



CHEMISTRY (CHEM)

Mission

Prepare students for careers in chemistry and chemistry related areas, such as health, environmental, and forensics, in the industry, government, and education sectors as well as for pursuit of graduate and professional degrees and to provide a supportive learning environment in which students can develop to their maximum potential.

The Chemistry program provides professional preparation for advanced training, research, and employment. It seeks to develop critical thinkers and teaches students to apply the scientific method in various academic and life applications. A Bachelor of Science (B.S.) degree and minor are offered.

Requirements for a Major in Chemistry

1. A minimum of 41 credit hours in Chemistry

* CHEM 1411—1412	General Chemistry I and II	8 hours
CHEM 2102	Second Year Science Seminar (Fall and Spring)	1 hour
CHEM 2412—2422	Organic Chemistry I and II	8 hours
CHEM 3413	Quantitative Analysis	4 hours
CHEM 3103	Third Year Science Seminar (Fall and Spring)	1 hour
CHEM 4101—4105	Senior Seminar	2 hours
CHEM 4464—4465	Physical Chemistry I and II	8 hours
CHEM 4308	Chemical Research	3 hours
Two Upper Division Chemistry Electives (CHEM 2422 strongly recommended)		6-8 hours

2. MATH 2413, MATH 2414 Calculus I and II 8 hours

3. PHYS 2425 and PHYS 2426 Physics I and II* 8 hours

4. Completion of departmental examinations

It is recommended that 6-12 hours of a foreign language be completed in French. An additional 6 hours in computer science beyond the core, COSC 1300, is highly recommended.

* Included in the core curriculum

Requirements for a Minor in Chemistry

A minor in Chemistry consists of 24 credit hours, including CHEM 1411, 1421, 2412, 2422, 3413, at least three hours of chemistry electives and one year of Science Seminar from CHEM 2102 or CHEM 3103.

For students transferring from another University, please reference department requirements listed under the Department of Natural Sciences and Mathematics.

A SUGGESTED COURSE SEQUENCE FOR THE B.S. CHEMISTRY MAJOR

YEAR 1

FALL				SPRING			
UNIV	1201 or	Freshman Seminar	2	CHEM 1412	General Chemistry II		4
RAMS	1201			MATH 2312	Pre-Calculus		3
CHEM	1411	General Chemistry I	4	ENGL 1302	Composition and		3
MATH	1316	Trigonometry For Science	3		Research		
		Majors		KINE 1304	Health and Wellness		3
ENGL	1301	Intro. College Composition	3	PSCI 1301	US Government		3
KINE	1100/1101	Personal Fitness/Sports	1				
COSC	1300	Introduction to Computers	3				
Total Hours			16	Total Hours			16

YEAR 2

FALL				SPRING			
CHEM	2412	Organic Chemistry I	4	CHEM 2422	Organic Chemistry II		4
CHEM	2102	2nd Year Seminar	1	MATH 2414	Calculus II		4
MATH	2413	Calculus I	4	PHYS 2426	Physics II		4
PHYS	2425	Physics I	3	Behavioral Science			3
COMM	1315	Public Speaking	3				
Total Hours			15	Total Hours			15

YEAR 3

FALL				SPRING			
CHEM	4464	Physical Chemistry I	4	CHEM 2423	Instrumental Analysis		4
CHEM	3103	3rd Year Seminar	1	CHEM 4466	Physical Chemistry II		4
CHEM	3413	Quantitative Analysis	4	ENGL 2331	World Literature		3
		Language I	3	Language II			3
		Diversity Core I such as HIST 1381	3	Diversity Core II			3
Total Hours			15	Total Hours			17

YEAR 4

FALL				SPRING			
CHEM 4104	Chemistry Elective		1	CHEM 4105	Senior Seminar Spring		1
	Computer Science Elective Fine Arts		3	CHEM 4208	Chemical Research		2
	Core		3		Computer Science Elective		3
HIST 1301	US History I or		3	PHIL 2301	Philosophy and Ethics or		3
HIST 1302	US History II		3	RELI 2302	Comparative Religion		
	CHEM 4308 Chemical Research				Elective		3
Total Hours			16	Total Hours			12

COURSES IN CHEMISTRY (CHE)

CHEM 1411 General Chemistry I

4 Credit Hours

General Chemistry covers the fundamental laws and theories of chemical processes involving the common elements and their compounds. Topics include atomic structure, periodic classifications, physical states, chemical formulas and equations, stoichiometry, chemical reactions, bonding theories, molecular structure and reactions in aqueous solutions. A working knowledge of these topics is obtained through a series of lectures, laboratory exercises, computer exercises and molecular models. Basic mathematics and elementary algebra are sufficient to understand the concepts presented; additional mathematical concepts are taught if needed. The student becomes more aware of the chemical nature of the world and understanding of everyday problems. Three lecture hours and one two-hour laboratory per week.

Pre/Co-requisite: MATH 1314 or higher

Offered: Fall/Yearly

CHEM 1412 General Chemistry II

4 Credit Hours

This course is a continuation of CHEM 1411. This course requires a working knowledge of the topics covered in CHEM 1411. Greater success is achieved when these courses are taken in successive semesters. Fundamental laws and theories of chemical processes involving the common elements and their compounds is continued and includes the following topics: reaction rates and mechanisms, colloids, organic carbon compounds and oxidation-reduction. A working knowledge of these topics is obtained through a series of lectures, laboratory exercises, computer exercises and molecular models. Basic mathematics and elementary algebra are sufficient to understand the concepts presented; additional mathematical concepts are taught if needed. The student becomes more aware of the chemical nature of the world and more understanding of everyday problems. Three lecture hours and one two-hour laboratory per week.

Prerequisite: CHEM 1411

Offered: Spring/Yearly

CHEM 2102 Second-Year Science Seminar

1 Credit Hour

Seminars are presented by faculty, guest lecturers and students. Topics will address recent findings in the sciences or may be relative to professional and career development of the science major. The course meets for a minimum of 1 hour weekly. Attendance, speaker evaluations and a presentation or paper is required for satisfactory completion of these science seminar courses.

Prerequisites: Chemistry Major and 24 College Credits

Offered: Fall/Spring Yearly

CHEM 2412 Organic Chemistry I

4 Credit Hours

Organic Chemistry I is the study of aliphatic hydrocarbons and their derivatives. This course emphasizes the functionality of different classes of organic compounds, isomerism, nomenclature, reaction mechanisms, and methods of preparation. Three lecture hours and one three-hour laboratory period each week.

Prerequisite: CHEM 1421

Offered: Fall/Yearly

CHEM 2422 Organic Chemistry II

4 Credit Hours

Continuation of CHEM 2412 and builds on the fundamentals covered in that course. Organic Chemistry II covers the study of aromatic, organometallic, and heterocyclic compounds, as well as spectroscopy. Reactions of the major functional groups and introductory biochemical structures and reactions are covered. Three lecture hours and one three-hour laboratory period each week.

Prerequisite: CHEM 2412

Offered: Spring/Yearly

CHEM 2423 Instrumental Analysis

4 Credit Hours

Introduction to the critical use of advanced electrical and optical measurements in chemical analysis. Two lecture hours and one four-hour laboratory period each week.

Prerequisite: CHEM 3413

Offered: Spring As Needed

CHEM 3103 Third Year Science Seminar Fall/Spring**1 Credit Hour**

Seminars are presented by faculty, guest lecturers and students. Topics will address recent findings in the sciences or may be relative to professional and career development of the science major. The course meets for a minimum of 1 hour weekly. Attendance, speaker evaluations and a presentation or paper is required for satisfactory completion of these science seminar courses.

Prerequisites: Chemistry Major and 48 College Credits**Offered: Fall/ Spring Yearly****CHEM 3413 Quantitative Analysis****4 Credit Hours**

Introduction to methods of chemical analysis. Laboratory work consists of selected experiments on volumetric analysis. Emphasis is placed on physicochemical principles and stoichiometric relations involved in each determination. Two lecture hours and one four-hour laboratory period each week.

Prerequisite: CHEM 1421**Offered: Yearly****CHEM 3423 Advanced Quantitative Analysis****4 Credit Hours**

This continuation of CHEM 3413 consists of an introduction to theory and practice of optical and electrical methods of analysis. Laboratory work is primarily gravimetric analysis and basic optical and electrochemical analysis. Two lecture hours and one four-hour laboratory period each week. **Prerequisite: CHEM 3413**

Offered: Spring As Needed**CHEM 3463 Biochemistry****4 Credit Hours**

A survey of the major constituents of living matter. Biophysical and biochemical processes in plants and animals are studied. Laboratory work includes isolation, identification, and application of quantitative analytical procedures to characteristic materials. Three lecture hours and one three-hour laboratory period each week.

Prerequisites: BIOL 1408 or BIOL 1410 and CHEM 2422**Offered: As Needed****CHEM 4104 Chemistry Senior Seminar Fall****1 Credit Hour**

These seminar courses are to be taken by all Chemistry majors. The student attends one discussion hour per week and at least one science seminar participation hour per week. Oral discussion, a written report, and presentation on selected topics developed from information gathered from professional journals and reference books. In some cases laboratory investigations with written reports may be substituted. Specific requirements for the satisfactory completion of this course are outlined in the course syllabus for each semester.

Prerequisite: Senior Standing**Offered: Fall Yearly****CHEM 4105 Chemistry Senior Seminar Spring****1 Credit Hour**

These seminar courses are to be taken by all Chemistry majors. The student attends one discussion hour per week and at least one science seminar participation hour per week. Oral discussion, a written report, and presentation on selected topics developed from information gathered from professional journals and reference books. In some cases laboratory investigations with written reports may be substituted. Specific requirements for the satisfactory completion of this course are outlined in the course syllabus for each semester.

Prerequisite: Senior Standing**Offered: Spring Yearly****CHEM 4365 Advanced Organic Chemistry****3 Credit Hours**

A study of carbon compounds. Emphasis on modern atomic structure, molecular spectra, electrophilic and nucleophilic substitutions, elimination reactions, and free-radical reactions. *This course is a writing intensive course.*

Prerequisite: CHEM 2422**Offered: As Needed**

CHEM 4366 Advanced Inorganic Chemistry**3 Credit Hours**

A study of non-carbon compounds. Emphasis on the theories and principles of atomic structure, periodic classification, chemical bonding, complex ions and coordination compounds, oxidation- reduction, acids and bases, and non-aqueous solvents.

Prerequisite: CHEM 2422 or CHEM 3413**Offered: As Needed****CHEM 4367 Special Topics in Chemistry****3 Credit Hours**

This course covers selected topics in chemistry of special interest to students or instructors. They may be a more in-depth treatment of survey courses or cover a specialty in chemistry. Possible topics include chemometrics, spectroscopy, electronic materials, environmental, forensic, and polymers.

Prerequisite: Instructor approval**Offered: As Needed****CHEM 4307 Chemistry Internship****3 Credit Hours**

This course is an internship experience for majors in chemistry. Students work as interns in a chemistry-related industry. Students may not enroll in this course without prior advisor approval. **Prerequisite: 12**

Credits in Chemistry and Advisor Approval**Offered: Fall/Spring Yearly****CHEM 4108 Chemical Research/Project****1 Credit Hour**

The student conducts independent investigation employing basic research techniques including instrumental methods such as infrared spectroscopy, gas chromatography, and visible and ultraviolet spectrophotometry, etc. The use of vacuum systems, inert solvent systems, and inert atmosphere systems may also be included. Library research is stressed as an integral part of the work. Variable hours per week.

Prerequisite: Instructor approval**Offered: Fall/Spring Yearly****CHEM 4208 Chemical Research/Project****2 Credit Hours**

The student conducts independent investigation employing basic research techniques including instrumental methods such as infrared spectroscopy, gas chromatography, and visible and ultraviolet spectrophotometry, etc. The use of vacuum systems, inert solvent systems, and inert atmosphere systems may also be included. Library research is stressed as an integral part of the work. Variable hours per week.

Prerequisite: Instructor approval**Offered: Fall/Spring Yearly****CHEM 4308 Chemical Research/Project****3 Credit Hours**

The student conducts independent investigation employing basic research techniques including instrumental methods such as infrared spectroscopy, gas chromatography, and visible and ultraviolet spectrophotometry, etc. The use of vacuum systems, inert solvent systems, and inert atmosphere systems may also be included. Library research is stressed as an integral part of the work. Variable hours per week.

Prerequisite: Instructor approval**Offered: Fall/Spring Yearly****CHEM 4408 Chemical Research/Project****4 Credit Hours**

The student conducts independent investigation employing basic research techniques including instrumental methods such as infrared spectroscopy, gas chromatography, and visible and ultraviolet spectrophotometry, etc. The use of vacuum systems, inert solvent systems, and inert atmosphere systems may also be included. Library research is stressed as an integral part of the work. Variable hours per week.

Prerequisite: Instructor approval**Offered: Fall/Spring Yearly****CHEM 4464 Physical Chemistry I****4 Credit Hours**

A presentation of the basic principles of physical chemistry with particular emphasis on thermodynamics and its application to gases, liquids, solids, and solutions. Three lecture hours and three laboratory hours each week.

Prerequisites: PHYS 2426, MATH 2414, and CHEM 2422**Offered: Fall As Needed****CHEM 4465 Physical Chemistry II****4 Credit Hours**

A continuation of CHEM 4464. An elementary presentation of the kinetic-molecular theory, chemical

kinetics, electrochemistry, surface chemistry, transport processes, and quantum mechanics are covered. Three lecture hours and three laboratory hours each week.

Offered: Spring As Needed

COURSES IN PHYSICS (PHYS)

The following physics courses are offered to fulfill requirements for the science core curriculum and for a Bachelor of Science degree in biology, chemistry, computer science, or mathematics.

Physical Science PHYS 1415

4 Credit Hours

This course consists of lectures, demonstrations, and laboratory exercises on topics relating to a study of the physical universe. Included is a survey of physics, astronomy, and chemistry in an integrated lecture laboratory sequence. This course develops a series of fundamental concepts in physics and chemistry through problem solving situations. The study includes empirical law and theories of matter, energy, loading, and structure. Three hours of lecture and two hours of laboratory per week.

Pre- or Co-requisite: MATH 1314

Offered: Fall/Spring Yearly

General Physics I PHYS 2425

4 Credit Hours

This course is primarily for science and engineering students. Vector notation and a mathematical approach are used in the development of conventional topics: mechanics, vibratory motion, wave motion and fluids. Topics from thermodynamics and relativity will be included if time permits. Three lecture hours, and one three-hour laboratory per week.

Pre- or Co-requisite: MATH 2413

Offered: Fall/Yearly

General Physics II PHYS 2426

4 Credit Hours

This course is a continuation of Physics 2425 primarily for science and pre-engineering students. Thermodynamics, electricity and magnetism are covered. Topics from modern physics will be included if time permits. Three lecture hours, and one three-hour laboratory per week.

Prerequisites: PHYS 2425 and