**CHEMISTRY MAJOR (B.S.)**

**Purpose**
The purpose of the Chemistry major is to prepare students for graduate school and employment in chemistry.

**Program Learning Outcomes**
The student will be able to:

1. Apply standards and principles of safe practice in the laboratory or field environment.
2. Understand ethical issues in the physical sciences in light of a biblical/Christian worldview.
3. Demonstrate knowledge of fundamental chemical concepts.
4. Conduct, analyze, and summarize chemical research.

**Program of Study**

**Delivery Format: Residential Only**

- Chemistry (B.S.) - Resident

**Career Opportunities**

- Analytical Chemist
- Chemical Laboratory Technician
- Chemical/Pharmaceutical Laboratory Supervisor
- Chemistry Teacher
- Computational/Theoretical Chemist
- Cosmetic Scientist
- Dietary Scientist
- Environmental Scientist
- Forensic Chemist/Scientist
- Government Chemist
- Laboratory Analyst
- Physician
- Principal Researcher in Chemistry
- Production Chemist
- Quality Assurance Representative
- Regulatory Agent
- Research Assistant
- Scientific Author
- Toxicologist

**Courses**

**CHEM 105 Elements of General Chemistry 4 Credit Hour(s)**
A study of the basic areas of general chemistry at an introductory level for the non-science major, including atomic and molecular structure; bonding, stoichiometry; and acids, bases and salts.

**CHEM 107 Essentials of General and Organic Chemistry 4 Credit Hour(s)**
**Resident Prerequisite:** MATH 110 (may be taken concurrently) or MATH 201 (may be taken concurrently) or BUSI 230 or ACT Math with a score of 20 or (pre2016 post1995)SAT Math with a score of 550 or SAT Section Math with a score of 570 or MATH 108 (may be taken concurrently) or Assessment - Mathematics II with a score of 15 or MATH 121 (may be taken concurrently) or MATH 131 (may be taken concurrently) or MATH 132 (may be taken concurrently) or MATH 126 (may be taken concurrently) or Placement Score-Math with a score of 070
A study of the basics of general and organic chemistry at an introductory level, including atomic structure, bonding, acids and bases, organic functional groups and selected organic reactions.

**Offered:** Resident

**CHEM 107L Essentials of General and Organic Chemistry Lab 0 Credit Hour(s)**
**Prerequisite:** CHEM 107 (may be taken concurrently)

**CHEM 108 Chemistry for Nursing Professionals 4 Credit Hour(s)**
**Resident Prerequisite:** MATH 110 (may be taken concurrently) or MATH 201 (may be taken concurrently) or BUSI 230 or (pre2016 post1995)SAT Math with a score of 550 or SAT Section Math with a score of 570 or ACT Math with a score of 20
A study of the basics of general and organic chemistry at an introductory level, including atomic structure, bonding, acids and bases, organic functional groups and selected organic reactions, with an emphasis on nursing applications. This course includes an independent hands-on microscale laboratory experience. Restricted to online students with an RN license pursuing a BSN.

**Offered:** Online

**CHEM 121 General Chemistry I 4 Credit Hour(s)**
**Resident Prerequisite:** MATH 121 or MATH 126 or MATH 131 or MATH 132 or ACT Composite with a score of 20 or SAT Section Math with a score of 530 or (pre2016 post1995)SAT Math with a score of 500 or Placement Score-Math with a score of 75
A study of the foundations of chemistry including: stoichiometry; atomic structure; chemical periodicity; covalent and ionic bonding; inorganic nomenclature; chemical reactions including aqueous precipitation, acid-base, and redox; basic thermodynamics in physical and chemical matter changes; electronic structure; molecular structure and polarity; gas laws.

**Offered:** Resident

**CHEM 121L General Chemistry I Lab 0 Credit Hour(s)**
**Prerequisite:** CHEM 121 (may be taken concurrently)

**CHEM 122 General Chemistry II 4 Credit Hour(s)**
**Resident Prerequisite:** CHEM 121 and CHEM 122L (may be taken concurrently)
A study of chemical topics including: behavior and properties of liquids, colligative properties of solutions; and properties of solids; kinetics; equilibrium; acids, bases, and other aqueous equilibria; entropy and free energy in chemical reactions; electrochemistry; nuclear chemistry; introductory organic and biochemistry.

**Offered:** Resident

**CHEM 122L General Chemistry II Lab 0 Credit Hour(s)**
**Prerequisite:** CHEM 121

**Offered:** Resident
Chemistry Major (B.S.)

CHEM 131 Advanced General Chemistry I 3 Credit Hour(s)
Prerequisite: MATH 121 or MATH 125 or MATH 130 or MATH 131 or MATH 132 or MATH 201 or MATH 217 or MATH 1XX or MATH 2XX or MATH 3XX or MATH 4XX or ACT Math with a score of 25 or MATH SECTION SCORE with a score of 580 or Placement Score-Math with a score of 75.
An in-depth study of the fundamental principles of chemistry including: stoichiometry; atomic theory; atomic structure; chemical periodicity; nature of covalent and ionic bonding; inorganic nomenclature; chemical reactions including aqueous precipitation, acid-base, and redox; basic thermodynamics in physical and chemical matter changes; electronic structure; molecular structure and polarity; gas laws. Examples are drawn from chemical, biological and materials systems.
Offered: Resident

CHEM 132 Advanced General Chemistry II 3 Credit Hour(s)
Prerequisite: CHEM 121 or CHEM 131
An advanced undergraduate study of chemical topics including: behavior and properties of liquids, colligative properties of solutions; and properties of solids; kinetics; equilibrium; acids, bases and other aqueous equilibria; entropy and free energy in chemical reactions; electrochemistry; nuclear chemistry; introductory organic and biochemistry.
Offered: Resident

CHEM 135 Advanced General Chemistry Lab 1 Credit Hour(s)
Prerequisite: CHEM 131
Laboratory experiments are drawn from chemical and material systems which reflect the topics of the lecture course which is an in-depth experimental study of the fundamental principles of chemistry including: stoichiometry; atomic theory; atomic structure; chemical periodicity; nature of covalent and ionic bonding; inorganic nomenclature; chemical reactions including aqueous precipitation, acid-base, and redox; basic thermodynamics in physical and chemical matter changes; electronic structure; molecular structure and polarity; gas laws.
Offered: Resident

CHEM 136 Advanced General Chemistry II Lab 1 Credit Hour(s)
Prerequisite: CHEM 121 or CHEM 135
Advanced first year undergraduate laboratory experiments are drawn from chemical and material systems which reflect the topics of the lecture course which is an in-depth experimental study of the fundamental principles of chemistry including: behavior and properties of liquids, colligative properties of solutions; and properties of solids; kinetics; equilibrium; acids, bases, and other aqueous equilibria; entropy and free energy in chemical reactions; electrochemistry; nuclear chemistry; introductory organic and biochemistry.
Offered: Resident

CHEM 301 Organic Chemistry I 4 Credit Hour(s)
Resident Prerequisite: CHEM 122 or (CHEM 132 and CHEM 136)
A study of alkanes, alkenes, and alkynes, including nomenclature; optical activity; stereochemistry; substitution and elimination reactions; and ring systems.
Offered: Resident

CHEM 301L Organic Chemistry I Lab 0 Credit Hour(s)
Prerequisite: CHEM 121 and CHEM 122
Offered: Resident

CHEM 302 Organic Chemistry II 4 Credit Hour(s)
Resident Prerequisite: CHEM 301
A study of the nomenclature and reactions of alcohols, ethers, epoxides, ketones, aldehydes, esters and acids, aromatic systems; and numerous name reactions in synthesis.
Offered: Resident

CHEM 302L Organic Chemistry II Lab 0 Credit Hour(s)
Prerequisite: CHEM 301
Offered: Resident

CHEM 321 Analytical Chemistry 4 Credit Hour(s)
Prerequisite: CHEM 122
An introduction to analytical chemistry. Evaluation of data, gravimetric and titrimetric analysis, and an introduction to instrumental methods. These include spectrophotometry, chromatography, and potentiometric methods. (Formerly CHEM 221)
Note: Offered spring semester
Offered: Resident

CHEM 322 Instrumental Analysis 4 Credit Hour(s)
Prerequisite: CHEM 321 and (RSCH 201 or Inquiry Research with a score of 80 or Research with a score of 80 or Research (prior to 2017-2018) with a score of 80)
Theory and practice of instrument-based chemical analyses. The course emphasizes the principles of analytical instruments and their applications in chemical sciences.
Offered: Resident

CHEM 400 Chemistry Seminar 1 Credit Hour(s)
Prerequisite: CHEM 302
The preparation and presentation of a paper, discussion of presentations and/or the discussion of articles in the scientific literature. This course can be repeated, and up to four hours can be applied toward the major. Restricted to Chemistry majors and minors.
Offered: Resident

CHEM 461 Physical Chemistry I 3 Credit Hour(s)
Prerequisite: CHEM 122 and (MATH 126 or MATH 131)
This course is an in-depth study of the properties of real and ideal gases, thermodynamics, kinetics, changes of state, solutions, phase equilibria, chemical equilibria, and electrochemistry.
Offered: Resident

CHEM 462 Physical Chemistry II 3 Credit Hour(s)
Prerequisite: CHEM 461
This course is a study of the foundational principles of quantum mechanics in atoms and molecules, molecular structure, spectroscopy, and statistical mechanics.
Offered: Resident

CHEM 465 Physical Chemistry I Lab 1 Credit Hour(s)
Prerequisite: CHEM 461 (may be taken concurrently)
This course is an in-depth study of laboratory techniques and the written expression in lab reports that follow the style of papers in chemistry periodicals for the properties of real and ideal gases, thermodynamics, kinetics, changes of state, solutions, phase equilibria, chemical equilibria, and electrochemistry.
Offered: Resident

CHEM 466 Physical Chemistry II Lab 1 Credit Hour(s)
Prerequisite: CHEM 462 (may be taken concurrently)
This course is a study of the lab skills associated with the foundational principles of quantum mechanics in atoms and molecules, molecular structure, spectroscopy, and statistical mechanics.
Offered: Resident
CHEM 471  Inorganic Chemistry  4 Credit Hour(s)
Prerequisite: CHEM 302
A study of inorganic chemistry, including symmetry, structure, and bonding, as well as a survey of the descriptive chemistry of the elements.
Offered: Resident

CHEM 495  Supervised Research in Chemistry  1-3 Credit Hour(s)
Offered: Resident

CHEM 497  Special Topics in Chemistry  1-3 Credit Hour(s)
CHEM 497- Special Topics in Chemistry (3 to 4 hours)
Offered: Resident

CHEM 499  Internship  1-6 Credit Hour(s)
A directed practical work experience under the supervision of the Chemistry Faculty Intern Advisor, in the student’s area of career interest. Applications are processed through the Chemistry Faculty Intern Advisor. Applicants must apply the semester prior to starting the internship.
Registration Restrictions: 3.00 GPA and Junior or Senior Standing and 20 hours completed in Chemistry (including 12 hours upper level Chemistry) and a declared major in the Biology and Chemistry department; not more than one CSER behind
Offered: Resident