

CHEMISTRY (BS)

Offered at: San Luis Obispo Campus

The Chemistry and Biochemistry Department provides curricula leading to the Bachelor of Science in Chemistry and the Bachelor of Science in Chemistry with a concentration in Polymers and Coatings. Both the BS in Chemistry and the BS in Chemistry with a concentration in Polymers and Coatings are certified by the American Chemical Society.

The baccalaureate curriculum in chemistry includes required foundational courses in general chemistry, analytical chemistry, inorganic chemistry, organic chemistry, biochemistry, polymer chemistry, and physical chemistry. Advanced undergraduates choose electives from courses that cover a broad range of specialized topics, such as instrumental and environmental chemistry, nutritional biochemistry, advanced organic and physical chemistry, pharmacology, and polymer chemistry. The curriculum emphasizes laboratory work, especially current techniques and the use of instrumentation in all fields of chemistry. The program provides opportunities for independent research under faculty guidance, including a requirement for a capstone project. Under the department's cooperative education program, bachelor's degree candidates may work full-time in industry or government for one or two semesters, for pay and academic credit.

Career opportunities for chemists lie in traditional areas such as environmental analysis, the health professions, industrial research and production, pharmacology, toxicology, product quality control, and teaching at the secondary or university level. Newer opportunities lie in related areas such as library science, market research, patent law, and safety engineering.

Concentrations

Polymers and Coatings

Offered at: San Luis Obispo Campus

Students may select the Polymers and Coatings concentration instead of advanced approved biochemistry electives in Major Courses. The concentration includes the required courses in the biochemistry curriculum and electives in the area of polymers, coatings, surface chemistry and materials engineering. The concentration gives students the background and practical experience to move into a rewarding career in a wide range of fields including paints and coatings, resins, plastics, adhesives and sealants.

Program Learning Objectives

1. Understand and apply the fundamental concepts of chemistry in the following areas: calculation and estimation, structure and properties of atoms, ions and molecules, chemical bonding and chemical reactivity.
2. Use techniques and modern tools to conduct, design, analyze, and interpret experiments in chemistry and biochemistry.
3. Communicate effectively with the scientific community.
4. Apply concepts of math, physical and biological sciences to chemical problems.
5. Integrate the concepts, skills and attitudes from a general education with their major program to understand and explain the impact of chemistry, science and technology on issues in global, economic, environmental, and societal contexts.

Degree Requirements and Curriculum

In addition to the program requirements on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (<https://catalog.calpoly.edu/academic-standards-policies/general-requirements-bachelors-degree/#generaleducationtext>) section of this catalog, including:

- 40 units of upper-division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No Major, Support or Concentration courses may be selected as credit/no credit. In addition, no more than 12 units of cooperative or internship courses can count towards your degree requirements.

Code	Title	Units
MAJOR COURSES		
CHEM 1103	Research Methods I	1
CHEM 1120	Fundamentals of Chemical Structure and Properties (5A & 5C) ¹	4
CHEM 1122	Fundamentals of Chemical Reactivity	4
CHEM 2201 or CHEM 2203	Undergraduate Research Research Methods II	1
CHEM 2220	Inorganic Chemistry I: D-Block Chemistry	3

CHEM 2221	Inorganic Chemistry I Laboratory	1
CHEM 2242	Organic Chemistry I	5
CHEM 3302	Undergraduate Seminar II	1
CHEM 3330	Foundations of Chemical Analysis	4
CHEM 3352	Biochemistry (Upper-Division 2/5) ¹	4
CHEM 3380	Foundations of Macromolecular Chemistry	4
CHEM 3392	Physical Chemistry I	3
CHEM 3393	Physical Chemistry Laboratory I	1
CHEM 4461	Senior Project I	1
CHEM 4462	Senior Project II	1

Advanced Lecture/Laboratory Subdiscipline Extension Electives

Select courses from two different subdisciplines from the following: 8-10

Analytical

CHEM 4430	Instrumental Analysis
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Biochemistry

CHEM 3356	Genetic Information Processing
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Inorganic

CHEM 3320 & CHEM 3321	Inorganic Chemistry II: Group Theory and Spectroscopy and Inorganic Chemistry II Laboratory
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Organic

CHEM 2244	Organic Chemistry II
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Physical Chemistry

CHEM 3394 & CHEM 3395	Physical Chemistry II and Physical Chemistry Laboratory II
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Polymers

CHEM 4480 & CHEM 4481	Polymer Synthesis and Characterization and Polymer Synthesis and Characterization Laboratory
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Concentration or Advanced Elective Courses 13-16

(See Concentration below)

Advanced Electives ^{2,3}

CHEM 2244	Organic Chemistry II
CHEM 3320 & CHEM 3321	Inorganic Chemistry II: Group Theory and Spectroscopy and Inorganic Chemistry II Laboratory
CHEM 3354	Metabolism
CHEM 3356	Genetic Information Processing
CHEM 3370	Marine Chemistry
CHEM 3372	Environmental Chemistry
CHEM 3374	Chemical and Biological Warfare
CHEM 3394 & CHEM 3395	Physical Chemistry II and Physical Chemistry Laboratory II
CHEM 4401	Advanced Undergraduate Research ⁴
CHEM 4404	Learning Assistant Seminar ⁵
CHEM 4415	College Teaching Practicum
CHEM 4420	Inorganic Chemistry III: Transition Metals in Context
CHEM 4430	Instrumental Analysis
CHEM 4432	Advanced Techniques in Chemical Analysis
CHEM 4440	Advanced Organic Chemistry - Mechanisms
CHEM 4442	Advanced Organic Chemistry - Synthesis
CHEM 4444	Advanced Organic Chemistry Laboratory
CHEM 4450	Nutritional Biochemistry
CHEM 4451	Bioinformatics Applications
CHEM 4452	Physical Biochemistry Methods and Applications
CHEM 4453	Molecular Biology Techniques

CHEM 4454	Protein Techniques	
CHEM 4456	Chemical Biology	
CHEM 4457	Chemistry of Drugs and Poisons	
CHEM 4458	Neurochemistry	
CHEM 4470	Special Advanced Topics	
CHEM 4471	Special Advanced Laboratory	
CHEM 4480 & CHEM 4481	Polymer Synthesis and Characterization and Polymer Synthesis and Characterization Laboratory	
CHEM 4482	Coatings and Formulations	
CHEM 4483	Coatings and Formulations Laboratory	
CHEM 4484	Functional Polymeric Materials	
CHEM 4485	Cooperative Education Experience ⁵	
CHEM 4486	Surface Chemistry of Materials	
CHEM 4487	Polymers and Coatings Internship	
CHEM 4490	Computational Chemistry	
CHEM 4495	Cooperative Education Experience ⁵	
SCM/ENGR 3302	The Learn By Doing Lab Teaching Practicum ⁵	
SUPPORT COURSES		
BIO 1151	Life: Molecules and Cells (5B) ¹	4
MATH 1261	Calculus I (2) ¹	4
MATH 1262	Calculus II	4
MATH 2263	Calculus III	3
PHYS 1141	General Physics I	4
PHYS 1143	General Physics II	4
GENERAL EDUCATION (GE)		
(See GE program requirements below)		30
FREE ELECTIVES		
Free Electives ^{6, 7}		3-6
Total Units		120

¹ Required in Major or Support; also satisfies General Education (GE) requirement.

² Courses taken to meet a Major requirement cannot be double-counted in the concentration or in the Advanced Electives.

³ Consultation with advisor is recommended prior to selecting advanced electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

⁴ Maximum of 4 units may be applied toward Advanced Electives from CHEM 4401.

⁵ Maximum of 2 units may be applied toward Advanced Electives from the following: CHEM 4404, CHEM 4485, CHEM 4495, or SCM/ENGR 3302.

⁶ If a General Education (GE) course is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.

⁷ Free Electives may need to be at the 3000-4000 level to ensure completion of the required minimum of 40 units of upper-division courses.

Concentrations

Polymers and Coatings

Code	Title	Units
REQUIRED COURSES		
CHEM 4480	Polymer Synthesis and Characterization	3
CHEM 4481	Polymer Synthesis and Characterization Laboratory	2
CHEM 4482	Coatings and Formulations	3
CHEM 4483	Coatings and Formulations Laboratory	2
CHEM 4486	Surface Chemistry of Materials	3
Total Units		13

General Education (GE) Requirements

- 43 units required, 13 of which are specified in Major and/or Support.
- If any of the remaining 30 Units is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.
- See the complete GE course listing (<https://catalog.calpoly.edu/academic-standards-policies/general-requirements-bachelors-degree/#generaleducationtext>).
- A grade of C- or better is required in one course in each of the following GE Areas: 1A (English Composition), 1B (Critical Thinking), 1C (Oral Communication), and 2 (Mathematics and Quantitative Reasoning).

Lower-Division General Education

Area 1	English Communication and Critical Thinking	
1A	Written Communication	3
1B	Critical Thinking	3
1C	Oral Communication	3
Area 2	Mathematics and Quantitative Reasoning	
2	Mathematics and Quantitative Reasoning (3 units in Support) ¹	0
Area 3	Arts and Humanities	
3A	Arts	3
3B	Humanities: Literature, Philosophy, Languages other than English	3
Area 4	Social and Behavioral Sciences (Area 4 courses must come from at least two different course prefixes.)	
4A	American Institutions (Title 5, Section 40404 Requirement)	3
4B	Social and Behavioral Sciences	3
Area 5	Physical and Life Sciences	
5A	Physical Sciences (3 units in Major) ¹	0
5B	Life Sciences (3 units in Support) ¹	0
5C	Laboratory (may be embedded in a 5A or 5B course) (1 units in Major) ¹	0
Area 6	Ethnic Studies	
6	Ethnic Studies	3

Upper-Division General Education

Upper-Division 2/5	Mathematics and Quantitative Reasoning or Physical and Life Sciences (3 units in Major) ¹	0
Upper-Division 3	Arts and Humanities	3
Upper-Division 4	Social and Behavioral Sciences (Area 4 courses must come from at least two different course prefixes.)	3

Total Units	30
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¹ Required in Major or Support; also satisfies General Education (GE) requirement.

Coming soon