

BIOCHEMISTRY

Biochemistry Major

The Biochemistry curriculum is designed to provide comprehensive background education and training for students interested in the chemistry of physiological systems. The B.S. curriculum meets the liberal arts requirements of the University with a concentration in advanced courses. It was developed for those students who wish to prepare for Biochemistry as a professional option. Holders of this degree seek employment directly in the field or they can pursue advanced degrees in graduate or professional schools.

The Biochemistry degree was developed for those students interested in Biochemistry as a means of preparation for entrance into health science professional schools such as allopathic, osteopathic, and podiatric medicine, dental medicine, optometry, etc. Two specific features of the program are that students (1) may pursue the first three years of the Biochemistry degree curriculum in the three-year option under one of the Wilkes University combined seven-year medical and baccalaureate degree programs or (2) use the seventh or eighth semesters in cooperative research programs. The latter option is particularly useful for those students selected to The Premedical Scholars Program (see Affiliated Degree Programs in Medicine).

The Wilkes Chemistry and Biochemistry programs are approved by the American Chemical Society for the professional training of chemists. Students who complete either of these B.S. programs are certified for membership eligibility in the Society at graduation. Students completing the B.A. program in Chemistry may be certified, dependent upon the student's choice of chemistry courses.

Biochemistry Major - Required Courses and Recommended Course Sequence

First Semester Credits

[[CHM-113]] - Elements & Compounds Lab	1
[[CHM-115]] - Elements & Compounds	3
[[BIO-121]] - Princ. of Modern Biology I	4
[[MTH-111]] - Calculus I	4
[[FYF-101]] - First-Year Foundations	3
	15

Second Semester

[[CHM-114]] - The Chem. Reaction Lab	1
[[CHM-116]] - The Chemical Reaction	3
[[BIO-122]] - Princ. of Modern Biology II	4

[[MTH-112]] - Calculus II	4
[[ENG-101]] - Composition	4
	16

Third Semester

[[CHM-231]] - Organic Chemistry I	3
[[CHM-233]] - Organic Chem. I Lab	1
[[PHY-201]] - General Physics I	3
[[PHY-203]] - General Physics I Lab	1
[[CS-125]] - Computer Science I	4
Distribution Requirements	6
	18

Fourth Semester

[[CHM-232]] - Organic Chemistry II	3
[[CHM-234]] - Organic Chem. II Lab	1
[[PHY-202]] - General Physics II	3
[[PHY-204]] - General Physics II Lab	1
[[MTH-212]] - Multivariable Calculus	4
[[CHM-248]] - Analytical Chemistry	3
[[CHM-246]] - Analytical Chemistry Lab	1
	16

Fifth Semester

[[CHM-351]] - Physical Chemistry: Quantum & Spectro	3
[[CHM-353]] - Physical Chem: Quantum & Spectro Lab	1
[[CHM-361]] - Biochemistry I	3
[[CHM-363]] - Biochemistry Lab*	1
Distribution Requirement	3
[[CHM-341]] - Instrumental Analysis	3
[[CHM-343]] - Instrumental Analysis Lab	1
	15

Biochemistry

Sixth Semester

[[CHM-352]] - Physical Chemistry: Kinetics & Thermo	3
[[CHM-354]] - Physical Chem: Kinetics & Thermo Lab	1
[[CHM-362]] - Biochemistry II	3
[[CHM-390]] - Junior Seminar	1
[[BIO-226]] - Cellular and Molecular Biology	4
Distribution Requirement	3
	15

Seventh Semester

[[CHM-391]] - Senior Research I	2
[[CHM-371]] Integrated Laboratory*	1
Major Elective**	3-4
Distribution Requirement	6
Free Elective	3
	15-16

Eighth Semester

[[CHM-322]] - Inorganic Chemistry	3
[[CHM-323]] - Inorganic Laboratory*	1
[[CHM-392]] - Senior Research II	2
Major Elective**	3-4
Free Elective	3
	12-13

*All biochemistry majors are required to take the Biochemistry Laboratory (CHM 363) plus two (2) credits total of Inorganic Laboratory (CHM 323) and/or Integrated Laboratory (CHM 370, 371, 372).

** All biochemistry majors are required to take a total of 2 major electives (6-8 credits) chosen from [[BIO-324]], [[BIO-326]], [[BIO-327]], [[BIO-329]], [[BIO-330]], [[BIO-345]], [[PHY-377]] or an approved [[CHM-398]] topics course.

CHM. CHEMISTRY

CHM-105. CHEMISTRY AND MODERN SOCIETY

Credits: 3

This course will emphasize consumer applications of chemistry with some emphasis on environmental consequences of the use of various forms of energy (nuclear, coal, petroleum, natural gas) and everyday chemicals (foods, drugs, agricultural chemicals, and chemicals used in pest control).

CHM-111. FUNDAMENTALS OF CHEMISTRY

Credits: 4

Designed for students who do not intend to major in science or engineering, this one-semester course presents principles of chemistry. Topics include atomic structure, chemical bonding, gas laws, solutions, acid/base chemistry and an introduction to organic and biochemistry. A laboratory component is required as part of this course, in which students will develop basic principles of laboratory technique. Students may not receive credit for both CHM 111 and CHM 113/115. Three hours of class, one hour of problem session, and two hours of lab per week.

[Click here for course fee.](#)

Pre-Requisites

Departmental placement criteria are met.

CHM-113. ELEMENTS AND COMPOUNDS LAB

Credits: 1

This is the first chemistry laboratory course in the two-semester general chemistry sequence. Experiments are performed to reinforce the concepts learned in CHM-115. One three-hour laboratory per week.

[Click here for course fee.](#)

Pre-Requisites

Departmental placement criteria are met

Co-Requisites

[[CHM-115]]

CHM-114. THE CHEMICAL REACTION LAB

Credits: 1

This is the second chemistry laboratory course in the two-semester general chemistry sequence. Experiments are performed to reinforce the concepts learned in CHM-116. One three-hour laboratory per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-113]] with a grade of 2.0 or better and [[CHM-115]] with a grade of 2.0 or better

Co-Requisites

[[CHM-116]]

CHM-115. ELEMENTS AND COMPOUNDS

Credits: 3

Emphasis is placed on the periodic table and stoichiometry, including chemical properties, physical states, and structure. Three hours of class and a one-hour problem session per week.

Corequisite: [[CHM-113]].

Pre-Requisites

Departmental placement criteria are met.

CHM-116. THE CHEMICAL REACTION**Credits:** 3

A detailed study of chemical equilibria in aqueous solution. Three hours of class and a one-hour problem session per week.

Pre-Requisites

[[CHM-113]] with a grade of 2.0 or better and [[CHM-115]] with a grade of 2.0 or better

Co-Requisites

[[CHM-114]]

CHM-117. INTRODUCTORY CHEMISTRY LAB FOR ENGINEERS**Credits:** 1

This is a one-semester introductory chemistry laboratory course for engineering students. Experiments are performed to reinforce the concepts learned in [[CHM-118]]. One three-hour lab per week.

[Click here for course fee.](#)

Pre-Requisites

Departmental placement criteria are met.

Co-Requisites

[[CHM-118]]

CHM-118. CHEMISTRY FOR ENGINEERS**Credits:** 3

This course covers the foundations of chemistry, matter and measurements, periodicity, atomic and molecular structure, stoichiometry, states of matter, phase changes, kinetics, equilibrium, thermochemistry and electrochemistry. Four hours of lecture per week.

Pre-Requisites

Departmental placement criteria are met

Co-Requisites

[[CHM-117]]

CHM-231. ORGANIC CHEMISTRY I**Credits:** 3**Terms Offered:** Summer

An introduction to the chemistry of carbon compounds, this course develops the interconnected relationship between bonding, structure, properties and reactivity in organic compounds. Instrumental methods will be presented as a means to determine structure. Three hours of class and a one-hour problem session per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better

Co-Requisites

[[CHM-233]]

CHM-232. ORGANIC CHEMISTRY II**Credits:** 3

This course continues [[CHM-231]], with emphasis on organic synthesis. Three hours of class and a one-hour problem session per week.

Pre-Requisites

[[CHM-231]] with a grade of 2.0 or better and [[CHM-233]] with a grade of 2.0 or better

Co-Requisites

[[CHM-234]]

CHM-233. ORGANIC CHEMISTRY I LAB**Credits:** 1

After an introduction to standard organic reaction, purification, physical characterization, and spectroscopic techniques, students will investigate concepts discussed in [[CHM-231]]. One three-hour laboratory per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better

Co-Requisites

[[CHM-231]]

CHM-234. ORGANIC CHEMISTRY II LAB**Credits:** 1

Weekly labs that parallel the lecture topics in [[CHM-232]] and emphasize organic synthesis and characterization, including multistep synthesis. Three hours per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-231]] with a grade of 2.0 or better and [[CHM-233]] with a grade of 2.0 or better

Co-Requisites

[[CHM-232]]

CHM-235. ESSENTIALS OF ORGANIC CHEMISTRY**Credits:** 3

A one semester course covering the fundamentals of carbon chemistry. Nomenclature, stereochemistry, functional groups, spectroscopy, and reactions and mechanisms of alcohols, ethers, amines, alkyl halides, carbonyl compounds, and benzene are covered. Four hours of lecture per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better.

Co-Requisites

[[CHM-237]]

CHM-237. ESSENTIALS OF ORGANIC CHEMISTRY LAB

Credits: 1

A one semester fundamental organic chemistry laboratory course that introduces organic reactions, purification, physical characterization and spectroscopic techniques.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better.

Co-Requisites

[[CHM-235]]

CHM-246. ANALYTICAL CHEMISTRY LAB

Credits: 1

Weekly labs that parallel the lecture topics in [[CHM-248]]. One three-hour laboratory per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better

Co-Requisites

[[CHM-248]]

CHM-248. ANALYTICAL CHEMISTRY

Credits: 3

A course in the application of the principles of chemical equilibria to obtain the qualitative and quantitative information about the composition and structure of matter. An introduction to the importance of sampling is included along with methods for the statistical treatment of data. The course focuses primarily on the analyses of elemental and ionic species using electrochemical, spectroscopic, and chromatographic techniques. Three hours of lecture per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better and [[CHM-116]] with a grade of 2.0 or better

Co-Requisites

[[CHM-246]]

CHM-256. POLYMER CHEMISTRY

Credits: 3

This course covers topics in polymer composition and structure, polymerization mechanisms, stereochemistry of polymerization and reaction of polymers. Three hours of lecture per week.

Pre-Requisites

[[CHM-117]] with a grade of 2.0 or better and [[CHM-118]] with a grade of 2.0 or better

CHM-258. POLYMER CHEMISTRY LABORATORY

Credits: 1

Experiments are conducted to emphasize the concepts learned in the Polymer Chemistry lecture course, [[CHM-256]]. Students will collect and process experimental data and develop laboratory skills. One three-hour laboratory per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-117]], [[CHM-118]]

Co-Requisites

[[CHM-256]]

CHM-322. INORGANIC CHEMISTRY

Credits: 3

[[CHM-322]] presents a survey of current topics in Inorganic Chemistry. The first half of the course offers a survey of main group chemistry, including individual group trends. The second half of the course covers Crystal Field Theory, Ligand Field Theory, reaction mechanisms, and organometallic compounds. Three hours of lecture per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better & [[CHM-116]] with a grade of 2.0 or better

CHM-323. ADVANCED INORGANIC CHEMISTRY LAB

Credits: 1

Advanced Inorganic Chemistry Laboratory is the complimentary laboratory to CHM-322 Inorganic Chemistry. Students will build upon the foundational concepts first explored in CHM-322. An emphasis will be placed on the synthesis and characterization of transition metal complexes. Coordination chemistry reactions and mechanisms will be introduced as well as the chemistry of lanthanides. Students will gain experience in the handling of air-sensitive materials. Laboratory, three hours per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-322]]

CHM-341. INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS

Credits: 3

A course in the fundamental principles that provide the basis for the design and fabrication of chemical instrumentation. The underlying physical basis for each method is introduced through an exploration of the capabilities, limitations, and applications of a wide range of separations, spectroscopic, and electrochemical methods. Three hours of lecture per week.

Pre-Requisites

[[CHM-246]] with a grade of 2.0 or better, [[CHM-248]] with a grade of 2.0 or better, [[MTH-112]], [[PHY-202]]

Co-Requisites

[[CHM-343]]

CHM-343. INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS LAB**Credits:** 1

Weekly lab that corresponds to the lecture topics in [[CHM-341]]. One three-hour laboratory per week.

[Click here for course fee.](#)

Co-Requisites

[[CHM-341]]

CHM-351. PHYSICAL CHEMISTRY: QUANTUM AND SPECTROSCOPY**Credits:** 3

This course emphasizes the molecular approach to physical chemistry. It begins discussing the principles of quantum mechanics and their applications in chemistry, leading to atomic and molecular structure, and chemical bonding. These concepts are then used in the development of atomic and molecular spectroscopy. Photochemistry is introduced. Three hours of lecture per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better, [[CHM-116]] with a grade of 2.0 or better, [[MTH-212]] and [[PHY-202]]

CHM-352. PHYSICAL CHEMISTRY: KINETICS AND THERMODYNAMICS**Credits:** 3

Statistical mechanics is used to formulate thermodynamics in terms of atomic and molecular properties, allowing a molecular interpretation of the laws of thermodynamics. Three hours of lecture a week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better, [[CHM-116]] with a grade of 2.0 or better, [[MTH-212]], and [[PHY-202]]

CHM-353. PHYSICAL CHEMISTRY: QUANTUM AND SPECTROSCOPY LAB**Credits:** 1

Laboratory experiments are performed in order to reinforce concepts in [[CHM-351]]. Bench as well as computational experiments will explore the photoelectric effect, resonance states of a particle in a one-dimensional box, applications of molecular orbital theory, and molecular spectroscopy. Three hours per week.

[Click here for course fee.](#)

Co-Requisites

[[CHM-351]]

CHM-354. PHYSICAL CHEMISTRY: KINETICS AND THERMODYNAMICS LAB**Credits:** 1

Laboratory experiments are performed in order to reinforce concepts in [[CHM-352]]. Bench as well as computational experiments explore calorimetry, phase equilibria, colligative properties, kinetics, and applications of the Monte Carlo method to chemical kinetics. One three-hour lab per week.

Co-Requisites

[[CHM-352]]

CHM-355. PHYSICAL CHEMISTRY FOR LIFE SCIENCES**Credits:** 3

An introduction to traditional physical chemistry topics, including additional topics related to life sciences. Laws of thermodynamics, equilibria, kinetics, and spectroscopy will be discussed in terms of their application to life sciences. Three hours of lecture per week.

Pre-Requisites

[[CHM-114]] with a grade of 2.0 or better, [[CHM-116]] with a grade of 2.0 or better, [[MTH-212]] and [[PHY-202]]

Co-Requisites

[[CHM-357]]

CHM-357. PHYSICAL CHEMISTRY FOR LIFE SCIENCES LAB**Credits:** 1

The laboratory experiments emphasize concepts presented in [[CHM-355]]. Course includes experimental work, analysis of a research article, and computer simulations relevant to life sciences. One three-hour laboratory pre week.

Co-Requisites

[[CHM-355]]

CHM-361. BIOCHEMISTRY: STRUCTURE AND FUNCTION**Credits:** 3

This course presents a study of the physical and chemical properties of proteins, nucleic acid, fatty acids, and carbohydrates, emphasizing the relationship between the chemical structure and the biological function. The course includes the physical methods of biochemistry, enzyme kinetics, bioenergetics, and nucleic acid transcription and translation. Three hours of lecture per week.

Pre-Requisites

[[CHM-232]] with a grade of 2.0 or better

CHM-362. BIOCHEMISTRY: METABOLISM**Credits:** 3

This course presents a study of the catabolism and anabolism of carbohydrates, fatty acids, and amino acids. The course emphasizes the regulation and integration of major metabolic pathways, including glycolysis, the Krebs cycle, electron transport, gluconeogenesis, pentose phosphate pathway, fatty acid metabolism, and amino acid metabolism. Three hours of lecture per week.

Pre-Requisites

[[CHM-232]] with a grade of 2.0 or better

Biochemistry

CHM-363. BIOCHEMISTRY LABORATORY

Credits: 1

Laboratory experiments, which emphasize biochemical techniques used in isolation and characterization of macromolecules. Included in the course are various chromatographic techniques, electrophoresis, spectrophotometry, and classic biochemical methods. Laboratory, three hours a week.

[Click here for course fee.](#)

Pre-Requisites

Prerequisite or Corequisite: [[CHM-361]] or permission of instructor.

CHM-365. MEDICAL BIOCHEMISTRY

Credits: 4

Introduction to basic biochemistry concepts, focusing on the structure and function of vitamins, proteins, and lipids, as well as bioenergetics and major catabolic pathways. The catabolism of carbohydrates, fats and amino acids, including reactions and regulation, will be discussed. Common metabolic pathways of drugs, enzyme induction and metabolism down regulation will also be presented. Four hours of lecture per week. Cross-listed with [[PHA-365]] and [[BEGR-465]].

Pre-Requisites

[[CHM-232]] or [[CHM-235]] with a grade of 2.0 or better, or permission of the instructor

CHM-370. CHM 371, CHM 372 INTEGRATED LABORATORIES I, II, III

Credits: 1-2 each

Laboratory experiments related to the five major areas of chemistry. Labs will be chosen in order that students might demonstrate proficiency in each of the required areas. Labs will include synthesis, isolation, and characterization of chemical compounds, spectroscopy, kinetics, calorimetry, chromatography, electrophoresis, and other chemical and biochemical methods. Three hours of laboratory per week per credit hour.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-232]] with a grade of 2.0 or better, [[CHM-234]] with a grade of 2.0 or better and [[CHM-341]] with a grade of 2.0 or better

CHM-390. JUNIOR SEMINAR

Credits: 1

CHM-390 is a one-hour course offered during the spring semester. It is designed to prepare chemistry and biochemistry majors for their careers after graduation and for their capstone research projects, undertaken in the fourth year. The course will cover topics such as résumé preparation, communication of scientific information, internships, job searches, and preparation for graduate school. Students will prepare a topical literature review on their chosen project in conjunction with their selection of a research advisor.

Pre-Requisites

45 hours of service to the Chemistry Department. Requirements; Junior standing and declared major in Chemistry or Biochemistry.

CHM-391. SENIOR RESEARCH I

Credits: 2

Students will plan and execute a chemistry research project under the direction of a faculty member. It is expected that this will be a laboratory research project. Students will also learn how to search the chemical literature. Students are required to attend weekly Department seminars and present at least one seminar. Requirements: Senior standing in a Chemistry curriculum.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-352]] with a grade of 2.0 or better or [[CHM-355]] with a grade of 2.0 or better

CHM-392. SENIOR RESEARCH II

Credits: 2

Students will carry out a chemistry research project under the direction of a faculty member. It is expected that the project will be a laboratory research project. The project must culminate in a written report and the results must be presented at a Department poster event. Students are also required to attend any seminars hosted by the Department. Six hours of laboratory / research work per week.

[Click here for course fee.](#)

Pre-Requisites

[[CHM-391]] with a grade of 2.0 or better

CHM-395. INDEPENDENT RESEARCH

Credits: 1-3

Independent study and research for advanced students in the field of the major under the direction of a staff member. A research paper is required.

Requirements: permission of the instructor.

[Click here for course fee.](#)

CHM-396. INDEPENDENT RESEARCH**Credits:** 1-3

Independent study and research for advanced students in the field of the major under the direction of a staff member. A research paper is required.

Requirements: permission of the instructor.

[Click here for course fee.](#)

CHM-398. TOPICS**Credits:** 1-3

A study of topics of special interest, such as advanced physical chemistry, advanced analytical chemistry, advanced organic chemistry, surface and colloid chemistry, nuclear chemistry, chemical kinetics, polymer chemistry, or spectroscopy.

Pre-Requisites

Will vary according to the specific topics course.

CHM-399. COOPERATIVE EDUCATION**Credits:** 1-6

Professional cooperative education placement in a private or public organization related to the student's academic objectives and career goals. In addition to their work experience, students are required to submit weekly reaction papers and an academic project to a Faculty Coordinator in the student's discipline. See the Cooperative Education section of this bulletin for placement procedures. Requirements: Sophomore standing; minimum 2.0 cumulative GPA; consent of the academic advisor; and approval of placement by the department chairperson. Students without the indicated prerequisites for 200 and 300-level chemistry courses may enroll after written permission of the instructor has been approved by the department chair.