

DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

Science and Technology Center (McNulty Hall)

(973) 761-9416

www.shu.edu/academics/artsci/chemistry (<http://www.shu.edu/academics/artsci/chemistry/>)

Faculty: Antonacci; Badillo; Buonopane; Fadeev; Gorun; Goldsmith; Hanson (*Director, Graduate Studies*); Kazakevich; Kelty (*Chair*); Khan; Marzabadi; Murphy; Rezae; Snow; Wiedman

Faculty Retired and Emeritus: Huchital

The Department of Chemistry and Biochemistry offers programs leading to the degrees of Bachelor of Science, Master of Science and Doctor of Philosophy. A dual-degree program with Stevens Institute of Technology leading to a Bachelor of Science and a Master of Engineering is also offered.

The bachelor's degrees in chemistry and biochemistry prepare students for careers and graduate studies in chemistry, biochemistry, forensic science or the health professions. The curriculum includes a rigorous study of the laws, principles and theories applied in the various branches of chemistry, and develops laboratory skills in methods of analysis, synthesis and instrumentation. Research opportunities on a wide range of chemical and biochemical topics are available to all majors in the program.

The B.S. (ACS) degree program is approved by the Committee on Professional Training of the American Chemical Society. For further information, visit the department website at www.shu.edu/academics/artsci/chemistry (<http://www.shu.edu/academics/artsci/chemistry/>).

Honors Program

The Honors Program in chemistry and biochemistry is for students of exceptional ability and includes seminars and preparation of a review article in the sophomore and junior years. Each student prepares a senior thesis based on original research and works closely with a faculty member on a tutorial basis.

Note to Students: The following listing represents those courses that are in the active rotation for each department, i.e., have been offered in the past five years. Some departments have additional courses offered more rarely but still available – to find the complete list of all official courses for a department, please use the “Course Catalogue Search” function in Self-Service Banner

Major

- Biochemistry Major (B.S.) (<http://catalogue.shu.edu/undergraduate/college-arts-sciences/department-chemistry-biochemistry/biochemistry-major-bs/>)
- Chemistry (Non-ACS) Major (B.S.) (<http://catalogue.shu.edu/undergraduate/college-arts-sciences/department-chemistry-biochemistry/chemistry-non-ac-s-major-bs/>)
- Chemistry Major (B.S.) (<http://catalogue.shu.edu/undergraduate/college-arts-sciences/department-chemistry-biochemistry/chemistry-major-bs/>)

Accelerated and Dual Degrees

- Chemistry Major Dual Degree (B.S.) (<http://catalogue.shu.edu/undergraduate/college-arts-sciences/department-chemistry-biochemistry/five-year-dual-degree-program/>)

Minor

- Chemistry Minor (<http://catalogue.shu.edu/undergraduate/college-arts-sciences/department-chemistry-biochemistry/chemistry-minor/>)

Course Descriptions

Please note: Laboratory fees are nonrefundable.

Successful completion of the New Jersey Basic Skills Computation and Algebra Tests, or completion of equivalent tests administered by the Seton Hall University mathematics department, is prerequisite to all courses listed below except CHEM 1001 Chemistry and the World Around Us - An Integrative Approach and CHEM 1011. (Successful completion means that the student placed into MATH 1015 Pre Calc Math Alg and Trig or higher).

CHEM 1001 Chemistry and the World Around Us - An Integrative Approach (3 Credits)

For students with no science background. Examination of the substances encountered in daily life, including common drugs, food, household chemicals, gasoline, paints, plastics and other consumer products. (For non-science students).

CHEM 1107 Principles of Chemistry I (5 Credits)

Development of the principles of chemistry, principally for chemistry and physics majors. Part I: four-hour lecture, four-hour laboratory per week. Part II: three-hour lecture, four-hour laboratory per week. Laboratory work includes inorganic qualitative analysis. Lab fee \$25. Corequisite: MATH 1015 or higher.

CHEM 1108 Principles of Chemistry II (4 Credits)

Development of the principles of chemistry, principally for chemistry and physics majors. Part I: four-hour lecture, four-hour laboratory per week. Part II: three-hour lecture, four-hour laboratory per week. Laboratory work includes inorganic qualitative analysis. Lab fee \$25. Corequisite: MATH 1015 or higher.

CHEM 1123 General Chemistry I (3 Credits)

Introduction to the principles of chemistry, principally for biology and allied health majors. Corequisite: MATH 1015 or higher.

CHEM 1124 General Chemistry II (3 Credits)

Introduction to the principles of chemistry, principally for biology and allied health majors. Corequisite: MATH 1401 or higher.

CHEM 1125 General Chemistry Lab I (1 Credit)

Introduction to the principles of the chemical laboratory. Companion courses to CHEM 1123 and 1124. Lab fee \$25. Corequisites: CHEM 1123/1124.

CHEM 1126 General Chemistry II Lab (1 Credit)

Introduction to the principles of the chemical laboratory. Companion courses to CHEM 1123 and 1124. Lab fee \$25. Corequisites: CHEM 1123/1124.

CHEM 1301 Elements of Organic and Biochemistry (5 Credits)

Fundamental chemistry. Emphasis on the principles of organic and biochemistry that contribute to health and disease. This course is primarily intended to fulfill the chemistry requirement for students in the College of Nursing. Four-hour lecture, three-hour lab per week. (Not for science majors or allied health science majors) Lab fee \$25. Prerequisite: CHEM 1011 or 1 year of high school chemistry.

CHEM 2215 Analytical Chemistry I (4 Credits)

A fundamental course for physical science majors on the classical methods of analysis. Topics include titrimetry, gravimetry, spectrophotometry, potentiometry, separations, sampling and statistics. Two-hour lecture, eight-hour laboratory per week. Lab fee \$25. Prerequisite: CHEM 1108 or 1124.

CHEM 2216 Analytical Chemistry II (4 Credits)

Theory and practice of modern instrumental methods. Emphasis on the principles of instrumentation. Three-hour lecture, four-hour laboratory per week. Lab fee \$25. Prerequisite: CHEM 2215 or permission of instructor.

CHEM 2226 Analytical Chemistry II (3 Credits)

Lecture-only portion for CHEM 2216. Prerequisite: CHEM 2215 or permission of instructor.

CHEM 2313 Organic Chemistry I (5 Credits)

Principal classes of aliphatic and aromatic compounds. Emphasis on structural theory, reaction mechanisms, organic syntheses. Experimental work emphasizes basic organic laboratory techniques and includes an introduction to qualitative organic analysis. Three-hour lecture, six-hour laboratory and recitation per week. Lab fee \$25. (For students majoring in chemistry). Prerequisite: CHEM 1108 or CHEM 1124.

CHEM 2314 Organic Chemistry II (5 Credits)

Principal classes of aliphatic and aromatic compounds. Emphasis on structural theory, reaction mechanisms, organic syntheses. Experimental work emphasizes basic organic laboratory techniques and includes an introduction to qualitative organic analysis. Three-hour lecture, six-hour laboratory and recitation per week. Lab fee \$25. (For students majoring in chemistry). Prerequisite: CHEM 1124 or CHEM 1108.

CHEM 2315 Organic Chemistry I-Lab (1 Credit)

Experimental organic chemistry. Companion course to CHEM 2321 and 2322. Lab fee \$25. Corequisites: CHEM 2321-2322.

CHEM 2316 Organic Chemistry II-Lab (1 Credit)

Experimental organic chemistry. Companion courses to CHEM 2321 and 2322. Lab fee \$25. Corequisites: CHEM 2321-2322.

CHEM 2321 Organic Chemistry I (3 Credits)

Principal classes of aliphatic and aromatic compounds. Reactions, mechanisms and synthesis involving simple organic and biochemical molecules. Prerequisite: CHEM 1108 or 1124.

CHEM 2322 Organic Chemistry II (3 Credits)

Principal classes of aliphatic and aromatic compounds. Reactions, mechanisms and synthesis involving simple organic and biochemical molecules. Prerequisite: CHEM 1108 or 1124.

CHEM 2781 Chemistry Honors I (1 Credit)

Seminars and discussions in biochemistry and organic chemistry under the direction of the sophomore honors faculty moderator. Each honors student must deliver one seminar. Seminars are intended to train the honors student in independent searching of the chemical literature, organization and presentation of a technical talk and leadership in discussion. One hour per week. Requires departmental invitation.

CHEM 3411 Physical Chemistry I (3 Credits)

Kinetic theory of gases. The laws of thermodynamics and their applications to ideal and real gases, liquids, mixtures and solutions. Rates of reactions and their theoretical interpretations. Application of elementary quantum chemistry to atomic and molecular structure. Prerequisites: PHYS 1702 or PHYS 1706; MATH 1411.

CHEM 3412 Physical Chemistry II (3 Credits)

Kinetic theory of gases. The laws of thermodynamics and their applications to ideal and real gases, liquids, mixtures and solutions. Rates of reactions and their theoretical interpretations. Application of elementary quantum chemistry to atomic and molecular structure. Prerequisites: PHYS 1702 or PHYS 1706; MATH 1411.

CHEM 3415 Physical Chemistry I (4 Credits)**CHEM 3416 Physical Chemistry II (4 Credits)****CHEM 3512 Elements of Biochemistry (4 Credits)**

Emphasizes the structures of the major biomacromolecules (nucleic acids, amino acids and proteins, lipids and carbohydrates) involved in cell architecture and dynamics. Included will be an overview of the primary functions of these molecules, including membrane structure and transport properties, biological catalysis, and enzyme function and regulation. In addition, the laboratory will provide training in modern biochemical techniques. Lab fee: \$25. Prerequisite: CHEM 2322 or CHEM 2314.

CHEM 3522 Elements of Biochemistry (3 Credits)

Lecture portion only of CHEM 3512. Prerequisite: CHEM 2322 or CHEM 2314.

CHEM 3550 Science - Theology of Food (3 Credits)**CHEM 3611 Inorganic Chemistry (3 Credits)**

Periodic properties of the elements, their comparative group characteristics and structure of some of their compounds. Introduction to transition metal and organometallic chemistry. Pre- or Corequisite: CHEM 2322 or CHEM 2314.

CHEM 3612 Inorganic Chemistry (5 Credits)**CHEM 3781 Chemistry Honors II (1 Credit)**

Faculty and student seminars and discussions in analytical, inorganic and physical chemistry under the direction of the junior honors faculty moderator. Each honors student must deliver one seminar. One hour per week. Requires departmental invitation.

CHEM 3782 Chemistry Honors III (1 Credit)

Independent library research culminating in preparation of a review article. The student works closely with a faculty member on a tutorial basis. Requires departmental invitation.

CHEM 3894 Chemistry Co-Op (3 Credits)**CHEM 3895 Chemistry Co-Op II (3 Credits)****CHEM 3896 Chemistry Co-Op III (3 Credits)****CHEM 4092 Research Experience (0 Credits)****CHEM 4202 Spectrochem Meth-Analy (3 Credits)****CHEM 4204 Spectrochemical Methods of Analysis (3 Credits)****CHEM 4205 Modern Separations Techniques (3 Credits)****CHEM 4301 Theoretical Organic Chemistry I (3 Credits)****CHEM 4303 Synthetic Organic Chemistry (3 Credits)****CHEM 4323 Sem Org Chem Entrpr Cosmetics (1 Credit)****CHEM 4399 Selected Topics: Organic Chemistry (3 Credits)**

CHEM 4401 Chemical Thermodynamics (3 Credits)**CHEM 4403 Quantum Chemistry (3 Credits)****CHEM 4404 Surface Chemistry (3 Credits)****CHEM 4411 Introduction to Polymer Chemistry (3 Credits)**

Classification of macromolecules; methods and mechanisms of polymerizations; methods of polymer characterization; properties of polymeric solids

CHEM 4423 Computational Chemistry (3 Credits)

The course will cover the fundamental theory and application of Molecular Mechanics, Classical Molecular Dynamics, Semiempirical, Ab Initio and Density Functional simulation and modeling techniques to atoms, molecules, and solids. Available application programs will be used by the students to demonstrate the principles and provide hands-on experience with modern computational chemistry tools. Prerequisite: CHEM 3412.

CHEM 4425 Princ Colloid-Interface Chem (3 Credits)

The course will introduce the fundamentals of colloid and interface chemistry. The main topics include: thermodynamics of flat and curved surfaces, surface energy and surface tension, capillarity, monolayers, surfactants, nucleation, adsorption and wetting phenomena, molecular and surface forces, and stability of colloidal systems. An overview of characterization methods and applications of colloids and surfaces in industry and research will be provided. 3 credits

CHEM 4501 General Biochemistry I (3 Credits)**CHEM 4502 Bio#Organic Chemistry (3 Credits)**

The course covers synthetic methods in organic chemistry applied to the major classes of biological molecules and their derivatives, such as those belonging to the: carbohydrates, amino acids, peptides, proteins, nucleic acids, terpenes, lipids and natural products. Emphasis will be dedicated to the reactions and mechanisms that contribute to their applications in biological systems.

CHEM 4512 General Biochemistry II (3 Credits)**CHEM 4601 Advanced Inorganic Chemistry (3 Credits)****CHEM 4699 Spec Topics Bio-Inorganic Chem (3 Credits)****CHEM 4801 Advanced Laboratory Project in Chemistry (1 Credit)**

Advanced laboratory techniques: instrumental methods; synthesis; separations; data analysis and formal reporting. Long-term projects with students forming teams of experts. Project development and reporting in consultation with local industrial scientists. Prerequisites: CHEM 2321-2322 or CHEM 2313-2314; CHEM 2215- 2216 or permission of the instructor.

CHEM 4802 Advanced Laboratory Project in Chemistry (1 Credit)

Advanced laboratory techniques: instrumental methods; synthesis; separations; data analysis and formal reporting. Long-term projects with students forming teams of experts. Project development and reporting in consultation with local industrial scientists. Prerequisites: CHEM 2321-2322 or CHEM 2313-2314; CHEM 2215- 2216 or permission of the instructor.

CHEM 4803 Summer Research Exper-Undergr (0 Credits)

Students will engage in an original research project under the direction of a faculty mentor during the summer session. Prerequisite: Permission of the instructor.

CHEM 4891 Chemistry Research (2 Credits)

Introduction to methods of original investigation. Individual laboratory research problems, conferences library research. Enrollment limited. (For students majoring in chemistry). Prerequisites: GPA of 3.0 in chemistry.

CHEM 4892 Chemistry Research (2 Credits)

Introduction to methods of original investigation. Individual laboratory research problems, conferences library research. Enrollment limited. (For students majoring in chemistry). Prerequisites: GPA of 3.0 in chemistry.

CHEM 4893 Chemistry Research (2 Credits)

Introduction to methods of original investigation. Individual laboratory research problems, conferences library research. Enrollment limited. (For students majoring in chemistry). Prerequisites: GPA of 3.0 in chemistry.

CHEM 4894 Chemistry Research (2 Credits)

Introduction to methods of original investigation. Individual laboratory research problems, conferences library research. Enrollment limited. (For students majoring in chemistry). Prerequisites: GPA of 3.0 in chemistry.