

BBMB Approved List of Biochemistry Graduate Courses for the Graduate Certificate

Effective Fall 2018

Experimental Courses are designated with an "X" after the course number. An experimental course must be offered and taught at least once before it will be added to the ISU course catalog.

BBMB 504: Amino Acids and Proteins. (2-0) Cr. 2. F. *Prereq:* CHEM 332 or equivalent. Review of amino acids and proteins, including atomic interactions, thermodynamics, structure and properties of amino acids, post-translational modifications, protein expression, purification and analysis, protein secondary, tertiary and quaternary structure, protein folding, oxygen transport and hemoglobin, models for equilibrium binding, elementary reactions and enzyme kinetics, biosynthesis of amino acids: pathways and mechanisms.

Instructor: Honzatko

BBMB 505: Bioenergetics and Metabolism. (2-0) Cr. 2. F. *Prereq:* CHEM 211, CHEM 332; a previous course in biochemistry is strongly recommended. Examination of catabolic pathways involved in the oxidation of organic and inorganic molecules, and energy metabolism involving inputs from light or other non-light sources. Central metabolism and glycolysis, fermentation, aerobic and anaerobic respiration, photosynthesis.

Also offered online as [BBMB 505 XW](#). Standard instate tuition and a College Delivery Fee of \$200 applies.

Instructor: Dispirito

BBMB 506: Membrane Biochemistry. (2-0) Cr. 2. F. *Prereq:* CHEM 332 or equivalent Analysis of the structure, function, and synthesis of membranes. Bacterial and eukaryotic membrane characteristics. Membrane transport and signaling mechanisms. Analysis of the structure and function of lipids and membrane proteins.

Also offered online as [BBMB 506 XW](#). Standard instate tuition and a College Delivery Fee of \$200 applies.

Instructor: Underbakke

BBMB 507: Biochemistry of Nucleic Acids. (2-0) Cr. 2. S. *Prereq:* CHEM 332 or equivalent. Analysis of the chemical structure, function, synthesis, and metabolism of nucleic acids. Chemical characterization of nucleotides, polynucleotides, DNA, and RNA. Analysis of transcription, translation, and the genetic code.

Also offered online as [BBMB 507 XW](#). Standard instate tuition and a College Delivery Fee of \$200 applies.

Instructor: Nelson

BBMB 510. Molecular Biology and Biochemistry of RNA. (2-0) Cr. 2. F. *Prereq:* BIOL 313, BBMB 405, BBMB 502, or Gen 409, or equivalent. Biochemical processes that define structure and function of nucleic acids. Emphasis on the molecular processes that take place during synthesis, processing, and function of different RNA species; review of recent advances in RNA research.

To be offered Alternate fall, even year (next offered fall 2018)

Instructor: MacIntosh

BBMB 512X. Principles of Glycobiology. (2-0) Cr. 2. S. *Prereq:* 3 credits in Organic Chemistry. Structure, synthesis, and functions of glycans, glycoproteins, glycolipids, and glycosylated secondary metabolites in prokaryotic and eukaryotic organisms. Fundamental role of glycans in living organisms along with the most advanced techniques used for their characterization. Biotechnological applications of glycans and glycoconjugates for human needs.

To be offered alternate spring, odd year (next offering spring 2019)

Instructor: Zabolina

BBMB 530: Prokaryotic Diversity and Ecology (Dual-listed with BBMB 430). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered odd-numbered years. *Prereq:* MICRO 302, MICRO 302L. Survey of the diverse groups of prokaryotes emphasizing important and distinguishing metabolic, phylogenetic, morphological, and ecological features of members of those groups.

Instructor: Bobik

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BBMB 531X. Plant Biochemistry. (2-0) Cr.2. S. *Prereqs: BBMB 301 or equivalent.* In-depth exploration of plant biochemistry with a focus on the unique aspects of plants versus heterotrophic organisms. Analysis of unique pathways, metabolic trafficking between unique organelles and tissues, and techniques for their characterization.

To be offered alternate fall, even year

Also offered online as [BBMB 531 XW](#). Standard instate tuition and a College Delivery Fee of \$200 applies.

Instructor: Peters

BBMB 532X. Enzyme Kinetics and Mechanisms. (2-0) Cr. 2. S. *Prereq: BBMB 504.* Advanced concepts of enzyme kinetics and catalysis. Experimental methods for determining kinetic and chemical reaction mechanisms. Enzyme structure/function relationships and the role of dynamics in catalysis.

To be offered alternate spring, odd year (next offered spring 2019)

Instructor: Nelson

BBMB 549X. Nuclear Magnetic Resonance Spectroscopy. (3-0) Cr. 3. F. *(Cross-listed with CHEM 549X.) Prereq: any one of the following: CHEM 324, CHEM 325, BBMB 461, BBMB 561.* Theoretical principles of NMR, practical aspects of experimental NMR, solution and solid state NMR, methodologies for molecule characterization, protein structure determination, NMR relaxation, and recent advances.

To be offered every year starting fall 2018

Instructor: Barb

BBMB 551X. Computational Biochemistry. (2-0) Cr. 2. F. *Prereq: BBMB 404 or equivalent.* Biological and structural databases, molecular visualization, sequence comparisons, homology searches, sequence motifs, construction of phylogenetic trees, structure comparisons, protein structure predictions, RNA structure predictions, molecular docking, metabolic pathways.

To be offered alternate spring, even year (next offering spring 2018)

Instructor: Jernigan

BBMB 553X. Current Research in Chemical and Physical Biology. (2-0) Cr. 2. F. *Prereqs: BBMB 404 or equivalent.* Principles and applications of chemical and physical methods to analyze biological structures and function ranging from cells to individual biomolecules. Synthetic and biosynthetic strategies, cell surface engineering, single molecule and super-resolution spectroscopy and imaging, membrane biophysics, and use of nuclear magnetic resonance.

To be offered alternate fall, even year

Instructor: Shin

BBMB 561: Molecular Biophysics. (Dual-listed with BBMB 461). (2-0) Cr. 2. S. *Prereq: Credit or enrollment in MATH 166 and CHEM 178 and PHYS 222 or PHYS 112.* Physical methods for the study of molecular structure and organization of biological materials. X-ray diffraction, nuclear magnetic resonance, hydrodynamics and fluorescence spectroscopy. Registration for the graduate credit commits the student to graduate-level examinations, which differ from undergraduate-level examinations in the number and/or difficulty of questions.

Instructor: Barb, Honzatko and Shogren-Knaak

BBMB 561L: Laboratory in Molecular Biophysics. (1-3) Cr. 2. S. *Prereq: Credit or enrollment in BBMB 461/BBMB 561.* Practice in methods of X-ray diffraction, nuclear magnetic resonance, hydrodynamics and fluorescence spectroscopy as applied to macromolecules.

Instructor: Fulton, Honzatko and Shogren-Knaak