

Area: Science and Engineering  
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Degree: A.S. - General Science

American River College's chemistry program offers you a high quality education whether you are seeking to transfer to a 4-year college, obtain an Associate's Degree, or seeking to obtain career technical education. The highly trained faculty in the Chemistry Department is committed to rigorous academic standards, large selection of classes, student-friendly atmosphere, and interactive classes. Our diverse faculty is dedicated to teaching and learning. They have backgrounds that cover all aspects of chemistry. The department provides hands-on experiential learning as well as access to a nationally award-winning peer assisted tutorial program (Beacon).

### Career Opportunities

The opportunities for those that have a core knowledge and understanding of the principles of chemistry are varied. Fields requiring a background in chemistry include: Chemistry, Medicine/Nursing, Engineering, Dentistry, Biochemistry, Forensics, Physical Therapy, Veterinary Medicine, Biotechnology, Respiratory Therapy, Dental Assistant/ Physician Assistant, Psychology, Biology, Environmental Science, Pharmacy, Pathology, Nutrition and Food Science, Physics, Optometry, Criminal Justice, Viticulture, Chiropractic Medicine, Geology, and Exercise Science.

## General Science Degree

**Major Code: 011229A01**

This program provides a broad study in the fields of biological and physical sciences in preparation for transfer to a four-year program and continuation of studies in upper division science courses.

### Student Learning Outcomes

*Upon completion of this program, the student will be able to:*

- evaluate new and accepted ideas about the natural universe using scientific methods.
- analyze a wide variety of natural phenomena using basic definitions and fundamental theories of biological or physical sciences.
- apply appropriate quantitative and qualitative methods to interpret and analyze pertinent data.
- outline the basic concepts and fundamental theories of a natural science.
- articulate orally and/or in writing the importance of continuous examination and modification of accepted ideas as a fundamental element in the progress of science.
- discuss ethical components of scientific decision making and apply personal and social values within the process of decision making in scientific endeavors.

### Requirements for Degree 18 Units

**A minimum of 18 units from the following:** ..... 18<sup>1</sup>

#### Physical Science Courses:

ASTR	300, 310, 320, 330, 400, 481, 495, 499
CHEM	305, 306, 309, 310, 400, 401, 420, 421, 423, 495, 499
GEOG	300, 301, 305, 306, 307, 308, 309, 391, 392, 393, 394, 495, 499
GEOL	300, 301, 305, 306, 310, 311, 320, 325, 330, 331, 345, 390, 495, 499
PHYS	310, 311, 312, 350, 360, 410, 421, 431, 495, 499
PS	300, 301, 495, 499

#### Biological Science Courses:

ANTH	300, 301, 303, 370, 372, 480, 495, 499
BIOL	300, 301, 303, 305, 310, 322, 332, 342, 352, 370, 375, 390, 400, 410, 415, 420, 430, 431, 440, 442, 482, 495, 499
BIOT	301, 305, 307, 311, 312, 499
NATR	300, 302, 303, 304, 305, 306, 307, 310, 320, 322, 324, 330, 332, 346, 495, 499
PSYC	310, 311, 495, 499

<sup>1</sup>must be transfer-level and must include one laboratory course in a physical science and one laboratory course in a biological science.

**Associate Degree Requirements:** The General Science Associate in Science (A.S.) Degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See ARC graduation requirements.

## Chemistry

**CHEM 83 Strategies for Problem Solving in General, Organic and Biological Chemistry .75 Units***Corequisite: CHEM 309**Hours: 40.5 hours LAB*

This course develops analytical reasoning strategies, critical thinking skills, and problem-solving abilities for both quantitative and qualitative problems in chemistry. It is designed to support students enrolled in CHEM 309 at American River College. Pass/No Pass only.

**CHEM 84 Strategies for Problem Solving in General Chemistry I .75 Units***Corequisite: CHEM 400**Hours: 40.5 hours LAB*

This course develops analytical reasoning strategies, critical thinking skills, and problem-solving abilities for both quantitative and qualitative problems in chemistry. It is designed to support students enrolled in CHEM 400 at American River College, with content that will be specific to CHEM 400. Pass/No Pass only.

**CHEM 86 Strategies for Problem Solving in Organic Chemistry I .75 Units***Corequisite: CHEM 420**Hours: 40.5 hours LAB*

This course develops analytical reasoning strategies, critical thinking skills, and problem-solving abilities for both quantitative and qualitative problems in chemistry. It is designed to support students enrolled in CHEM 420 at American River College. Pass/No Pass Only.

**CHEM 87 Strategies for Problem Solving in Organic Chemistry II .75 Units***Corequisite: CHEM 421**Hours: 40.5 hours LAB*

This course develops analytical reasoning strategies, critical thinking skills, and problem-solving abilities for both quantitative and qualitative problems in chemistry. It is designed to support students enrolled in CHEM 421 at American River College.

**CHEM 130 Chemistry for Funeral Service 4 Units***Corequisite: BUS 340, FSE 310, and FSE 320**Enrollment Limitation: Acceptance into the Funeral Service Education program.**Hours: 72 hours LEC*

This course is a survey of the basic principles of chemistry as they relate to funeral service. Topics include chemical principles involved in sanitation, disinfection, public health, and embalming practices. It also covers the development and use of personal, professional, and community sanitation practices, as well as use of and precautions related to potentially harmful chemicals that are currently used in the field of funeral service.

**CHEM 305 Introduction to Chemistry 5 Units***Prerequisite: MATH 100, 104, or 132 with a grade of "C" or better**Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.**General Education: AA/AS Area IV; CSU Area B1; CSU Area B3;**IGETC Area 5A; IGETC Area 5C**Course Transferable to UC/CSU**Hours: 72 hours LEC; 54 hours LAB*

This course covers general principles of chemistry, such as unit analysis, atomic structure, nomenclature, mole concept, stoichiometry, and gases. It also introduces organic chemistry and biochemistry. This course is primarily designed for allied health majors. (C-ID CHEM 101; Part of C-ID PHYS 140)

**CHEM 306 Introduction to Organic and Biological Chemistry 5 Units***Prerequisite: CHEM 305 with a grade of "C" or better**Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.**General Education: CSU Area B1; CSU Area B3; IGETC Area 5A; IGETC Area 5C**Course Transferable to UC/CSU**Hours: 72 hours LEC; 54 hours LAB*

This course is a continuation of CHEM 305. It covers the organic functional groups and reactions involved in the chemistry of life (biochemistry) as applied to the health sciences. (C-ID CHEM 102)

**CHEM 309 Integrated General, Organic, and Biological Chemistry 5 Units***Prerequisite: MATH 100, 104, 129, or 132 with a grade of "C" or better, or placement through the assessment process.**Advisory: One year of high school chemistry with a grade of "C" or better; AND MATH 120 or MATH 133; AND eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300, OR ESLR 340 AND ESLW 340.**General Education: AA/AS Area IV; CSU Area B1; CSU Area B3;**IGETC Area 5A; IGETC Area 5C**Course Transferable to UC/CSU**Hours: 72 hours LEC; 54 hours LAB*

This course is an intensive survey of general, organic, and biological chemistry specifically designed for students majoring in nursing and other health-related fields. Topics include general chemistry, organic chemistry, and biological chemistry as they apply to the chemistry of the human body. This course satisfies the requirements of those health-career programs which require one semester of chemistry. Students enrolled in this course are strongly encouraged to co-enroll in CHEM 83.

**CHEM 310 Chemical Calculations 4 Units***Prerequisite: MATH 100, 104, 129, or 132 with a grade of "C" or better**Corequisite: MATH 120, 124, or 133**Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.**General Education: AA/AS Area IV**Course Transferable to CSU**Hours: 54 hours LEC; 54 hours LAB*

This course introduces calculations, terminology, chemical techniques, and laboratory techniques. It provides intensive problem solving skills necessary for CHEM 400.

**CHEM 400 General Chemistry I 5 Units***Prerequisite: MATH 120, 125, 129, or 133 with a grade of "C" or better AND one of the following: 1) CHEM 310 with a grade of "C" or better; or, 2) Previous chemistry course with a grade of "C" or better AND a passing score on the Chemistry Assessment Test from the Assessment Center at American River College.**Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.**General Education: AA/AS Area IV; CSU Area B1; CSU Area B3;**IGETC Area 5A; IGETC Area 5C**Course Transferable to UC/CSU**Hours: 54 hours LEC; 108 hours LAB*

This course covers the basic principles of chemistry with an emphasis on chemical calculations, chemical reactions including balancing of complicated reduction-oxidation (REDOX) reactions, stoichiometry, gas laws, thermochemistry, atomic structure and bonding theories, ionic equations, solutions, intermolecular forces and phases of matter, and acid/base chemistry including titrations and pH. Laboratory work is devoted to investigations of the theoretical work discussed in lecture. (C-ID CHEM 110; Part of C-ID CHEM 120S)

**CHEM 401 General Chemistry II****5 Units***Prerequisite: CHEM 400 with a grade of "C" or better**Advisory: Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300; OR ESLR 340 AND ESLW 340.**General Education: CSU Area B1; CSU Area B3; IGETC Area 5A; IGETC Area 5C**Course Transferable to UC/CSU**Hours: 54 hours LEC; 108 hours LAB*

This course is a continuation of the principles of chemistry with emphasis on equilibria, bonding, thermodynamics, kinetics, and electrochemistry. A brief introduction to organic chemistry is included. Laboratory work is devoted to qualitative analysis and experiments dealing with the theoretical work discussed in lecture. (Part of C-ID CHEM 120S)

**CHEM 420 Organic Chemistry I****5 Units***Prerequisite: CHEM 401 with a grade of "C" or better**Course Transferable to UC/CSU**Hours: 54 hours LEC; 108 hours LAB*

This course is designed to prepare students who are majoring in chemistry or chemical engineering, for transfer to a four-year institution, or to prepare students for entrance into professional schools in the fields of medicine, pharmacy, or dentistry. Emphasis is on the application of modern principles regarding structure, reactivity, methods of synthesis and physical properties of carbon compounds. (C-ID CHEM 150; Part of C-ID CHEM 160S)

**CHEM 421 Organic Chemistry II****5 Units***Prerequisite: CHEM 420 with a grade of "C" or better**Course Transferable to UC/CSU**Hours: 54 hours LEC; 108 hours LAB*

This course covers general physical and chemical properties of aromatic compounds, ethers, carbonyl compounds, amines, carbonyl derivatives, and biological compounds of interest. It also includes mass spectrometry, ultraviolet-visible (UV-VIS) spectroscopy, and carbon-13 nuclear magnetic resonance (NMR). Special attention is given to development of reaction mechanisms, methods of organic synthesis, and instrumental analysis as they apply to organic chemistry. (Part of C-ID CHEM 160S)

**CHEM 423 Organic Chemistry - Short Survey****5 Units***Prerequisite: CHEM 401 with a grade of "C" or better**General Education: CSU Area B1; CSU Area B3; IGETC Area 5A; IGETC Area 5C**Course Transferable to UC/CSU**Hours: 72 hours LEC; 54 hours LAB*

This course is a survey of carbon containing compounds with emphasis on organic compounds of biological interest. Topics include the chemistry of organic functional groups, Infra Red spectroscopy, and mechanisms of reactions. This course is designed primarily for students majoring in the life sciences, nutrition/dietetics, and related fields. This course is not recommended for students majoring in chemistry, chemical engineering, medicine, dentistry, pharmacy, or chiropractics.

**CHEM 495 Independent Studies in Chemistry****1-3 Units***Prerequisite: None**Course Transferable to CSU**Hours: 54-162 hours LAB*

Independent Study is an opportunity for the student to extend classroom experience in this subject, while working independently of a formal classroom situation. Independent study is an extension of work offered in a specific class in the college catalog. To be eligible for independent study, students must have completed the basic regular catalog course at American River College. They must also discuss the study with a professor in this subject and secure approval. Only one independent study for each catalog course will be allowed.