

## Department of Chemistry

Department Head: Granger  
Professors: Granger, Mabrouk, Zuraw  
Associate Professors: Adair, Bevsek  
Assistant Professors: Dorko, Le-Vasicek, Moyer  
Instructor: Kendall

The Chemistry Department offers a bachelors of science (B.S.) and a bachelors of arts (B.A.) degree. Each degree is designed to optimize a student's career objectives and within each degree there are different tracks a student can pursue. The BS degree is designed to prepare students to enroll as graduate students at leading universities and is also well suited for students wishing to pursue medical professions or enter directly into the industrial sector. Within the B.S. degree, students may also choose to pursue an American Chemical Society Accredited degree or a Biochemistry Specialization. Regardless of which path a student selects, the BS curricula embodies training in the five fundamental subdivisions of chemistry: biochemistry, inorganic, organic, analytical, and physical chemistry..

The B.A. degree is designed for those students who would like to combine a strong foundation in chemistry with other specific career goals such as pre-med, pre-dentistry, pre-patent law, pre-pharmacy, pre-chemical engineering, forensic science and more. In addition, within the BA degree, students can choose to pursue an Environmental Chemistry concentration or a Clinical Chemistry concentration.

Regardless of which path a student selects, a specific curriculum will be developed in consultation with the student's academic advisor to fit each student's specific career goals. All undergraduate courses taken at The Citadel with a subject prefix of CHEM will count towards the major GPA.

The department occupies Byrd Hall. Within its 52,000 square feet, this facility houses a lecture theater, modern class rooms, laboratories, computer laboratory, and conveniently located stock, preparation, and balance rooms.

### **B.S. in Chemistry**

Requirements of the degree are:

- CHEM 151/163 General Chemistry I/General Chemistry Laboratory  
for Majors I
- CHEM 152/164 General Chemistry II/General Chemistry Laboratory  
for Majors II
- CHEM 207/217 Organic Chemistry I/Organic Chemistry Laboratory I
- CHEM 208/218 Organic Chemistry II/Organic Chemistry Laboratory II

CHEM 300	Quantitative Analysis
CHEM 302	Instrumental Analysis
CHEM 305/315	Physical Chemistry I/Physical Chemistry Laboratory I
CHEM 306/316	Physical Chemistry II/Physical Chemistry Laboratory II
CHEM220	Introduction to Chemical Research
CHEM 401	Inorganic Chemistry I
CHEM 409	Biochemistry I
CHEM 419	Senior Research I
CHEM 420	Senior Research II

B.S. in Chemistry majors must also take the following supporting courses:

MATH 131	Analytical Geometry and Calculus I
MATH 132	Analytical Geometry and Calculus II
PHYS 221/271	Physics with Calculus I/Laboratory for Physics with Calculus I
PHYS 222/272	Physics with Calculus II/Laboratory for Physics with Calculus II

Majors in the B.S. in Chemistry program must also take an approved elective from the following selection: BIOL 290, 308, 421, 424, 427; CHEM 402, 404, 410; CSCI 205; MATH 303, 335, 343, 344, 381, 403, 411, 422, 470; PHYS 301, 307, 308, 315, 320, 403, 405, 409, 410.

In addition, majors in B.S. in Chemistry must take another approved elective from the following selection: CHEM 402, 404, 410.

#### **B.S. in Chemistry (American Chemical Society Accredited)**

Students who wish to pursue research-related careers (chemical, medical, industrial) should consider taking the courses to complete the American Chemical Society approved program. Students completing these additional requirements are awarded a certificate by the American Chemical Society documenting their status as professional chemists and are frequently given preferential treatment as candidates for professional positions. In order to qualify for this distinction, students must complete all the requirements of the B.S. in Chemistry program and these additional courses:

MATH 234	Applied Engineering Mathematics I
CHEM 460	Biochemistry Laboratory

A chapter of the Student Members of the American Chemical Society is active at The Citadel.



B.A. in Chemistry majors must also select 14 additional credit hours from the following approved electives:

CHEM 300 Quantitative Analysis  
CHEM 302 Instrumental Methods  
CHEM 305/315 Physical Chemistry I + Lab  
CHEM 306/316 Physical Chemistry II + Lab  
CHEM 401 Inorganic Chemistry I  
CHEM 402 Inorganic Chemistry II  
CHEM 403 Special Topics In Chemistry  
CHEM 409 Biochemistry I  
CHEM 410 Biochemistry II  
CHEM 460 Biochemistry Lab  
CHEM 419 Senior Research I  
PHYS 204 or 222  
PHYS 272

**B.A. in Chemistry – Clinical Concentration**

CHEM 151/163 General Chemistry I/General Chemistry Laboratory  
for Majors I  
CHEM 152/164 General Chemistry II/General Chemistry Laboratory for Majors II  
CHEM 207/217 Organic Chemistry I/Organic Chemistry Laboratory I  
CHEM 208/218 Organic Chemistry II/Organic Chemistry Laboratory II  
CHEM 220 Introduction to Chemical Research  
CHEM 300 Quantitative Analysis  
CHEM 302 Instrumental Methods  
CHEM 409 Biochemistry I  
CHEM 410 Biochemistry II  
CHEM 460 Biochemistry Lab  
CHEM 420 Senior Research II

B.A. in Chemistry – Clinical Concentration majors must also take the following supporting courses:

MATH 106 or 131  
MATH 107 or 132 or STATS 160  
PHYS 203/253 College Physics I/Laboratory for College Physics I  
BIOL 130/131 Introduction to Biology I + Lab  
BIOL 140/141 Introduction to Biology II + Lab  
BIOL 205 Cell Biology

B.A. in Chemistry – Clinical Concentration majors must also take two courses selected from the following approved electives:

BIOL 217 Anatomy and Physiology I  
BIOL218 Anatomy and Physiology II  
BIOL 206 or 308 Genetics

BIOL290 Micro Biology  
BIOL 340 Pathophysiology  
BIOL 341 Pharmacology  
BIOL 421 Toxicology  
BIOL 424 Molecular Genetics  
BIOL 427 Immunology

**B.A. in Chemistry – Environmental Concentration**

CHEM 151/163 General Chemistry I/General Chemistry Laboratory  
for Majors I  
CHEM 152/164 General Chemistry II/General Chemistry Laboratory  
for Majors II  
CHEM 207/217 Organic Chemistry I/Organic Chemistry Laboratory I  
CHEM 208/218 Organic Chemistry II/Organic Chemistry Laboratory II  
CHEM 220 Introduction to Chemical Research  
CHEM 420 Senior Research II

B.A. in Chemistry – Environmental Concentration majors must also take the following supporting courses:

MATH 106 or 131  
MATH 107 or 132 or STATS 160  
PHYS 204 or 222  
BIOL 130/131 Introduction to Biology I + Lab  
BIOL 209 Environmental Science

B.A. in Chemistry – Environmental Concentration majors must also take three courses selected from the following approved electives:

BIOL 140/141 Introduction to Biology II + Lab  
BIOL 292 Lead4Envr Sustain  
BIOL 406 Ecology  
BIOL 409 Marine Bio  
BIOL 425 Rain Forest & Reef Ecol  
BIOL 426 Freshwater Bio  
PHYS 243 Meteorology  
PHYS 343 Climatology

**Premedical Program**

Students who plan to enter medical, pharmacy or dental school should consider majoring in chemistry. Most allied health schools require a minimum of five chemistry courses. Students who plan to enter medical, pharmacy or dental school upon completion of their baccalaureate degrees should acquaint themselves with requirements of the medical schools of their choice and plan their programs accordingly. An extremely worthwhile reference to the entrance requirements for all medical schools in the United States and Canada is Medi-

cal School Admission Requirements, published each year by the Association of American Medical Colleges, <http://www.aamc.org>. Another good source of information regarding pre-medical preparation can be found here, <https://www.princetonreview.com/college-majors/226/pre-medicine>

### Minor in Chemistry

*Objectives:* The minor in chemistry will provide students with a stronger background in chemistry than they would obtain from the requirements in the core curriculum. It is designed to acquaint students with the more advanced theories and techniques that are illustrated in the major subfields of chemistry.

*Knowledge and/or Skills to be Achieved:* In general, the student completing the minor will have a more in-depth foundation in chemical bonding, physical properties and synthesis of compounds, chemical thermodynamics and kinetics, chemical and instrumental analyses, properties of biomolecules, and the design of polymers. More specifically, by the choice of advanced courses, the student may gain greater insight with regards to one or more of these general areas to meet specific career goals. Additionally, because the department places considerable emphasis on oral and written presentations, the student will gain considerable experience in interpreting and presenting chemical data in a professional manner.

**This minor is not approved for students majoring in Chemistry.**

#### Structure of the minor:

1. Required Courses: (8 Credit Hours)
 

CHEM 151	General Chemistry I*
CHEM 161	General Chemistry Laboratory I*
CHEM 152	General Chemistry II*
CHEM 162	General Chemistry Laboratory II*
CHEM 207	Organic Chemistry I
CHEM 217	Organic Chemistry Laboratory I
CHEM 208	Organic Chemistry II
CHEM 218	Organic Chemistry Laboratory II

\*These four courses meet the requirements for the core curriculum, and their hours are **not** counted toward the total for the Minor in Chemistry. Also note that CHEM 103/113 and CHEM 104/114 do **not** meet the requirements for the Minor in Chemistry. Biology majors may count CHEM 207/217 and CHEM 208/218 towards the minor.

2. Electives: (7 Credit Hours)
  - A. One of the four sequential upper-level offerings (300 or above)
 

CHEM 305/306	Physical Chemistry I & II
CHEM 300/302	Quantitative Analysis/Instrumental Analysis
CHEM 401/402	Inorganic Chemistry I & II
CHEM 409/410	Biochemistry I & II

- B. If the Physical Chemistry, Inorganic Chemistry, or Biochemistry sequence is chosen, at least one upper-level laboratory course (CHEM 315, 316, or 460) must also be completed.

The additional courses must be approved in advance by the Head of the Department of Chemistry.

*Total Credit Hours Required:* 15, at least 9 of which must be completed at The Citadel.

### **Minor in Molecular Biology and Biochemistry**

The Departments of Biology and Chemistry offer a joint minor in Molecular Biology and Biochemistry. This minor will be beneficial to students interested in careers in medicine, dentistry, and other health science fields as well as those who wish to pursue careers in the chemical and biochemical industry. Active learning exercises, use of scientific literature, computer modeling, inquiry-based laboratories, and research are important components of the courses in the sequence. Requirements for the minor vary slightly depending on the student's major. The following courses are prerequisites for the minor: BIOL 130/131 and 140/141; CHEM 151/161, 152/162, 207/217, and 208/218.

#### **Requirements for Students Majoring in Biology**

BIOL 424	Molecular Genetics
BIOL or CHEM 429	Literature Seminar
CHEM 409	Biochemistry I
CHEM 410	Biochemistry II
CHEM 460	Biochemistry Laboratory
BIOL 290	Microbiology
or	
CHEM 300	Quantitative Analysis

#### **Requirements for Students Majoring in Chemistry**

BIOL 308	Genetics
BIOL 424	Molecular Genetics
BIOL or CHEM 429	Literature Seminar
CHEM 409	Biochemistry I
CHEM 410	Biochemistry II
CHEM 460	Biochemistry Laboratory

#### **Requirements for All Other Majors**

BIOL 308	Genetics
BIOL 424	Molecular Genetics
BIOL or CHEM 429	Literature Seminar
CHEM 409	Biochemistry I
CHEM 410	Biochemistry II
CHEM 460	Biochemistry Laboratory

*Total Credit Hours Required:* 16 credit hours, 9 of which must be completed at The Citadel

**Chemistry Course Descriptions**

CHEM 103 *Introduction to Chemistry I* Three Credit Hours  
Corequisite or prerequisite: CHEM 113

The course will cover the fundamentals of chemistry including electronic structure of the atoms, bonding, basic chemical calculations, gases, and various types of reactions. Mathematical emphasis will be less rigorous than in CHEM 151. Chemical processes of products used in everyday life will be stressed.

Lecture: three hours.

CHEM 104 *Introduction to Chemistry II* Three Credit Hours  
Prerequisites: CHEM 103 and CHEM 113 or CHEM 151 and CHEM 161

Corequisite or prerequisite: CHEM 114

Among the topics to be covered will be the relationship of chemistry to the environment, to the human body, to energy production, and to product manufacturing. Emphasis will be placed on making students more informed consumers as they choose and use everyday products.

Lecture: three hours.

CHEM 105 *Foundations in Chemistry:  
Health Perspectives* Three Credit Hours

Bugs, pesticides, drugs (both legal and illegal), and of course food and drink are consumed by humans on a regular basis. Chemistry is a large part of food production, transportation, storage, and consumption. Drugs can be medicines or toxins and the side effects for one drug can be the wanted effect for another. This course will allow students to explore various aspects of how chemistry affects their health and wellness. This course fulfills the first year science requirement in the General Education program when taken with the laboratory component.

CHEM 106 *Foundations in Chemistry:  
Forensic Perspectives* Three Credit Hours

This course will focus on introductory chemistry principles for non-science majors using a forensic science theme. The fundamentals of chemistry like physical and chemical properties, bonding, equilibrium, and thermodynamics will be studied with applications in forensics integrated throughout the course. Legal cases will be included to highlight the forensic applications. This course fulfills the first year science requirement in the General Education program when taken with the laboratory component.

CHEM 113 *Introduction to Chemistry I Laboratory* One Credit Hour  
Prerequisite or corequisite: CHEM 103

Required of all students selecting CHEM 103.

Student-conducted laboratory procedures and experiments designed to parallel as closely as possible and to enhance the material covered in CHEM 103. Emphasis will be placed on basic laboratory techniques. Demonstrations will be used to illustrate important chemical concepts.

Laboratory: two hours.



CHEM 114 *Introduction to Chemistry II Laboratory* One Credit Hour

Prerequisites: CHEM 103 and CHEM 113

Corequisite or Prerequisite: CHEM 104

Required of all students selecting CHEM 104.

A continuation of CHEM 113. Experiments and demonstrations will parallel, as closely as possible, and enhance the material covered in CHEM 104. Preparation and analysis of some interesting common products will be conducted.

Laboratory: two hours.

CHEM 115 *Foundations in Chemistry:  
Health Perspectives Laboratory* One Credit Hour

Health Perspectives Laboratory provides students experiments to support and enhance topics discussed in CHEM 105. Students will develop skills in recording data, making observations, and utilizing the data and observations to draw logical conclusions. This course fulfills the first year science requirement in the General Education program when taken with the lecture component.

CHEM 116 *Foundations in Chemistry:  
Forensic Perspectives Laboratory* One Credit Hour

Forensic Perspectives Laboratory will focus on introductory chemistry principles for non-science major students using a forensic science theme. Fundamentals of chemistry like physical and chemical properties, bonding, stoichiometry, and thermochemistry will be studied with applications in forensics. This course fulfills the first year science requirement in the General Education program when taken with the lecture component.

CHEM 140 *General Chemistry for Engineers* Three Credit Hours

Prerequisite or corequisite: CHEM 141

Required of freshmen majoring in electrical or mechanical engineering.

This course is designed to introduce the engineering student to some of the fundamental concepts of chemistry. Topics to be covered include: stoichiometry, atomic structure, chemical bonding, properties and reactions of inorganic compounds, properties of gases, periodic trends, Lewis dot structures, molecular geometries, intermolecular forces, phase diagrams, solids, and polymers.

Lecture: three hours.

CHEM 141 *General Chemistry for Engineers  
Laboratory* One Credit Hour

Prerequisite or corequisite: CHEM 140

Required of all students selecting CHEM 140.

The first hour of this course will serve as a discussion section meant to reinforce chemical concepts being discussed in CHEM 140. The last two hours will be an introduction to laboratory techniques and experiments designed to accompany the topics covered in CHEM 140.

Lecture: one hour; laboratory: two hours.

CHEM 151 *General Chemistry I* Three Credit Hours

Corequisite or prerequisite: CHEM 161

Required of all freshmen majoring in the sciences and engineering; the chemistry option for B.S. in Mathematics or Computer Science; elective to others.

Problem-solving techniques and essential concepts, including structure and properties, reactions, stoichiometry, states of matter, thermochemistry, and bonding. Calculators with logarithmic capability are required.

Lecture: three hours.

CHEM 152 *General Chemistry II* Three Credit Hours

Prerequisites: CHEM 151 and CHEM 161

Corequisite or prerequisite: CHEM 162

Required of all students majoring in the sciences; the chemistry option for B.S. in Mathematics or Computer Science; elective to others.

Continuation of CHEM 151. Emphasis includes solutions, kinetics, equilibrium, acids and bases, solubility, redox, and an introduction to organic chemistry.

Lecture: three hours.

CHEM 153 *General Chemistry I for Chemistry Majors* Three Credit Hours

Prerequisite or corequisite: CHEM 163

Required of all freshmen majoring in chemistry. Chemistry majors must have a grade of C or higher.

Students will learn about stoichiometry, atomic structure, chemical bonding, properties and reactions of inorganic compounds, periodic trends, thermochemistry, properties of gases, Lewis dot structures, molecular geometries, and molecular orbital theory. Introduction to research methods and problem solving techniques will be incorporated throughout the semester.

Lecture: three hours.

CHEM 154 *General Chemistry II for Chemistry Majors* Three Credit Hours

Prerequisites: CHEM 153 and CHEM 163 or permission of department head.

Corequisite: CHEM 164

Required of all freshmen majoring in chemistry. Chemistry majors must have a grade of C or higher.

A continuation of CHEM 153 in which students continue to explore theory and application of chemical concepts including solubility and solutions, kinetics, equilibrium, acid/base chemistries, oxidation/reduction reactions, nuclear chemistry, and an introduction to organic chemistry. Introduction to research methods and problem solving techniques will continue to be discussed and practiced.

Lecture: three hours.

CHEM 161 *General Chemistry I Laboratory* One Credit Hour

Prerequisite or corequisite: CHEM 151

Required of all students selecting CHEM 151.

Introduction to laboratory techniques and experiments designed to accompany the topics covered in CHEM 151.

Laboratory: two hours.

CHEM 162 *General Chemistry II Laboratory* One Credit Hour

Prerequisites: CHEM 151 and CHEM 161

Corequisite or prerequisite: CHEM 152

Required of all students selecting CHEM 152.

A continuation of CHEM 161; experiments include an introduction to qualitative analysis, quantitative techniques, and selected instrumental methods.

Laboratory: two hours.

CHEM 163 *General Chemistry I Laboratory for Chemistry Majors* One Credit Hour

Prerequisite or corequisite: CHEM 153

The first hour of this course will serve as a discussion section meant to reinforce chemical concepts being discussed in CHEM 153. The last two hours will be an introduction to laboratory techniques and experiments designed to accompany the topics covered in CHEM 153.

Lecture: one hour; laboratory: two hours.

CHEM 164 *General Chemistry II Laboratory for Chemistry Majors* One Credit Hour

Prerequisites: CHEM 151 and CHEM 161

Corequisite or prerequisite: CHEM 152

Required of all students majoring in chemistry.

A continuation of CHEM 161; experiments include an introduction to qualitative analysis, quantitative techniques, and selected instrumental methods. Research skills are introduced and utilized in a project.

Lecture: one hour; laboratory: two hours.

CHEM 207 *Organic Chemistry I* Three Credit Hours

Prerequisites: CHEM 152/162 or CHEM 154/164; Chemistry majors must have a grade of C or higher.

Required of all sophomores majoring in chemistry.

A study of the aliphatic hydrocarbons, their preparations and reactions, with emphasis on reaction mechanisms and transformations.

Lecture: three hours.

CHEM 208 *Organic Chemistry II* Three Credit Hours

Prerequisites: CHEM 207 and CHEM 217

Corequisite or prerequisite: CHEM 218

A study of aromatic compounds and the various functional classes of compounds. Emphasis will be placed on reactions, reaction mechanisms, and transformations. Important biomolecules will be covered briefly.

Lecture: three hours.

CHEM 217 *Organic Chemistry I Laboratory* One Credit Hour

Corequisite or prerequisite: CHEM 207

A course which emphasizes the development of skill in the use of basic laboratory techniques through the completion of a series of experiments involving various types of reactions such as substitution, elimination, and addition reactions

with an introduction to modern instrumentation such as the IR spectrometer, gas chromatograph, and NMR spectrometer.

Laboratory: three hours.

CHEM 218 *Organic Chemistry II Laboratory* One Credit Hour

Prerequisites: CHEM 207 and CHEM 217

Corequisite or prerequisite: CHEM 208

A continuation of CHEM 217 with the emphasis on the synthesis, reactions, and identification of the various classes of organic compounds.

Laboratory: three hours.

CHEM 220 *Scientific Communications* Three Credit Hours

Prerequisites: FSWI 101

Students will learn to communicate scientific (primarily chemistry) information effectively using different methods. Students will examine and compare styles of writing from proposals, industry reports, and peer-reviewed journal articles..

Lecture: three hours.

CHEM 300 *Quantitative Analysis* Four Credit Hours

Prerequisites: CHEM 152/162 or CHEM 154/164 and MATH 107 or the equivalent or permission of the instructor.

Required of all juniors pursuing the B.S. in chemistry; elective to others.

This course has as a primary focus the chemical principles involved with classical gravimetric and volumetric analysis; however, modern methods of analysis including colorimetry and potentiometry are introduced.

Lecture and discussion: three hours; laboratory: three hours.

CHEM 302 *Instrumental Methods* Four Credit Hours

Prerequisites: CHEM 300 or permission of the instructor.

Required of all juniors pursuing the B.S. in chemistry; elective to others.

Modern instrumental methods of analysis are discussed, with emphasis on the physical or chemical principles involved in the method, design or analytical instruments, and treatment of analytical data. Laboratory work provides practice in the three major areas of instrument analysis—chromatography, electrochemistry, and spectroscopy.

Lecture: two hours; laboratory: four hours.

CHEM 305 *Physical Chemistry I* Three Credit Hours

Prerequisites: MATH 132 or MATH 107; PHYS 204/254 or PHYS 222/272; CHEM 151/162 or CHEM 152/164 or permission of department head.

Corequisite for CHEM 305: CHEM 315 (except biochemistry specialty majors)

This course provides a detailed study of the postulates of quantum mechanics, simple quantum mechanical systems, approximation methods, many-electron systems, bonding, and spectroscopy.

Lecture: three hours.

CHEM 306 *Physical Chemistry II* Three Credit Hours  
Prerequisites: MATH 132 or MATH 107; PHYS 204/254 or PHYS 222/272;  
CHEM 152/162 or CHEM 154/164 or permission of department head.

Corequisite for CHEM 306: CHEM 316

This course provides a detailed study of statistical mechanics, the kinetic theory of gases, the laws of thermodynamics, equilibrium, and kinetics and mechanics of reactions.

Lecture: three hours.

CHEM 309 *Current Topics in Chemistry* Three Credit Hours  
Prerequisites: A two-semester sequence of Introduction to Chemistry, CHEM 103/104 or General Chemistry, CHEM 151/152.

General elective only.

Interesting current topics will be presented at a level appropriate for students with a general chemistry background. The topics will be determined by student interest and faculty availability.

Lecture: three hours.

CHEM 315 *Physical Chemistry I Laboratory* One Credit Hour

Prerequisite: MATH 107 or MATH 132

Corequisites or prerequisites: CHEM 305

Required of all chemistry majors.

This course is devoted to attaining skills in the evaluation, analysis, and presentation of experimental data. Topics covered will include graphing techniques, error analysis, extraction of useful quantities from raw data, and the use of spreadsheets. Experiments will be performed on topics covered in CHEM 305. Laboratory: three hours.

CHEM 316 and *Physical Chemistry II Laboratory* One Credit Hour

Prerequisite: MATH 107 or MATH 132

Corequisites or prerequisites: CHEM 306

Required of all chemistry majors; CHEM 316 is required for biochemistry specialty majors; elective to others.

This course is devoted to hands-on study of experimental physical chemistry on topics covered in CHEM 306, emphasizing the acquisition of data that can be analyzed using the skills learned in the first semester.

Laboratory: three hours.

CHEM 319 *Applied Current Topics in Chemistry* Three Credit Hours

Prerequisites: Two semester sequence of general chemistry, and permission of Department Head and Instructor.

General elective for all majors.

Faculty will guide students through an exploration of an applied topic in chemistry that is of interest to all involved. The course is designed for students with a general chemistry background and provides an opportunity to apply the material in both lecture and laboratory settings.

This course has combined lecture and lab components that total 5 hours per week.

CHEM 320 *Polymer Chemistry* Three Credit Hours

Prerequisites: CHEM 208 and CHEM 305 or approval of the instructor

A general overview of polymer chemistry which includes mechanisms of polymerization, reactions of monomers, molecular weight distributions and limitations, polymer morphology and rheology, structure elucidation, applications, and industrial processing.

Lecture: three hours.

CHEM 330 *Methods and Applications of Science* Three Credit Hours

Prerequisites: CHEM 152/162 or CHEM 154/164

A practical experience in the design and implementation of laboratory and field exercises appropriate for secondary level science classes. Applications of science and the scientific method in society are emphasized. Safety in the laboratory and on field experiences as well as science fair preparation are included. This course satisfies the ROTC fulfillment requirement for juniors and seniors.

Lecture: two hours; laboratory: three hours

CHEM 331 *Academic Leadership in STEM* Three Credit Hours

Academic Leadership in STEM will focus on developing students to be effective peer mentors who will assist general chemistry students with concepts and problem solving in a small group environment. This course will foster the development of effective leadership skills (e.g., communication and team-building) in the peer mentors. Additionally, through leading general chemistry students in small group problem solving sessions, the peer mentors will deepen their own understanding of chemistry concepts. This course satisfies the ROTC fulfillment requirement.

Lecture: three hours

CHEM 401 *Inorganic Chemistry I* Three Credit Hours

Prerequisites: CHEM 208 or approval of instructor

Required of all chemistry majors.

An introduction to the systematic chemistry of the elements and the structures and reactions of their compounds. Topics covered include atomic and bonding theories, acid-base theories, symmetry and spectroscopy, and chemistry of the main group elements.

Lecture: three hours.

CHEM 402 *Inorganic Chemistry II* Three Credit Hours

Prerequisite: CHEM 401

The chemistry of the transition metals, including bonding theories, coordination compounds, organometallic chemistry, catalysis and bioinorganic chemistry.

Lecture: three hours.

CHEM 403 *Special Topics in Chemistry* Three Credit Hours

Prerequisites: CHEM 208 or permission of the instructor.

An in-depth study of a selected topic in chemistry that requires a thorough understanding of organic chemistry. Topics vary depending on student interest and instructor availability.

Lecture: three hours.

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CHEM 404 *Advanced Topics in Chemistry* Three Credit Hours

Prerequisites: CHEM 300 and CHEM 305

Elective course.

A detailed study of a selected contemporary topic will be presented at a level that requires comprehension of the subject matter covered in the physical chemistry and quantitative analysis courses.

Lecture: three hours.

CHEM 409 *Biochemistry I* Three Credit Hours

Prerequisites: CHEM 208, and CHEM 218

Elective course.

A coverage of the chemistry of amino acids, peptides and proteins; enzymes; biochemical energetics; Krebs's cycle; electron transport system and oxidative phosphorylation; and amino acid metabolism.

Lecture: three hours.

CHEM 410 *Biochemistry II* Three Credit Hours

Prerequisite: CHEM 409 or permission of the instructor.

A continuation of the topics covered in Biochemistry I. Topics include lipids with emphasis on fatty acid oxidation, synthesis and lipid biosynthesis, and carbohydrates and their metabolism, and nucleic acid biochemistry.

Lecture: three hours.

CHEM 419 *Senior Research I* Three Credit Hours

Required of all Chemistry majors; elective to others with permission of the instructor.

This course provides an introduction to a research topic of the student's choosing and under the direction of a faculty advisor. After the topic has been approved by the faculty advisor, the student will be allowed to initiate the project. Using this topic, the student will be required to develop a research proposal which will be presented in the form of a seminar to the Chemistry Department Faculty and the chemistry majors. This course satisfies the ROTC fulfillment requirement.

CHEM 420 *Senior Research II* Three Credit Hours

Prerequisite: CHEM 419

A continuation of CHEM 419 in which the research project is completed and the data and results are compiled into a senior thesis. To finalize the project, the student will present a seminar to the Chemistry Department Faculty and chemistry majors and defend the thesis before a committee of faculty members from the Chemistry Department. This course satisfies the ROTC fulfillment requirement.

CHEM 429 *Literature Seminar* One Credit Hour

Prerequisites: CHEM 152/162 or CHEM 154/164; CHEM 208/218.

A current topics course that involves discussions of relevant biochemistry journal articles and related materials.

CHEM 460 *Biochemistry Laboratory* One Credit Hour  
Corequisite: CHEM 409 OR CHEM 410  
Covers experimental techniques commonly used in biochemistry including protein isolation and characterization, enzyme kinetics, isolation and manipulation of DNA, reactions and characterization of lipids and carbohydrates.  
Laboratory: three hours.



**B.S. CHEMISTRY MAJOR****First Semester****FRESHMAN YEAR**

First Year Experience .....	LDRS	101	1	(2,0)*
General Chemistry I.....	CHEM	151	3	(3,0)
General Chemistry I Laboratory 161 or 163.....	CHEM		1	(0,3)
Analytic Geometry and Calculus I.....	MATH	131	4	(4,0)
Modern Language .....			3	(3,0)
Physical Fitness, Resiliency, and Wellness ....	RPED	260	3	(3,0)
1st Year Basic ROTC .....		101	1	(1,0)

**SOPHOMORE YEAR**

Leadership Service Lab.....	LDRS	211	0	(0,1)
Organic Chemistry I.....	CHEM	207	3	(3,0)
Organic Chemistry I Laboratory.....	CHEM	217	1	(0,3)
Physics with Calculus I.....	PHYS	221	3	(3,0)
Physics with Calculus I Laboratory .....	PHYS	271	1	(0,2)
General Elective.....			3	(3,0)
General Elective.....			3	(3,0)
Required Physical Education .....	RPED		0	(0,1)
2nd Year Basic ROTC.....		201	2	(2,0)

**JUNIOR YEAR**

Junior Ethics Enrichment Experience .....	LDRS	311	0	(1,0)
Principled Leadership in American Gov.....	LDRS	202	3	(0,3)
Quantitative Analysis.....	CHEM	300	4	(3,3)
Physical Chemistry I.....	CHEM	305	3	(3,0)
Physical Chemistry I Lab.....	CHEM	315	1	(0,3)
Strand Course§.....			3	(3,0)
***Approved ACS Elective .....			3	(3,0)
1st Year Advanced ROTC .....				

**SENIOR YEAR**

Senior Leadership Integration Seminar .....	LDRS	411	0	(1,0)
Inorganic Chemistry I .....	CHEM	401	3	(3,0)
Biochemistry .....	CHEM	409	3	(3,0)
Senior Research .....	CHEM	419	3	
**Approved Elective .....			3	(3,0)
General Elective.....			3	(3,0)
2nd Year Advanced ROTC.....				

\*Represents semester credit, lecture, and laboratory hours, in that order.

\*\*Approved Electives: BIOL 290, 308, 421, 424, 427; CHEM 402, 404, 410; CSCI 205; MATH 303, 335, 343, 344, 381, 403, 411, 422, 470; PHYS 301, 307, 308, 315, 320, 403, 405, 409, 410.

§Students must complete three strand courses, which may be completed in any order: English(ENGS 30X), History (HISS 30X), and Social Science (SCSS 30X).

**B.S. CHEMISTRY MAJOR**

**Second Semester**

**FRESHMAN YEAR**

Freshman Seminar .....	FSEM	101	3	(3,0)
Freshman Linked Writing Intensive.....	FSWI	101	3	(3,0)
Modern Language .....			3	(3,0)
General Chemistry II.....	CHEM	152	3	(3,0)
General Chemistry II Laboratory 162 or 164	CHEM		1	(0,3)
Analytic Geometry and Calculus II .....	MATH	132	4	(4,0)
1st Year Basic ROTC .....		102	1	(1,0)

**SOPHOMORE YEAR**

Organic Chemistry II .....	CHEM	208	3	(3,0)
Organic Chemistry II Laboratory.....	CHEM	218	1	(0,3)
Scientific Communications .....	CHEM	220	3	(3,0)
Physics with Calculus II.....	PHYS	222	3	(3,0)
Physics with Calculus II Laboratory.....	PHYS	272	1	(0,2)
Strand Course§ .....			3	(3,0)
Required Physical Education .....	RPED		0	(0,1)
2nd Year Basic ROTC.....				

**JUNIOR YEAR**

Leadership in Organizations .....	LDRS	371	3	(3,0)
Instrumental Methods .....	CHEM	302	4	(2,4)
Physical Chemistry II.....	CHEM	306	3	(3,0)
Physical Chemistry II Laboratory .....	CHEM	316	1	(0,3)
Strand Course§ .....			3	(3,0)
General Elective.....			3	(3,0)
1st Year Advanced ROTC .....				

**SENIOR YEAR**

***Approved ACS Elective.....	CHEM		3	(3,0)
Capstone/Senior Research Project .....	CHEM	420	3	
General Elective.....			3	(3,0)
General Elective.....			3	(3,0)
2nd Year Advanced ROTC.....				

\*\*\*Approved ACS Elective: Students pursuing the ACS accredited degree need to take MATH 234 and CHEM 460 for two of their free electives.

REQUIRED FOR GRADUATION: 121 credit hours plus successful completion of all RPED, ROTC, and LDRS graduation requirements. ROTC hours (credits, lectures, and labs) vary each semester by military department.

**B.S. CHEMISTRY MAJOR**  
**Biochemistry Specialty**  
**First Semester**

**FRESHMAN YEAR**

First Year Experience .....	LDRS	101	1	(2,0)*
General Chemistry I.....	CHEM	151	3	(3,0)
General Chemistry I Laboratory 161 or 163.....	CHEM		1	(0,3)
Analytic Geometry and Calculus I.....	MATH	131	4	(4,0)
Modern Language .....			3	(3,0)
Physical Fitness, Resiliency, and Wellness ....	RPED	260	3	(3,0)
1st Year Basic ROTC .....		101	1	(1,0)

**SOPHOMORE YEAR**

Leadership Service Lab..... (May be taken either semester)	LDRS	211	0	(0,1)
Organic Chemistry I.....	CHEM	207	3	(3,0)
Organic Chemistry I Laboratory.....	CHEM	217	1	(0,3)
Physics with Calculus I.....	PHYS	221	3	(3,0)
Physics with Calculus I Laboratory .....	PHYS	271	1	(0,2)
Strand Course§.....			3	(3,0)
General Elective.....			3	(3,0)
Required Physical Education .....	RPED		0	(0,1)
2nd Year Basic ROTC.....		201	2	(2,0)

**JUNIOR YEAR**

Junior Ethics Enrichment Experience .....	LDRS	311	0	(1,0)
Quantitative Analysis.....	CHEM	300	4	(3,3)
Physical Chemistry I.....	CHEM	305	3	(3,0)
Biochemistry I.....	CHEM	409	3	(3,0)
Biochemistry Laboratory .....	CHEM	460	1	(0,3)
Strand Course§.....			3	(3,0)
1st Year Advanced ROTC .....				

**SENIOR YEAR**

Senior Leadership Integration Seminar .....	LDRS	411	0	(1,0)
Inorganic Chemistry I .....	CHEM	401	3	(3,0)
Senior Research I.....	CHEM	419	3	
General Elective.....			3	(3,0)
General Elective.....			3	(3,0)
**Approved Elective .....			3	(3,0)
2nd Year Advanced ROTC.....				

\*Represents semester credit, lecture, and laboratory hours, in that order.

\*\*Approved Biology electives: BIOL 290, 308, 421, 424, 427. Please check Biology prerequisites when planning your curriculum.

\*\*\*Students pursuing an ACS accredited degree need to choose MATH 243 and CHEM 315 as two of their free electives.

**B.S. CHEMISTRY MAJOR**  
**Biochemistry Specialty**  
**Second Semester**

**FRESHMAN YEAR**

Freshman Seminar .....	FSEM	101	3	(3,0)
Freshman Linked Writing Intensive.....	FSWI	101	3	(3,0)
Modern Language .....			3	(3,0)
General Chemistry II.....	CHEM	152	3	(3,0)
General Chemistry II Laboratory 162 or 164	CHEM		1	(0,3)
Analytic Geometry and Calculus II .....	MATH	132	4	(4,0)
1st Year Basic ROTC .....		102	1	(1,0)

**SOPHOMORE YEAR**

Organic Chemistry II .....	CHEM	208	3	(3,0)
Organic Chemistry II Laboratory.....	CHEM	218	1	(0,3)
Physics with Calculus II.....	PHYS	222	3	(3,0)
Physics with Calculus II Laboratory.....	PHYS	272	1	(0,2)
Scientific Communications .....	CHEM	220	3	(3,0)
Strand Course§.....			3	(3,0)
Required Physical Education .....	RPED		0	(0,1)
2nd Year Basic ROTC.....				

**JUNIOR YEAR**

Principled Leadership in American Gov.....	LDRS	202	3	(3,0)
Leadership in Organizations .....	LDRS	371	3	(3,0)
Instrumental Methods .....	CHEM	302	4	(2,4)
Physical Chemistry II.....	CHEM	306	3	(3,0)
Biochemistry II .....	CHEM	410	3	(3,0)
1st Year Advanced ROTC .....				

**SENIOR YEAR**

Capstone/Senior Research II.....	CHEM	420	3	(3,0)
Physical Chemistry II Laboratory.....	CHEM	316	1	(0,3)
General Elective.....			3	(3,0)
General Elective.....			3	(3,0)
General Elective.....			3	(3,0)
Elective .....			3	(3,0)
2nd Year Advanced ROTC.....				

§Students must complete three strand courses, which may be completed in any order: English (ENGS 30X), History (HISS 30X), and Social Science (SCSS 30X)

REQUIRED FOR GRADUATION: 123 credit hours plus successful completion of all RPED, ROTC, and LDRS graduation requirements. ROTC hours (credits, lectures, and labs) vary each semester by military department.

**B.A. CHEMISTRY MAJOR****First Semester****FRESHMAN YEAR**

First Year Experience .....	LDRS	101	1	(2,0)*
Freshman Seminar .....	FSEM	101	3	(3,0)
Freshman Linked Writing Intensive.....	FSWI	101	3	(3,0)
General Chemistry I.....	CHEM	151	3	(3,0)
General Chemistry I Laboratory 161 or 163.....	CHEM		1	(0,3)
Applied Calculus I.....	MATH	106	3	(3,0)
or Analytic Geometry and Calculus I.....	MATH	131	4	(4,0)
Modern Language .....			3	(3,0)
1st Year Basic ROTC .....		101	1	(1,0)

**SOPHOMORE YEAR**

Principled Leadership in American Gov. ....	LDRS	202	3	(3,0)
Leadership Service Lab.....	LDRS	211	0	(0,1)
(May be taken either semester)				
Strand Course§ .....			3	(3,0)
Organic Chemistry I.....	CHEM	207	3	(3,0)
Organic Chemistry I Laboratory .....	CHEM	217	1	(0,3)
College Physics I.....	PHYS	203	3	(3,0)
College Physics I Laboratory.....	PHYS	253	1	(0,2)
Required Physical Education .....	RPED		0	(0,1)
2nd Year Basic ROTC.....		201	2	(2,0)

**JUNIOR YEAR**

Junior Ethics Enrichment Experience.....	LDRS	311	0	(1,0)
Strand Course§ .....			3	(3,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
**Approved Elective .....			3	(3,0)
1st Year Advanced ROTC .....				

**SENIOR YEAR**

Senior Leadership Integration Seminar .....	LDRS	411	0	(1,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
**Approved Elective .....			3 or 4	
2nd Year Advanced ROTC.....				

\*Represents semester credit, lecture, and laboratory hours, in that order.

\*\*The BA also requires 14 credit hours of advanced electives from the following list of courses: CHEM 300, 302, 305/315, 306/316, 401, 402, 403, 409, 410, 460, 419, or PHYS 204/254, PHYS 222.

§Students must complete four strand courses, which may be completed in any order: English(ENGS 30X), History (HISS 30X), Social Science (SCSS 30X), and Science (NTSS 30X).

**B.A. CHEMISTRY MAJOR**

**Second Semester**

FRESHMAN YEAR

General Chemistry II.....	CHEM	152	3	(3,0)
General Chemistry II Laboratory 162 or 164 .....	CHEM		1	(0,3)
Applied Calculus II.....	MATH	107	3	(3,0)
or Analytic Geometry and Calculus II .....	MATH	132	4	(4,0)
or Statistical Methods .....	STAT	160	3	(3,0)
Modern Language .....			3	(3,0)
Physical Fitness, Resiliency, and Wellness ....	RPED	260	3	(3,0)
Elective .....			3	(3,0)
1st Year Basic ROTC .....		102	1	(1,0)

SOPHOMORE YEAR

Organic Chemistry II .....	CHEM	208	3	(3,0)
Organic Chemistry II Laboratory.....	CHEM	218	1	(0,3)
Scientific Communications .....	CHEM	220	3	(3,0)
Strand Course§.....			3	(3,0)
Elective .....			3	(3,0)
Required Physical Education .....	RPED		0	(0,1)
2nd Year Basic ROTC.....				

JUNIOR YEAR

Leadership in Organizations .....	LDRS	371	3	(3,0)
Strand Course§.....			3	(3,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
**Approved Elective .....			3 or 4	
1st Year Advanced ROTC .....				

SENIOR YEAR

Capstone/Senior Research II.....	CHEM	420	3	(3,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
**Approved Elective .....			3 or 4	
2nd Year Advanced ROTC.....				

REQUIRED FOR GRADUATION: 120-124 credit hours plus successful completion of all RPED, ROTC, and LDRS graduation requirements. ROTC hours (credits, lectures, and labs) vary each semester by military department.

**B.A. CHEMISTRY MAJOR****Clinical Concentration****First Semester****FRESHMAN YEAR**

First Year Experience .....	LDRS	101	1	(2,0)*
Freshman Seminar .....	FSEM	101	3	(3,0)
Freshman Linked Writing Intensive.....	FSWI	101	3	(3,0)
General Chemistry I.....	CHEM	151	3	(3,0)
General Chemistry I Laboratory 161 or 163.....	CHEM		1	(0,3)
Applied Calculus I.....	MATH	106	3	(3,0)
or Analytic Geometry and Calculus I.....	MATH	131	4	(4,0)
Modern Language .....			3	(3,0)
1st Year Basic ROTC.....		101	1	(1,0)

**SOPHOMORE YEAR**

Leadership Service Lab.....	LDRS	211	0	(0,1)
(May be taken either semester)				
Strand Course§.....			3	(3,0)
Strand Course§.....			3	(3,0)
Organic Chemistry I.....	CHEM	207	3	(3,0)
Organic Chemistry I Laboratory.....	CHEM	217	1	(0,3)
College Physics I.....	PHYS	203	3	(3,0)
College Physics I Laboratory.....	PHYS	253	1	(0,2)
Required Physical Education .....	RPED		0	(0,1)
2nd Year Basic ROTC.....		201	2	(2,0)

**JUNIOR YEAR**

Junior Ethics Enrichment Experience.....	LDRS	311	0	(1,0)
Principled Leadership in American Gov.....	LDRS	202	3	(3,0)
Introduction to Biology II.....	BIOL	140	3	(3,0)
Introduction to Biology II Laboratory.....	BIOL	141	1	(0,3)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
1st Year Advanced ROTC.....				

**SENIOR YEAR**

Senior Leadership Integration Seminar.....	LDRS	411	0	(1,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
**Required Concentration Course with Lab.....			3 or 4	
2nd Year Advanced ROTC.....				

\*Represents semester credit, lecture, and laboratory hours, in that order.

\*\*The Clinical Concentration requires two additional courses selected from BIOL 206, 217, 218, 290, 308, 340, 341, 421, 424, 427.

§Students must complete four strand courses, which may be completed in any order: English (ENGS 30X), History (HISS 30X), Social Science (SCSS 30X), and Science (NTSS 30X)

**B.A. CHEMISTRY MAJOR**

**Clinical Concentration**

**Second Semester**

FRESHMAN YEAR

General Chemistry II.....	CHEM	152	3	(3,0)
General Chemistry II Laboratory 162 or 164 .....	CHEM		1	(0,3)
Applied Calculus II.....	MATH	107	3	(3,0)
or Analytic Geometry and Calculus II .....	MATH	132	4	(4,0)
or Statistical Methods .....	STAT	160	3	(3,0)
Modern Language .....			3	(3,0)
Physical Fitness, Resiliency, and Wellness ....	RPED	260	3	(3,0)
Elective .....			3	(3,0)
1st Year Basic ROTC .....		102	1	(1,0)

SOPHOMORE YEAR

Strand Course§.....			3	(3,0)
Organic Chemistry II .....	CHEM	208	3	(3,0)
Organic Chemistry II Laboratory.....	CHEM	218	1	(0,3)
Scientific Communications .....	CHEM	220	3	(3,0)
Introduction to Biology I .....	BIOL	130	3	(3,0)
Introduction to Biology I Laboratory.....	BIOL	131	3	(3,0)
Required Physical Education .....	RPED		0	(0,1)
2nd Year Basic ROTC.....				

JUNIOR YEAR

Leadership in Organizations .....	LDRS	371	3	(3,0)
Strand Course§.....			3	(3,0)
Elective .....			3	(3,0)
Instrumental Methods .....	CHEM	302	4	(2,4)
Cell Biology.....	BIOL	205	4	(3,3)
1st Year Advanced ROTC .....				

SENIOR YEAR

Capstone/Senior Research II.....	CHEM	420	3	(3,0)
Biochemistry II .....	CHEM	410	3	(3,0)
and Biochemistry Laboratory .....	CHEM	460	1	(0,3)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
**Required Concentration Course with Lab.....			3 or 4	
2nd Year Advanced ROTC.....				

REQUIRED FOR GRADUATION: 123-126 credit hours plus successful completion of all RPED, ROTC, and LDRS graduation requirements. ROTC hours (credits, lectures, and labs) vary each semester by military department.



**B.A. CHEMISTRY MAJOR**  
**Environmental Concentration**  
**First Semester**

<b>FRESHMAN YEAR</b>				
First Year Experience .....	LDRS	101	1	(2,0)*
Freshman Seminar .....	FSEM	101	3	(3,0)
Freshman Linked Writing Intensive.....	FSWI	101	3	(3,0)
Modern Language .....			3	(3,0)
General Chemistry I.....	CHEM	151	3	(3,0)
General Chemistry I Laboratory 161 or 163.....	CHEM		1	(0,3)
Applied Calculus I .....	MATH	106	3	(3,0)
or Analytic Geometry and Calculus I .....	MATH	131	4	(4,0)
1st Year Basic ROTC .....		101	1	(1,0)
<b>SOPHOMORE YEAR</b>				
Leadership Service Lab.....	LDRS	211	0	(0,1)
(May be taken either semester)				
Strand Course§ .....			3	(3,0)
Strand Course§ .....			3	(3,0)
Organic Chemistry I.....	CHEM	207	3	(3,0)
Organic Chemistry I Laboratory .....	CHEM	217	1	(0,3)
College Physics I.....	PHYS	203	3	(3,0)
College Physics I Laboratory.....	PHYS	253	1	(0,2)
Required Physical Education .....	RPED		0	(0,1)
2nd Year Basic ROTC.....		201	2	(2,0)
<b>JUNIOR YEAR</b>				
Junior Ethics Enrichment Experience .....	LDRS	311	0	(1,0)
Principled Leadership in American Gov. ....	LDRS	202	3	(3,0)
Introduction to Biology I .....	BIOL	130	3	(3,0)
Introduction to Biology I Laboratory.....	BIOL	131	3	(3,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
Elective .....			3	(3,0)
1st Year Advanced ROTC .....				
<b>SENIOR YEAR</b>				
Senior Leadership Integration Seminar .....	LDRS	411	0	(1,0)
**Advanced Course with Lab.....			3 or 4	
***Concentration Course with Lab .....			3 or 4	
***Concentration Course with Lab .....			3 or 4	
Elective .....			3	(3,0)
Elective .....			3	(3,0)
2nd Year Advanced ROTC.....				

\*Represents semester credit, lecture, and laboratory hours, in that order.

§Students must complete four strand courses, which may be completed in any order: English (ENGS 30X), History (HISS 30X), Social Science (SCSS 30X), and Science (NTSS 30X)

**B.A. CHEMISTRY MAJOR**  
**Environmental Concentration**  
**Second Semester**

**FRESHMAN YEAR**

General Chemistry II.....	CHEM	152	3	(3,0)
General Chemistry II Laboratory 162 or 164 .....	CHEM		1	(0,3)
Applied Calculus II.....	MATH	107	3	(3,0)
or Analytic Geometry and Calculus II .....	MATH	132	4	(4,0)
or Statistical Methods .....	STAT	160	3	(3,0)
Modern Language .....			3	(3,0)
Physical Fitness, Resiliency, and Wellness ....	RPED	260	3	(3,0)
Elective .....			3	(3,0)
1st Year Basic ROTC .....		102	1	(1,0)

**SOPHOMORE YEAR**

Organic Chemistry II .....	CHEM	208	3	(3,0)
Organic Chemistry II Laboratory.....	CHEM	218	1	(0,3)
Scientific Communications .....	CHEM	220	3	(3,0)
College Physics II .....	PHYS	204	3	(3,0)
Physics with Calculus II.....	PHYS	222	3	(3,0)
Strand Course§.....			3	(3,0)
Required Physical Education .....	RPED		0	(0,1)
2nd Year Basic ROTC.....				

**JUNIOR YEAR**

Leadership in Organizations .....	LDRS	371	3	(3,0)
Strand Course§.....			3	(3,0)
Elective .....			3	(3,0)
Environmental Science .....	BIOL	209	3	(3,0)
**Advanced Course with Lab.....			3 or 4	
1st Year Advanced ROTC .....				

**SENIOR YEAR**

Capstone/Senior Research II.....	CHEM	420	3	(3,0)
**Advanced Course with Lab.....			3 or 4	
***Concentration Course with Lab .....			3 or 4	
Elective .....			3	(3,0)
Elective .....			3	(3,0)
2nd Year Advanced ROTC.....				

\*\*The BA also requires 14 credit hours of advanced electives from the following list of courses: CHEM 300, 302, (305/315), (306/316), 401, 402, 403, 409, 410, 460, 419, or PHYS 204/222.

\*\*\*The Environmental Concentration requires three additional courses selected from BIOL 140/141, BIOL 292, BIOL 406, BIOL 409, BIOL 425, BIOL 426, PHYS 243, PHYS 343.

REQUIRED FOR GRADUATION: 121-127 credit hours plus successful completion of all RPED, ROTC, and LDRS graduation requirements. ROTC hours (credits, lectures, and labs) vary each semester by military department.