



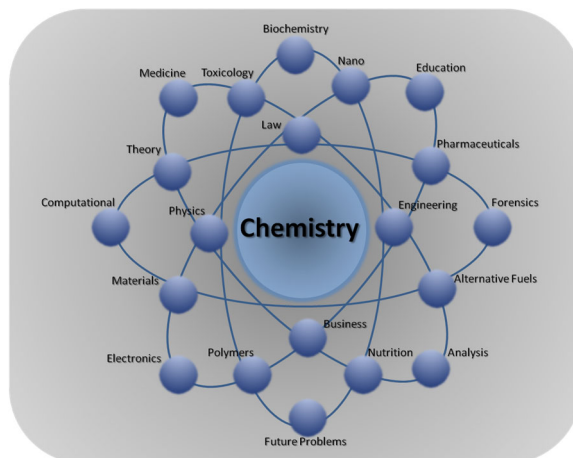
## Department of Chemistry And Life Science



## Chemistry Major

## Chemistry Major

Chemistry is the branch of sciences that studies the composition, structure, properties, changes and interactions of matter. Therefore, it is truly the central science and underpins much of the efforts of scientists and engineers to improve life for humankind.



### Chemistry Program Goals

- Use information resources to gather, organize, and understand scientific material.
- Design and execute experiments to address a problem or question.
- Analyze and assess scientific data gathered in the laboratory.
- Effectively and clearly communicate scientific information in written and oral form to a variety of audiences.
- Understand the applications of chemistry in the Army and society.
- Recognize relationships between the properties of a substance, its molecular structure, and its reactivity.
- Understand and apply the physical concepts of chemistry.



Image: 20th CBRNE Command



## Chemistry Program 8TAPs



40 (42) Required courses:  
26 Core, 3 Core Engineering Sequence (CES), 11 (13) Major

4th Class Year		3rd Class Year		2nd Class Year		1st Class Year	
Fall Term	Spring Term	Fall Term	Spring Term	Fall Term	Spring Term	Fall Term	Spring Term
MA103 Intro to Calc	MA104 Calculus 1	MA206 Prob and Stat	PY201 Philosophy	PL300 Mil Leadership	HI302 Mil Art	MX400 Officership	LW403 Con & Mil Law
CH101 Gen Chem 1	CH102 Gen Chem 2	PH205 Physics 1	PH206 Physics 2	MA205 Calculus 2	IT305 Info Tech Sys	CH472 Inorg Chem	CH487 Adv Chem Lab
EN101 Composition	EN102 Literature	EV203 Phy Geo	CH371 Anal Chem	CES1 Eng Seq 1	CES2 Eng Seq 2	CES3 Eng Seq 3	CH471 Polymer Chem
IT105 Intro to Comp	PL100 Gen Psych	CH383 Org Chem 1	CH384 Org Chem 2	CH481 Phys Chem 1	CH482 Phys Chem 2	Elective	SS307 Int'l Rel
HI105 History 1	HI108 History 2	SS201 Economics	SS202 Am Politics	DFL1 Language 1	DFL2 Language 2	CH474 Instrumental	CH473 Biochem
						CH489 Research	CH490 Research

\*ACS Certified Degree requires 4.5 credit hours of individual research from any combination of research courses.

\*Chemistry Degree with Honors requires:

- GPA  $\geq 3.0$  in 26 Core Courses and 3 Course Engineering Sequence
- GPA  $\geq 3.5$  in 13 Chemistry Program Courses

\*Elective can be selected from:

- Department of Chemistry and Life Science
- Any other Academic Department (pending approval of the Chemistry Program)

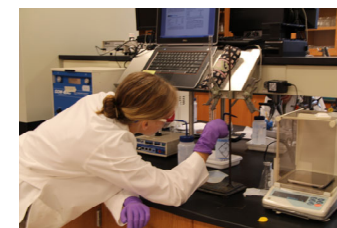
### ACS Certified Degree Program

The Chemistry Major provides an opportunity to earn an American Chemical Society (ACS) Certified Degree in addition to the baseline major. In order to receive an ACS Certified Degree, a Cadet must complete the 11 baseline Chemistry Major courses and a minimum of 4.5 credit hours of individual research in any combination of the research courses.

### Honors Program

The Chemistry Major also offers an Honors Program in addition to the baseline and ACS Certified Degree. To receive a Chemistry Major with Honors degree, a Cadet must complete the ACS Certified Degree requirements and:

- CH489 and CH490 (Individual Research I and II)
- Attain a QPA  $\geq 3.0$  in the 26 core academic program courses and 3-course engineering sequence
- Attain a QPA  $> 3.5$  in the 13 chemistry program courses



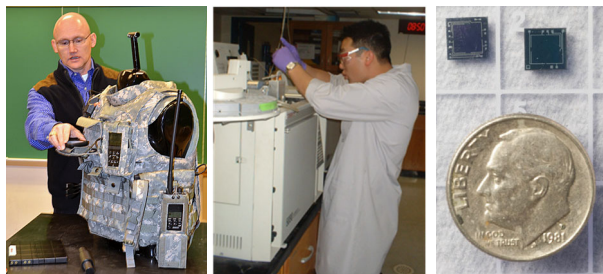


Image: Michael Merier/UAH

## AIAD Opportunities

The Advanced Individual Academic Development (AIAD) program allows Cadets to participate in a variety of summer enrichment opportunities that broaden their academic experience. The following are examples of organizations that support AIAD opportunities:

- Army Research Laboratory, Aberdeen Proving Ground and Adelphi, MD
- Edgewood Chemical and Biological Center, MD
- Picatinny Arsenal, NJ
- Walter Reed Army Medical Center, MD
- The Mint, West Point, NY
- U.S. Department of Agriculture, Washington, D.C.



Image: uam.es

Image: exponent.com

Image: 20th CBRNE Command

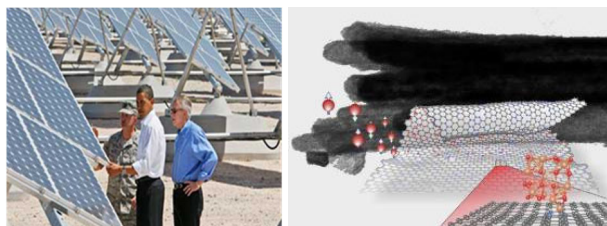


Image: Charles Dharapak

Image: Umea Universitet

## Required Courses

### CH371 Introduction to Analytical Chemistry:

The course provides an overview of contemporary analytical techniques with a focus on fundamental concepts. Topics include complexometric titration, acid-base equilibria, separations, redox potentials, electrochemistry, and spectroscopy.

### CH383/384 Organic Chemistry:

These courses focus on the relationship between chemical structure and the physical and chemical properties of molecules, to include relationships between free energy changes and equilibria, and between activation energy and rate of reaction. Reaction mechanisms and relationships between mechanisms, least energy path, intermediates, and transition states are also explored.

### CH471 Polymer Chemistry:

This course is an introduction to macromolecules and their properties. Topics include morphology, methods of polymerization and copolymerization, characterization, and testing.

### CH472 Inorganic Chemistry:

This course provides an in-depth study of main group and transition metal elements and their compounds, to include an emphasis on chemical bonding, and atomic and molecular structures that allow for a breadth of applications.

### CH473 Biochemistry:

This course focuses on biochemical systems at the molecular level with emphasis on structure-function relationships, metabolism, and regulation of systems and processes.

### CH474 Instrumental Methods of Analysis:

This is a laboratory-based course designed to develop theoretical understanding and proficiency in the selection and use of modern instrumental methods of chemical analysis.

### CH481 Physical Chemistry I:

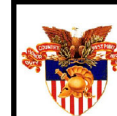
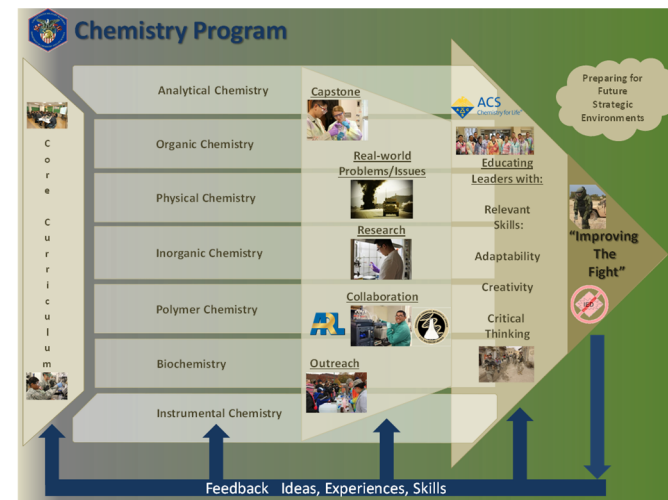
This course focuses on chemical thermodynamics with emphasis on chemical equilibrium, chemical kinetics, and intermolecular interactions. Topics include properties of real gases, kinetic theory of gases, laws of thermodynamics, diffusion, rates of reactions, and molecular reaction dynamics.

### CH482 Physical Chemistry II:

This course builds on the concepts covered in CH481 through a study of the quantum mechanics of atoms and molecules, their interaction with radiation, and statistical thermodynamics.

### CH487 Advanced Chemistry Laboratory:

This is an integrative laboratory experience in which students will further develop their knowledge and understanding of organic and inorganic syntheses, quantitative and qualitative instrumental analyses, and applications of physical chemistry principles pertaining to molecular structure and kinetics. Students will develop and conduct independent projects that involve synthesis and characterization techniques based on their collective classroom and laboratory experiences. Students will present the outcome of their studies in a scientific presentation.



## **United States Military Academy**

For more information contact:

Department of Chemistry and Life Science  
Bartlett Hall, Room 430  
West Point, NY 10996

COL Chi Nguyen  
845-938-4983  
chi.nguyen@westpoint.edu

LTC Victor Jaffett  
845-938-3909  
victor.jaffett@westpoint.edu

