

Chemistry BS

The St. Louis metropolitan area has long been a major center for industrial chemistry, and in the past decade it has also become vibrant in life sciences research and development. A bachelor's degree in chemistry provides a student with the professional training needed to contribute to this dynamic industry. The B.S. degree is THE professional degree in chemistry, and students who earn the B.S. degree are well prepared for a career in the chemical industry, graduate work in the chemical sciences, medicine, business or law. The department provides opportunities for undergraduates to become involved in ongoing research projects.

General Education Requirements

Students must satisfy the university and college general education requirements. Courses in chemistry may be used to meet the university's science and mathematics area requirement. The college's foreign language requirement fulfills the departmental requirements for B.A. candidates. B.S. degree candidates are not required to take a foreign language; however, the American Chemical Society (ACS) states that the study of a foreign language is recommended, especially for students planning to pursue graduate studies in chemistry.

Satisfactory/Unsatisfactory Restrictions

Chemistry majors may not take required chemistry, mathematics, or physics courses on a satisfactory/unsatisfactory basis.

Declaring the Chemistry Major

Students seeking to major in chemistry are first designated as 'pre-chemistry majors' until they have completed both CHEM 1111 and CHEM 1121 or equivalent courses. Upon successful completion of CHEM 1111 and CHEM 1121 with grades of C or better, students will be allowed to declare chemistry as their major. Each of these courses must be completed successfully within two attempts.

Related Area Requirements

Bachelor of Arts and Bachelor of Science in Chemistry

Candidates for both degrees must also complete:

MATH 1800	Analytic Geometry and Calculus I	5
MATH 1900	Analytic Geometry and Calculus II	5
MATH 2000	Analytic Geometry and Calculus III	5
PHYSICS 2111	Physics: Mechanics and Heat	4
PHYSICS 2111L	Mechanics and Heat Laboratory	1
PHYSICS 2112	Physics: Electricity, Magnetism, and Optics	4
PHYSICS 2112L	Electricity, Magnetism, and Optics Laboratory	1

Total Hours 25

This degree may be taken as a terminal degree by students intending to become professional chemists or for preparation for graduate work in chemistry or biochemistry. Students may choose to specialize in chemistry or biochemistry.

Core Courses

CHEM 1000	Chemistry: The Central Science	1
CHEM 1111	Introductory Chemistry I (MOTR CHEM 150L)	5
CHEM 1121	Introductory Chemistry II	5
CHEM 2223	Quantitative Analysis in Chemistry	3
CHEM 2612	Organic Chemistry I	3
CHEM 2622	Organic Chemistry II	3
CHEM 2633	Organic Chemistry Laboratory	2
CHEM 3022	Introduction to Chemical Literature	1
CHEM 3312	Physical Chemistry I: Thermodynamics and Kinetics	3
CHEM 3322	Physical Chemistry II: Quantum Chemistry and Spectroscopy	3
CHEM 3333	Physical Chemistry Laboratory I	2
CHEM 3412	Basic Inorganic Chemistry	3
CHEM 4897	Seminar in Chemistry	2
Select one of the following:		2
CHEM 3643	Advanced Organic Chemistry Laboratory	
CHEM 4233	Laboratory in Instrumental Analysis	
CHEM 4343	Physical Chemistry Laboratory II	
CHEM 4433	Inorganic Chemistry Laboratory	
CHEM 4733	Biochemistry Laboratory	

Total Hours 38

Chemistry Option

In addition to the requirements above, the following chemistry courses are required:

CHEM 3643	Advanced Organic Chemistry Laboratory	2
CHEM 4212	Instrumental Analysis	3
CHEM 4233	Laboratory in Instrumental Analysis	2
CHEM 4343	Physical Chemistry Laboratory II	2
CHEM 4412	Advanced Inorganic Chemistry	3
CHEM 4433	Inorganic Chemistry Laboratory	2
CHEM 4612	Introduction to Macromolecular, Supramolecular, and Nanoscale Chemistry	1
CHEM 4712	Biochemistry	3

Total Hours 18

Biochemistry Option

In addition to the requirements above, the following chemistry and biology courses are required:

Chemistry		
CHEM 3643	Advanced Organic Chemistry Laboratory	2
CHEM 4212	Instrumental Analysis	3
CHEM 4233	Laboratory in Instrumental Analysis	2
CHEM 4612	Introduction to Macromolecular, Supramolecular, and Nanoscale Chemistry	1

CHEM 4712	Biochemistry	3
CHEM 4722	Advanced Biochemistry	3
CHEM 4733	Biochemistry Laboratory	2
Select one of the following:		3
CHEM 4772	Physical Biochemistry	
CHEM 4774	Introduction to Bioinformatics	
CHEM 3905	Chemical Research (3 credits)	
BIOL 4905	Research (3 credits)	
Biology		
BIOL 1831	Introductory Biology: From Molecules to Organisms (MOTR BIOL 150L)	
BIOL 2012 or BIOL 2482	Genetics Microbiology	
Total Hours		19

If either research option is chosen, the project must be in biochemistry and must include a written final report submitted to the Department of Chemistry and Biochemistry.

B.S. Ed. in Secondary Education with Emphasis in Chemistry

The B.S. Ed. is a professional education degree designed for students who wish to pursue a teaching career in secondary schools. Much of the discipline-specific coursework parallels the B.A. or B.S. degree in the discipline; however, the Missouri Department of Elementary and Secondary Education (DESE) requires specific coursework for teacher certification. Therefore, students interested in the B.S. Ed. should contact the advising office (OASIS) 314-516-5937 in the College of Education for discipline-specific requirements. *Note: To obtain teaching certification, DESE requires a 3.0 GPA in the discipline and professional education coursework, as well as a 2.75 GPA overall.*

B.A. or B.S. in Chemistry with Master's Level Coursework for Secondary Teacher Certification

In addition to the B.S. Ed., students may opt to complete a B.A. or B.S. degree in their discipline as an undergraduate, followed by admission to the Graduate School for Master's level teaching certification. The College of Education has a one-year accelerated program for post-graduate certification called Teach in 12, or students can choose a traditional path to certification. Graduate coursework for certification can apply towards a Master's Degree in Secondary Education, with additional coursework. Students interested in Master's Level teacher certification should contact the advising office (OASIS) 314-516-5937 in the College of Education. *Note: To obtain teaching certification, DESE requires a 3.0 GPA in the discipline and professional education coursework, as well as a 2.75 GPA overall.*

- B.S. degree students will demonstrate a clear understanding of the essential principles of the five foundational areas of chemistry and be able to apply them to solve chemical problems. The foundational areas of chemistry are specified as analytical, organic, inorganic, physical and biochemistry and include both the study of small molecules and macromolecules. B.A. degree students do not need to meet this outcome in biochemistry. Demonstrating understanding and application at the foundational level requires a thorough comprehension of

basic chemical concepts from the introductory course sequence including stoichiometry, states of matter, molecular structure and bonding, thermodynamics, equilibria and kinetics. B.S. degree graduates will demonstrate proficiency in at least four of the foundational areas at an in-depth level. B.A. degree graduates will demonstrate proficiency at an in-depth level in organic chemistry and physical chemistry.

- Students will apply appropriate concepts and investigative and quantitative methods as used in all sub-disciplines of chemistry research.
- Students will critically evaluate existing scientific studies to integrate and apply that body of knowledge to the design of studies to test specific hypotheses addressing unsolved problems in the chemical and life sciences.
- Students will use computers and the required scientific software in data acquisition, processing, presentation or analysis, including statistical and regression analysis.
- Students will demonstrate basic skills associated with safely performing and properly documenting laboratory experiments in chemistry following a broad introduction of commonly used equipment and procedures. B.S. degree graduates will demonstrate skills in performing laboratory experiments using advanced and specialized instrumentation related to the areas of chemistry that are studied in depth. Students will demonstrate the ability to work either independently or as a part of a small team.
- Students will be able to identify the need for information, procure the information from relevant scientific literature publications and databases, properly cite the information, and critically evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias.
- Students will effectively communicate orally, visually and in writing about the processes of the chemical sciences and the results of scientific inquiry.
- Students will follow ethical practices in research, experimental interpretation, presentation, citation and application of research.

Sample Four Year Plan Chemistry BS

First Year			
Fall	Hours	Spring	Hours
INTDSC 1003		1 CHEM 1121	5
CHEM 1000		1 MATH 1800	5
CHEM 1111		5 CORE - Communication Proficiency	3
ENGL 1100		3 EXPLORE - Social Sciences	3
MATH 1035		2	
CORE - US History and Government		3	
		15	16
Second Year			
Fall	Hours	Spring	Hours
CHEM 2223		3 CHEM 2622	3
CHEM 2612		3 CHEM 2633	2
MATH 1900		5 CHEM 3412	3
EXPLORE - Humanities and Fine Arts		3 MATH 2000	5
EXPLORE - Social Sciences		3 EXPLORE - Humanities and Fine Arts	3
		17	16
Third Year			
Fall	Hours	Spring	Hours
CHEM 3022		1 CHEM 3322	3

CHEM 3312	3	CHEM 3333	2
CHEM 4712	3	PHYSICS 2112	4
PHYSICS 2111	4	PHYSICS 2112L	1
PHYSICS 2111L	1	ENGL 3160	3
Cultural Diversity Requirement	3	EXPLORE - Social Sciences	3
	15		16

Fourth Year

Fall	Hours	Spring	Hours
CHEM 3643		2 CHEM 3905	1
CHEM 3905		1 CHEM 4233	2
CHEM 4212		3 CHEM 4433	2
CHEM 4343		2 CHEM 4612	1
CHEM 4412		3 CHEM 4897	2
EXPLORE - Humanities and Fine Arts		3 Elective or minor	3
		Elective or minor	1
	14		12

Total Hours: 121

¹ INTDSC 1003 is required only for first-time freshmen and transfer students with less than 24 college credits.

PLEASE NOTE: This plan is an example of what a four year plan could look like for a typical student. Placement exam scores in math as well as the completion of coursework may change the plan. It should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor each semester. All requirements are subject to change.

Chemistry BS, Biochemistry Track**First Year**

Fall	Hours	Spring	Hours
INTDSC 1003 ¹		1 CHEM 1121	5
CHEM 1000		1 MATH 1800	5
CHEM 1111		5 CORE – Communicating Proficiency	3
ENGL 1100		3 EXPLORE - Social Sciences	3
MATH 1035		2	
CORE - US History and American Government		3	
	15		16

Second Year

Fall	Hours	Spring	Hours
CHEM 2223		3 CHEM 2622	3
CHEM 2612		3 CHEM 2633	2
MATH 1900		5 CHEM 3412	3
EXPLORE - Humanities and Fine Arts		3 MATH 2000	5
EXPLORE - Social Sciences		3 EXPLORE - Humanities and Fine Arts	3
	17		16

Third Year

Fall	Hours	Spring	Hours
CHEM 3312		3 CHEM 3322	3
CHEM 4712		3 CHEM 3333	2
CHEM 4733		2 PHYSICS 2112	4
PHYSICS 2111		4 PHYSICS 2112L	1
PHYSICS 2111L		1 ENGL 3160	3
Cultural Diversity Requirement		3	
	16		13

Fourth Year

Fall	Hours	Spring	Hours
BIOL 1831		5 BIOL 2012	3
CHEM 3022		1 CHEM 3905	3
CHEM 3643		2 CHEM 4233	2
CHEM 3905		1 CHEM 4612	1

CHEM 4212	3	CHEM 4722	3
EXPLORE - Humanities and Fine Arts	3	CHEM 4897	2
		EXPLORE - Social Sciences	3
	15		17

Total Hours: 125

¹ INTDSC 1003 is required only for first-time freshmen and transfer students with less than 24 college credits.

PLEASE NOTE: This plan is an example of what a four year plan could look like for a typical student. Placement exam scores in math as well as the completion of coursework may change the plan. It should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor each semester. All requirements are subject to change.