Biochemistry Major Courses

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| **Fall Freshman Year (15 or 16 Credits)** | | **Spring Freshman Year (15 Credits)** | | **Professional Opportunities** |
| CHEM 146 (3 credits) Principles of General Chemistry | Prerequisite: Must have math eligibility of MATH140 or higher. Corequisite: CHEM177. Three hours of lecture and one hour of discussion per week. The Periodic Table, inorganic substances, ionic and covalent bonding, bulk properties of materials, chemical equilibrium, and quantitative chemistry. | CHEM 237 (4 credits) Principles of Organic Chemistry I | Three hours of lecture, four hours of laboratory and one hour of discussion per week. The chemistry of carbons: aliphatic compounds, aromatic compounds, stereochemistry arenes, halides, alcohols, esters, and spectroscopy. |  |
| CHEM 177 (2 credits) Laboratory | Introduction to laboratory techniques, including safety practices, scientific ethics, and presentation of current research topics. |  |  |
| ENGL 101 (3 credits) Introduction to Writing | An introductory course in expository writing. | BSCI 170/171 (4  credits) Principles of Biology (formerly BSCI 105) | Three hours of lecture and three hours of laboratory per week. Prerequisite: placement in MATH 111 or higher. Basic principles of biology with special emphasis on cellular and molecular biology. |
| MATH 140 (4 credits) Calculus I | Prerequisite: satisfactory score on the mathematics placement exam, or MATH 115 with a grade of C- or better.  Introduction to calculus, including functions, limits, continuity, derivatives and applications of the derivative, sketching of graphs of functions, definite and indefinite integrals, and calculation of area. | MATH 141 (4 credits) Calculus II | Continuation of MATH 140, including techniques of integration, improper integrals, applications of integration (such as volumes, work, arc length, moments), inverse functions, exponential and logarithmic functions, sequences and series. |
| GenEd (3 credits) |  | GenEd (3 credits) |  |
| UNIV 100 (1 credit) The Student in the University  or  UNIV 101 (2 credits) The Student in the University and Introduction to Computer Resources | Two hours of lecture per week for 12 weeks. Introduces students to University life.  Two hours of lecture per week. Introduces students to University life and current computer resources. |  |  |

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| **Biochemistry Major, Fall Sophomore Year (15 Credits)** | | **Biochemistry Major, Spring Sophomore Year (16 Credits)** | | **Professional Opportunities** |
| CHEM 247 (4 credits) Principles of Organic Chemistry II | Three hours of lecture, four hours of laboratory, and one hour of discussion per week. A continuation of CHEM 237 with emphasis on molecular structure, substitution reactions; carbonium ions; aromaticity; synthetic processes; macromolecules. | CHEM 276 (2 credits) General Chemistry and Energetics | Two hours of lecture and one hour of discussion/recitation per week. An introduction to the physical aspects of chemistry for BCHM and CHEM majors. Chemical kinetics, thermodynamics and electrochemistry in the context of current chemistry research. |  |
| BSCI LL (4 credits)  BSCI 207, 222, 223, 283 or 330 |  | CHEM 277 (3 credits) Fundamentals of Analytical and Bio- analytical Chemistry Laboratory | One hour of lecture and 6 hours of lab per week. Quantitative analysis, inorganic analytical chemistry, and an introduction to bio-analytical instrumentation and techniques. |
| PHYS 161 (3 credits) General Physics | Laws of motion, force, and energy; principles of mechanics, collisions, linear momentum, rotation, and gravitation. Must have completed or be concurrently enrolled in MATH141. | PHYS 260/261  (4 credits) General Physics | Vibrations, waves, fluids; heat, kinetic theory, and thermodynamics; electrostatics, circuits, and magnetism. PHYS260 and PHYS261 must be taken in the same semester and the grade for the courses will be combined into a single grade for both. |
| GenEd (3 credits) |  | MATH 241 (4 credits) Calculus III  Optional course. | Introduction to multivariable calculus, including vectors and vector-valued functions, partial derivatives and applications of partial derivatives (such as tangent planes and Lagrange multipliers), multiple integrals, volume, surface area, and the classical theorems of Green, Stokes and Gauss. |
|  |  | GenEd (3 credits) |  |
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\* Most biochemistry majors will elect to take BCHM 461 in semester 5.

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| **Biochemistry Major, Fall Junior Year (13 Credits)** | | **Biochemistry Major, Spring Junior Year (15 Credits)** | | **Professional Opportunities** |
| BCHM 461 (3 credits) Biochemistry I | First semester of a comprehensive introduction to modern biochemistry. Structure, chemical properties, and function of proteins and enzymes, carbohydrates, lipids, and nucleic acids. Basic enzyme kinetics and catalytic mechanisms. | BCHM 485 (3 credits) Physical Biochemistry  Or CHEM 482 | The application of physical chemistry to biological systems. Principal topics: quantum mechanics, biochemical spectroscopy, statistical mechanics, polymer dynamics, transport processes in liquid phase, chemical and biochemical kinetics, modeling and simulation. (Spring semester only/may take CHEM 482 instead.) |  |
| CHEM 481 (3 credits) | A course primarily for chemists and chemical engineers. | CHEM 483 (2 credits) Physical Chemistry Laboratory I | One hour lecture-recitation and one three- hour laboratory period per week.  Pre/Corequisite: CHEM 481. An introduction to the principles and application of quantitative techniques in physical chemical measurements.  Experiments will be coordinated with topics in CHEM 481. |
| BSCI UL (4 credits) BSCI 353, 410, 411,  420, 421, 422, 424,  426, 430, 433, 434,  437, 440, 442, 443,  447, 471 |  | ENGL 39X (3 credits) Junior English |  |
| GenEd (3 credits) |  | CHEM 395 (1 credit) Professional Issues in Chemistry and Biochemistry | Junior standing. Seminar on professional issues. Professional responsibilities, ethics, interview techniques, career opportunities, graduate/professional school, race and gender issues. (Spring semester only.) |
|  |  | GenEd (6 credits) |  |

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| **Biochemistry Major, Fall Senior Year (16 Credits)** | | **Biochemistry Major, Spring Senior Year (15 Credits)** | | **Professional Opportunities** |
| BCHM 462 (3 credits) Biochemistry II | A continuation of BCHM 461. Metabolic pathways and metabolic regulation, energy transduction in biological systems, enzyme catalytic mechanisms. | BCHM 465 (3 credits) Biochemistry III | An advanced course in biochemistry. Biochemical approach to cellular information processing. DNA and RNA structure. DNA replication, transcription, and repair. Translation of mRNA to make proteins. | Honors Research and Thesis— The Chemistry Honors Program is open to CHEM or BCHM majors (or double majors) with  >3.0 GPA who perform at least two semesters of chemical or biochemical research for a minimum of 3 credits total within the department (as CHEM 399) and then, in their final semester at the University, register for CHEM 398, which is the thesis- writing course. At the end of CHEM 398, a written thesis is submitted for judgment by the Honors and Awards Committee and a seminar is presented to the same group.  On the basis of that research, thesis, and presentation, the student can graduate with Departmental High Honors, Honors or no honors. |
| CHEM 425 (4 credits) Instrumental Methods of Analysis | Two hours of lecture and six hours of laboratory per week. Modern instrumentation in analytical chemistry. Electronics, spectroscopy, chromatography and electrochemistry. | BCHM 464 (3 credits) Biochemistry Lab | Biochemical and genetic methods for studying protein function. Site-directed mutagenesis and molecular cloning, protein purification, enzyme activity assays, computer modeling of protein structure. |
| GenEd (3 credits) |  | Electives (9 credits) |  |
| Elective (6 credits) |  |  |  |