

BIOCHEMISTRY COURSES (18+ cr.)**BBMB 101 (1 cr.) *Introduction to Biochemistry***

Career opportunities in biochemistry. Current research in biochemistry and an introduction to structure function of biochemical compounds

BBMB 102 (1 cr.) *Introduction to Biochemistry Laboratory*

Students isolate and characterize some biochemical substances, using techniques of chromatography, spectrophotometry, electrophoresis, etc.

BBMB 201 (2 cr.) *Chemical Principles in Biological Systems*

Survey of chemical principles as they apply in biological systems including: water, organic chemistry of functional groups in biomolecules and biochemical cofactors, weak bonds and their contribution to biomolecular structure, oxidation-reduction reactions and redox potential, thermodynamic laws and bioenergetics, chemical equilibria and kinetics, inorganic chemistry in biological systems, data presentation. The subjects will be taught using molecules from biological systems as examples.

BBMB 312 (2 cr.) *Experimental Research Skills in Biochemistry*

Inquiry-based introduction to biochemical techniques such as protein purification, enzymatic assays, solution preparation, hypothesis formation and testing, data analysis, high-throughput methodology, research record keeping, technical writing and scientific communication.

BBMB 404 and BBMB 405 (3 cr ea.) *Biochemistry*

Fundamental, rigorous treatment of biochemistry. Structure of amino acids, structure and function of proteins, enzyme kinetics, enzyme mechanisms, structure of carbohydrates, structure of lipids, structure of nucleic acids, metabolism of carbohydrates, metabolism of lipids, metabolism of amino acids, biosynthesis of DNA and replication, the genetic code, translation and protein biosynthesis, and hormone action.

BBMB 411 (4 cr.) *Techniques in Biochemical Research*

Laboratory techniques for studying biochemistry, including properties of biomolecules, enzymology, spectrophotometry, chromatography, electrophoresis, use of radioisotopes, enzyme purification, enzyme kinetics, radioimmunoassay, and recombinant DNA experiments.

BBMB 461 or 561 (2 cr.) *Molecular Biophysics*

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 graduate credit commits the student to graduate-level examinations, which differ from the undergraduate-level examinations in the number and/or difficulty of questions.

BBMB 561L (2 cr.) *Molecular Biophysics Laboratory*

Practice in methods of X-ray diffraction, nuclear magnetic resonance, hydrodynamics and fluorescence spectroscopy as applied to macromolecules. Must be concurrently enrolled in BBMB461/561.

BBMB 499 (variable) *Undergraduate Research*

Direct participation as an investigator in one of the department's research laboratories is highly recommended but not required.

CHEMISTRY COURSES (19– 21 cr.)**CHEM 177 (4cr.) and 178 (3cr.) *General Chemistry*** Two semester sequence.

Principles and quantitative relationships, stoichiometry, chemical equilibrium, acid-base chemistry, thermochemistry, rates and mechanism of reactions, changes of state, solution behavior, atomic structure, periodic relationships, chemical bonding.

CHEM 177N or 177L (1 cr.) *Laboratory in General Chemistry* required concurrent enrollment with CHEM 177.

OR

CHEM 201 (5 cr.) *Advanced General Chemistry* This course is for chemistry and biochemistry majors only.

Principles and quantitative relationships, stoichiometry, chemical equilibrium, acid-base chemistry, thermo-chemistry, rates and mechanism of reactions, changes of state, solution behavior, atomic structure, periodic relationships, chemical bonding. Electro-chemistry, acid-base equilibria, thermodynamics, nuclear chemistry, and descriptive topics (non-metals, transition metals, coordination compounds, organic compounds, polymers, biological molecules).

CHEM 201L (1cr.) *Laboratory in Advanced General Chemistry* Required concurrent enrollment in CHEM 201.**CHEM 331 and CHEM 332 (3 cr. ea.) *Organic Chemistry I and II***

Modern organic chemistry including nomenclature, synthesis, structure and bonding, reaction mechanisms, natural products, carbohydrates and proteins.

CHEM 331L (1 cr.) *Laboratory in Organic Chemistry*

Laboratory to accompany CHEM 331 (Students have the option to take the more advanced 2 cr. laboratory—CHEM 333L.)

CHEM 324 and CHEM 325 (3 cr. ea.) *Physical Chemistry I and II*

Classical thermodynamics 1st, 2nd, and 3rd laws with applications to gases and interfacial systems, multicomponent, multiphase equilibrium of reacting systems, surface chemistry, and electrochemical cells. Kinetic theory of gases; transport properties, chemical kinetics; quantum mechanics, atomic and molecular structure, spectroscopy, statistical thermodynamics, solids.

MATHEMATICS AND PHYSICS COURSES (21-22 cr.)**MATH 165 and MATH 166 (4 cr. ea.) *Calculus I and II***

Functions, limits, continuity, differentiation, derivatives of vector-valued functions, applications of derivatives. Integration, applications of the integral, matrices, differentiation of functions of several variables.

MATH 265 (4 cr.) *Calculus III*

OR Multiple integrals, vector fields and vector integrals, sequences and series.

MATH 266 (3 cr.) *Elementary Differential Equations*

Solution methods for ordinary differential equations. First order equations, linear equations, constant coefficient equations. Eigen value methods for systems of first order linear equations. Introduction to stability and phase plane analysis.

PHYS 221 (5 cr.) and PHYS 232X + PHYS 232L (4 +1 cr.) *Introduction to Classical Physics I and II*

Elementary mechanics including kinematics and dynamics of particles, work and energy, linear and angular momentum, conservation laws, rotational motion, oscillations, gravitation. Electric forces and fields. Electrical currents; DC circuits. Magnetic forces and fields: LR, LC, LCR circuits; Maxwell's equations; waves and sound; ray optics and image formation; wave optics: heat, thermodynamics, kinetic theory of gases; topics in modern physics. Laboratories required.

LIFE SCIENCES (13 cr.)**BIOL 211 and BIOL 212 (3 cr. ea.) *Principles of Biology I and II***

Introduction to the nature of life, including the cellular basis of life; the nature of heredity; evolution; diversity of microbial, plant, and animal life; form and function of microbial, plant, and animal life; principles of ecology; energy relationships.

BIOL 313 (3 cr.) *Principles of Genetics*

Introduction to the principles of transmission and molecular genetics of plants, animals, and bacteria. Recombination, structure and replication of DNA, gene expression, cloning, quantitative and population genetics.

BIOL 314 (3 cr.) *Principles of Molecular Cell Biology*

Integration of elementary principles of metabolism, bioenergetics, cell structure and function to develop a molecular view of how the cell works.

BIOL 211L or BIOL 212L or BIOL 313L (1 cr.) *Biology Laboratory*

Laboratory to accompany one of the biology courses

AGRICULTURAL SCIENCES (9 cr.) Courses from approved list***ELECTIVES (var.)****CALS COLLEGE REQUIREMENTS (10 cr.)****COMMUNICATIONS:**

ENGL 150 (3 cr.)

ENGL 250 (3 cr.) minimum grade of C

SP CM 212 (3 cr.)

LIB 160 (1 cr.)

HUMANITIES, ETHICS, and SOCIAL SCIENCE (12 cr.) *Courses from approved list.

3 cr. Humanities

3 cr. Ethics*

3 cr. Social Science*

3 cr. each U.S. Diversity* and International Perspectives*

A total of 128 credits is needed to complete the B.S. degree in the College of Agricultural and Life Sciences.