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Biochemistry

Biochemistry deals with the chemistry of life and uses the techniques of analytical, organic, and physical chemistry, as well as those of molecular and structural biology. A degree in biochemistry prepares a student for many fields beyond biochemistry or biomedical sciences. It provides the basis for many applied fields including biotechnology, genetic engineering, molecular genetics, immunology, pharmacology, toxicology and forensic science. A Bachelor of Science degree in biochemistry is an ideal preparation for a career or graduate study in these applied fields. A biochemistry degree is also potentially useful for students interested in business, law, journalism or technical writing related to the life sciences. Undergraduate research experiences are readily available under the supervision of a faculty advisor. Students are encouraged to meet with an undergraduate advisor to design a curriculum focused on their career goals.

Pre-professional students and those interested in biological chemistry are ideally suited for the Biochemistry major.

All science majors require proficiency in mathematics, which is prerequisite for upper level coursework in biochemistry. Students are encouraged to enroll in the highest level of mathematics appropriate to their background within the first semester. All students are expected to show proficiency in biochemistry prerequisites that are biochemistry/chemistry courses with a grade of C- or better, or obtain consent of the instructor for enrollment in the subsequent biochemistry/chemistry course. For biochemistry majors, a grade of C- or better is needed in every chemistry introductory course and in every chemistry/biochemistry foundation course to be eligible for graduation. A minimum grade point average of 2.0 in biochemistry coursework is needed for a student to receive the B.S. degree in Biochemistry. A student cannot repeat a course or its equivalent in which a grade of B or better was earned without the consent of the program or offering school.

Students wishing more detailed information should visit [our website](#) or contact an undergraduate advisor at the School of Chemical and Biomolecular Sciences, Neckers Hall, Rm. 224 - Mail Code 4409, Southern Illinois University Carbondale, Carbondale, Illinois 62901.

Bachelor of Science (B.S.) in Biochemistry Degree Requirements

Degree Requirements	Credit Hours
University Core Curriculum Requirements ¹	39
Biochemistry Major Requirements ²	73-74
Supportive Skills- CS 201 or CS 202; ENGL 290 or ENGL 291 or ENGL 391; MATH 282 or MATH 483	6
CHEM 200 or CHEM 205 or CHEM 205H, CHEM 201, CHEM 202 or CHEM 207 or CHEM 207H, CHEM 210 or CHEM 215 or CHEM 215H, CHEM 211, CHEM 212 or CHEM 217 or CHEM 217H (3 hours included in the UCC Physical Science hours)	7

Degree Requirements	Credit Hours
CHEM 311, CHEM 330, CHEM 340, CHEM 341, CHEM 350/BCHM 350, BCHM 351/CHEM 351, CHEM 360, CHEM 361	22
MATH 150, MATH 250 (included in the UCC Quantitative Reasoning hours)	5
MATH 221 or MATH 251 or MATH 305 or MATH 483	3-4
PHYS 205A, PHYS 255A, PHYS 205B, PHYS 255B	8
CHEM 442, CHEM 443	5
BCHM 452/CHEM 452, BCHM 453/CHEM 453	5
BIOL 305, BIOL 306	6
Six credit hours from the following: PHSL 310, MICR 302, MICR 403, MICR 421, PLB 475, BCHM 451B/CHEM 451B, PLB 471	6
General Electives	8-9
Total	120-122

¹ A total of nine hours of biological science, quantitative reasoning, and physical science coursework are accounted for in the 39-hour University Core Curriculum requirement. An additional two hours of human health are accounted for if students choose PHSL 310 as part of the Biochemistry.

² A total of three hours of biological sciences are completed with biological chemistry or biochemistry. CHEM 451A/BCHM 451A may substitute for CHEM 350/BCHM 350, if a student continues with CHEM 451B/BCHM 451B. Prerequisite is MATH 106, MATH 111 or MATH 108 and MATH 109. The elective hours are decreased by three to six hours for students who place into a course lower than calculus.

Transfer Credit

Credit for a course in Biochemistry successfully completed at another accredited institution will be accepted to meet major or minor requirements in Biochemistry at SIU Carbondale, subject to the following conditions:

1. The course number must bear a program prefix clearly indicating the course is a Biochemistry course.
2. The course must have covered substantially the same material as a course currently offered at SIU Carbondale to meet major requirements.
3. Any course used to meet major or minor requirements in chemistry must be explicitly approved by the School of Chemical and Biomolecular Sciences.

Technology Fee

The College of Agricultural, Life, and Physical Sciences assesses undergraduate majors a technology fee of \$4.58 per credit hour up to 12 credit hours. The fee is charged Fall and Spring semesters.

Biochemistry Courses

BCHM350 - Introduction to Biological Chemistry (Same as CHEM 350) Fundamental concepts in Biological Chemistry include biomolecular structure, enzyme catalysis, metabolism and gene expression. Three lectures per week. Prerequisite: C- or better in CHEM 210 and CHEM 339 or CHEM 340; C- or better in one semester biological sciences course (not University Core Curriculum course). Offered spring semester only. Credit Hours: 3

BCHM351 - Biochemistry Laboratory (Same as CHEM 351) A one semester biochemistry laboratory covering techniques and laboratory procedures; isolation, purification and characterization of amino acids, peptides, proteins, nucleic acids, lipids and cofactors; spectroscopic and chromatographic analysis of biomolecules; study of protein-ligand interactions; enzyme kinetics. One one-hour lecture and one four-hour laboratory per week. Prerequisites: CHEM 210, 211, 339 or 340, 341. Prerequisite or corequisite: BCHM/CHEM 350 or 451B. Offered spring semester. Lab fee: \$60. Credit Hours: 2

BCHM396 - Undergraduate Research Research under the direction and supervision of a faculty advisor culminating in a written report. Safety training is required. Prerequisite: one semester of chemistry with laboratory experience. Special approval needed from the instructor. Credit Hours: 1-2

BCHM451A - Biochemistry (Same as CHEM 451A) First half of the 451A,B two semester course. Introduction to structure and function of biomolecules including nucleic acids, proteins, sugars, polysaccharides, lipids and membranes, biochemical techniques, expression of genetic information, signal transduction and transport through membranes. Prerequisites: CHEM 340 and CHEM 342 or 442, or equivalents with grades of C- or better. Credit Hours: 3

BCHM451B - Biochemistry (Same as CHEM 451B) Second half of 451A,B two semester course. Basic kinetics, enzyme kinetics, enzyme inhibitors, regulation of enzymes, oxidation-reduction, high energy bonds, carbohydrate metabolism, aerobic/anaerobic metabolism, lipid metabolism, nitrogen metabolism, hormonal control of metabolism. Prerequisites: BCHM 451A or CHEM 451A or equivalent with a C- or better. Credit Hours: 3

BCHM452 - Advanced Biochemistry (Same as CHEM 452) Advanced study of biological chemistry including the structure-function relationship in proteins, the mechanism of enzyme reactions and the biochemical basis of gene expression, signal transduction, nerve impulses, molecular motors and other physiological processes. For graduate students, this course may be taken to meet deficiencies in biochemical knowledge, but will not meet the formal coursework requirements for the master or doctoral level degrees. Prerequisite: C- or better in CHEM 340, CHEM 341, BCHM/CHEM 350. Credit Hours: 3

BCHM453 - Advanced Biochemistry Lab (Same as CHEM 453) A one semester advanced biochemistry laboratory covering techniques and laboratory procedures for the isolation, purification and characterization of biomolecules. Two three-hour laboratories per week. Prerequisites: C- or better in BCHM/CHEM 350 and 351. Lab fee: \$60. Credit Hours: 2

BCHM456 - Biophysical Chemistry (Same as CHEM 456) A one-semester course in Biophysical Chemistry intended for biochemists and molecular biologists. Emphasis will be on solution thermodynamics, kinetics and spectroscopy applied to biological systems. Prerequisites: CHEM 340 and 442, MATH 141 or 150, BCHM 451A or CHEM 451A, or equivalents. Credit Hours: 3

BCHM490 - Undergraduate Research Participation Investigation of a problem, either individually or as a research group, under the direction of a member of the faculty. Not for graduate credit. Prerequisites: 3.0 grade point average in sciences courses. Special approval needed from the instructor. Credit Hours: 1-6

BCHM496 - Research Independent research under the direction of a faculty advisor culminating in a written report. Safety training is required. Prerequisite: C- or better in CHEM 330. Special approval needed from the instructor and a minimum 3.0 grade point average in all chemistry course work. Credit Hours: 1-6

BCHM496H - Honors Research Independent research under the direction of a faculty advisor culminating in a written report. Safety training is required. Prerequisite: C- or better in CHEM 330. Special approval needed from the instructor and a minimum 3.0 grade point average in all chemistry course work. Credit Hours: 1-6

BCHM499H - Honors Thesis Preparation of a well-written honors thesis under the supervision of a faculty advisor based on an honors research project. The written thesis will be submitted to the faculty advisor and the program. A public presentation of the honors thesis research is required as a seminar or poster presentation. A proposal for honors research must be submitted to the program one year prior to completion of the honors thesis. Pre/Co-requisite: BCHM 496H. Credit Hours: 3

Biochemistry Faculty

Bancroft, Senetta, Associate Professor, Chemical Education, Ph.D., University of Akron, 2014; 2016. K-16 science educator professional development, teacher beliefs, attitudes, and values, equity and student persistence in STEM higher education.

Deria, Pravas, Associate Professor, Inorganic Chemistry, Ph.D., University of Pennsylvania, 2009; 2015. Physical inorganic chemistry, photophysical, photochemical, and electrochemical behaviors of porous molecular assemblies.

Du, Zhihua, Associate Professor, Biochemistry, Ph.D., University of Texas, 1997; 2009. Structural biology, biochemistry, biotechnology.

Gao, Yong, Professor, Organic Chemistry, Ph.D., University of Alberta, 1998; 2000. Polymer, redox flow battery, fuel cell, and clean energy.

Ge, Qingfeng, Professor, Distinguished Scholar, and Director, Physical Chemistry, Ph.D., Tianjin University, 1991; 2003. Catalysis for renewable energy and resources, CO₂ conversion and utilization, chemical kinetics, catalysis by metal oxides.

Goodson, Boyd, Professor, Distinguished Scholar, and Associate Dean, Physical Chemistry, Ph.D., University of California, Berkeley, 1999; 2002. Magnetic resonance and optical spectroscopies, NMR and MRI, lasers, hyperpolarization, contrast agents, biomedical imaging, catalysis, liquid crystals, technique development; nuclear physics and fundamental symmetries.

Kinsel, Gary, Professor, Analytical Chemistry, Ph.D., University of Colorado-Boulder, 1989; 2005. Applied mass spectrometry, ion-molecule reaction chemistry, fundamentals of matrix-assisted laser desorption / ionization MS.

Kohli, Punit, Professor and Interim IMAGE Director, Analytical Chemistry, Ph.D., Michigan State University, 2000; 2004. Fabrication and characterization of functional materials and devices for resource-limited countries.

McCarroll, Matthew, Professor and Fermentation Science Institute Director, Analytical Chemistry, Ph.D., University of Idaho, 1998; 2000. Analytical chemistry and fermentation science.

Moran, Sean, Associate Professor, Biochemistry, Ph.D., Columbia University, 2008; 2014. Biophysical chemistry, biomolecular structure and dynamics, ultrafast spectroscopy.

Plunkett, Kyle, Professor, Organic Chemistry, Ph.D., University of Illinois, 2005; 2010. Organic electronic materials for renewable energy, polymer chemistry, supramolecular chemistry.

Prakash, Divya, Assistant Professor, Biochemistry, Ph.D., Auburn University, 2014; 2022. Biochemistry of anaerobic microbes, molecular biology, bioinorganic chemistry, spectroscopy, transient state kinetics.

Shamsi, Mohtashim, Associate Professor, Analytical Chemistry, Ph.D., University of Toronto, 2012; 2015. Electroanalysis, biosensing, and microfabrication of microdevices for biomedical applications.

Tucker, Sheryl A., Professor and Provost, Analytical Chemistry, Ph.D., University Of North Texas, 1994; 2023.

Wang, Lichang, Professor, Physical Chemistry, Ph.D., University of Copenhagen, 1993; 2001. Solar energy harvesting using organic small molecules; fluorescence sensors; catalysis in fuel production and fuel cells; method development.

Emeriti Faculty

Bausch, Mark, Professor, Emeritus, Organic Chemistry, Ph.D., Northwestern, 1984; 1987.

Koropchak, John A., Professor, Emeritus, Analytical Chemistry, Ph.D., University of Georgia, 1980.

Koster, David F., Professor, Emeritus, Physical Chemistry, Ph.D., Texas A & M University, 1965.

Tyrrell, James, Professor, Emeritus, Physical Chemistry, Ph.D., University of Glasgow, 1963.

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