# APPLIED CHEMISTRY, BACHELOR OF SCIENCE

**College of Letters & Science**

Chemistry studies the composition of matter, its structure, and the means by which it is converted from one form to another.

## The Program

The Department of Chemistry offers two Bachelor of Science degree emphases under the heading of Applied Chemistry: Environmental Chemistry and Forensic Chemistry. The B.S. emphasis in Applied Chemistry falls outside of the classical chemistry degree and instead draws on significant course material from areas relevant to their particular fields. The Environmental Chemistry program provides students with tools to understand the processes governing chemical transformations in soil, air, and water, analyze key substances in the environment, and make meaningful predictions about the fates of these chemicals. The Forensic Chemistry program involves the identification and quantification of scientific evidence both in the natural environment and in urban settings, including substances sometimes available in only trace amounts.

### Career Alternatives

Environmental chemistry graduates with the bachelor's degree will be able to pursue advanced degrees in areas such as atmospheric chemistry, geochemistry, toxicology, and environmental science. They will also have access to a range of scientific careers including regulatory agencies, environmental consulting firms, and industries concerned with the environmental impacts and fates of their products. Forensic chemistry graduates will be able to pursue careers in private forensic labs as well as law enforcement and regulatory agencies at many levels, including police and sheriff's departments, district attorney crime labs, and laboratories of federal agencies including the FBI, DEA, FDA, and many others.

### Major Advisor

To contact a major advisor in the Department of Chemistry, see Academic Advising (https://chemistry.ucdavis.edu/undergraduate/academic-advising/).

### Honors & Honors Program

The student must take CHE 194HA, CHE 194HB, & CHE 194HC, and complete a capstone research project (typically a written honors thesis). For more information, see Undergraduate Research (https://chemistry.ucdavis.edu/undergraduate/undergraduate-research/) on the department's website.

## Graduate Study

The Department of Chemistry offers programs of study and research leading to M.S. and Ph.D. degrees in Chemistry. Detailed information regarding graduate study may be obtained by contacting the Graduate Advisor, Department of Chemistry. See also Graduate Studies (http://gradstudies.ucdavis.edu/).

The major requirements below are in addition to meeting University Degree Requirements (https://catalog.ucdavis.edu/undergraduate-education/university-degree-requirements/) & College Degree Requirements (https://catalog.ucdavis.edu/undergraduate-education/college-degree-requirements/); unless otherwise noted. Respective of the Emphasis, the minimum number of units required for the Applied Chemistry Bachelor of Science are 95 & 99.

## Environmental Chemistry Emphasis

| Code | Title | Units |
|---|---|---|
| **Preparatory Subject Matter** | | |
| *Chemistry* | | |
| Choose a series: | | 15 |
| CHE 002A<br>& CHE 002B<br>& CHE 002C | General Chemistry<br>and General Chemistry<br>and General Chemistry | |
| CHE 004A<br>& CHE 004B<br>& CHE 004C | General Chemistry for the Physical Sciences & Engineering<br>and General Chemistry for the Physical Sciences & Engineering<br>and General Chemistry for the Physical Sciences & Engineering | |
| *Physics* | | |
| Choose a series: | | 12-15 |
| PHY 007A<br>& PHY 007B<br>& PHY 007C | General Physics<br>and General Physics<br>and General Physics | |
| PHY 009A<br>& PHY 009B<br>& PHY 009C | Classical Physics<br>and Classical Physics<br>and Classical Physics | |
| **Mathematics** | | |
| Choose a series: | | 9-12 |
| MAT 016A<br>& MAT 016B<br>& MAT 016C DISCO | and<br>and (Discontinued) | |
| MAT 017A<br>& MAT 017B<br>& MAT 017C | Calculus for Biology & Medicine<br>and Calculus for Biology & Medicine<br>and Calculus for Biology & Medicine | |
| MAT 019A<br>& MAT 019B<br>& MAT 019C | Calculus for Data-Driven Applications<br>and Calculus for Data-Driven Applications<br>and Calculus for Data-Driven Applications | |
| MAT 021A<br>& MAT 021B<br>& MAT 021C | Calculus<br>and Calculus<br>and Calculus | |
| *Biological Science* | | *5* |
| BIS 002A | Introduction to Biology: Essentials of Life on Earth | |
| *Statistics* | | |
| Choose one: | | 4 |
| STA 013 | Elementary Statistics | |
| or STA 013Y | Elementary Statistics | |
| STA 032 | Gateway to Statistical Data Science | |
| STA 100 | Applied Statistics for Biological Sciences | |
| Preparatory Subject Matter Subtotal | | 45-51 |
| **Depth Subject Matter** | | |
| *Chemistry* | | *32-39* |
| CHE 100 | Environmental Water Chemistry | |
| CHE 105 | Analytical & Physical Chemical Methods | |
| CHE 115 | Instrumental Analysis | |
| CHE 124A | Inorganic Chemistry: Fundamentals | |

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|---|---|---|
| Choose a series: | | |
| CHE 107A<br>& CHE 107B | Physical Chemistry for the Life Sciences<br>and Physical Chemistry for the Life Sciences | |
| CHE 110A<br>& CHE 110B<br>& CHE 110C | Physical Chemistry: Introduction to Quantum Mechanics<br>and Physical Chemistry: Properties of Atoms & Molecules<br>and Physical Chemistry: Thermodynamics, Equilibria & Kinetics | |
| Choose 118 series or 128 series, & CHE 129A & CHE 129B: | | |
| CHE 118A<br>& CHE 118B<br>& CHE 118C | Organic Chemistry for Health & Life Sciences<br>and Organic Chemistry for Health & Life Sciences<br>and Organic Chemistry for Health & Life Sciences | |
| **OR** | | |
| CHE 128A<br>& CHE 128B<br>& CHE 128C | Organic Chemistry<br>and Organic Chemistry<br>and Organic Chemistry | |
| **AND** | | |
| CHE 129A<br>& CHE 129B | Organic Chemistry Laboratory<br>and Organic Chemistry Laboratory | |
| *Environmental Science & Policy* | | *4* |
| ESP 110 | Principles of Environmental Science | |
| *Environmental Toxicology* | | *4* |
| ETX 101 | Principles of Environmental Toxicology | |
| Choose three: | | 7-15 |
| ATM 160 | Introduction to Atmospheric Chemistry | |
| ESM 120 | Global Environmental Interactions | |
| ESP 151 | Limnology | |
| ETX 102A | Environmental Fate of Toxicants | |
| ETX 102B | Quantitative Analysis of Environmental Toxicants | |
| ETX 120 | Perspectives in Aquatic Toxicology | |
| ETX 131 | Environmental Toxicology of Air Pollutants | |
| ETX 135 | Health Risk Assessment of Toxicants | |
| ETX 146 | Exposure & Dose Assessment | |
| ETX 180 | Chemistry & Toxicology of Metals | |
| FPS 161 | Structure & Properties of Fibers | |
| FPS 161L | Textile Chemical Analysis Laboratory | |
| GEL 146 | Radiogenic Isotope Geochemistry & Cosmochemistry | |
| GEL 148 | Stable Isotopes & Geochemical Tracers | |
| GEL/ESP 150A | Physical & Chemical Oceanography | |
| HYD 134 | Aqueous Geochemistry | |
| SSC 102 | Environmental Soil Chemistry | |
| SSC 111 | Soil Microbiology | |
| At least three additional upper division units in Chemistry (CHE) [1] | | 3 |
| Depth Subject Matter Subtotal | | 50-65 |
| **Total Units** | | **95-116** |

1

CHE 199 strongly encouraged. In order to enroll in CHE 199, students must first secure an undergraduate research position with a chemistry faculty member.

# Forensic Chemistry Emphasis

| Code | Title | Units |
|---|---|---|
| **Preparatory Subject Matter** | | |
| *Chemistry* | | |
| Choose a series: | | 15 |
| CHE 002A<br>& CHE 002B<br>& CHE 002C | General Chemistry<br>and General Chemistry<br>and General Chemistry | |
| CHE 004A<br>& CHE 004B<br>& CHE 004C | General Chemistry for the Physical Sciences & Engineering<br>and General Chemistry for the Physical Sciences & Engineering<br>and General Chemistry for the Physical Sciences & Engineering | |
| *Physics* | | |
| Choose a series: | | 12-15 |
| PHY 007A<br>& PHY 007B<br>& PHY 007C | General Physics<br>and General Physics<br>and General Physics | |
| PHY 009A<br>& PHY 009B<br>& PHY 009C | Classical Physics<br>and Classical Physics<br>and Classical Physics | |
| *Mathematics* | | |
| Choose a series: | | 9-12 |
| MAT 016A<br>& MAT 016B<br>& MAT 016C DISCO | and<br>and (Discontinued) | |
| MAT 017A<br>& MAT 017B<br>& MAT 017C | Calculus for Biology & Medicine<br>and Calculus for Biology & Medicine<br>and Calculus for Biology & Medicine | |
| MAT 019A<br>& MAT 019B<br>& MAT 019C | Calculus for Data-Driven Applications<br>and Calculus for Data-Driven Applications<br>and Calculus for Data-Driven Applications | |
| MAT 021A<br>& MAT 021B<br>& MAT 021C | Calculus<br>and Calculus<br>and Calculus | |
| *Biological Science* | | *5* |
| BIS 002A | Introduction to Biology: Essentials of Life on Earth | |
| *Environmental Toxicology* | | *3* |
| ETX 020 | Introduction to Forensic Science | |
| *Statistics* | | |
| Choose one: | | 4 |
| STA 013 | Elementary Statistics | |
| or STA 013Y | Elementary Statistics | |
| STA 032 | Gateway to Statistical Data Science | |
| STA 100 | Applied Statistics for Biological Sciences | |
| Preparatory Subject Matter Subtotal | | 48-54 |
| **Depth Subject Matter** | | |
| *Chemistry* | | *29-36* |

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|---|---|---|
| CHE 104 | Forensic Applications of Analytical Chemistry | |
| CHE 105 | Analytical & Physical Chemical Methods | |
| CHE 115 | Instrumental Analysis | |
| Choose a series: | | |
| CHE 107A<br>& CHE 107B | Physical Chemistry for the Life Sciences<br>and Physical Chemistry for the Life Sciences | |
| CHE 110A<br>& CHE 110B<br>& CHE 110C | Physical Chemistry: Introduction to Quantum Mechanics<br>and Physical Chemistry: Properties of Atoms & Molecules<br>and Physical Chemistry: Thermodynamics, Equilibria & Kinetics | |
| Choose 118 series or 128 series, & CHE 129A & CHE 129B: | | |
| CHE 118A<br>& CHE 118B<br>& CHE 118C | Organic Chemistry for Health & Life Sciences<br>and Organic Chemistry for Health & Life Sciences<br>and Organic Chemistry for Health & Life Sciences | |
| **OR** | | |
| CHE 128A<br>& CHE 128B<br>& CHE 128C | Organic Chemistry<br>and Organic Chemistry<br>and Organic Chemistry | |
| **AND** | | |
| CHE 129A<br>& CHE 129B | Organic Chemistry Laboratory<br>and Organic Chemistry Laboratory | |
| *Environmental Toxicology* | | *13* |
| ETX 101 | Principles of Environmental Toxicology | |
| ETX 102A | Environmental Fate of Toxicants | |
| ETX 102B | Quantitative Analysis of Environmental Toxicants | |
| Choose one from each of the following lists: | | 6-9 |
| Choose one: | | |
| ESP 110<br>or ESP 161 | Principles of Environmental Science<br>Environmental Law | |
| Choose one: | | |
| BIS 101<br>or BIS 101V | Genes & Gene Expression<br>Genes & Gene Expression | |
| ETX 103A | Biological Effects of Toxicants | |
| ETX 103B | Biological Effects of Toxicants: Experimental Approaches | |
| ETX 111 | Introduction to Mass Spectrometry | |
| ETX 135 | Health Risk Assessment of Toxicants | |
| ETX 138 | Legal Aspects of Environmental Toxicology | |
| STA 108 | Applied Statistical Methods: Regression Analysis | |
| STA 130A | Mathematical Statistics: Brief Course | |
| At least three additional upper division units in Chemistry (CHE) [1] | | 3 |
| Depth Subject Matter Subtotal | | 51-61 |
| **Total Units** | | **99-115** |

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CHE 199 strongly encouraged. In order to enroll in CHE 199, students must first secure an undergraduate research position with a chemistry faculty member.