

CHEMISTRY, BS - GRADES 7-12 PHYSICAL SCIENCE EDUCATION CONCENTRATION

Program Description

Introduction

The College of Science is committed to the support of students seeking to become science, mathematics and technology educators at all levels. The Science, Mathematics and Technology Education (SMTE) program offers content courses for students seeking K-12 science, mathematics and technology education. SMTE classes are also an integral part of the course work for degrees preparing students for Teacher Certifications. The SMTE program does not offer a degree; rather, degrees leading to Teacher Certification are offered by other Science programs and by the College of Education and Human Development. Students seeking to teach in the elementary and secondary schools of Texas must meet degree requirements as well as certification requirements. The requirements and procedure to become a science, mathematics or technology teacher in Texas are outlined below. Undergraduate students who are graduating from the College of Science or the College of Liberal Arts who are seeking initial teacher certification at the 4-8, 7-12 and EC-12 levels prior to graduation.

How to Become a Science, Mathematics or Technology Teacher in Texas

In order to be recommended for teacher certification at this university, a candidate must fulfill three basic requirements:

1. have a bachelor's degree from an accredited college or university that includes an academic major and teacher training courses,
2. complete teacher training through an approved program, and
3. successfully complete the appropriate teacher certification tests for the subject and grade level that the candidate wishes to teach.

Additional information on the requirements to become a teacher in Texas can be obtained at the State Board of Educator Certification (SBEC) website: <http://www.sbec.state.tx.us/SBECOnline/certinfo/becometeacher.asp>. This website also provides information on the resources available to help students pay for a teacher training program.

SBEC has approved three levels of teacher certification for regular educators:

1. Early childhood to grade 6 which includes foundation subjects and enrichment areas such as art, PE, and music,
2. Grade 4-8 which includes the foundation areas only, and
3. Grade 7-12 certification.

Students can find information on the different certifications at the official Texas Examinations of Educator Standards (TEXES) Web site: <http://www.texas.ets.org>. Texas A&M University-Corpus Christi offers several degrees leading to a number of these teacher certifications. The College of Education and Human Development offers several degrees leading to teacher certification. The College of Science offers bachelor's degrees leading to teacher certification in the sciences, mathematics and technology at the 4-8 and the 7-12 levels:

- Biology, BS - Grades 7-12 Life Science Education Concentration (<https://catalog.tamucc.edu/undergraduate/science/teaching-certificates/biology-bs-grades-7-12-life-science-education-concentration/>) (120-122 sem. hrs.)
- **Chemistry, BS - Grades 7-12 Physical Science Education Concentration** (127-129 sem. hrs.) Details immediately follow below.
- Environmental Science, BS - Grades 4-8 Science Education Concentration (<https://catalog.tamucc.edu/undergraduate/science/teaching-certificates/environmental-science-bs-grades-4-8-science-education-concentration/>) (125-130 sem. hrs.)
- Elementary Education, BS - Grades 4-8 with Mathematics Certification (<https://catalog.tamucc.edu/undergraduate/education-human-development/bachelors/elementary-education-bs/#requirements-text>) (College of Education and Human Development)
- Mathematics, BS - Grades 7-12 Mathematics Education Concentration (<https://catalog.tamucc.edu/undergraduate/science/teaching-certificates/mathematics-bs-grades-7-12-education-concentration/>) (120 sem. hrs.)

Mathematics 7-12 teacher certification is also possible with an undergraduate major other than mathematics. Details can be found in the Mathematics, Grades 7-12 Teacher Certification Without a Mathematics Major (<https://catalog.tamucc.edu/undergraduate/science/teaching-certificates/mathematics-grades-7-12-teacher-certification-without-major/>) section.

The individual programs, Biology, Chemistry, Computer Science, Environmental Science, and Mathematics offer these degrees and courses.

Students seeking Teacher Certification are also strongly urged to contact the Certification Officer in the College of Education and Human Development about current requirements and procedures that must be met to obtain the certificate. In particular, students following a degree plan leading to teacher certification must be admitted to the Teacher Education Program at Texas A&M University-Corpus Christi **prior** to enrolling in any 4000 level EDCI or EDUC courses. Application forms for admission to the teacher education program may be obtained from the Undergraduate or Certification Office, room FC 201. The students are referred to the College of Education and Human Development section of this catalog for more information on the Teacher Education Program.

Grade Point Average for Admission to Teacher Education

A minimum grade point average of 2.75 (4.0 = A) in all work attempted, a minimum grade point average of 2.75 in all science, math, or specialization areas, and no grade below "C" in any science or mathematics course on a student's degree plan and/or education courses within the teacher education core block of courses are required. (See College of Education and Human Development, "Admission to Teacher Education" and "Admission to Student Teaching" for other requirements.)

Alteration of a Certification Plan

Any amendment to a degree plan originally filed must be approved by the student's academic advisor, the Department Chair, the Dean of the College of Science, and the Certification Officer of the College of Education and Human Development for the degree to be granted.

General Requirements

The Bachelor of Science degree in Chemistry with a Physical Science Education concentration is designed for those planning to teach

chemistry or physics at the 7-12 level, or who need chemical knowledge and skills relevant to future studies in the sciences. The BS in Chemistry requires at least 120 semester hours with a university required 45 upper-division hours. Students may have to take additional hours to meet university general education requirements such as First-Year Seminar courses. The degree requirements for the physical science education concentration are as follows:

Requirements	Credit Hours
University Seminar (when applicable) ¹	0-2
Core Curriculum Program (https://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/)	42
Special Foundation Courses	4
Chemistry Major Requirements	46
Electives	8
Teacher Education Core Requirements	27
Total Credit Hours	127-129

¹ Full-time, first time in college students are required to take university seminar.

- USSE 1201 University Seminar (2 sch)

Program Requirements

Code	Title	Hours
Full-time, First-year Students¹		
USSE 1201	University Seminar	2
Core Curriculum Program		
University Core Curriculum		42
Students choosing a physical science education concentration must take THE FOLLOWING as part of their core curriculum requirements:		
MATH 2413	Calculus I	
MATH 2414	Calculus II	
PHYS 2425	University Physics I	
PHYS 2426	University Physics II	
<i>Social and Behavioral Sciences</i>		
EDUC 1354	Child Growth and Development	
Special Foundations for Physical Science Education Concentration		
PHYS 2425	University Physics I (included in University Core) ²	
PHYS 2426	University Physics II (included in University Core) ²	
MATH 2413	Calculus I (included in University Core) ²	
MATH 2414	Calculus II (lecture included in University Core) ²	1
MATH 3315	Differential Equations	3
Chemistry Major for Physical Science Education Concentration		
CHEM 1411	General Chemistry I	4
CHEM 1412	General Chemistry II	4
CHEM 3411	Organic Chemistry I	4
CHEM 3412	Organic Chemistry II	4
CHEM 3417	Quantitative Analysis	4
CHEM 3418	Instrumental Analysis	4

CHEM 4401	Biochemistry I	4
CHEM 4443	Environmental Chemistry	4
CHEM 4423	Physical Chemistry I	4
PHYS 3334	Modern Physics I	3
SMTE 4217	Secondary Approaches to the Life Sciences	2
SMTE 4270	Science Education Topics I	2
SMTE 4320	Secondary Science Laboratory Techniques	3
Electives		
BIOL 1406	Biology I	4
BIOL 1407	Biology II	4
Teacher Education Core Requirements		
EDUC 2211	Foundations of Education	2
SPED 3310	Individual Differences in Schools and Communities	3
READ 3353	Content Area Reading for Secondary Students	3
or READ 3352	Content Area Reading for Elementary Students	
EDUC 3211	Culturally and Linguistically Responsive Teaching	2
BIEM 3357	Methods of Teaching English as a Second Language	3
EDUC 4305	Seminar I	3
IDET 4210	Design and Development of Technology-Integrated Learning Environments	2
EDUC 4694	Clinical Teaching	6
EDUC 4395	Seminar II	3
Total Hours		129

¹ Students entering with some college credit may not be required to take one or both of the First-Year Seminar courses (see the "First-Year Seminar" section of the Core Curriculum Program for rules and exceptions concerning these courses).

² Fifteen of these hours are used to fulfill the University Core Curriculum science and mathematics requirements.

Teacher Education Core Requirements

Students who seek an 7-12 level Physical Science teaching certificate should contact a Certification Officer in the College of Education and Human Development about requirements and procedures that must be met to obtain the certificate. The teacher education core must be taken in a specific order and it is recommended that students contact the College of Education and Human Development early in their academic careers for specific details on these courses.

Course Sequencing

First Year		
Fall		Hours
CHEM 1411	General Chemistry I	4
USSE 1201	University Seminar	2
BIOL 1406	Biology I	4
ENGL 1301	Writing and Rhetoric I	3
EDUC 1354	Child Growth and Development	3
Hours		16
Spring		
CHEM 1412	General Chemistry II	4
BIOL 1407	Biology II	4
ENGL 1302	Writing and Rhetoric II	3

American History Core Requirement	3
Hours	14
Summer	
MATH 2413 Calculus I	4
American History Core Requirement	3
Hours	7
Second Year	
Fall	
CHEM 3411 Organic Chemistry I	4
PHYS 2425 University Physics I	4
EDUC 2211 Foundations of Education	2
Language, Philosophy & Culture Core Requirement	3
MATH 2414 Calculus II	4
Hours	17
Spring	
CHEM 3412 Organic Chemistry II	4
PHYS 2426 University Physics II	4
POLS 2306 State and Local Government	3
SPED 3310 Individual Differences in Schools and Communities	3
POLS 2305 U.S. Government and Politics	3
Hours	17
Summer	
Creative Arts Core Requirement	3
CHEM 4401 Biochemistry I	4
Hours	7
Third Year	
Fall	
SMTE 4320 Secondary Science Laboratory Techniques	3
SMTE 4270 Science Education Topics I	2
SMTE 4217 Secondary Approaches to the Life Sciences	2
READ 3353 Content Area Reading for Secondary Students or READ 3352 Content Area Reading for Elementary Students	3
EDUC 3211 Culturally and Linguistically Responsive Teaching	2
CHEM 3418 Instrumental Analysis	4
Hours	16
Spring	
PHYS 3334 Modern Physics I	3
CHEM 3417 Quantitative Analysis	4
CHEM 4423 Physical Chemistry I	4
CHEM 4443 Environmental Chemistry	4
Hours	15
Fourth Year	
Fall	
EDUC 4305 Seminar I	3
IDET 4210 Design and Development of Technology-Integrated Learning Environments	2
BIEM 3357 Methods of Teaching English as a Second Language	3

MATH 3315 Differential Equations	3
Hours	11
Spring	
EDUC 4694 Clinical Teaching	6
EDUC 4395 Seminar II	3
Hours	9
Total Hours	129

Courses

CHEM 1305 Introductory Chemistry

3 Semester Credit Hours (3 Lecture Hours)

A one-semester principles course for students in non-science related majors covering the major concepts of chemistry (atomic structure, bonding, stoichiometry, elementary thermodynamics) and the role of chemistry in contemporary society (polymers, energy, pollution, etc.). Will not substitute for CHEM 1411.

TCCNS: CHEM 1305

CHEM 1406 Introductory Physiological Chemistry

4 Semester Credit Hours (3 Lecture Hours, 1 Lab Hour)

Fundamentals of chemistry with a descriptive introduction to organic and physiological chemistry. For students in nursing and other allied health programs which require only one semester of a laboratory chemistry. Safety training given during a laboratory meeting early in the semester is required for continued participation in this course.

Co-requisite: SMTE 0093.

CHEM 1411 General Chemistry I

4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

The foundation course in chemistry. Stoichiometry, chemical equilibria, atomic structure, chemical bonding, periodic properties, thermodynamics, chemical kinetics, and descriptive chemistry of the elements. Laboratory involves development of basic skills. This course counts toward the natural science component of the University Core Curriculum. Either CHEM 1305 - Introductory Chemistry or CHEM 1411, but not both, may be applied towards the core requirement. This course is offered in Fall, Spring and typically during both Summer sessions.

Co-requisite: SMTE 0093.

TCCNS: CHEM 1411

CHEM 1412 General Chemistry II

4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

The continuation of CHEM 1411 - General Chemistry I, the foundation course in chemistry with emphasis on quantitative aspects. Laboratory involves development of basic skills. This course counts toward the natural science component of the University Core Curriculum. CHEM 1411 - General Chemistry I and MATH 1314 - College Algebra or equivalent math competency or higher. This course is offered in Fall, Spring and typically both Summer sessions.

Prerequisite: CHEM 1411 and (MATH 1314, 1316, 1325, 2312, 2413, 2414, 2415 or 2305).

Co-requisite: SMTE 0093.

TCCNS: CHEM 1412

CHEM 2490 Special Topics

4 Semester Credit Hours (1-4 Lecture Hours, 3 Lab Hours)

May be repeated for credit. Subject materials variable. Offered on sufficient demand.

CHEM 3411 Organic Chemistry I**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

The structure, nomenclature, synthesis, reactions, and reaction mechanisms of the principal classes of organic compounds. Stereochemistry and spectroscopy of organic compounds. Laboratory involves separation and synthetic techniques and development of basic skills. This course is offered in Fall, Spring and typically during the Summer I session.

Prerequisite: CHEM 1411.

Co-requisite: SMTE 0093.

CHEM 3412 Organic Chemistry II**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A continuation of CHEM 3411. The course concludes with a survey of the structures of biomolecules. Laboratory involves spectroscopy and qualitative analysis techniques. This course is offered in Fall, Spring and typically during the Summer II session.

Prerequisite: CHEM 3411.

Co-requisite: SMTE 0093.

CHEM 3417 Quantitative Analysis**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A course in quantitative analysis, which includes chemical statistics and the use of acid-base, complexation, precipitation, and redox reactions to perform analyses and separations. Laboratory includes standard volumetric and gravimetric methods and development of basic quantitative techniques. This course is typically offered in Spring.

Prerequisite: CHEM 1412.

Co-requisite: SMTE 0093.

CHEM 3418 Instrumental Analysis**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

An introduction to instrumental methods of analysis: spectroscopy, chromatography, and electrochemical methods. Laboratory involves use of instrumentation in chemical analysis. This course is typically offered in Fall and Spring.

Prerequisite: CHEM 1412.

Co-requisite: SMTE 0093.

CHEM 4085 Major Field Test in Chemistry**0 Semester Credit Hours**

The Major Field Test (MFT) in Chemistry is a national examination given in the Fall and Spring semesters only. It is a graduation requirement for all Chemistry students. Students enroll in this course during the semester that they plan to take the MFT. There is no cost to the student for either this course or for the MFT.

CHEM 4292 Senior Chemistry Seminar**2 Semester Credit Hours (2 Lecture Hours)**

Presentation and discussion of selected topics in chemistry. Includes literature searches and reviews, paper presentations, survey of professional opportunities and requirements, career guidance and job searching skills.

CHEM 4309 Advanced Instrumental Analysis**3 Semester Credit Hours (3 Lecture Hours)**

An advanced course in analytical chemistry covering the underlying theories of instrumental methods. This course is typically offered on an irregular basis.

Prerequisite: (CHEM 3411, 3412 and 3418).

CHEM 4320 Drugs, Toxins and Natural Products Chemistry**3 Semester Credit Hours (3 Lecture Hours)**

The chemistry and biological activity of pharmaceuticals, toxins and selected natural products. Examines how chemical structure relates to biological activity. Also examines action of antibiotics, chemotherapy agents, analgesics, steroids, and compounds targeting the central and peripheral nervous system. This course is typically offered in Fall and Spring.

Prerequisite: CHEM 4401.

CHEM 4341 Organic Synthesis**3 Semester Credit Hours (3 Lecture Hours)**

This three-credit hour course will entail detailed description of structure, synthesis, and reactions and mechanisms in organic chemistry including important named reactions. This course will also introduce them to the art of writing reaction mechanisms and retrosynthetic analysis. Moreover, they will be learning about separation, purification and characterization of organic compounds followed by scientific abstract writing. Designed only for science major. There is NO laboratory associated with the course.

Prerequisite: CHEM 3412.

CHEM 4344 Chemical Oceanography**3 Semester Credit Hours (3 Lecture Hours)**

The study of the oceans and seas as a chemical system, including interactions with both the biota and the solid earth. This course is typically offered in Spring.

Prerequisite: CHEM 1412.

CHEM 4350 Polymer Chemistry**3 Semester Credit Hours (3 Lecture Hours)**

An advanced lecture course in organic chemistry. Characterization of polymers. Polymerization mechanisms. Current research directions such as biomedical applications and electroactive polymers. This course is offered on an irregular basis.

Prerequisite: CHEM 3412.

CHEM 4360 Molecular Spectroscopy**3 Semester Credit Hours (3 Lecture Hours)**

Spectroscopy and Structure of Organic Compounds is a three-credit that introduce you to concepts used in the identification of organic compounds with methods based on NMR, mass spectrometry, UV and IR.

Prerequisite: CHEM 3412.

CHEM 4401 Biochemistry I**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

The structure and function of carbohydrates, lipids, proteins, and nucleic acids. An introduction to enzyme kinetics, cell membrane structure and biochemical signaling. Laboratory exercises demonstrate the basic principles and techniques used in Biochemistry. This course is typically offered in Fall, Spring and Summer.

Prerequisite: CHEM 3412 and (BIOL 1406 and 1407).

Co-requisite: SMTE 0093.

CHEM 4402 Biochemistry II**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A continuation of CHEM 4401. Biochemical energetics, including glycolysis, fatty acid oxidation, amino acid oxidation, citric acid cycle, oxidative phosphorylation, photophosphorylation and photosynthesis. Carbohydrate, fatty acid and amino acid biosynthesis. Laboratory is a continuation of biochemical techniques. This course is typically offered in Fall and Spring.

Prerequisite: CHEM 4401.

Co-requisite: SMTE 0093.

CHEM 4407 Inorganic Chemistry**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A survey of inorganic chemistry. Theories of atomic structure, covalent bonding, ionic solids, metallic solids, and coordination compounds. Modern acid/base concepts. Laboratory involves the synthesis of inorganic compounds.

Prerequisite: CHEM 3412.

Co-requisite: SMTE 0093.

CHEM 4420 Physical Biochemistry**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A fundamental approach to the study of physical and chemical phenomena, including the study of thermodynamics, gases and phase equilibria. This course is typically offered on an irregular basis.

Prerequisite: CHEM 1412 and (PHYS 1402 or 2426) and MATH 2414.

Co-requisite: SMTE 0093.

CHEM 4423 Physical Chemistry I**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A fundamental approach to the study of physical and chemical phenomena, including the study of thermodynamics, gases and phase equilibria. This course is typically offered in Fall.

Prerequisite: CHEM 1412 and (PHYS 1402 or 2426) and MATH 2414.

Co-requisite: SMTE 0093.

CHEM 4424 Physical Chemistry II**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A continuation of CHEM 4423, including the study of chemical kinetics, electrochemistry, molecular structure, and quantum mechanics. This course is typically offered in Spring.

Prerequisite: CHEM 4423.

Co-requisite: SMTE 0093.

CHEM 4443 Environmental Chemistry**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A study of the impact of chemistry on the environment, including topics of air pollution, water pollution, and beneficial chemical modifications of the environment. Laboratory devoted to field techniques of sampling, sample preservation, and analytical techniques applied to the environment. This course is typically offered in Spring.

Prerequisite: CHEM 1412.

Co-requisite: SMTE 0093.

CHEM 4490 Special Topics**4 Semester Credit Hours (1 Lecture Hour, 1 Lab Hour)**

May be repeated for credit. Subject materials variable.

CHEM 4696 Directed Independent Study**1-6 Semester Credit Hours**

Requires a formal proposal of study to be completed in advance of registration, to be approved by the supervising faculty, the chairperson and the dean of the College.