# CHEMISTRY, BS

Natural Sciences, Mathematics, and Engineering (nsme) (https://catalog.csub.edu/general-information/csub-information/school-natural-sciences-mathematics-engineering/)

Department of Chemistry and Biochemistry (https://catalog.csub.edu/general-information/csub-information/school-natural-sciences-mathematics-engineering/department-chemistry-biochemistry/)

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www.csub.edu/Chemistry (http://www.csub.edu/Chemistry/)

Program Maps for Natural Sciences, Mathematics, and Engineering (https://programmap.csub.edu/academics/interest-clusters/4e942a6e-b8e4-4b60-a1ae-334235acc581/)

## Program Description

Modern chemistry occupies a central position among the sciences. The goal of chemical science is to discover the fundamental regularities by which matter in its multitude of aggregations interacts with energy in its many forms. Mathematical models and physical principles are utilized in the interpretation of chemical concepts. The organization of chemical knowledge leads to an understanding of natural phenomena in the real world of earth and life sciences.

Biochemistry is a continuously advancing field, vitally important to modern life sciences such as agriculture, biology, microbiology, medicine, pharmacy, and veterinary science. This field studies life in all biological systems, i.e., human, animal, plant, microorganisms, and viruses at the molecular level. Biochemistry is the discipline that explains the structures and the activities of living things at a sub-microscopic level combining principles of biology, chemistry, and physics. Biochemical understanding has served as the basis for major developments in health sciences related research, and significantly contributed to the formation of the biotechnology industry. The emerging knowledge has resulted in a revolution of our understanding of life forces and will have a continuously increasing impact on society.

The departmental academic program is designed to provide essential preparation for students to pursue professional careers and/or advanced studies in chemistry or related disciplines, such as Agricultural Chemistry, Biochemistry, Clinical Chemistry, Environmental Chemistry, and Forensics Chemistry. The department offers course work for chemistry majors to meet the requirements of medical and other professional schools in the health sciences, including dentistry, pharmacy, and veterinary medicine. It also cooperates with other departments and the School of Social Sciences and Education in developing a balanced program of academic and professional preparation for chemistry majors who seek teaching credentials.

## Teaching Credential: Science Teacher Preparation Program Leading to a Degree in Natural Sciences, Primary Concentration in Chemistry

The California Commission on Teacher Credentialing (CCTC) has authorized CSUB to offer a single subject matter preparation program in Natural Sciences leading to a Bachelor of Arts degree. This course work satisfies the subject matter requirements for a "Secondary Teaching Credential in Science." The program consists of three components: I. Primary Concentration (major); II. Secondary Concentration (minor); and III. Breadth (cognates). Program completion leads to a BA degree in Natural Sciences with a major in the area of primary concentration and a minor in the secondary concentration. Additional information may be obtained from the Chemistry Department office (661-654-2030).

For a detailed description of the course requirements, please turn to the Natural Sciences section in this catalog.

## General Chemistry and Transfer Students

Students who have taken a full year of general chemistry and then transfer to CSUB will typically receive credit for CHEM 1000, 1001, 1100, and 1600. However, topics in CHEM 1100 and CHEM 1600 are covered in greater depth than in a typical general chemistry course and some students elect to take one or both courses even after completing general chemistry.

## Academic Regulations

A grade of "C" in chemistry, cognate, and all other major/minor courses is the minimal grade acceptable for progression into subsequent chemistry courses and for graduation. Students who fail to achieve at least a "C" may repeat the course. If a course is satisfactorily completed, the prior unsatisfactory grade will no longer bar a student from continuing in the Chemistry program. Credit, no-credit courses are not acceptable for the major or minor.

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| Code | Title | Units |
|---|---|---|
| **General Education Requirements** | | |
| First-Year Seminar (FYS) | | 2 |
| Lower Division Area A: Foundational Skills | | 9 |
| Lower Division Area B: Natural Sciences [2] | | 3 |
| Lower Division Area C: Arts and Humanities | | 6 |
| Lower Division Area D: Social and Behavioral Sciences | | 3 |
| Lower Division Area E: Student Enrichment and Lifelong Learning (SELF) [6] | | 0 |
| Lower Division Area F: Ethnic Studies | | 3 |
| American Institutions: Government and History | | 6 |

| | | |
|---|---|---|
| Junior Year Diversity & Reflection (JYDR) | | 3 |
| Graduation Writing Assessment Requirement (GWAR) [7] | | 0 |
| Upper Division Thematic Area C and D | | 6 |
| General Education Capstone [2] | | 0 |
| *General Education Subtotal* | | *41* |
| **Major Requirements** [1] | | |
| *Lower Division* [2] | | |
| CHEM 1000 | Foundations of Chemistry | 3 |
| CHEM 1001 | Foundations of Chemistry Laboratory | 2 |
| CHEM 1100 | Foundations of Analytical Chemistry | 2 |
| CHEM 1600 | Foundations of Physical Chemistry | 2 |
| CHEM 2110 | Foundations of Quantitative Chemical Analysis | 3 |
| CHEM 2200 | Foundations of Inorganic Chemistry | 2 |
| or CHEM 2240 | Foundations of Bioinorganic Chemistry | |
| CHEM 2300 | Foundations of Organic Chemistry | 3 |
| CHEM 2400 | Foundations of Biochemistry | 2 |
| CHEM 2900 | Research Methods in Chemistry [3] | 2 |
| *Upper Division* [2] | | |
| CHEM 3110 | Advanced Quantitative Chemical Analysis | 3 |
| CHEM 3300 | Intermediate Organic Chemistry | 3 |
| CHEM 3301 | Organic Chemistry Laboratory I | 2 |
| CHEM 3310 | Advanced Organic Chemistry | 2 |
| CHEM 3311 | Organic Chemistry Laboratory II | 2 |
| CHEM 3600 | Physical Chemistry:Thermodynamics and Kinetics | 3 |
| CHEM 3610 | Physical Chemistry: Quantum and Statistical Mechanics | 3 |
| CHEM 3908 | Seminar in Chemical Literature | 3 |
| CHEM 4100 | Chemical Separations | 1 |
| CHEM 4101 | Chemical Separations Laboratory | 1 |
| CHEM 4110 | Spectroscopy | 1 |
| CHEM 4200 | Inorganic Chemistry | 3 |
| CHEM 4908 | Senior Seminar in Chemistry | 3 |
| Select four additional units of the following: | | 4 |
| CHEM 3400 | Biochemistry of Metabolic Pathways | |
| CHEM 3401 | Biochemistry Laboratory I | |
| CHEM 3500 | Concepts of Food Analysis | |
| CHEM 3510 | Food Science | |
| CHEM 4010 | Symmetry and Group Theory | |
| CHEM 4020 | Computational Chemistry | |
| CHEM 4120 | Nuclear Magnetic Resonance | |
| CHEM 4121 | Spectroscopy Laboratory | |
| CHEM 4400 | Biochemistry of Nucleic Acids | |
| CHEM 4401 | Biochemistry Laboratory II | |
| CHEM 4410 | Protein Chemistry | |
| CHEM 4420 | Plant Biochemistry | |
| CHEM 4500 | Food Chemistry | |
| CHEM 4510 | Advanced Nutrition and Metabolism | |
| CHEM 4700 | Special Topics in Chemistry | |
| CHEM 4800 | Honors Research | |
| CHEM 4830 | Instruction in Chemistry | |
| *Cognates* [2] | | |
| Mathematics [4] | | |
| Select one of the following: | | 8 |
| MATH 2010 & MATH 2020 | Calculus for the Biological and Chemical Sciences I and Calculus for Biological & Chemical Sciences II | |
| MATH 2310 & MATH 2320 | Single Variable Calculus I for Engineers and Single Variable Calculus II for Engineers | |
| MATH 2510 & MATH 2520 | Single Variable Calculus I and Single Variable Calculus II | |
| Physics [5] | | |
| Select one of the following: | | 8 |
| PHYS 2110 & PHYS 2120 | College Physics I and College Physics II | |
| PHYS 2210 & PHYS 2220 | Physics for Scientists and Engineers I and Physics for Scientists and Engineers II | |
| *Major Subtotal* | | *71* |
| **Additional Units Needed Towards Graduation** | | **7-8** |
| **Total Units** | | **119-120** |

1 The minimum GPA for these 71-72 units is 2.0
2 Satisfied in major or cognate
3 Satisfies Area B1
4 Satisfies Area B4
5 Satisfies Area B1/B3
6 The SELF requirement is met by completing a LD Area C, or D course with a SELF component.
7 Can be satisfied by exam.