CHEMISTRY (BS)

This program was approved for students entering the university in the Summer 2023–Spring 2024 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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General Education Requirements (link above)</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>College/School Requirements</td>
<td>13-15</td>
</tr>
<tr>
<td></td>
<td>Program/Major Requirements</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Supporting Courses</td>
<td>16-18</td>
</tr>
<tr>
<td></td>
<td>Track Requirements</td>
<td>34-51</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General Education Requirements (link above)</td>
<td>31</td>
</tr>
</tbody>
</table>

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

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

*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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEN 100</td>
<td>Student Success Center First Year Experience</td>
<td>1</td>
</tr>
<tr>
<td>or GEN 101</td>
<td>Arts &amp; Sciences First Year Experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Foreign Language</td>
<td>6-8</td>
</tr>
</tbody>
</table>

1 Some foreign language courses may be used to satisfy the General Education Requirements. Students may satisfy the foreign language requirement by completing the following courses:

- French 101
- Spanish 101
- German 101
- Italian 101
- Russian 101
- Japanese 101
- Chinese 101
- Other languages approved by the department

Specific coursework information can be found on the Degree Requirements tab.
Electives in Humanities or Social Sciences at the 300-level or above  2  6
WR—two approved courses at the 300 level or above  3

Minimum Total Hours  13-15

<table>
<thead>
<tr>
<th>Program/Major Requirements</th>
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</thead>
<tbody>
<tr>
<td>Code</td>
</tr>
<tr>
<td>CHEM 201</td>
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<td>CHEM 202</td>
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<td>CHEM 207</td>
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<td>CHEM 344</td>
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<tr>
<td>CHEM 425</td>
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<tr>
<td>CHEM 470</td>
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</tbody>
</table>

Minimum Total Hours  25

<table>
<thead>
<tr>
<th>Supporting Courses</th>
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</thead>
<tbody>
<tr>
<td>Code</td>
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<tr>
<td>MATH 205</td>
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<tr>
<td>MATH 206</td>
</tr>
</tbody>
</table>

Complete one of the following sequences:  8-10
Sequence 1:
- PHYS 221 | Fundamentals of Physics I |
- PHYS 222 | Fundamentals of Physics II |
- PHYS 223 | Fundamentals of Physics Lab I |
- PHYS 224 | Fundamentals of Physics Laboratory II |

Sequence 2:
- PHYS 295 | Introductory Laboratories I |
- PHYS 296 | Introductory Laboratories II |
- PHYS 298 | Introductory Mechanics, Heat and Sound |
- PHYS 299 | Introductory Electricity, Magnetism and Light |

Minimum Total Hours  16-18

<table>
<thead>
<tr>
<th>Track Requirements</th>
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</thead>
<tbody>
<tr>
<td>Code</td>
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<tr>
<td>CHEM 426</td>
</tr>
<tr>
<td>CHEM 465</td>
</tr>
<tr>
<td>CHEM 466</td>
</tr>
</tbody>
</table>

Select two of the following CHEM Lecture Electives:  6
- CHEM 445 | Survey of Biochemistry |
- CHEM 515 | Inorganic Chemistry |
- CHEM 527 | Spectroscopic Identification of Organic Compounds |
- CHEM 545 | Biochemistry I |
- CHEM 547 | Biochemistry II |
- CHEM 550 | Group Theory and its Chemical Applications |
- CHEM 557 | Bio-Organic Phenomena |

Select two of the following CHEM Lab Electives:  4-5
- CHEM 528 | Contemporary Methods of Organic Synthesis and Analysis |
- CHEM 529 | Contemporary Methods of Inorganic Synthesis and Analysis |
- CHEM 546 | BIOCHEMISTRY LAB |
- CHEM 555 | Theory and Application of Computational Chemistry |

Select one of the following CHEM Research courses:  3
- CHEM 390 | Undergraduate Research |
- CHEM 391 | Undergraduate Research |
- CHEM 392 | Undergraduate Research |
- CHEM 491 | Undergraduate Research |
- CHEM 492 | Undergraduate Research |

MATH 301 | Calculus III (Select one of the following CHEM Research courses:) | 4 |

Electives  1  6
Elective  2  3

Minimum Total Hours  34-35

<table>
<thead>
<tr>
<th>Culminating Undergraduate Experience</th>
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</thead>
<tbody>
<tr>
<td>Code</td>
</tr>
<tr>
<td>CHEM 390</td>
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<td>CHEM 391</td>
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<tr>
<td>CHEM 392</td>
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<td>CHEM 420</td>
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<tr>
<td>CHEM 430</td>
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<tr>
<td>CHEM 491</td>
</tr>
<tr>
<td>CHEM 528</td>
</tr>
</tbody>
</table>

1 Completion of the second semester of a single foreign language; hours will vary depending on language taken
2 In addition to courses counted toward General Education
3 May be incorporated into other degree requirements
4 Fulfills General Education requirement.
5 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 (non-track option)
Academic Plan Code(s): CHM_BS

| Code | Title | Hours |
|-----------------------------|
| CHEM 426 | Instrumental and Statistical Analysis Laboratory | 2 |
| CHEM 465 | Physical Chemistry I | 3 |
| CHEM 466 | Physical Chemistry II | 3 |

Select two of the following CHEM Lecture Electives:  6
| Code | Title | Hours |
|-----------------------------|
| CHEM 445 | Survey of Biochemistry |
| CHEM 515 | Inorganic Chemistry |
| CHEM 527 | Spectroscopic Identification of Organic Compounds |
| CHEM 545 | Biochemistry I |
| CHEM 547 | Biochemistry II |
| CHEM 550 | Group Theory and its Chemical Applications |
| CHEM 557 | Bio-Organic Phenomena |

Select two of the following CHEM Lab Electives:  4-5
| Code | Title | Hours |
|-----------------------------|
| CHEM 528 | Contemporary Methods of Organic Synthesis and Analysis |
| CHEM 529 | Contemporary Methods of Inorganic Synthesis and Analysis |
| CHEM 546 | BIOCHEMISTRY LAB |
| CHEM 555 | Theory and Application of Computational Chemistry |

Select one of the following CHEM Research courses:  3
| Code | Title | Hours |
|-----------------------------|
| CHEM 390 | Undergraduate Research |
| CHEM 391 | Undergraduate Research |
| CHEM 392 | Undergraduate Research |
| CHEM 491 | Undergraduate Research |
| CHEM 492 | Undergraduate Research |

MATH 301 | Calculus III (Select one of the following CHEM Research courses:) | 4 |

Electives  1  6
Elective  2  3

Minimum Total Hours  34-35

Culminating Undergraduate Experience  Undergraduate Research
Chemistry (BS)

1 Electives in Mathematics, Physics, or Chemistry at 300 level or above.
2 Elective in Natural Sciences Division, other than Chemistry, at 300 level or above.

Chemistry BS (ACS track)
Academic Plan Code(s): CHEM_BS_ACS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 426</td>
<td>Instrumental and Statistical Analysis Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 445</td>
<td>Survey of Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 545</td>
<td>Biochemistry I</td>
<td></td>
</tr>
<tr>
<td>CHEM 465</td>
<td>Physical Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 466</td>
<td>Physical Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 515</td>
<td>Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 527</td>
<td>Spectroscopic Identification of Organic Compounds</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 528</td>
<td>Contemporary Methods of Organic Synthesis and Analysis</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 529</td>
<td>Contemporary Methods of Inorganic Synthesis and Analysis</td>
<td>2</td>
</tr>
<tr>
<td>Select on of the following CHEM research courses:</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHEM 390</td>
<td>Undergraduate Research</td>
<td></td>
</tr>
<tr>
<td>CHEM 391</td>
<td>Undergraduate Research</td>
<td></td>
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<tr>
<td>CHEM 392</td>
<td>Undergraduate Research</td>
<td></td>
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<tr>
<td>CHEM 491</td>
<td>Undergraduate Research</td>
<td></td>
</tr>
<tr>
<td>CHEM 492</td>
<td>Undergraduate Research</td>
<td></td>
</tr>
<tr>
<td>MATH 301</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>Elective 1</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Elective 2</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Minimum Total Hours 34

Culminating Undergraduate Experience Undergraduate Research

1 Electives in Mathematics, Physics or Chemistry at 300 level or above.
2 Elective in Natural Sciences Division, other than Chemistry, at 300 level or above.

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 441</td>
<td>Elements of Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 465</td>
<td>Physical Chemistry I</td>
<td></td>
</tr>
<tr>
<td>CHEM 445</td>
<td>Survey of Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 545</td>
<td>Biochemistry I</td>
<td></td>
</tr>
<tr>
<td>CHEM 515</td>
<td>Inorganic Chemistry</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 426</td>
<td>Instrumental and Statistical Analysis Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 528</td>
<td>Contemporary Methods of Organic Synthesis and Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

Track in Business
Academic Plan Code(s): 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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 441</td>
<td>Elements of Physical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 465</td>
<td>Physical Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 445</td>
<td>Survey of Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 515</td>
<td>Inorganic Chemistry</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 426</td>
<td>Instrumental and Statistical Analysis Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 528</td>
<td>Contemporary Methods of Organic Synthesis and Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>
CHEM 529  Contemporary Methods of Inorganic Synthesis and Analysis
CHEM 546  BIOCHEMISTRY LAB

Chemistry Research or Internship - Select one of the following: 3
CHEM 390  Undergraduate Research
CHEM 391  Undergraduate Research
CHEM 392  Undergraduate Research
CHEM 420  Cooperative Internship in Chemistry
CHEM 491  Undergraduate Research
CHEM 492  Undergraduate Research

CHEM electives at 300 level or above (other than Independent Study) 2-3
- See table below

Supporting Courses
ECON 201  Principles of Microeconomics 3
ECON 202  Principles of Macroeconomics 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 201  Business Statistics
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
CHEM 391  Undergraduate Research
CHEM 392  Undergraduate Research
CHEM 420  Cooperative Internship in Chemistry
CHEM 430  Practicum in Chemistry Education
CHEM 491  Undergraduate Research

Minimum Total Hours 49-50

Chemistry Electives
Code  Title  Hours
CHEM 390  Undergraduate Research 3
CHEM 391  Undergraduate Research 1-3
CHEM 392  Undergraduate Research 1-3
CHEM 420  Cooperative Internship in Chemistry 1-3
CHEM 491  Undergraduate Research 1-3
CHEM 492  Undergraduate Research 1-3
CHEM 527  Spectroscopic Identification of Organic Compounds 3
CHEM 528  Contemporary Methods of Organic Synthesis and Analysis 3
CHEM 529  Contemporary Methods of Inorganic Synthesis and Analysis 3
CHEM 546  BIOCHEMISTRY LAB 2
CHEM 547  Biochemistry II 3
CHEM 555  Theory and Application of Computational Chemistry 3
CHEM 557  Bio-Organic Phenomena 3

1 Fulfills General Education requirement.
2 CHEM 470 plus 3 semester hours of another WR course will fulfill the WR requirement.
3 With the consent of the instructor(s), graduate level courses in Chemistry may also be used to fulfill these requirements.

Flight Plan

Chemistry BS
Year 1
Fall
CHEM 201  General Chemistry I 3
CHEM 207  Introduction to Chemical Analysis I 1
CHEM 208  Introduction to Chemical Analysis II 1
GEN 100  Student Success Center First Year Experience 1
GEN 101  Arts & Sciences First Year Experience 1
ENGL 101  Introduction to College Writing 3
General Education: Cardinal Core Arts & Humanities - AH 3
General Education: Social & Behavioral Sciences and Historical Perspective (SBH) 3

Hours 15

Spring
CHEM 202  General Chemistry II 3
CHEM 209  Introduction to Chemical Analysis III 1
CHEM 210  Introduction to Chemical Analysis IV 1
MATH 205  Calculus I 4
ENGL 102  Intermediate College Writing 3
General Education: Cardinal Core Oral Communication - OC 3

Hours 15

Year 2
Fall
CHEM 341  Organic Chemistry I 3
CHEM 343  Organic Chemistry Laboratory I 2
PHYS 221  Fundamentals of Physics I 3
PHYS 222  Fundamentals of Physics Lab I 1
MATH 206  Calculus II 4
Foreign Language 1 3-4

Hours 16-17

Spring
CHEM 342  Organic Chemistry II 3
CHEM 344  Organic Chemistry Laboratory II 2
PHYS 222  Fundamentals of Physics II 3
PHYS 224  Fundamentals of Physics Laboratory II 1
MATH 301  Calculus III 4
Foreign Language 2 3-4

Hours 16-17

Year 3
Fall
CHEM 425  Instrumental and Statistical Analysis 3
CHEM 465  Physical Chemistry I 3
CHEM 426  Instrumental and Statistical Analysis Laboratory 2
Chemistry Undergraduate Research or Co-Op 3
Math, Physics, or Chemistry Elective (300 level or above) 3

Hours 14
## Track in Biochemistry

### Year 1

#### Fall
- **CHEM 201**: General Chemistry I  
- **CHEM 202**: Introduction to Chemical Analysis I  
- **CHEM 207**: Introduction to Chemical Analysis II  
- **Biol 240**: Unity of Life  
- **GEN 100**: Student Success Center First Year Experience  
- **ENGL 101**: Introduction to College Writing  
- **CHEM 529**: Inorganic Chemistry

#### Spring
- **CHEM 205**: Calculus I  
- **MATH 205**: Calculus I  
- **CHEM 528**: Contemporary Methods of Organic Synthesis and Analysis  
- **CHEM 529**: Contemporary Methods of Inorganic Synthesis and Analysis  
- **Chemistry Elective**  
- **General Education: Cardinal Core Social & Behavioral US Diversity - SBD1**

#### Hours
- **15**

### Minimum Total Hours
- **121-123**

## Track in Business

### Year 1

#### Fall
- **CHEM 201**: General Chemistry I  
- **CHEM 202**: Introduction to Chemical Analysis III  
- **CHEM 207**: Introduction to Chemical Analysis IV  
- **Biol 242**: Diversity of Life  
- **ENGL 102**: Intermediate College Writing  
- **MATH 205**: Calculus I  
- **CHEM 547**: Biochemistry II

#### Spring
- **CHEM 202**: General Chemistry II  
- **CHEM 209**: Organic Chemistry I  
- **CHEM 210**: Organic Chemistry Laboratory I  
- **PHYS 221**: Fundamentals of Physics I  
- **PHYS 223**: Fundamentals of Physics Lab I  
- **MATH 206**: Calculus II

#### Hours
- **16**

### Minimum Total Hours
- **15**

## Track in Business

### Year 1

#### Fall
- **CHEM 201**: General Chemistry I  
- **CHEM 207**: Introduction to Chemical Analysis I  
- **CHEM 208**: Introduction to Chemical Analysis II  
- **ECO 201**: Principles of Macroeconomics  
- **GEN 100**: Student Success Center First Year Experience  
- **ENGL 101**: Introduction to College Writing  
- **CHEM 546**: BIOCHEMISTRY LAB

#### Spring
- **CHEM 202**: General Chemistry II  
- **CHEM 209**: Introduction to Chemical Analysis III  
- **CHEM 210**: Introduction to Chemical Analysis IV  
- **ECO 202**: Principles of Microeconomics  
- **MATH 205**: Calculus I  
- **ENGL 102**: Intermediate College Writing  
- **CHEM 445**: Organic Chemistry II

#### Hours
- **16**

### Minimum Total Hours
- **15**

## Track in Business

### Year 1

#### Fall
- **CHEM 201**: General Chemistry I  
- **CHEM 207**: Introduction to Chemical Analysis I  
- **CHEM 208**: Introduction to Chemical Analysis II  
- **ECO 201**: Principles of Macroeconomics  
- **GEN 100**: Student Success Center First Year Experience  
- **ENGL 101**: Introduction to College Writing  
- **CHEM 445**: Organic Chemistry II

#### Spring
- **CHEM 202**: General Chemistry II  
- **CHEM 209**: Introduction to Chemical Analysis III  
- **CHEM 210**: Introduction to Chemical Analysis IV  
- **ECO 202**: Principles of Microeconomics  
- **MATH 205**: Calculus I  
- **ENGL 102**: Intermediate College Writing  
- **CHEM 445**: Organic Chemistry II

#### Hours
- **16**

### Minimum Total Hours
- **15**
The Flight Planner tool is available for you to create a personalized Flight Plan to graduation. Advisors have access to review your Flight Planner and can help you adjust it to ensure you remain on track to graduate in a timely manner.

To create these reports:

a. Log into your ULink account.
b. Click on the Academic Progress tile.
c. Select the appropriate report.
   i. To run a Degree Audit report, click on "View my Degree Audit."
   ii. To create a What-if report, click on "Create a What-if Advisement Report."
   iii. To run a Flight Planner report, click on "Use My Flight Planner."

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