>
<td>Directed Readings for Graduate Students</td>
<td>arr.</td>
<td>Directed readings with course content arranged with professor.</td>
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<tr>
<td>BMB:5240</td>
<td>Biophysics and Advanced Biochemistry</td>
<td>3 s.h.</td>
<td>Principles and experimental approaches used to study macromolecular structure, stability, and function; ligand binding and macromolecular interactions; enzyme kinetics and mechanisms; X-ray crystallography and NMR spectroscopy; single molecule and other biophysical approaches. Requirements: one year of biochemistry. Recommendations: physical chemistry course and one semester of calculus.</td>
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<tr>
<td>BMB:5243</td>
<td>Biophysical Chemistry I, Module I</td>
<td>1 s.h.</td>
<td>Overview of principles of protein structure, stability, folding, and dynamics; brief treatment of structural biology approaches to help students become critical users of models derived from X-ray crystallography and NMR; taken alone or as part of BMB:5241. Requirements: introductory course in biochemistry.</td>
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<tr>
<td>BMB:5244</td>
<td>Molecular Recognition</td>
<td>1 s.h.</td>
<td>Focus on determinants in protein small molecule binding, particularly involving pharmaceutically relevant enzymes and receptors; how modern structure-based drug discovery is greatly aided by ability to employ protein structures in discovery and design of certain classes of drugs; structural approaches for predicting and improving drug affinity and selectivity, which have made a lasting impact across a number of diseases; important contemporary topics include in-depth lectures on fragment based drug discovery (FBDD), use and pitfalls of in silico docking and other screening methods, and emergence of covalent drugs. Requirements: introductory course in biochemistry.</td>
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<tr>
<td>BMB:5245</td>
<td>Biophysical Chemistry I, Module II</td>
<td>1 s.h.</td>
<td>In-depth examination of statistical thermodynamics and molecular forces in biological systems as related to protein structure, stability, and folding; nucleic acid structure and stability; taken alone or as part of BMB:5241. Requirements: introductory course in biochemistry.</td>
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<tr>
<td>BMB:5246</td>
<td>Biophysical Chemistry II, Module II</td>
<td>1 s.h.</td>
<td>Utilization of X-ray crystallography and NMR spectroscopy in determining atomic resolution biomolecular structures; crystal geometry, X-ray diffraction, the phase problem, data collection, structure solving and refinement; basic principles of NMR spectroscopy including magnetic properties of nuclei, chemical shift, resonance assignments, determination of NOEs, scalar couplings, RDCs, and simulated annealing approaches to structure determination; for students interested in structural biology; taken alone or as part of BMB:5241. Requirements: introductory course in biochemistry.</td>
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<tr>
<td>BMB:5247</td>
<td>Biophysical Chemistry I, Module III</td>
<td>1 s.h.</td>
<td>In-depth examination of protein-protein interactions and protein-nucleic acid interactions; implications in biological motility, transcription, and replication; taken alone or as part of BMB:5241. Requirements: introductory course in biochemistry.</td>
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<td>BMB:5248</td>
<td>Biophysical Chemistry II, Module III</td>
<td>1 s.h.</td>
<td>Methods for studying biomolecular dynamics, structure of large biomolecules and biomolecular complexes; measurement and analysis of NMR parameters for characterization of dynamics including T1, T2, hetNOE, CPMG-RD, and RDCs; introduction to computational approaches (e.g., molecular dynamics); NMR methods for studying large biomolecular systems and survey of other approaches including cryoEM and SAX; for students interested in structural biology; taken alone or as part of BMB:5241. Requirements: one year of biochemistry. Recommendations: basic knowledge of spectroscopy and some previous exposure to NMR from basic chemistry courses.</td>
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<tr>
<td>BMB:5261</td>
<td>Research Techniques</td>
<td>1-6 s.h.</td>
<td>Laboratory rotation for first-year graduate students in biochemistry.</td>
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<td>BMB:5282</td>
<td>Seminar</td>
<td>0-2 s.h.</td>
<td>How to evaluate reports of scientific investigations critically; techniques for presenting scientific information.</td>
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<td>BMB:5875</td>
<td>Perspectives in Biocatalysis</td>
<td>1-3 s.h.</td>
<td>Applied enzymology, protein design, structure-activity relationships, biosensor technology, microbial transformations, biodegradation of environmental pollutants. Requirements: graduate standing in a participating department supported by the Predoctoral Training Program in Biotechnology. Same as CBE:5875, CEE:5875, CHEM:5875, MICR:5875, PHAR:5875.</td>
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BMB:7251 Introduction to Protein Structures  1 s.h.
Basics of protein structures and amino acids; module covers chapters 1-5 of Lehninger's Principles of Biochemistry.
Recommendations: first-year graduate standing in biosciences or physical sciences.

BMB:7252 Enzymes, Carbohydrates, Nucleic Acids, and Bioenergetics  1 s.h.
Basics of enzyme kinetics and enzyme mechanisms, carbohydrates, nucleic acids, and bioenergetics; module covers chapters 6, 7, 8, and 13 of Lehninger's Principles of Biochemistry. Recommendations: first-year graduate standing in biosciences or physical sciences.

BMB:7253 Metabolism I  1 s.h.
Basics of carbohydrate metabolism (glycolysis, gluconeogenesis, the pentose phosphate pathway), hormonal regulation of carbohydrate metabolism, the citric acid cycle, amino acid catabolism, oxidative phosphorylation; assignment of an advanced topic related to material, typically a recent research paper, extending inquiry beyond that presented in class and presented orally at end of five-week module. Requirements: undergraduate biochemistry course or background in enzyme function.

BMB:7254 Cellular Biochemistry  1 s.h.
Carbohydrate biosynthesis in plants and bacteria, lipid structure/function, biological membranes and transport, signaling, and protein turnover; can be taken alone or as part of BMB:3130; for graduate students who wish to refresh or advance their knowledge of cellular biochemistry. Recommendations: first-year graduate standing in biosciences or physical sciences.

BMB:7255 Metabolism II  1 s.h.
Fatty acid metabolism, lipid biosynthesis, synthesis of nitrogen containing compounds (amino acids, nucleotides) and principles of hormonal regulation of metabolic pathways; can be taken alone or as part of BMB:3130; for graduate students who wish to refresh or advance their knowledge of metabolism. Recommendations: first-year graduate standing in biosciences or physical sciences.

BMB:7256 Molecular Biology  1 s.h.
Chromosomal organization, DNA replication, gene expression, RNA processing, and translation; can be taken alone or as part of BMB:3130; for graduate students who wish to refresh or advance their knowledge of the central dogma of molecular biology. Recommendations: first-year graduate standing in biosciences or physical sciences.

BMB:7292 Research Biochemistry  arr.
Thesis research.

BMB:8101 Biochemistry for Dental Students  3 s.h.