

CHEMISTRY (BS)



This program was approved for students entering the university in the Summer 2019–Spring 2020 catalog year. For more information about catalog year, go to Catalog Year Information (<http://catalog.louisville.edu/undergraduate/university-wide-unit-specific-policies/catalog-year>).

Bachelor of Science in Chemistry

Unit: College of Arts and Sciences (AS) (<http://www.louisville.edu/a-s>)

Department: Chemistry (<http://louisville.edu/chemistry>)

Academic Plan Code(s): See Track Requirements tab

Program Information

The BS in Chemistry degree program is designed to prepare professional chemists for industrial, governmental, academic, and research positions. This curriculum meets approved requirements for professional training.

Completion of this degree requires work to be submitted for the department's Learning Outcomes Measurement. For details, contact the department.

Degree Summary

Code	Title	Hours
	General Education Requirements (http://catalog.louisville.edu/undergraduate/general-education-requirements) ¹	31
	College/School Requirements	13-15
	Program/Major Requirements ¹	41
	Track Requirements	34-51
	Minimum Total Hours	121

¹ Some credit hours from the General Education Requirements may be satisfied by courses defined by the program, in which case additional electives may be required to complete the minimum hours for the degree. To complete the degree in the minimum number of hours listed for the Business track, some hours from the General Education Requirements must be satisfied by courses defined by the unit and/or program. Using other courses to satisfy General Education requirements will require additional hours to complete the degree requirements.

Specific coursework information can be found on the Degree Requirements tab.

Early Start Program (Jointly with the College of Education and Human Development)

The Master of Arts in Teaching program in conjunction with the undergraduate programs in Chemistry, Biology, and Mathematics offers a comprehensive and professionally-focused program leading to an additional degree of MAT Middle or Secondary Education. This early start program enables superior students to receive two degrees within five years. A total of 148 credits are required for the dual degrees: 121 credits of coursework devoted toward the baccalaureate degree and 36 credits toward the MAT, with nine hours double-counted. This program will be available for students who are entering their junior year. They may take graduate level courses in the College of Education and Human Development (CEHD) in their 4th year of study.

The current qualifications for the joint degree program have been agreed upon by discipline faculty from the Colleges of Arts and Sciences and Education and Human Development. The criteria vary by discipline. Students enrolling in the accelerated program will be non-thesis students and must adhere to all policies pertaining to Graduate Students. All interested students must submit an application to the College of Education and Human Development (CEHD) MAT program and meet the admission criteria.

Departmental Admission Requirements

Admission to the major in Chemistry requires completion of CHEM 202 (or equivalent course from another institution) with a grade of C or better.

The Application for Major form can be found on the Arts & Sciences Advising Center website (<http://louisville.edu/artsandsciences/advising/apply>).

General Education Requirements

Code	Title	Hours
	General Education Requirements (http://catalog.louisville.edu/undergraduate/general-education-requirements) [*]	31

The following courses are required by the program and can satisfy the respective General Education Requirement:

CHEM 201	General Chemistry I - S
CHEM 207	Introduction to Chemical Analysis I - SL
MATH 205	Calculus I - QR
PHYS 221	Fundamentals of Physics I - S
	or PHYS 295 Introductory Laboratories I - SL

^{*}All degrees require the completion of the University-wide General Education Program (link provided above). Some General Education requirements may be met in the requirements for the major or supporting coursework, in which case additional electives may be required to complete the minimum hours for the degree. To complete the Business track in the **minimum number of hours** listed, some hours from the General Education Requirements must be satisfied by courses defined by the unit and/or program.

College/School Requirements

Code	Title	Hours
Arts & Sciences Requirements		
GEN 100	Student Success Center Orientation	1
	or GEN 101 Arts and Sciences Orientation	
	Foreign Language ¹	6-8

Electives in Humanities or Social Sciences at the 300-level or above² 6
WR—two approved courses at the 300 level or above³

Minimum Total Hours 13-15

Program/Major Requirements

Code	Title	Hours
Department of Chemistry		
CHEM 201	General Chemistry I - S ⁴	3
CHEM 202	General Chemistry II - S	3
CHEM 207	Introduction to Chemical Analysis I - SL ⁴	1
CHEM 208	Introduction to Chemical Analysis II - SL	1
CHEM 209	Introduction to Chemical Analysis III	1
CHEM 210	Introduction to Chemical Analysis IV	1
CHEM 341	Organic Chemistry I	3
CHEM 342	Organic Chemistry II	3
CHEM 343	Organic Chemistry Laboratory I	2
CHEM 344	Organic Chemistry Laboratory II	2
CHEM 470	Physical Chemistry Laboratory - WR	2
CHEM 527	Introduction to Separations and Spectroscopy - WR	3
Supporting Courses		
MATH 205	Calculus I - QR ⁴	4
MATH 206	Calculus II	4
Complete one of the following sequences:		8-10
Sequence 1:		
PHYS 221	Fundamentals of Physics I - S ⁴	
PHYS 222	Fundamentals of Physics II - S	
PHYS 223	Fundamentals of Physics Lab I - SL	
PHYS 224	Fundamentals of Physics Laboratory II - SL	
Sequence 2:		
PHYS 295	Introductory Laboratories I - SL ⁴	
PHYS 296	Introductory Laboratories II - SL	
PHYS 298	Introductory Mechanics, Heat and Sound - S ⁴	
PHYS 299	Introductory Electricity, Magnetism and Light	
Track Requirements		34-51
Minimum Total Hours		75-92

Only 60 hours in the major department may be applied toward the Bachelor of Science degree.

At least 50 of the total minimum hours required must be at the 300 level or above.

Code	Title	Hours
Culminating Undergraduate Experience (Graduation requirement)		
Requirement fulfilled by completing one of the following:		
CHEM 390	Undergraduate Research - CUE, WR	
CHEM 391	Undergraduate Research - CUE	
CHEM 392	Undergraduate Research - CUE	
CHEM 420	Cooperative Internship in Chemistry - CUE, WR	
CHEM 430	Practicum in Chemistry Education - CUE	
CHEM 491	Undergraduate Research - CUE	

CHEM 528 Contemporary Methods of Synthesis and Analysis I - CUE

- Completion of the second semester of a single foreign language; hours will vary depending on language taken
- In addition to courses counted toward General Education
- May be incorporated into other degree requirements
- Fulfills General Education requirement.
- CHEM 470 plus 3 semester hours of another WR course will fulfill the WR requirement.

Track Requirements

Students completing the BS in Chemistry may pursue the standard degree track or a specialized track in Biochemistry or a track in Business. Requirements for all three of these options are listed below.

Chemistry BS

Academic Plan Code(s): CHM_BS

Code	Title	Hours
Department of Chemistry		
CHEM 425	Instrumental and Statistical Analysis	3
CHEM 465	Physical Chemistry I	3
CHEM 466	Physical Chemistry II	3
CHEM 445	Survey of Biochemistry	3
or CHEM 545	Biochemistry I	
CHEM 515	Inorganic Chemistry	3
CHEM 528	Contemporary Methods of Synthesis and Analysis I - CUE	3
CHEM 529	Contemporary Methods of Synthesis and Analysis II	3
Undergraduate Research or Cooperative Internship		3
Supporting Courses		
MATH 301	Calculus III	4
Elective in Mathematics, Physics, or Chemistry at 300 level or above ¹		3
Elective in Natural Sciences Division, other than Chemistry, at the 300 level or above		3
Minimum Total Hours		34

- As many as 3 additional hours in Undergraduate Research in Chemistry may be applied toward the degree. With the consent of the instructor, graduate-level courses in Chemistry may also be used.

Track in Biochemistry

Academic Plan Code(s): CHM_BS_BIO

This degree track is designed to prepare students for a career that combines both chemistry and modern biology.

Code	Title	Hours
Department of Chemistry		
CHEM 465	Physical Chemistry I	3
CHEM 466	Physical Chemistry II	3
CHEM 545	Biochemistry I	3
CHEM 547	Biochemistry II	3
CHEM 546	Biochemistry Laboratory	2

Undergraduate Research or Cooperative Internship		3
Supporting Courses		
BIOL 240	Unity of Life - S	3
BIOL 242	Diversity of Life - S	3
BIOL 329	Cellular and Molecular Biology	3
BIOL 330	Genetics and Molecular Biology	3
BIOL 331	Genetics and Molecular Biology: Laboratory	2
CHEM or BIOL electives - see table below (at least 3 hours of which must be in Chemistry) ³		4-6
MATH 301	Calculus III	4
Minimum Total Hours		39-41

¹ Fulfills General Education requirement.

² CHEM 470 plus 3 semester hours of another WR course will fulfill the WR requirement

³ As many as 3 additional hours in Undergraduate Research in Chemistry may be applied toward the degree. With the consent of the instructor, graduate level courses in Chemistry may also be used.

Chemistry or Biology Electives

Code	Title	Hours
BIOL 357	General Microbiology	3
or BIOL 485	Microbial Physiology - CUE, WR	
BIOL 358	Microbiology Laboratory	1
BIOL 400	Histology	4
BIOL 465	Principles of Physiology	3
BIOL 541	Medicinal Plant Biochemistry - CUE, WR	3
BIOL 542	Gene Structure and Function - WR	3
CHEM 425	Instrumental and Statistical Analysis	3
CHEM 430	Practicum in Chemistry Education - CUE	1
CHEM 515	Inorganic Chemistry	3
CHEM 528	Contemporary Methods of Synthesis and Analysis I - CUE	3
CHEM 529	Contemporary Methods of Synthesis and Analysis II	3
CHEM 555	Theory and Application of Computational Chemistry	3
CHEM 557	Bio-Organic Phenomena	3

Track in Business

Academic Plan Codes: CHM_BS_BUS

This degree track combines a general program in chemistry with a fundamental program in business. The curriculum is designed to prepare chemists for industrial and governmental positions.

Code	Title	Hours
Department of Chemistry		
CHEM 441	Elements of Physical Chemistry	3
or CHEM 465	Physical Chemistry I	
CHEM electives at 300 level or above (other than Independent Study) ³		15
Supporting Courses		
ECON 201	Principles of Microeconomics - SB	3

ECON 202	Principles of Macroeconomics - SB	3
CIS 250	Introduction to Data and Information Management	3
CIS 300	Computer Information Systems	3
ACCT 201	Principles of Financial Accounting	3
ACCT 202	Principles of Managerial Accounting	3
Select one of the following:		3
BSTA 301	Business Statistics (previously BSTA 201)	
PSYC 301	Statistics for Psychology	
SOC 301	Introduction to Social Statistics	
MGMT 301	Management and Organizational Behavior	3
MKT 301	Principles of Marketing	3
FIN 301	Corporate Finance	3
Elective in the School of Business at the 300-level or above		3

Culminating Undergraduate Experience (Graduation requirement)

Requirement fulfilled by completing one of the following approved CUE courses:

CHEM 390	Undergraduate Research - CUE, WR	
CHEM 391	Undergraduate Research - CUE	
CHEM 392	Undergraduate Research - CUE	
CHEM 420	Cooperative Internship in Chemistry - CUE, WR	
CHEM 430	Practicum in Chemistry Education - CUE	
CHEM 491	Undergraduate Research - CUE	
CHEM 492	Undergraduate Research	
CHEM 528	Contemporary Methods of Synthesis and Analysis I - CUE	

Minimum Total Hours 51

Chemistry Electives

Code	Title	Hours
CHEM 425	Instrumental and Statistical Analysis	3
CHEM 430	Practicum in Chemistry Education - CUE	1
CHEM 445	Survey of Biochemistry ⁴	3
CHEM 515	Inorganic Chemistry	3
CHEM 528	Contemporary Methods of Synthesis and Analysis I - CUE	3
CHEM 529	Contemporary Methods of Synthesis and Analysis II	3
CHEM 545	Biochemistry I ⁴	3
CHEM 546	Biochemistry Laboratory	2
CHEM 547	Biochemistry II	3
CHEM 555	Theory and Application of Computational Chemistry	3
CHEM 557	Bio-Organic Phenomena	3
CHEM 390	Undergraduate Research - CUE, WR	3
CHEM 391	Undergraduate Research - CUE	1-3
CHEM 392	Undergraduate Research - CUE	1-3
CHEM 491	Undergraduate Research - CUE	1-3
CHEM 492	Undergraduate Research	1-3
CHEM 420	Cooperative Internship in Chemistry - CUE, WR	1-3

¹ Fulfills General Education requirement.

² CHEM 470 plus 3 semester hours of another WR course will fulfill the WR requirement.

³ See Chemistry Electives below. With the consent of the instructor(s), graduate level courses in Chemistry may also be used to fulfill these requirements.

⁴ Credit may not be earned for CHEM 445 and CHEM 545.

Flight Plan

Chemistry BS

Course	Title	Hours
Year 1		
Fall		
GEN 100 or GEN 101	Student Success Center Orientation or Arts and Sciences Orientation	1
ENGL 101	Introduction to College Writing - WC	3
General Education: Cardinal Core Arts & Humanities - AH		3
General Education: Cardinal Core Social & Behavioral Historical Perspectives - SBH		3
CHEM 201	General Chemistry I - S	3
CHEM 207	Introduction to Chemical Analysis I - SL	1
CHEM 208	Introduction to Chemical Analysis II - SL	1
Hours		15
Spring		
ENGL 102	Intermediate College Writing - WC	3
General Education: Cardinal Core Oral Communication - OC		3
MATH 205	Calculus I - QR	4
CHEM 202	General Chemistry II - S	3
CHEM 209	Introduction to Chemical Analysis III	1
CHEM 210	Introduction to Chemical Analysis IV	1
Hours		15
Year 2		
Fall		
Foreign Language 1		3-4
MATH 206	Calculus II	4
PHYS 221	Fundamentals of Physics I - S	3
PHYS 223	Fundamentals of Physics Lab I - SL	1
CHEM 341	Organic Chemistry I	3
CHEM 343	Organic Chemistry Laboratory I	2
Hours		16-17
Spring		
Foreign Language 2		3-4
MATH 301	Calculus III	4
PHYS 222	Fundamentals of Physics II - S	3
PHYS 224	Fundamentals of Physics Laboratory II - SL	1
CHEM 342	Organic Chemistry II	3
CHEM 344	Organic Chemistry Laboratory II	2
Hours		16-17
Year 3		
Fall		
CHEM 425	Instrumental and Statistical Analysis	3
CHEM 465	Physical Chemistry I	3
Chemistry Undergraduate Research or Co-Op		3
General Elective		3
General Elective		3
Hours		15
Spring		
Humanities or Social Science WR Elective (300 level or above)		3
CHEM 445 or CHEM 545	Survey of Biochemistry or Biochemistry I	3
CHEM 466	Physical Chemistry II	3
CHEM 470	Physical Chemistry Laboratory - WR	2

General Elective	3
Hours	14
Year 4	
Fall	
General Education: Cardinal Core Social & Behavioral US Diversity - SBD1	
Natural Science Elective (300 level or above)	3
Math, Physics, or Chemistry Elective (300 level or above)	3
CHEM 527	Introduction to Separations and Spectroscopy - WR
CHEM 515	Inorganic Chemistry
Hours	15
Spring	
General Education: Cardinal Core Arts & Humanities Global Diversity - AHD2	
General Elective	3
Humanities or Social Science Elective (300 level or above)	
CHEM 528	Contemporary Methods of Synthesis and Analysis I - CUE
CHEM 529	Contemporary Methods of Synthesis and Analysis II
Hours	15
Minimum Total Hours	121-123

Track in Biochemistry

Course	Title	Hours
Year 1		
Fall		
GEN 100 or GEN 101	Student Success Center Orientation or Arts and Sciences Orientation	1
ENGL 101	Introduction to College Writing - WC	3
General Education: Cardinal Core Arts & Humanities - AH		3
BIOL 240	Unity of Life - S	3
CHEM 201	General Chemistry I - S	3
CHEM 207	Introduction to Chemical Analysis I - SL	1
CHEM 208	Introduction to Chemical Analysis II - SL	1
Hours		15
Spring		
ENGL 102	Intermediate College Writing - WC	3
MATH 205	Calculus I - QR	4
BIOL 242	Diversity of Life - S	3
CHEM 202	General Chemistry II - S	3
CHEM 209	Introduction to Chemical Analysis III	1
CHEM 210	Introduction to Chemical Analysis IV	1
Hours		15
Year 2		
Fall		
MATH 206	Calculus II	4
PHYS 221	Fundamentals of Physics I - S	3
PHYS 223	Fundamentals of Physics Lab I - SL	1
BIOL 329	Cellular and Molecular Biology	3
CHEM 341	Organic Chemistry I	3
CHEM 343	Organic Chemistry Laboratory I	2
Hours		16
Spring		
MATH 301	Calculus III	4
PHYS 222	Fundamentals of Physics II - S	3
PHYS 224	Fundamentals of Physics Laboratory II - SL	1
CHEM 342	Organic Chemistry II	3
CHEM 344	Organic Chemistry Laboratory II	2
General Education: Cardinal Core Arts & Humanities Global Diversity - AHD2		3
Hours		16
Year 3		
Fall		
BIOL 330	Genetics and Molecular Biology	3

BIOL 331	Genetics and Molecular Biology: Laboratory	2
CHEM 465	Physical Chemistry I	3
Historical Perspectives-SBH		3
Chemistry Undergraduate Research or Co-op (CUE)		3
Hours		14
Spring		
General Education: Cardinal Core Oral Communication - OC		3
General Education: Cardinal Core Social & Behavioral US Diversity - SBD1		3
Foreign Language 1		4
CHEM 466	Physical Chemistry II	3
CHEM 470	Physical Chemistry Laboratory - WR	2
Hours		15
Year 4		
Fall		
Humanities or Social Science WR Elective (300 level or above)		3
Foreign Language 2		4
CHEM 527	Introduction to Separations and Spectroscopy - WR	3
CHEM 545	Biochemistry I	3
CHEM 546	Biochemistry Laboratory	2
Hours		15
Spring		
CHEM 547	Biochemistry II	3
Chemistry Elective		3
Biology or Chemistry Elective		3
Humanities or Social Science Elective (300 level or above)		3
General Elective		3
Hours		15
Minimum Total Hours		121

Track in Business

Course	Title	Hours
Year 1		
Fall		
GEN 100 or GEN 101	Student Success Center Orientation or Arts and Sciences Orientation	1
ENGL 101	Introduction to College Writing - WC	3
General Education: Cardinal Core Oral Communication - OC		3
ECON 201	Principles of Microeconomics - SB	3
CHEM 201	General Chemistry I - S	3
CHEM 207	Introduction to Chemical Analysis I - SL	1
CHEM 208	Introduction to Chemical Analysis II - SL	1
Hours		15
Spring		
ENGL 102	Intermediate College Writing - WC	3
MATH 205	Calculus I - QR	4
ECON 202	Principles of Macroeconomics - SB	3
CHEM 202	General Chemistry II - S	3
CHEM 209	Introduction to Chemical Analysis III	1
CHEM 210	Introduction to Chemical Analysis IV	1
General Education: Cardinal Core Social & Behavioral Historical Perspectives - SBH		3
Hours		18
Year 2		
Fall		
MATH 206	Calculus II	4
ACCT 201	Principles of Financial Accounting	3
PHYS 221	Fundamentals of Physics I - S	3
PHYS 223	Fundamentals of Physics Lab I - SL	1
CHEM 341	Organic Chemistry I	3
CHEM 343	Organic Chemistry Laboratory I	2
Hours		16

Spring		
ACCT 202	Principles of Managerial Accounting	3
CIS 250	Introduction to Data and Information Management	3
PHYS 222	Fundamentals of Physics II - S	3
PHYS 224	Fundamentals of Physics Laboratory II - SL	1
CHEM 342	Organic Chemistry II	3
CHEM 344	Organic Chemistry Laboratory II	2
Hours		15

Year 3		
Fall		
General Education: Cardinal Core Arts & Humanities US Diversity - AHD1		3
Foreign Language 1		3-4
CIS 300	Computer Information Systems	3
MGMT 201	Business Statistics	3
CHEM 441 or CHEM 465	Elements of Physical Chemistry or Physical Chemistry I	3
Hours		15-16

Spring		
Foreign Language 2		3-4
Humanities or Social Science WR Elective (300 level or above)		3
MGMT 301	Management and Organizational Behavior	3
CHEM 470	Physical Chemistry Laboratory - WR	2
Chemistry Elective		3
Chemistry Elective		3
Hours		17-18

Year 4		
Fall		
General Education: Cardinal Core Arts & Humanities Global Diversity - AHD2		3
MKT 301	Principles of Marketing	3
CHEM 527	Introduction to Separations and Spectroscopy - WR	3
Chemistry Electives		6
Hours		15

Spring		
CHEM 528	Contemporary Methods of Synthesis and Analysis I - CUE (or Undergraduate Research - CUE)	3
Chemistry Elective (300 level or above)		3
Humanities or Social Science Elective (300 level or above)		3
FIN 301	Corporate Finance	3
Business Elective (300 level)		3
Hours		15
Minimum Total Hours		126-128

Degree Audit Report

Degree Audit reports illustrate how your completed courses fulfill the requirements of your academic plan. What-if reports allow you to compare the courses you have completed in your current academic plan to the courses required in another academic plan. Should you have questions about either report, please consult with your academic advisor.

To create either report:

1. Log into your ULink account.
2. Click on the Student Services tab.
3. Next, click on "View my Academic Advisement Report" to run a Degree Audit report in the Undergraduate Advising area.
4. To create a What-if report, click on "Create a What-if Advisement Report."

Click here to run a Degree Audit report, or create a What-if report. (<https://ulink.louisville.edu>)

Flight Planner

Based on your major, the Flight Planner tool may be available for you to create a personalized Flight Plan. The Flight Planner can be found in the ULink Student Center. Consult with your advisor for assistance with the Flight Planner.